== Cumulative global warming exam version B ==

<quiz display=simple>

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

+a) all of these are true

-b) by verifying its ability to calculate current climate conditions.

-c) by verifying its ability to calculate past climate conditions.

-d) by making predictions about future years and seeing if they come true.

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 10%

-b) 50%

+c) 0%

-d) 30%

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

+b) both of these are true

-c) ice and snow melts

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Anthropogenic means something that}

-a) humans cannot repair

-b) humans can repair

-c) will hurt humans

+d) human caused

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) about the same

+b) twice as much

-c) half as much

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

+b) cement production and land use changes

-c) population growth

-d) population growth and waste disposal

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) on the ocean surface

-c) near the equator

-d) in the western hemisphere

{Which external force plays the smallest role in current efforts to model global warming?}

+a) orbital cycles

-b) greenhouse gasses

-c) volcanic eruptions

-d) solar luminosity (i.e. variations in energy from the sun)

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{What happens when water is heated?}

-a) it absorbs CO2

+b) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

-b) 0.7 &deg;C per year

+c) 0.7 &deg;C per century

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 90% of the academies of science

-b) all but the US academy of science

-c) 60% of the academies of science

+d) all of the academies of science

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-b) estimates of how greenhouse gasses are absorbed and emitted by nature

+c) estimates of changes in future emission levels of greenhouse gases

-d) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Changes in ice-albedo refers to changes in}

+a) how much the Earth's surface absorbs or reflects incoming sunlight

-b) how much CO2 is absorbed by the sun

-c) how much ice is melted during the summer months

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the contributions from everything except fossil fuels

+c) estimates made in the year 2000 of what would happen in the future

-d) estimates of the impact on land temperatures

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

+a) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{In climate science, mitigation refers to:}

-a) adaptation to the effects of global warming

-b) climate engineering

+c) reduction of green house emissions

-d) building systems resilient to the effects of global warming

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the Little Ice Age being less prominent than the Medieval Warming period

-b) a divergence between the tree and pollen proxy measurements

+c) a tiny gap at the end of the proxy measurements

-d) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) tree proxy measurements

-b) the Medieval Warming Period

-c) the Little Ice Age

+d) thermometer measurements

-e) a 10 year average

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) is more related to the ozone problem than to global warming

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 30%

+b) 3%

-c) 0%

-d) 0.3%

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 1.6&deg; Celsius

-b) 0.16&deg; Celsius

-c) 16&deg; Celsius

-d) 0.06&deg; Celsius

+e) 0.6&deg; Celsius

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The [[w:cryosphere|cryosphere]] refers to}

+a) two of these are true

-b) the north and south poles

-c) the upper atmosphere

-d) the highest mountains

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Central Europe has warmed more than the continental United States

+b) all portions of Antarctica have warmed

-c) The United States has warmed more than Australia

-d) Northern Asia has warmed more than southern Asia

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

-b) is an effort to store carbon in underground caves.

+c) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) about the same

-b) twice as much

+c) half as much

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

-b) 7.0&deg;C

+c) 0.07&deg;C

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the earth's distance from the sun

+b) the world economy

-c) worldwide efforts to curtail emissions

-d) the sun's energy output

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

+a) 10

-b) 30

-c) 300

-d) 100

-e) 3

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the equators

-b) land; near the poles

-c) sea; in the bottom kilometer

+d) sea; in the top kilometer

-e) air; in the water vapor

</quiz>

== Cumulative global warming exam version C ==

<quiz display=simple>

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) half as much

-b) about the same

+c) twice as much

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Changes in ice-albedo refers to changes in}

+a) how much the Earth's surface absorbs or reflects incoming sunlight

-b) how much CO2 is absorbed by the sun

-c) how much ice is melted during the summer months

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Which external force plays the smallest role in current efforts to model global warming?}

-a) solar luminosity (i.e. variations in energy from the sun)

-b) greenhouse gasses

+c) orbital cycles

-d) volcanic eruptions

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Medieval Warming Period

-b) the Little Ice Age

+c) thermometer measurements

-d) a 10 year average

-e) tree proxy measurements

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-b) estimates of how greenhouse gasses are absorbed and emitted by nature

+c) estimates of changes in future emission levels of greenhouse gases

-d) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 100

+b) 10

-c) 300

-d) 30

-e) 3

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The [[w:cryosphere|cryosphere]] refers to}

+a) two of these are true

-b) the north and south poles

-c) the highest mountains

-d) the upper atmosphere

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate past climate conditions.

-b) by making predictions about future years and seeing if they come true.

-c) by verifying its ability to calculate current climate conditions.

+d) all of these are true

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is an effort to store carbon in underground caves.

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

+a) cement production and land use changes

-b) population growth

-c) population growth and waste disposal

-d) cement production and waste disposal

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-b) a divergence between the tree and pollen proxy measurements

-c) the Little Ice Age being less prominent than the Medieval Warming period

+d) a tiny gap at the end of the proxy measurements

{In climate science, mitigation refers to:}

+a) reduction of green house emissions

-b) climate engineering

-c) adaptation to the effects of global warming

-d) building systems resilient to the effects of global warming

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the equators

-b) land; near the poles

-c) air; in the water vapor

+d) sea; in the top kilometer

-e) sea; in the bottom kilometer

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 60% of the academies of science

-b) 90% of the academies of science

-c) all but the US academy of science

+d) all of the academies of science

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

+b) both of these are true

-c) water tends to expand as it warms

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

+a) 0.07&deg;C

-b) 7.0&deg;C

-c) 0.7&deg;C

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 30%

+b) 0%

-c) 50%

-d) 10%

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) about the same

-b) twice as much

+c) half as much

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

-c) it absorbs CO2

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the contributions from everything except fossil fuels

-c) estimates of the impact on land temperatures

+d) estimates made in the year 2000 of what would happen in the future

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 1.6&deg; Celsius

-b) 16&deg; Celsius

+c) 0.6&deg; Celsius

-d) 0.06&deg; Celsius

-e) 0.16&deg; Celsius

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) is more related to the ozone problem than to global warming

+b) exerts a cooling effect by increasing the reflection of incoming sunlight

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0%

+b) 3%

-c) 0.3%

-d) 30%

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Anthropogenic means something that}

-a) humans can repair

-b) will hurt humans

-c) humans cannot repair

+d) human caused

{The largest temperature increases (from 2000-2009) have occurred }

-a) on the ocean surface

+b) near the poles

-c) near the equator

-d) in the western hemisphere

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per year

-b) 0.7 &deg;C per decade

+c) 0.7 &deg;C per century

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the earth's distance from the sun

-b) the sun's energy output

-c) worldwide efforts to curtail emissions

+d) the world economy

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

+a) all portions of Antarctica have warmed

-b) Northern Asia has warmed more than southern Asia

-c) The United States has warmed more than Australia

-d) Central Europe has warmed more than the continental United States

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

</quiz>

== Cumulative global warming exam version D ==

<quiz display=simple>

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Changes in ice-albedo refers to changes in}

+a) how much the Earth's surface absorbs or reflects incoming sunlight

-b) how much CO2 is absorbed by the sun

-c) how much ice is melted during the summer months

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

+a) the world economy

-b) the sun's energy output

-c) worldwide efforts to curtail emissions

-d) the earth's distance from the sun

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{In climate science, mitigation refers to:}

+a) reduction of green house emissions

-b) adaptation to the effects of global warming

-c) climate engineering

-d) building systems resilient to the effects of global warming

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) twice as much

-c) about the same

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 7.0&deg;C

+b) 0.07&deg;C

-c) 0.7&deg;C

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 30%

-b) 0%

-c) 0.3%

+d) 3%

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

+a) 10

-b) 30

-c) 3

-d) 300

-e) 100

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) tree proxy measurements

-b) the Medieval Warming Period

+c) thermometer measurements

-d) a 10 year average

-e) the Little Ice Age

{Emissions scenarios are}

+a) estimates of changes in future emission levels of greenhouse gases

-b) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-c) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-d) estimates of how greenhouse gasses are absorbed and emitted by nature

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

-b) 0.7 &deg;C per year

+c) 0.7 &deg;C per century

{Which external force plays the smallest role in current efforts to model global warming?}

-a) greenhouse gasses

-b) volcanic eruptions

+c) orbital cycles

-d) solar luminosity (i.e. variations in energy from the sun)

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{What happens when water is heated?}

-a) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

+b) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-c) it absorbs CO2

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

+a) cement production and land use changes

-b) population growth and waste disposal

-c) cement production and waste disposal

-d) population growth

{How is the validity of a computer model typically tested?}

+a) all of these are true

-b) by making predictions about future years and seeing if they come true.

-c) by verifying its ability to calculate past climate conditions.

-d) by verifying its ability to calculate current climate conditions.

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

-b) ice and snow melts

+c) both of these are true

{Anthropogenic means something that}

+a) human caused

-b) humans can repair

-c) humans cannot repair

-d) will hurt humans

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 30%

-b) 50%

+c) 0%

-d) 10%

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 90% of the academies of science

-b) all but the US academy of science

+c) all of the academies of science

-d) 60% of the academies of science

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 1.6&deg; Celsius

-b) 0.06&deg; Celsius

+c) 0.6&deg; Celsius

-d) 0.16&deg; Celsius

-e) 16&deg; Celsius

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) air; in the water vapor

+b) sea; in the top kilometer

-c) land; near the poles

-d) land; near the equators

-e) sea; in the bottom kilometer

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) about the same

-c) half as much

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) is more related to the ozone problem than to global warming

+b) exerts a cooling effect by increasing the reflection of incoming sunlight

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Northern Asia has warmed more than southern Asia

+b) all portions of Antarctica have warmed

-c) Central Europe has warmed more than the continental United States

-d) The United States has warmed more than Australia

{The [[w:cryosphere|cryosphere]] refers to}

-a) the upper atmosphere

-b) the north and south poles

+c) two of these are true

-d) the highest mountains

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the contributions from everything except fossil fuels

+c) estimates made in the year 2000 of what would happen in the future

-d) estimates of the impact on land temperatures

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

+a) a tiny gap at the end of the proxy measurements

-b) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-c) a divergence between the tree and pollen proxy measurements

-d) the Little Ice Age being less prominent than the Medieval Warming period

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

{The largest temperature increases (from 2000-2009) have occurred }

-a) on the ocean surface

-b) near the equator

+c) near the poles

-d) in the western hemisphere

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is an effort to store carbon in underground caves.

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

</quiz>

== Cumulative global warming exam version E ==

<quiz display=simple>

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

+b) cement production and land use changes

-c) population growth

-d) population growth and waste disposal

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the north and south poles

+b) two of these are true

-c) the highest mountains

-d) the upper atmosphere

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) about the same

-b) twice as much

+c) half as much

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the sun's energy output

+b) the world economy

-c) the earth's distance from the sun

-d) worldwide efforts to curtail emissions

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) a 10 year average

-b) the Medieval Warming Period

-c) the Little Ice Age

-d) tree proxy measurements

+e) thermometer measurements

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 30%

-b) 0%

+c) 3%

-d) 0.3%

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) about the same

-c) half as much

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-b) estimates of how greenhouse gasses are absorbed and emitted by nature

-c) estimates of how greenhouse gasses are absorbed and emitted by agriculture

+d) estimates of changes in future emission levels of greenhouse gases

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) a divergence between the tree and pollen proxy measurements

-b) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-c) the Little Ice Age being less prominent than the Medieval Warming period

+d) a tiny gap at the end of the proxy measurements

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) in the western hemisphere

-c) near the equator

-d) on the ocean surface

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate current climate conditions.

-b) by making predictions about future years and seeing if they come true.

+c) all of these are true

-d) by verifying its ability to calculate past climate conditions.

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

-b) greenhouse gasses

+c) orbital cycles

-d) solar luminosity (i.e. variations in energy from the sun)

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{The [[w:carbon cycle|carbon cycle]] }

-a) is an effort to store carbon in underground caves.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is a proposal to trade carbon credits.

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 7.0&deg;C

+b) 0.07&deg;C

-c) 0.7&deg;C

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.06&deg; Celsius

+b) 0.6&deg; Celsius

-c) 16&deg; Celsius

-d) 1.6&deg; Celsius

-e) 0.16&deg; Celsius

{What happens when water is heated?}

-a) it absorbs CO2

-b) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

+c) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the equators

+b) sea; in the top kilometer

-c) sea; in the bottom kilometer

-d) land; near the poles

-e) air; in the water vapor

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) exerts a heating effect by absorbing infra-red radiation from earth's surface

+b) exerts a cooling effect by increasing the reflection of incoming sunlight

-c) is more related to the ozone problem than to global warming

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{In climate science, mitigation refers to:}

+a) reduction of green house emissions

-b) climate engineering

-c) building systems resilient to the effects of global warming

-d) adaptation to the effects of global warming

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

-b) 0.7 &deg;C per year

+c) 0.7 &deg;C per century

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Northern Asia has warmed more than southern Asia

+b) all portions of Antarctica have warmed

-c) Central Europe has warmed more than the continental United States

-d) The United States has warmed more than Australia

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

{Anthropogenic means something that}

-a) humans cannot repair

-b) will hurt humans

-c) humans can repair

+d) human caused

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

+b) both of these are true

-c) water tends to expand as it warms

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the impact on land temperatures

+c) estimates made in the year 2000 of what would happen in the future

-d) estimates of the contributions from everything except fossil fuels

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 3

-b) 30

-c) 100

+d) 10

-e) 300

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 60% of the academies of science

+b) all of the academies of science

-c) all but the US academy of science

-d) 90% of the academies of science

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 50%

-b) 10%

+c) 0%

-d) 30%

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Changes in ice-albedo refers to changes in}

-a) how much ice is melted during the summer months

-b) how much CO2 is absorbed by the sun

+c) how much the Earth's surface absorbs or reflects incoming sunlight

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

</quiz>

== Cumulative global warming exam version F ==

<quiz display=simple>

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Which external force plays the smallest role in current efforts to model global warming?}

+a) orbital cycles

-b) solar luminosity (i.e. variations in energy from the sun)

-c) greenhouse gasses

-d) volcanic eruptions

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Medieval Warming Period

+b) thermometer measurements

-c) tree proxy measurements

-d) a 10 year average

-e) the Little Ice Age

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) on the ocean surface

-c) near the equator

-d) in the western hemisphere

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by nature

-b) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

+c) estimates of changes in future emission levels of greenhouse gases

-d) estimates of how greenhouse gasses are absorbed and emitted by agriculture

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) exerts a heating effect by absorbing infra-red radiation from earth's surface

-b) is more related to the ozone problem than to global warming

+c) exerts a cooling effect by increasing the reflection of incoming sunlight

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Changes in ice-albedo refers to changes in}

-a) how much CO2 is absorbed by the sun

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much ice is melted during the summer months

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the sun's energy output

-b) worldwide efforts to curtail emissions

+c) the world economy

-d) the earth's distance from the sun

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{In climate science, mitigation refers to:}

-a) climate engineering

-b) building systems resilient to the effects of global warming

+c) reduction of green house emissions

-d) adaptation to the effects of global warming

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate past climate conditions.

-b) by making predictions about future years and seeing if they come true.

-c) by verifying its ability to calculate current climate conditions.

+d) all of these are true

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the poles

-b) land; near the equators

+c) sea; in the top kilometer

-d) sea; in the bottom kilometer

-e) air; in the water vapor

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Northern Asia has warmed more than southern Asia

-b) Central Europe has warmed more than the continental United States

+c) all portions of Antarctica have warmed

-d) The United States has warmed more than Australia

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

+a) all of the academies of science

-b) 90% of the academies of science

-c) 60% of the academies of science

-d) all but the US academy of science

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Anthropogenic means something that}

-a) will hurt humans

-b) humans cannot repair

-c) humans can repair

+d) human caused

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

+b) both of these are true

-c) ice and snow melts

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

+a) 0.6&deg; Celsius

-b) 0.06&deg; Celsius

-c) 0.16&deg; Celsius

-d) 1.6&deg; Celsius

-e) 16&deg; Celsius

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per year

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 30

-b) 300

+c) 10

-d) 3

-e) 100

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) twice as much

-c) about the same

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) half as much

-c) about the same

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

+c) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 10%

+b) 0%

-c) 30%

-d) 50%

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

+a) 3%

-b) 0%

-c) 0.3%

-d) 30%

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the upper atmosphere

-b) the north and south poles

+c) two of these are true

-d) the highest mountains

{The [[w:carbon cycle|carbon cycle]] }

-a) is an effort to store carbon in underground caves.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is a proposal to trade carbon credits.

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) a divergence between the tree and pollen proxy measurements

-b) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-c) the Little Ice Age being less prominent than the Medieval Warming period

+d) a tiny gap at the end of the proxy measurements

{What happens when water is heated?}

-a) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

-b) it absorbs CO2

+c) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

-b) 7.0&deg;C

+c) 0.07&deg;C

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the contributions from everything except fossil fuels

-c) estimates of the impact on land temperatures

+d) estimates made in the year 2000 of what would happen in the future

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

+b) cement production and land use changes

-c) population growth

-d) population growth and waste disposal

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

</quiz>

== Cumulative global warming exam version G ==

<quiz display=simple>

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) about the same

-b) twice as much

+c) half as much

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0%

-b) 0.3%

+c) 3%

-d) 30%

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) a 10 year average

-b) the Medieval Warming Period

-c) the Little Ice Age

+d) thermometer measurements

-e) tree proxy measurements

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{The [[w:carbon cycle|carbon cycle]] }

-a) is an effort to store carbon in underground caves.

-b) is a proposal to trade carbon credits.

+c) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Which external force plays the smallest role in current efforts to model global warming?}

+a) orbital cycles

-b) solar luminosity (i.e. variations in energy from the sun)

-c) greenhouse gasses

-d) volcanic eruptions

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) exerts a heating effect by absorbing infra-red radiation from earth's surface

-b) is more related to the ozone problem than to global warming

+c) exerts a cooling effect by increasing the reflection of incoming sunlight

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 16&deg; Celsius

-b) 0.16&deg; Celsius

-c) 1.6&deg; Celsius

+d) 0.6&deg; Celsius

-e) 0.06&deg; Celsius

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

-b) ice and snow melts

+c) both of these are true

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) worldwide efforts to curtail emissions

-b) the sun's energy output

-c) the earth's distance from the sun

+d) the world economy

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-b) a divergence between the tree and pollen proxy measurements

+c) a tiny gap at the end of the proxy measurements

-d) the Little Ice Age being less prominent than the Medieval Warming period

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) sea; in the bottom kilometer

-b) air; in the water vapor

+c) sea; in the top kilometer

-d) land; near the poles

-e) land; near the equators

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 50%

+b) 0%

-c) 10%

-d) 30%

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-b) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-c) estimates of how greenhouse gasses are absorbed and emitted by nature

+d) estimates of changes in future emission levels of greenhouse gases

{Changes in ice-albedo refers to changes in}

+a) how much the Earth's surface absorbs or reflects incoming sunlight

-b) how much ice is melted during the summer months

-c) how much CO2 is absorbed by the sun

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 100

-b) 30

-c) 300

+d) 10

-e) 3

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) population growth and waste disposal

+b) cement production and land use changes

-c) population growth

-d) cement production and waste disposal

{What happens when water is heated?}

-a) it absorbs CO2

+b) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the contributions from everything except fossil fuels

-c) estimates of the impact on land temperatures

+d) estimates made in the year 2000 of what would happen in the future

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 60% of the academies of science

+b) all of the academies of science

-c) 90% of the academies of science

-d) all but the US academy of science

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) The United States has warmed more than Australia

-b) Northern Asia has warmed more than southern Asia

-c) Central Europe has warmed more than the continental United States

+d) all portions of Antarctica have warmed

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) about the same

-c) half as much

{Anthropogenic means something that}

-a) will hurt humans

+b) human caused

-c) humans cannot repair

-d) humans can repair

{The largest temperature increases (from 2000-2009) have occurred }

-a) in the western hemisphere

-b) on the ocean surface

+c) near the poles

-d) near the equator

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{In climate science, mitigation refers to:}

-a) climate engineering

-b) adaptation to the effects of global warming

+c) reduction of green house emissions

-d) building systems resilient to the effects of global warming

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

+a) 0.07&deg;C

-b) 7.0&deg;C

-c) 0.7&deg;C

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the upper atmosphere

-b) the north and south poles

-c) the highest mountains

+d) two of these are true

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per year

-b) 0.7 &deg;C per decade

+c) 0.7 &deg;C per century

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate current climate conditions.

+b) all of these are true

-c) by making predictions about future years and seeing if they come true.

-d) by verifying its ability to calculate past climate conditions.

</quiz>

== Cumulative global warming exam version H ==

<quiz display=simple>

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 10%

-c) 50%

-d) 30%

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 3

-b) 100

-c) 30

+d) 10

-e) 300

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it absorbs CO2

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) worldwide efforts to curtail emissions

-b) the sun's energy output

+c) the world economy

-d) the earth's distance from the sun

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Emissions scenarios are}

+a) estimates of changes in future emission levels of greenhouse gases

-b) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-c) estimates of how greenhouse gasses are absorbed and emitted by nature

-d) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

-b) solar luminosity (i.e. variations in energy from the sun)

-c) greenhouse gasses

+d) orbital cycles

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

-b) 0.7 &deg;C per year

+c) 0.7 &deg;C per century

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the impact on land temperatures

-b) estimates of the contributions from everything except fossil fuels

-c) estimates of the contributions from fossil fuels alone

+d) estimates made in the year 2000 of what would happen in the future

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) on the ocean surface

-c) in the western hemisphere

-d) near the equator

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) exerts a heating effect by absorbing infra-red radiation from earth's surface

-c) is more related to the ozone problem than to global warming

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{In climate science, mitigation refers to:}

-a) climate engineering

-b) building systems resilient to the effects of global warming

+c) reduction of green house emissions

-d) adaptation to the effects of global warming

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 60% of the academies of science

-b) 90% of the academies of science

-c) all but the US academy of science

+d) all of the academies of science

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

+a) 0.07&deg;C

-b) 7.0&deg;C

-c) 0.7&deg;C

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) sea; in the bottom kilometer

-b) air; in the water vapor

-c) land; near the poles

-d) land; near the equators

+e) sea; in the top kilometer

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) about the same

-c) twice as much

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

+a) cement production and land use changes

-b) population growth and waste disposal

-c) population growth

-d) cement production and waste disposal

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) half as much

-b) about the same

+c) twice as much

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate current climate conditions.

-b) by making predictions about future years and seeing if they come true.

+c) all of these are true

-d) by verifying its ability to calculate past climate conditions.

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Changes in ice-albedo refers to changes in}

-a) how much CO2 is absorbed by the sun

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much ice is melted during the summer months

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Medieval Warming Period

-b) the Little Ice Age

-c) a 10 year average

+d) thermometer measurements

-e) tree proxy measurements

{The [[w:cryosphere|cryosphere]] refers to}

-a) the north and south poles

-b) the upper atmosphere

+c) two of these are true

-d) the highest mountains

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-b) the Little Ice Age being less prominent than the Medieval Warming period

+c) a tiny gap at the end of the proxy measurements

-d) a divergence between the tree and pollen proxy measurements

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) The United States has warmed more than Australia

-b) Central Europe has warmed more than the continental United States

+c) all portions of Antarctica have warmed

-d) Northern Asia has warmed more than southern Asia

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Anthropogenic means something that}

-a) humans cannot repair

-b) humans can repair

+c) human caused

-d) will hurt humans

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 1.6&deg; Celsius

+b) 0.6&deg; Celsius

-c) 16&deg; Celsius

-d) 0.06&deg; Celsius

-e) 0.16&deg; Celsius

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0%

+b) 3%

-c) 0.3%

-d) 30%

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

-b) is an effort to store carbon in underground caves.

+c) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

+b) both of these are true

-c) ice and snow melts

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

</quiz>

== Cumulative global warming exam version I ==

<quiz display=simple>

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{The largest temperature increases (from 2000-2009) have occurred }

-a) on the ocean surface

+b) near the poles

-c) near the equator

-d) in the western hemisphere

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-b) estimates of how greenhouse gasses are absorbed and emitted by nature

-c) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

+d) estimates of changes in future emission levels of greenhouse gases

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 7.0&deg;C

-b) 0.7&deg;C

+c) 0.07&deg;C

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) The United States has warmed more than Australia

-b) Northern Asia has warmed more than southern Asia

-c) Central Europe has warmed more than the continental United States

+d) all portions of Antarctica have warmed

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) about the same

+b) twice as much

-c) half as much

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the poles

-b) land; near the equators

+c) sea; in the top kilometer

-d) sea; in the bottom kilometer

-e) air; in the water vapor

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

+b) a tiny gap at the end of the proxy measurements

-c) a divergence between the tree and pollen proxy measurements

-d) the Little Ice Age being less prominent than the Medieval Warming period

{Changes in ice-albedo refers to changes in}

-a) how much ice is melted during the summer months

-b) how much CO2 is absorbed by the sun

+c) how much the Earth's surface absorbs or reflects incoming sunlight

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Anthropogenic means something that}

-a) humans can repair

+b) human caused

-c) will hurt humans

-d) humans cannot repair

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

-b) greenhouse gasses

+c) orbital cycles

-d) solar luminosity (i.e. variations in energy from the sun)

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) about the same

+b) half as much

-c) twice as much

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

+b) both of these are true

-c) water tends to expand as it warms

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the north and south poles

-b) the highest mountains

+c) two of these are true

-d) the upper atmosphere

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 10%

-b) 50%

-c) 30%

+d) 0%

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) exerts a heating effect by absorbing infra-red radiation from earth's surface

-b) is more related to the ozone problem than to global warming

+c) exerts a cooling effect by increasing the reflection of incoming sunlight

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from everything except fossil fuels

+b) estimates made in the year 2000 of what would happen in the future

-c) estimates of the impact on land temperatures

-d) estimates of the contributions from fossil fuels alone

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{How is the validity of a computer model typically tested?}

-a) by making predictions about future years and seeing if they come true.

-b) by verifying its ability to calculate current climate conditions.

-c) by verifying its ability to calculate past climate conditions.

+d) all of these are true

{In climate science, mitigation refers to:}

-a) building systems resilient to the effects of global warming

-b) climate engineering

+c) reduction of green house emissions

-d) adaptation to the effects of global warming

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0.3%

-b) 0%

-c) 30%

+d) 3%

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

-b) population growth and waste disposal

-c) population growth

+d) cement production and land use changes

{What happens when water is heated?}

-a) it absorbs CO2

+b) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 100

-b) 3

-c) 30

-d) 300

+e) 10

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 60% of the academies of science

+b) all of the academies of science

-c) all but the US academy of science

-d) 90% of the academies of science

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per year

-b) 0.7 &deg;C per decade

+c) 0.7 &deg;C per century

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) worldwide efforts to curtail emissions

-b) the sun's energy output

+c) the world economy

-d) the earth's distance from the sun

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.16&deg; Celsius

+b) 0.6&deg; Celsius

-c) 16&deg; Celsius

-d) 0.06&deg; Celsius

-e) 1.6&deg; Celsius

{The [[w:carbon cycle|carbon cycle]] }

+a) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-b) is an effort to store carbon in underground caves.

-c) is a proposal to trade carbon credits.

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Little Ice Age

+b) thermometer measurements

-c) a 10 year average

-d) tree proxy measurements

-e) the Medieval Warming Period

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

</quiz>

== Cumulative global warming exam version J ==

<quiz display=simple>

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is an effort to store carbon in underground caves.

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Anthropogenic means something that}

+a) human caused

-b) will hurt humans

-c) humans cannot repair

-d) humans can repair

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

+a) thermometer measurements

-b) tree proxy measurements

-c) the Little Ice Age

-d) a 10 year average

-e) the Medieval Warming Period

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate current climate conditions.

+b) all of these are true

-c) by making predictions about future years and seeing if they come true.

-d) by verifying its ability to calculate past climate conditions.

{The [[w:cryosphere|cryosphere]] refers to}

-a) the highest mountains

-b) the north and south poles

-c) the upper atmosphere

+d) two of these are true

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Which external force plays the smallest role in current efforts to model global warming?}

+a) orbital cycles

-b) solar luminosity (i.e. variations in energy from the sun)

-c) greenhouse gasses

-d) volcanic eruptions

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

+b) estimates made in the year 2000 of what would happen in the future

-c) estimates of the contributions from everything except fossil fuels

-d) estimates of the impact on land temperatures

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 30%

-b) 10%

-c) 50%

+d) 0%

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

+a) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{In climate science, mitigation refers to:}

-a) climate engineering

+b) reduction of green house emissions

-c) building systems resilient to the effects of global warming

-d) adaptation to the effects of global warming

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per year

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per decade

{What happens when water is heated?}

-a) it absorbs CO2

+b) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) half as much

-c) about the same

{A rise in the sea level is associated with global warming because}

+a) both of these are true

-b) ice and snow melts

-c) water tends to expand as it warms

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

+a) 0.07&deg;C

-b) 0.7&deg;C

-c) 7.0&deg;C

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 90% of the academies of science

-b) all but the US academy of science

+c) all of the academies of science

-d) 60% of the academies of science

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

+a) the world economy

-b) worldwide efforts to curtail emissions

-c) the sun's energy output

-d) the earth's distance from the sun

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 3

-b) 300

-c) 100

-d) 30

+e) 10

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

+a) all portions of Antarctica have warmed

-b) Northern Asia has warmed more than southern Asia

-c) Central Europe has warmed more than the continental United States

-d) The United States has warmed more than Australia

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 30%

+b) 3%

-c) 0.3%

-d) 0%

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by agriculture

+b) estimates of changes in future emission levels of greenhouse gases

-c) estimates of how greenhouse gasses are absorbed and emitted by nature

-d) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

+b) a tiny gap at the end of the proxy measurements

-c) a divergence between the tree and pollen proxy measurements

-d) the Little Ice Age being less prominent than the Medieval Warming period

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) exerts a heating effect by absorbing infra-red radiation from earth's surface

-c) is more related to the ozone problem than to global warming

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

-b) population growth

+c) cement production and land use changes

-d) population growth and waste disposal

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Changes in ice-albedo refers to changes in}

-a) how much ice is melted during the summer months

-b) how much CO2 is absorbed by the sun

+c) how much the Earth's surface absorbs or reflects incoming sunlight

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

+a) sea; in the top kilometer

-b) land; near the equators

-c) land; near the poles

-d) air; in the water vapor

-e) sea; in the bottom kilometer

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) twice as much

-b) about the same

+c) half as much

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) near the equator

-c) on the ocean surface

-d) in the western hemisphere

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 16&deg; Celsius

-b) 0.06&deg; Celsius

+c) 0.6&deg; Celsius

-d) 0.16&deg; Celsius

-e) 1.6&deg; Celsius

</quiz>

== Cumulative global warming exam version K ==

<quiz display=simple>

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-b) a divergence between the tree and pollen proxy measurements

-c) the Little Ice Age being less prominent than the Medieval Warming period

+d) a tiny gap at the end of the proxy measurements

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

+a) sea; in the top kilometer

-b) sea; in the bottom kilometer

-c) land; near the equators

-d) land; near the poles

-e) air; in the water vapor

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

-b) 7.0&deg;C

+c) 0.07&deg;C

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Anthropogenic means something that}

+a) human caused

-b) will hurt humans

-c) humans cannot repair

-d) humans can repair

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) twice as much

-c) about the same

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{In climate science, mitigation refers to:}

-a) climate engineering

-b) adaptation to the effects of global warming

+c) reduction of green house emissions

-d) building systems resilient to the effects of global warming

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.16&deg; Celsius

-b) 1.6&deg; Celsius

-c) 16&deg; Celsius

+d) 0.6&deg; Celsius

-e) 0.06&deg; Celsius

{The [[w:carbon cycle|carbon cycle]] }

-a) is an effort to store carbon in underground caves.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is a proposal to trade carbon credits.

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 90% of the academies of science

+b) all of the academies of science

-c) all but the US academy of science

-d) 60% of the academies of science

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

+b) estimates of changes in future emission levels of greenhouse gases

-c) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-d) estimates of how greenhouse gasses are absorbed and emitted by nature

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-b) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+c) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

{Changes in ice-albedo refers to changes in}

+a) how much the Earth's surface absorbs or reflects incoming sunlight

-b) how much CO2 is absorbed by the sun

-c) how much ice is melted during the summer months

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 300

-b) 3

-c) 30

+d) 10

-e) 100

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{A rise in the sea level is associated with global warming because}

+a) both of these are true

-b) ice and snow melts

-c) water tends to expand as it warms

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) worldwide efforts to curtail emissions

-b) the earth's distance from the sun

-c) the sun's energy output

+d) the world economy

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it absorbs CO2

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

+a) cement production and land use changes

-b) population growth and waste disposal

-c) population growth

-d) cement production and waste disposal

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from everything except fossil fuels

+b) estimates made in the year 2000 of what would happen in the future

-c) estimates of the contributions from fossil fuels alone

-d) estimates of the impact on land temperatures

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) is more related to the ozone problem than to global warming

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Which external force plays the smallest role in current efforts to model global warming?}

+a) orbital cycles

-b) greenhouse gasses

-c) volcanic eruptions

-d) solar luminosity (i.e. variations in energy from the sun)

{The largest temperature increases (from 2000-2009) have occurred }

-a) near the equator

+b) near the poles

-c) on the ocean surface

-d) in the western hemisphere

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) half as much

-b) about the same

+c) twice as much

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate past climate conditions.

-b) by making predictions about future years and seeing if they come true.

-c) by verifying its ability to calculate current climate conditions.

+d) all of these are true

{In the twentieth century, the rate of earth's average temperature rise was closest to}

+a) 0.7 &deg;C per century

-b) 0.7 &deg;C per year

-c) 0.7 &deg;C per decade

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 50%

-c) 10%

-d) 30%

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

+a) 3%

-b) 0.3%

-c) 30%

-d) 0%

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the upper atmosphere

+b) two of these are true

-c) the highest mountains

-d) the north and south poles

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) The United States has warmed more than Australia

-b) Central Europe has warmed more than the continental United States

+c) all portions of Antarctica have warmed

-d) Northern Asia has warmed more than southern Asia

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) tree proxy measurements

-b) a 10 year average

-c) the Medieval Warming Period

+d) thermometer measurements

-e) the Little Ice Age

</quiz>

== Cumulative global warming exam version L ==

<quiz display=simple>

{Changes in ice-albedo refers to changes in}

+a) how much the Earth's surface absorbs or reflects incoming sunlight

-b) how much ice is melted during the summer months

-c) how much CO2 is absorbed by the sun

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Which external force plays the smallest role in current efforts to model global warming?}

+a) orbital cycles

-b) solar luminosity (i.e. variations in energy from the sun)

-c) greenhouse gasses

-d) volcanic eruptions

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) The United States has warmed more than Australia

-b) Central Europe has warmed more than the continental United States

-c) Northern Asia has warmed more than southern Asia

+d) all portions of Antarctica have warmed

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by agriculture

+b) estimates of changes in future emission levels of greenhouse gases

-c) estimates of how greenhouse gasses are absorbed and emitted by nature

-d) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) air; in the water vapor

+b) sea; in the top kilometer

-c) land; near the equators

-d) sea; in the bottom kilometer

-e) land; near the poles

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

+b) 0.07&deg;C

-c) 7.0&deg;C

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

+a) cement production and land use changes

-b) population growth

-c) cement production and waste disposal

-d) population growth and waste disposal

{In climate science, mitigation refers to:}

-a) adaptation to the effects of global warming

-b) climate engineering

+c) reduction of green house emissions

-d) building systems resilient to the effects of global warming

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.16&deg; Celsius

-b) 16&deg; Celsius

-c) 0.06&deg; Celsius

-d) 1.6&deg; Celsius

+e) 0.6&deg; Celsius

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 30%

+b) 3%

-c) 0%

-d) 0.3%

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Little Ice Age

+b) thermometer measurements

-c) the Medieval Warming Period

-d) tree proxy measurements

-e) a 10 year average

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the contributions from everything except fossil fuels

+c) estimates made in the year 2000 of what would happen in the future

-d) estimates of the impact on land temperatures

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 50%

-c) 10%

-d) 30%

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

+a) a tiny gap at the end of the proxy measurements

-b) the Little Ice Age being less prominent than the Medieval Warming period

-c) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-d) a divergence between the tree and pollen proxy measurements

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 90% of the academies of science

-b) all but the US academy of science

-c) 60% of the academies of science

+d) all of the academies of science

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 30

-b) 300

+c) 10

-d) 100

-e) 3

{The [[w:cryosphere|cryosphere]] refers to}

-a) the upper atmosphere

-b) the north and south poles

-c) the highest mountains

+d) two of these are true

{The largest temperature increases (from 2000-2009) have occurred }

-a) on the ocean surface

-b) near the equator

+c) near the poles

-d) in the western hemisphere

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

-b) ice and snow melts

+c) both of these are true

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Anthropogenic means something that}

-a) will hurt humans

+b) human caused

-c) humans can repair

-d) humans cannot repair

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

+a) the world economy

-b) the sun's energy output

-c) the earth's distance from the sun

-d) worldwide efforts to curtail emissions

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) about the same

-b) half as much

+c) twice as much

{How is the validity of a computer model typically tested?}

+a) all of these are true

-b) by making predictions about future years and seeing if they come true.

-c) by verifying its ability to calculate past climate conditions.

-d) by verifying its ability to calculate current climate conditions.

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per year

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per decade

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) about the same

-b) twice as much

+c) half as much

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is an effort to store carbon in underground caves.

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{What happens when water is heated?}

-a) it absorbs CO2

-b) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

+c) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) is more related to the ozone problem than to global warming

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

</quiz>

== Cumulative global warming exam version M ==

<quiz display=simple>

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate current climate conditions.

-b) by verifying its ability to calculate past climate conditions.

-c) by making predictions about future years and seeing if they come true.

+d) all of these are true

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the poles

-b) air; in the water vapor

+c) sea; in the top kilometer

-d) land; near the equators

-e) sea; in the bottom kilometer

{Anthropogenic means something that}

-a) humans can repair

+b) human caused

-c) humans cannot repair

-d) will hurt humans

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

-b) water tends to expand as it warms

+c) both of these are true

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

+b) 0.07&deg;C

-c) 7.0&deg;C

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

+a) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) population growth

-b) cement production and waste disposal

-c) population growth and waste disposal

+d) cement production and land use changes

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

+a) thermometer measurements

-b) the Little Ice Age

-c) the Medieval Warming Period

-d) tree proxy measurements

-e) a 10 year average

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

+a) all of the academies of science

-b) all but the US academy of science

-c) 90% of the academies of science

-d) 60% of the academies of science

{The largest temperature increases (from 2000-2009) have occurred }

-a) on the ocean surface

-b) in the western hemisphere

-c) near the equator

+d) near the poles

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 30%

-b) 0.3%

-c) 0%

+d) 3%

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

+a) the world economy

-b) the sun's energy output

-c) the earth's distance from the sun

-d) worldwide efforts to curtail emissions

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is an effort to store carbon in underground caves.

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

+b) estimates of changes in future emission levels of greenhouse gases

-c) estimates of how greenhouse gasses are absorbed and emitted by nature

-d) estimates of how greenhouse gasses are absorbed and emitted by agriculture

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per year

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Changes in ice-albedo refers to changes in}

-a) how much ice is melted during the summer months

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much CO2 is absorbed by the sun

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the impact on land temperatures

-b) estimates of the contributions from everything except fossil fuels

+c) estimates made in the year 2000 of what would happen in the future

-d) estimates of the contributions from fossil fuels alone

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Central Europe has warmed more than the continental United States

-b) The United States has warmed more than Australia

+c) all portions of Antarctica have warmed

-d) Northern Asia has warmed more than southern Asia

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 50%

-c) 10%

-d) 30%

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

-c) it absorbs CO2

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) half as much

+b) twice as much

-c) about the same

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

+a) a tiny gap at the end of the proxy measurements

-b) a divergence between the tree and pollen proxy measurements

-c) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-d) the Little Ice Age being less prominent than the Medieval Warming period

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

+b) orbital cycles

-c) solar luminosity (i.e. variations in energy from the sun)

-d) greenhouse gasses

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) twice as much

-c) about the same

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.06&deg; Celsius

-b) 0.16&deg; Celsius

-c) 16&deg; Celsius

-d) 1.6&deg; Celsius

+e) 0.6&deg; Celsius

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the highest mountains

-b) the upper atmosphere

-c) the north and south poles

+d) two of these are true

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 30

-b) 3

-c) 300

-d) 100

+e) 10

{In climate science, mitigation refers to:}

+a) reduction of green house emissions

-b) building systems resilient to the effects of global warming

-c) adaptation to the effects of global warming

-d) climate engineering

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) is more related to the ozone problem than to global warming

+b) exerts a cooling effect by increasing the reflection of incoming sunlight

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

</quiz>

== Cumulative global warming exam version N ==

<quiz display=simple>

{Changes in ice-albedo refers to changes in}

-a) how much CO2 is absorbed by the sun

-b) how much ice is melted during the summer months

+c) how much the Earth's surface absorbs or reflects incoming sunlight

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

+a) 10

-b) 100

-c) 300

-d) 3

-e) 30

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

+a) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{The [[w:carbon cycle|carbon cycle]] }

+a) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-b) is a proposal to trade carbon credits.

-c) is an effort to store carbon in underground caves.

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 10%

-b) 50%

+c) 0%

-d) 30%

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) near the equator

-c) in the western hemisphere

-d) on the ocean surface

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0%

-b) 30%

+c) 3%

-d) 0.3%

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the poles

-b) sea; in the bottom kilometer

+c) sea; in the top kilometer

-d) air; in the water vapor

-e) land; near the equators

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the impact on land temperatures

-c) estimates of the contributions from everything except fossil fuels

+d) estimates made in the year 2000 of what would happen in the future

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{In climate science, mitigation refers to:}

-a) climate engineering

-b) building systems resilient to the effects of global warming

-c) adaptation to the effects of global warming

+d) reduction of green house emissions

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Medieval Warming Period

-b) a 10 year average

-c) the Little Ice Age

-d) tree proxy measurements

+e) thermometer measurements

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

+b) orbital cycles

-c) greenhouse gasses

-d) solar luminosity (i.e. variations in energy from the sun)

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

-b) water tends to expand as it warms

+c) both of these are true

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) exerts a heating effect by absorbing infra-red radiation from earth's surface

-b) is more related to the ozone problem than to global warming

+c) exerts a cooling effect by increasing the reflection of incoming sunlight

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the sun's energy output

+b) the world economy

-c) the earth's distance from the sun

-d) worldwide efforts to curtail emissions

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

+a) cement production and land use changes

-b) population growth

-c) cement production and waste disposal

-d) population growth and waste disposal

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per year

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) about the same

-c) half as much

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

+a) 0.07&deg;C

-b) 7.0&deg;C

-c) 0.7&deg;C

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it absorbs CO2

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 60% of the academies of science

-b) 90% of the academies of science

-c) all but the US academy of science

+d) all of the academies of science

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Central Europe has warmed more than the continental United States

+b) all portions of Antarctica have warmed

-c) The United States has warmed more than Australia

-d) Northern Asia has warmed more than southern Asia

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate current climate conditions.

-b) by verifying its ability to calculate past climate conditions.

+c) all of these are true

-d) by making predictions about future years and seeing if they come true.

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-b) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-c) estimates of how greenhouse gasses are absorbed and emitted by nature

+d) estimates of changes in future emission levels of greenhouse gases

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 1.6&deg; Celsius

-b) 16&deg; Celsius

-c) 0.06&deg; Celsius

+d) 0.6&deg; Celsius

-e) 0.16&deg; Celsius

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) a divergence between the tree and pollen proxy measurements

-b) the Little Ice Age being less prominent than the Medieval Warming period

+c) a tiny gap at the end of the proxy measurements

-d) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Anthropogenic means something that}

+a) human caused

-b) humans can repair

-c) will hurt humans

-d) humans cannot repair

{The [[w:cryosphere|cryosphere]] refers to}

-a) the highest mountains

-b) the upper atmosphere

-c) the north and south poles

+d) two of these are true

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) twice as much

-b) about the same

+c) half as much

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

</quiz>

== Cumulative global warming exam version O ==

<quiz display=simple>

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0.3%

-b) 0%

+c) 3%

-d) 30%

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) a 10 year average

-b) tree proxy measurements

-c) the Little Ice Age

-d) the Medieval Warming Period

+e) thermometer measurements

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from everything except fossil fuels

+b) estimates made in the year 2000 of what would happen in the future

-c) estimates of the contributions from fossil fuels alone

-d) estimates of the impact on land temperatures

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by agriculture

+b) estimates of changes in future emission levels of greenhouse gases

-c) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-d) estimates of how greenhouse gasses are absorbed and emitted by nature

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) half as much

-c) about the same

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the sun's energy output

-b) the earth's distance from the sun

+c) the world economy

-d) worldwide efforts to curtail emissions

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the equators

-b) land; near the poles

-c) sea; in the bottom kilometer

-d) air; in the water vapor

+e) sea; in the top kilometer

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

+b) 0.07&deg;C

-c) 7.0&deg;C

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

+a) all of these are true

-b) by making predictions about future years and seeing if they come true.

-c) by verifying its ability to calculate past climate conditions.

-d) by verifying its ability to calculate current climate conditions.

{Anthropogenic means something that}

+a) human caused

-b) will hurt humans

-c) humans cannot repair

-d) humans can repair

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) all but the US academy of science

-b) 60% of the academies of science

-c) 90% of the academies of science

+d) all of the academies of science

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 30%

+b) 0%

-c) 50%

-d) 10%

{What happens when water is heated?}

-a) it absorbs CO2

+b) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) is more related to the ozone problem than to global warming

-b) exerts a heating effect by absorbing infra-red radiation from earth's surface

+c) exerts a cooling effect by increasing the reflection of incoming sunlight

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) near the equator

-c) on the ocean surface

-d) in the western hemisphere

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per year

-b) 0.7 &deg;C per decade

+c) 0.7 &deg;C per century

{In climate science, mitigation refers to:}

-a) building systems resilient to the effects of global warming

+b) reduction of green house emissions

-c) climate engineering

-d) adaptation to the effects of global warming

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

+a) all portions of Antarctica have warmed

-b) The United States has warmed more than Australia

-c) Central Europe has warmed more than the continental United States

-d) Northern Asia has warmed more than southern Asia

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) about the same

-b) twice as much

+c) half as much

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

+a) cement production and land use changes

-b) population growth

-c) population growth and waste disposal

-d) cement production and waste disposal

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 300

-b) 3

+c) 10

-d) 30

-e) 100

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

-b) water tends to expand as it warms

+c) both of these are true

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the Little Ice Age being less prominent than the Medieval Warming period

+b) a tiny gap at the end of the proxy measurements

-c) a divergence between the tree and pollen proxy measurements

-d) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

{The [[w:carbon cycle|carbon cycle]] }

+a) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-b) is an effort to store carbon in underground caves.

-c) is a proposal to trade carbon credits.

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the upper atmosphere

+b) two of these are true

-c) the highest mountains

-d) the north and south poles

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{Which external force plays the smallest role in current efforts to model global warming?}

-a) solar luminosity (i.e. variations in energy from the sun)

-b) greenhouse gasses

+c) orbital cycles

-d) volcanic eruptions

{Changes in ice-albedo refers to changes in}

-a) how much CO2 is absorbed by the sun

-b) how much ice is melted during the summer months

+c) how much the Earth's surface absorbs or reflects incoming sunlight

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.16&deg; Celsius

-b) 16&deg; Celsius

-c) 1.6&deg; Celsius

+d) 0.6&deg; Celsius

-e) 0.06&deg; Celsius

</quiz>

== Cumulative global warming exam version P ==

<quiz display=simple>

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate current climate conditions.

-b) by making predictions about future years and seeing if they come true.

+c) all of these are true

-d) by verifying its ability to calculate past climate conditions.

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{The [[w:carbon cycle|carbon cycle]] }

+a) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-b) is an effort to store carbon in underground caves.

-c) is a proposal to trade carbon credits.

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

+a) all of the academies of science

-b) 90% of the academies of science

-c) all but the US academy of science

-d) 60% of the academies of science

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Medieval Warming Period

+b) thermometer measurements

-c) a 10 year average

-d) the Little Ice Age

-e) tree proxy measurements

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the earth's distance from the sun

-b) the sun's energy output

-c) worldwide efforts to curtail emissions

+d) the world economy

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) air; in the water vapor

-b) sea; in the bottom kilometer

+c) sea; in the top kilometer

-d) land; near the equators

-e) land; near the poles

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

+a) estimates made in the year 2000 of what would happen in the future

-b) estimates of the impact on land temperatures

-c) estimates of the contributions from fossil fuels alone

-d) estimates of the contributions from everything except fossil fuels

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

-b) water tends to expand as it warms

+c) both of these are true

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 7.0&deg;C

+b) 0.07&deg;C

-c) 0.7&deg;C

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

-b) greenhouse gasses

-c) solar luminosity (i.e. variations in energy from the sun)

+d) orbital cycles

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 10%

-c) 50%

-d) 30%

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0.3%

+b) 3%

-c) 30%

-d) 0%

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Central Europe has warmed more than the continental United States

-b) The United States has warmed more than Australia

+c) all portions of Antarctica have warmed

-d) Northern Asia has warmed more than southern Asia

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 100

-b) 300

-c) 30

+d) 10

-e) 3

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{In climate science, mitigation refers to:}

+a) reduction of green house emissions

-b) adaptation to the effects of global warming

-c) climate engineering

-d) building systems resilient to the effects of global warming

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-b) the Little Ice Age being less prominent than the Medieval Warming period

-c) a divergence between the tree and pollen proxy measurements

+d) a tiny gap at the end of the proxy measurements

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Anthropogenic means something that}

+a) human caused

-b) will hurt humans

-c) humans can repair

-d) humans cannot repair

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.16&deg; Celsius

+b) 0.6&deg; Celsius

-c) 1.6&deg; Celsius

-d) 0.06&deg; Celsius

-e) 16&deg; Celsius

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

-c) it absorbs CO2

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

+a) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) about the same

-b) twice as much

+c) half as much

{The [[w:cryosphere|cryosphere]] refers to}

-a) the upper atmosphere

-b) the north and south poles

-c) the highest mountains

+d) two of these are true

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

+a) 0.7 &deg;C per century

-b) 0.7 &deg;C per year

-c) 0.7 &deg;C per decade

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Changes in ice-albedo refers to changes in}

-a) how much CO2 is absorbed by the sun

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much ice is melted during the summer months

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) is more related to the ozone problem than to global warming

-b) exerts a heating effect by absorbing infra-red radiation from earth's surface

+c) exerts a cooling effect by increasing the reflection of incoming sunlight

{Emissions scenarios are}

+a) estimates of changes in future emission levels of greenhouse gases

-b) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-c) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-d) estimates of how greenhouse gasses are absorbed and emitted by nature

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) about the same

-c) half as much

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

+a) cement production and land use changes

-b) population growth

-c) cement production and waste disposal

-d) population growth and waste disposal

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{The largest temperature increases (from 2000-2009) have occurred }

-a) in the western hemisphere

-b) near the equator

+c) near the poles

-d) on the ocean surface

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

</quiz>

== Cumulative global warming exam version Q ==

<quiz display=simple>

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-b) estimates of how greenhouse gasses are absorbed and emitted by nature

-c) estimates of how greenhouse gasses are absorbed and emitted by agriculture

+d) estimates of changes in future emission levels of greenhouse gases

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) a 10 year average

-b) tree proxy measurements

-c) the Medieval Warming Period

+d) thermometer measurements

-e) the Little Ice Age

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The [[w:carbon cycle|carbon cycle]] }

+a) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-b) is a proposal to trade carbon credits.

-c) is an effort to store carbon in underground caves.

{Anthropogenic means something that}

-a) humans can repair

-b) humans cannot repair

-c) will hurt humans

+d) human caused

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) exerts a heating effect by absorbing infra-red radiation from earth's surface

-c) is more related to the ozone problem than to global warming

{Which external force plays the smallest role in current efforts to model global warming?}

+a) orbital cycles

-b) greenhouse gasses

-c) volcanic eruptions

-d) solar luminosity (i.e. variations in energy from the sun)

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 10%

-b) 50%

-c) 30%

+d) 0%

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{The [[w:cryosphere|cryosphere]] refers to}

+a) two of these are true

-b) the north and south poles

-c) the highest mountains

-d) the upper atmosphere

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

+a) a tiny gap at the end of the proxy measurements

-b) the Little Ice Age being less prominent than the Medieval Warming period

-c) a divergence between the tree and pollen proxy measurements

-d) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) about the same

+b) twice as much

-c) half as much

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) about the same

-c) twice as much

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the earth's distance from the sun

-b) the sun's energy output

+c) the world economy

-d) worldwide efforts to curtail emissions

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

-b) 7.0&deg;C

+c) 0.07&deg;C

{In climate science, mitigation refers to:}

-a) climate engineering

-b) adaptation to the effects of global warming

-c) building systems resilient to the effects of global warming

+d) reduction of green house emissions

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

-b) ice and snow melts

+c) both of these are true

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Central Europe has warmed more than the continental United States

-b) Northern Asia has warmed more than southern Asia

+c) all portions of Antarctica have warmed

-d) The United States has warmed more than Australia

{In the twentieth century, the rate of earth's average temperature rise was closest to}

+a) 0.7 &deg;C per century

-b) 0.7 &deg;C per year

-c) 0.7 &deg;C per decade

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) sea; in the bottom kilometer

+b) sea; in the top kilometer

-c) land; near the poles

-d) air; in the water vapor

-e) land; near the equators

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{What happens when water is heated?}

-a) it absorbs CO2

-b) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

+c) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate current climate conditions.

+b) all of these are true

-c) by making predictions about future years and seeing if they come true.

-d) by verifying its ability to calculate past climate conditions.

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) all but the US academy of science

+b) all of the academies of science

-c) 60% of the academies of science

-d) 90% of the academies of science

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) population growth and waste disposal

-b) cement production and waste disposal

-c) population growth

+d) cement production and land use changes

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

+b) estimates made in the year 2000 of what would happen in the future

-c) estimates of the contributions from everything except fossil fuels

-d) estimates of the impact on land temperatures

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) on the ocean surface

-c) in the western hemisphere

-d) near the equator

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0.3%

-b) 0%

-c) 30%

+d) 3%

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Changes in ice-albedo refers to changes in}

-a) how much CO2 is absorbed by the sun

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much ice is melted during the summer months

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 1.6&deg; Celsius

-b) 0.06&deg; Celsius

+c) 0.6&deg; Celsius

-d) 0.16&deg; Celsius

-e) 16&deg; Celsius

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 300

+b) 10

-c) 100

-d) 3

-e) 30

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

</quiz>

== Cumulative global warming exam version R ==

<quiz display=simple>

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-b) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+c) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

-b) population growth

+c) cement production and land use changes

-d) population growth and waste disposal

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{The largest temperature increases (from 2000-2009) have occurred }

-a) on the ocean surface

+b) near the poles

-c) near the equator

-d) in the western hemisphere

{What happens when water is heated?}

-a) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

+b) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-c) it absorbs CO2

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Central Europe has warmed more than the continental United States

-b) The United States has warmed more than Australia

+c) all portions of Antarctica have warmed

-d) Northern Asia has warmed more than southern Asia

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) tree proxy measurements

-b) the Little Ice Age

+c) thermometer measurements

-d) the Medieval Warming Period

-e) a 10 year average

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) all but the US academy of science

+b) all of the academies of science

-c) 90% of the academies of science

-d) 60% of the academies of science

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

+b) both of these are true

-c) ice and snow melts

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate current climate conditions.

-b) by verifying its ability to calculate past climate conditions.

+c) all of these are true

-d) by making predictions about future years and seeing if they come true.

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Changes in ice-albedo refers to changes in}

-a) how much ice is melted during the summer months

-b) how much CO2 is absorbed by the sun

+c) how much the Earth's surface absorbs or reflects incoming sunlight

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) exerts a heating effect by absorbing infra-red radiation from earth's surface

-c) is more related to the ozone problem than to global warming

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per year

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) about the same

-c) half as much

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 10%

-b) 30%

-c) 50%

+d) 0%

{Anthropogenic means something that}

-a) humans can repair

-b) will hurt humans

-c) humans cannot repair

+d) human caused

{The [[w:cryosphere|cryosphere]] refers to}

-a) the highest mountains

-b) the upper atmosphere

+c) two of these are true

-d) the north and south poles

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0.3%

-b) 30%

-c) 0%

+d) 3%

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

-b) is an effort to store carbon in underground caves.

+c) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

{In climate science, mitigation refers to:}

-a) adaptation to the effects of global warming

-b) climate engineering

+c) reduction of green house emissions

-d) building systems resilient to the effects of global warming

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

+b) estimates of changes in future emission levels of greenhouse gases

-c) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-d) estimates of how greenhouse gasses are absorbed and emitted by nature

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the sun's energy output

+b) the world economy

-c) the earth's distance from the sun

-d) worldwide efforts to curtail emissions

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) sea; in the bottom kilometer

-b) land; near the poles

-c) air; in the water vapor

+d) sea; in the top kilometer

-e) land; near the equators

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

+a) 0.6&deg; Celsius

-b) 1.6&deg; Celsius

-c) 0.06&deg; Celsius

-d) 16&deg; Celsius

-e) 0.16&deg; Celsius

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) twice as much

-c) about the same

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the impact on land temperatures

+b) estimates made in the year 2000 of what would happen in the future

-c) estimates of the contributions from fossil fuels alone

-d) estimates of the contributions from everything except fossil fuels

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 7.0&deg;C

-b) 0.7&deg;C

+c) 0.07&deg;C

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) a divergence between the tree and pollen proxy measurements

-b) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-c) the Little Ice Age being less prominent than the Medieval Warming period

+d) a tiny gap at the end of the proxy measurements

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 300

+b) 10

-c) 30

-d) 3

-e) 100

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

-b) solar luminosity (i.e. variations in energy from the sun)

+c) orbital cycles

-d) greenhouse gasses

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

</quiz>

== Cumulative global warming exam version S ==

<quiz display=simple>

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

+a) 0.07&deg;C

-b) 7.0&deg;C

-c) 0.7&deg;C

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

+a) all portions of Antarctica have warmed

-b) Central Europe has warmed more than the continental United States

-c) Northern Asia has warmed more than southern Asia

-d) The United States has warmed more than Australia

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

+a) thermometer measurements

-b) tree proxy measurements

-c) the Little Ice Age

-d) the Medieval Warming Period

-e) a 10 year average

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

-b) 0.7 &deg;C per year

+c) 0.7 &deg;C per century

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the north and south poles

-b) the upper atmosphere

-c) the highest mountains

+d) two of these are true

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) sea; in the bottom kilometer

-b) air; in the water vapor

-c) land; near the poles

-d) land; near the equators

+e) sea; in the top kilometer

{Anthropogenic means something that}

-a) humans cannot repair

-b) humans can repair

-c) will hurt humans

+d) human caused

{Changes in ice-albedo refers to changes in}

-a) how much CO2 is absorbed by the sun

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much ice is melted during the summer months

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the Little Ice Age being less prominent than the Medieval Warming period

+b) a tiny gap at the end of the proxy measurements

-c) a divergence between the tree and pollen proxy measurements

-d) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0%

-b) 0.3%

+c) 3%

-d) 30%

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate past climate conditions.

+b) all of these are true

-c) by making predictions about future years and seeing if they come true.

-d) by verifying its ability to calculate current climate conditions.

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

+b) cement production and land use changes

-c) population growth and waste disposal

-d) population growth

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the sun's energy output

-b) worldwide efforts to curtail emissions

+c) the world economy

-d) the earth's distance from the sun

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 60% of the academies of science

+b) all of the academies of science

-c) all but the US academy of science

-d) 90% of the academies of science

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) is more related to the ozone problem than to global warming

+b) exerts a cooling effect by increasing the reflection of incoming sunlight

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Emissions scenarios are}

+a) estimates of changes in future emission levels of greenhouse gases

-b) estimates of how greenhouse gasses are absorbed and emitted by nature

-c) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-d) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

+b) both of these are true

-c) water tends to expand as it warms

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 10%

-b) 30%

+c) 0%

-d) 50%

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the contributions from everything except fossil fuels

-c) estimates of the impact on land temperatures

+d) estimates made in the year 2000 of what would happen in the future

{What happens when water is heated?}

-a) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

+b) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-c) it absorbs CO2

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

+b) orbital cycles

-c) greenhouse gasses

-d) solar luminosity (i.e. variations in energy from the sun)

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{In climate science, mitigation refers to:}

-a) building systems resilient to the effects of global warming

-b) adaptation to the effects of global warming

-c) climate engineering

+d) reduction of green house emissions

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) half as much

+b) twice as much

-c) about the same

{The [[w:carbon cycle|carbon cycle]] }

+a) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-b) is a proposal to trade carbon credits.

-c) is an effort to store carbon in underground caves.

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-b) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+c) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{The largest temperature increases (from 2000-2009) have occurred }

-a) near the equator

-b) in the western hemisphere

+c) near the poles

-d) on the ocean surface

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 3

+b) 10

-c) 300

-d) 100

-e) 30

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.16&deg; Celsius

+b) 0.6&deg; Celsius

-c) 1.6&deg; Celsius

-d) 0.06&deg; Celsius

-e) 16&deg; Celsius

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) twice as much

-b) about the same

+c) half as much

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

</quiz>

== Cumulative global warming exam version T ==

<quiz display=simple>

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 7.0&deg;C

-b) 0.7&deg;C

+c) 0.07&deg;C

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

+a) 0.6&deg; Celsius

-b) 16&deg; Celsius

-c) 0.06&deg; Celsius

-d) 1.6&deg; Celsius

-e) 0.16&deg; Celsius

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-b) the Little Ice Age being less prominent than the Medieval Warming period

+c) a tiny gap at the end of the proxy measurements

-d) a divergence between the tree and pollen proxy measurements

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) sea; in the bottom kilometer

-b) land; near the poles

-c) air; in the water vapor

-d) land; near the equators

+e) sea; in the top kilometer

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-b) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+c) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{How is the validity of a computer model typically tested?}

-a) by making predictions about future years and seeing if they come true.

-b) by verifying its ability to calculate past climate conditions.

+c) all of these are true

-d) by verifying its ability to calculate current climate conditions.

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

-b) population growth and waste disposal

+c) cement production and land use changes

-d) population growth

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per year

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per decade

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 90% of the academies of science

-b) all but the US academy of science

-c) 60% of the academies of science

+d) all of the academies of science

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 30%

-c) 10%

-d) 50%

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

-b) greenhouse gasses

+c) orbital cycles

-d) solar luminosity (i.e. variations in energy from the sun)

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the highest mountains

-b) the upper atmosphere

-c) the north and south poles

+d) two of these are true

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) on the ocean surface

-c) near the equator

-d) in the western hemisphere

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 30

-b) 300

-c) 100

-d) 3

+e) 10

{The [[w:carbon cycle|carbon cycle]] }

-a) is an effort to store carbon in underground caves.

-b) is a proposal to trade carbon credits.

+c) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Anthropogenic means something that}

-a) humans can repair

-b) will hurt humans

-c) humans cannot repair

+d) human caused

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

+a) the world economy

-b) the sun's energy output

-c) the earth's distance from the sun

-d) worldwide efforts to curtail emissions

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) about the same

+b) half as much

-c) twice as much

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) is more related to the ozone problem than to global warming

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

{In climate science, mitigation refers to:}

+a) reduction of green house emissions

-b) climate engineering

-c) adaptation to the effects of global warming

-d) building systems resilient to the effects of global warming

{Changes in ice-albedo refers to changes in}

-a) how much ice is melted during the summer months

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much CO2 is absorbed by the sun

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

+a) thermometer measurements

-b) a 10 year average

-c) tree proxy measurements

-d) the Medieval Warming Period

-e) the Little Ice Age

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

+b) both of these are true

-c) ice and snow melts

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) about the same

+b) twice as much

-c) half as much

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Central Europe has warmed more than the continental United States

-b) Northern Asia has warmed more than southern Asia

+c) all portions of Antarctica have warmed

-d) The United States has warmed more than Australia

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

+a) estimates made in the year 2000 of what would happen in the future

-b) estimates of the contributions from everything except fossil fuels

-c) estimates of the contributions from fossil fuels alone

-d) estimates of the impact on land temperatures

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Emissions scenarios are}

+a) estimates of changes in future emission levels of greenhouse gases

-b) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-c) estimates of how greenhouse gasses are absorbed and emitted by nature

-d) estimates of how greenhouse gasses are absorbed and emitted by agriculture

{What happens when water is heated?}

-a) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

-b) it absorbs CO2

+c) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 30%

-b) 0.3%

+c) 3%

-d) 0%

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

</quiz>

== Cumulative global warming exam version U ==

<quiz display=simple>

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Anthropogenic means something that}

-a) humans can repair

+b) human caused

-c) humans cannot repair

-d) will hurt humans

{Which external force plays the smallest role in current efforts to model global warming?}

-a) solar luminosity (i.e. variations in energy from the sun)

+b) orbital cycles

-c) greenhouse gasses

-d) volcanic eruptions

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) worldwide efforts to curtail emissions

-b) the sun's energy output

+c) the world economy

-d) the earth's distance from the sun

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

+a) all portions of Antarctica have warmed

-b) The United States has warmed more than Australia

-c) Central Europe has warmed more than the continental United States

-d) Northern Asia has warmed more than southern Asia

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) exerts a heating effect by absorbing infra-red radiation from earth's surface

-c) is more related to the ozone problem than to global warming

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0%

-b) 0.3%

+c) 3%

-d) 30%

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the Little Ice Age being less prominent than the Medieval Warming period

-b) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

+c) a tiny gap at the end of the proxy measurements

-d) a divergence between the tree and pollen proxy measurements

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) twice as much

-b) about the same

+c) half as much

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) half as much

+b) twice as much

-c) about the same

{The largest temperature increases (from 2000-2009) have occurred }

-a) near the equator

-b) in the western hemisphere

+c) near the poles

-d) on the ocean surface

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 7.0&deg;C

+b) 0.07&deg;C

-c) 0.7&deg;C

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the poles

-b) sea; in the bottom kilometer

-c) air; in the water vapor

+d) sea; in the top kilometer

-e) land; near the equators

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Little Ice Age

-b) a 10 year average

-c) the Medieval Warming Period

-d) tree proxy measurements

+e) thermometer measurements

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The [[w:carbon cycle|carbon cycle]] }

-a) is an effort to store carbon in underground caves.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is a proposal to trade carbon credits.

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

+b) both of these are true

-c) water tends to expand as it warms

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{In climate science, mitigation refers to:}

-a) building systems resilient to the effects of global warming

+b) reduction of green house emissions

-c) adaptation to the effects of global warming

-d) climate engineering

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

+a) all of these are true

-b) by verifying its ability to calculate current climate conditions.

-c) by verifying its ability to calculate past climate conditions.

-d) by making predictions about future years and seeing if they come true.

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

+a) all of the academies of science

-b) 60% of the academies of science

-c) 90% of the academies of science

-d) all but the US academy of science

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 30%

-c) 10%

-d) 50%

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 30

-b) 100

+c) 10

-d) 300

-e) 3

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

-c) it absorbs CO2

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Emissions scenarios are}

+a) estimates of changes in future emission levels of greenhouse gases

-b) estimates of how greenhouse gasses are absorbed and emitted by nature

-c) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-d) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

+b) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.16&deg; Celsius

-b) 0.06&deg; Celsius

-c) 1.6&deg; Celsius

+d) 0.6&deg; Celsius

-e) 16&deg; Celsius

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from everything except fossil fuels

+b) estimates made in the year 2000 of what would happen in the future

-c) estimates of the impact on land temperatures

-d) estimates of the contributions from fossil fuels alone

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per year

{The [[w:cryosphere|cryosphere]] refers to}

-a) the north and south poles

-b) the upper atmosphere

+c) two of these are true

-d) the highest mountains

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

+b) cement production and land use changes

-c) population growth

-d) population growth and waste disposal

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Changes in ice-albedo refers to changes in}

-a) how much ice is melted during the summer months

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much CO2 is absorbed by the sun

</quiz>

== Cumulative global warming exam version V ==

<quiz display=simple>

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{How is the validity of a computer model typically tested?}

+a) all of these are true

-b) by verifying its ability to calculate past climate conditions.

-c) by verifying its ability to calculate current climate conditions.

-d) by making predictions about future years and seeing if they come true.

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is an effort to store carbon in underground caves.

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) half as much

+b) twice as much

-c) about the same

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by nature

+b) estimates of changes in future emission levels of greenhouse gases

-c) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-d) estimates of how greenhouse gasses are absorbed and emitted by agriculture

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

+a) estimates made in the year 2000 of what would happen in the future

-b) estimates of the contributions from everything except fossil fuels

-c) estimates of the impact on land temperatures

-d) estimates of the contributions from fossil fuels alone

{The largest temperature increases (from 2000-2009) have occurred }

-a) on the ocean surface

-b) in the western hemisphere

-c) near the equator

+d) near the poles

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

+b) 0.07&deg;C

-c) 7.0&deg;C

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

+a) 10

-b) 100

-c) 3

-d) 300

-e) 30

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it absorbs CO2

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.16&deg; Celsius

+b) 0.6&deg; Celsius

-c) 0.06&deg; Celsius

-d) 16&deg; Celsius

-e) 1.6&deg; Celsius

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Anthropogenic means something that}

+a) human caused

-b) humans cannot repair

-c) humans can repair

-d) will hurt humans

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Medieval Warming Period

-b) a 10 year average

+c) thermometer measurements

-d) tree proxy measurements

-e) the Little Ice Age

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 50%

-b) 30%

+c) 0%

-d) 10%

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) twice as much

-b) about the same

+c) half as much

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

+c) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the equators

-b) air; in the water vapor

+c) sea; in the top kilometer

-d) sea; in the bottom kilometer

-e) land; near the poles

{Which external force plays the smallest role in current efforts to model global warming?}

-a) greenhouse gasses

-b) volcanic eruptions

+c) orbital cycles

-d) solar luminosity (i.e. variations in energy from the sun)

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

+a) a tiny gap at the end of the proxy measurements

-b) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-c) the Little Ice Age being less prominent than the Medieval Warming period

-d) a divergence between the tree and pollen proxy measurements

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the sun's energy output

-b) worldwide efforts to curtail emissions

-c) the earth's distance from the sun

+d) the world economy

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{In climate science, mitigation refers to:}

-a) climate engineering

-b) adaptation to the effects of global warming

-c) building systems resilient to the effects of global warming

+d) reduction of green house emissions

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) population growth

+b) cement production and land use changes

-c) cement production and waste disposal

-d) population growth and waste disposal

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{Changes in ice-albedo refers to changes in}

-a) how much ice is melted during the summer months

-b) how much CO2 is absorbed by the sun

+c) how much the Earth's surface absorbs or reflects incoming sunlight

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) is more related to the ozone problem than to global warming

-b) exerts a heating effect by absorbing infra-red radiation from earth's surface

+c) exerts a cooling effect by increasing the reflection of incoming sunlight

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

+b) both of these are true

-c) ice and snow melts

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) 60% of the academies of science

-b) all but the US academy of science

+c) all of the academies of science

-d) 90% of the academies of science

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

+a) 0.7 &deg;C per century

-b) 0.7 &deg;C per decade

-c) 0.7 &deg;C per year

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

+a) 3%

-b) 30%

-c) 0.3%

-d) 0%

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Central Europe has warmed more than the continental United States

-b) The United States has warmed more than Australia

+c) all portions of Antarctica have warmed

-d) Northern Asia has warmed more than southern Asia

{The [[w:cryosphere|cryosphere]] refers to}

-a) the north and south poles

-b) the upper atmosphere

-c) the highest mountains

+d) two of these are true

</quiz>

== Cumulative global warming exam version W ==

<quiz display=simple>

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 100

+b) 10

-c) 3

-d) 300

-e) 30

{In climate science, mitigation refers to:}

+a) reduction of green house emissions

-b) climate engineering

-c) building systems resilient to the effects of global warming

-d) adaptation to the effects of global warming

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

-b) population growth

+c) cement production and land use changes

-d) population growth and waste disposal

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) the Medieval Warming Period

-b) a 10 year average

+c) thermometer measurements

-d) the Little Ice Age

-e) tree proxy measurements

{Changes in ice-albedo refers to changes in}

+a) how much the Earth's surface absorbs or reflects incoming sunlight

-b) how much CO2 is absorbed by the sun

-c) how much ice is melted during the summer months

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{What happens when water is heated?}

-a) it absorbs CO2

+b) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) air; in the water vapor

-b) land; near the poles

-c) land; near the equators

+d) sea; in the top kilometer

-e) sea; in the bottom kilometer

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Anthropogenic means something that}

-a) humans cannot repair

-b) humans can repair

+c) human caused

-d) will hurt humans

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) all but the US academy of science

-b) 60% of the academies of science

+c) all of the academies of science

-d) 90% of the academies of science

{Emissions scenarios are}

+a) estimates of changes in future emission levels of greenhouse gases

-b) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-c) estimates of how greenhouse gasses are absorbed and emitted by nature

-d) estimates of how greenhouse gasses are absorbed and emitted by agriculture

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) half as much

+b) twice as much

-c) about the same

{The largest temperature increases (from 2000-2009) have occurred }

-a) in the western hemisphere

+b) near the poles

-c) near the equator

-d) on the ocean surface

{The [[w:carbon cycle|carbon cycle]] }

-a) is a proposal to trade carbon credits.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is an effort to store carbon in underground caves.

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

+a) all portions of Antarctica have warmed

-b) Northern Asia has warmed more than southern Asia

-c) The United States has warmed more than Australia

-d) Central Europe has warmed more than the continental United States

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the contributions from fossil fuels alone

-b) estimates of the impact on land temperatures

+c) estimates made in the year 2000 of what would happen in the future

-d) estimates of the contributions from everything except fossil fuels

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

+b) both of these are true

-c) ice and snow melts

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

+a) 3%

-b) 30%

-c) 0%

-d) 0.3%

{Which external force plays the smallest role in current efforts to model global warming?}

+a) orbital cycles

-b) greenhouse gasses

-c) volcanic eruptions

-d) solar luminosity (i.e. variations in energy from the sun)

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

-a) twice as much

+b) half as much

-c) about the same

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-b) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

+c) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the earth's distance from the sun

-b) worldwide efforts to curtail emissions

+c) the world economy

-d) the sun's energy output

{How is the validity of a computer model typically tested?}

-a) by making predictions about future years and seeing if they come true.

-b) by verifying its ability to calculate current climate conditions.

+c) all of these are true

-d) by verifying its ability to calculate past climate conditions.

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the north and south poles

-b) the highest mountains

+c) two of these are true

-d) the upper atmosphere

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 1.6&deg; Celsius

-b) 0.06&deg; Celsius

-c) 0.16&deg; Celsius

+d) 0.6&deg; Celsius

-e) 16&deg; Celsius

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) is more related to the ozone problem than to global warming

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 30%

-c) 50%

-d) 10%

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the Little Ice Age being less prominent than the Medieval Warming period

-b) a divergence between the tree and pollen proxy measurements

+c) a tiny gap at the end of the proxy measurements

-d) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

{In the twentieth century, the rate of earth's average temperature rise was closest to}

+a) 0.7 &deg;C per century

-b) 0.7 &deg;C per decade

-c) 0.7 &deg;C per year

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

-b) 7.0&deg;C

+c) 0.07&deg;C

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

</quiz>

== Cumulative global warming exam version X ==

<quiz display=simple>

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{The [[w:carbon cycle|carbon cycle]] }

-a) is an effort to store carbon in underground caves.

+b) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

-c) is a proposal to trade carbon credits.

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 1.6&deg; Celsius

-b) 16&deg; Celsius

-c) 0.16&deg; Celsius

+d) 0.6&deg; Celsius

-e) 0.06&deg; Celsius

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{Anthropogenic means something that}

-a) will hurt humans

-b) humans cannot repair

-c) humans can repair

+d) human caused

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) air; in the water vapor

-b) sea; in the bottom kilometer

+c) sea; in the top kilometer

-d) land; near the poles

-e) land; near the equators

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

+b) cement production and land use changes

-c) population growth

-d) population growth and waste disposal

{Which external force plays the smallest role in current efforts to model global warming?}

-a) volcanic eruptions

-b) solar luminosity (i.e. variations in energy from the sun)

-c) greenhouse gasses

+d) orbital cycles

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

-a) estimates of the impact on land temperatures

-b) estimates of the contributions from everything except fossil fuels

+c) estimates made in the year 2000 of what would happen in the future

-d) estimates of the contributions from fossil fuels alone

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the north and south poles

-b) the highest mountains

-c) the upper atmosphere

+d) two of these are true

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) twice as much

-c) about the same

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 100

-b) 3

+c) 10

-d) 300

-e) 30

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) Central Europe has warmed more than the continental United States

-b) The United States has warmed more than Australia

-c) Northern Asia has warmed more than southern Asia

+d) all portions of Antarctica have warmed

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

+a) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 30%

-b) 0%

+c) 3%

-d) 0.3%

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) a 10 year average

+b) thermometer measurements

-c) the Medieval Warming Period

-d) tree proxy measurements

-e) the Little Ice Age

{In climate science, mitigation refers to:}

-a) building systems resilient to the effects of global warming

-b) climate engineering

+c) reduction of green house emissions

-d) adaptation to the effects of global warming

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-b) a divergence between the tree and pollen proxy measurements

-c) the Little Ice Age being less prominent than the Medieval Warming period

+d) a tiny gap at the end of the proxy measurements

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

+a) all of the academies of science

-b) all but the US academy of science

-c) 90% of the academies of science

-d) 60% of the academies of science

{The largest temperature increases (from 2000-2009) have occurred }

-a) in the western hemisphere

+b) near the poles

-c) on the ocean surface

-d) near the equator

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) about the same

+b) twice as much

-c) half as much

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

-c) it absorbs CO2

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by nature

+b) estimates of changes in future emission levels of greenhouse gases

-c) estimates of how greenhouse gasses are absorbed and emitted by agriculture

-d) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per year

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per decade

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{Changes in ice-albedo refers to changes in}

-a) how much CO2 is absorbed by the sun

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much ice is melted during the summer months

{How is the validity of a computer model typically tested?}

+a) all of these are true

-b) by verifying its ability to calculate past climate conditions.

-c) by making predictions about future years and seeing if they come true.

-d) by verifying its ability to calculate current climate conditions.

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) worldwide efforts to curtail emissions

-b) the earth's distance from the sun

-c) the sun's energy output

+d) the world economy

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) is more related to the ozone problem than to global warming

-c) exerts a heating effect by absorbing infra-red radiation from earth's surface

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 0.7&deg;C

-b) 7.0&deg;C

+c) 0.07&deg;C

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{A rise in the sea level is associated with global warming because}

+a) both of these are true

-b) water tends to expand as it warms

-c) ice and snow melts

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 30%

-c) 10%

-d) 50%

</quiz>

== Cumulative global warming exam version Y ==

<quiz display=simple>

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Which external force plays the smallest role in current efforts to model global warming?}

+a) orbital cycles

-b) solar luminosity (i.e. variations in energy from the sun)

-c) greenhouse gasses

-d) volcanic eruptions

{The largest temperature increases (from 2000-2009) have occurred }

+a) near the poles

-b) near the equator

-c) on the ocean surface

-d) in the western hemisphere

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) about the same

-c) twice as much

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 30

-b) 3

+c) 10

-d) 100

-e) 300

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Changes in ice-albedo refers to changes in}

-a) how much CO2 is absorbed by the sun

-b) how much ice is melted during the summer months

+c) how much the Earth's surface absorbs or reflects incoming sunlight

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

+a) twice as much

-b) half as much

-c) about the same

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

+b) a tiny gap at the end of the proxy measurements

-c) a divergence between the tree and pollen proxy measurements

-d) the Little Ice Age being less prominent than the Medieval Warming period

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 1.6&deg; Celsius

-b) 0.06&deg; Celsius

+c) 0.6&deg; Celsius

-d) 16&deg; Celsius

-e) 0.16&deg; Celsius

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) population growth and waste disposal

-b) cement production and waste disposal

-c) population growth

+d) cement production and land use changes

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

+a) 0%

-b) 30%

-c) 50%

-d) 10%

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{The [[w:carbon cycle|carbon cycle]] }

-a) is an effort to store carbon in underground caves.

-b) is a proposal to trade carbon credits.

+c) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{Anthropogenic means something that}

+a) human caused

-b) humans cannot repair

-c) humans can repair

-d) will hurt humans

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) The United States has warmed more than Australia

-b) Central Europe has warmed more than the continental United States

-c) Northern Asia has warmed more than southern Asia

+d) all portions of Antarctica have warmed

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

+a) all of the academies of science

-b) 90% of the academies of science

-c) all but the US academy of science

-d) 60% of the academies of science

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the equators

-b) air; in the water vapor

-c) land; near the poles

-d) sea; in the bottom kilometer

+e) sea; in the top kilometer

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

-a) 7.0&deg;C

-b) 0.7&deg;C

+c) 0.07&deg;C

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

+a) estimates made in the year 2000 of what would happen in the future

-b) estimates of the impact on land temperatures

-c) estimates of the contributions from fossil fuels alone

-d) estimates of the contributions from everything except fossil fuels

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{What happens when water is heated?}

-a) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

-b) it absorbs CO2

+c) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

+a) exerts a cooling effect by increasing the reflection of incoming sunlight

-b) exerts a heating effect by absorbing infra-red radiation from earth's surface

-c) is more related to the ozone problem than to global warming

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) tree proxy measurements

-b) the Medieval Warming Period

+c) thermometer measurements

-d) the Little Ice Age

-e) a 10 year average

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

+a) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

-c) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{A rise in the sea level is associated with global warming because}

-a) ice and snow melts

+b) both of these are true

-c) water tends to expand as it warms

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0.3%

-b) 0%

+c) 3%

-d) 30%

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{In climate science, mitigation refers to:}

-a) adaptation to the effects of global warming

-b) building systems resilient to the effects of global warming

-c) climate engineering

+d) reduction of green house emissions

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

+a) two of these are true

-b) the north and south poles

-c) the highest mountains

-d) the upper atmosphere

{How is the validity of a computer model typically tested?}

-a) by verifying its ability to calculate past climate conditions.

-b) by verifying its ability to calculate current climate conditions.

-c) by making predictions about future years and seeing if they come true.

+d) all of these are true

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

+a) the world economy

-b) the earth's distance from the sun

-c) worldwide efforts to curtail emissions

-d) the sun's energy output

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Emissions scenarios are}

-a) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-b) estimates of how greenhouse gasses are absorbed and emitted by nature

+c) estimates of changes in future emission levels of greenhouse gases

-d) estimates of how greenhouse gasses are absorbed and emitted by agriculture

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{In the twentieth century, the rate of earth's average temperature rise was closest to}

+a) 0.7 &deg;C per century

-b) 0.7 &deg;C per year

-c) 0.7 &deg;C per decade

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

</quiz>

== Cumulative global warming exam version Z ==

<quiz display=simple>

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements. The solid black line represents}

-a) a 10 year average

-b) the Little Ice Age

-c) tree proxy measurements

-d) the Medieval Warming Period

+e) thermometer measurements

{Soot tends to cool the earth when it accumulates in atmospheric brown clouds.}

+a) true

-b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that more heat is lost from the planet to compensate.}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows little or no temperature rise over the last \_\_\_\_ years}

-a) 3

-b) 30

-c) 300

-d) 100

+e) 10

{How is the validity of a computer model typically tested?}

+a) all of these are true

-b) by verifying its ability to calculate past climate conditions.

-c) by verifying its ability to calculate current climate conditions.

-d) by making predictions about future years and seeing if they come true.

{Global dimming, caused by air-born particulates produced by volcanoes and human made pollutants}

-a) exerts a heating effect by absorbing infra-red radiation from earth's surface

+b) exerts a cooling effect by increasing the reflection of incoming sunlight

-c) is more related to the ozone problem than to global warming

{In the arctic, soot tends to cool the earth.}

-a) true

+b) false

{Which external force plays the smallest role in current efforts to model global warming?}

-a) greenhouse gasses

-b) solar luminosity (i.e. variations in energy from the sun)

-c) volcanic eruptions

+d) orbital cycles

{In climate science, mitigation refers to:}

-a) building systems resilient to the effects of global warming

+b) reduction of green house emissions

-c) adaptation to the effects of global warming

-d) climate engineering

{Computer models accurately model feedback mechanisms associated with the role of clouds as a feedback mechanism.}

-a) true

+b) false

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows dips and rises that are caused by changes in}

-a) the sun's energy output

-b) worldwide efforts to curtail emissions

-c) the earth's distance from the sun

+d) the world economy

{The [[:File:2000\_Year\_Temperature\_Comparison.png|Reconstructed Temperature]] (0-2000 AD) plot in "Observed Temperature Changes" shows temperature measurements, as well as what curious feature? (See also [[w:Divergence problem|Divergence problem]])}

-a) the fact that the different proxy measurements deviate considerably from the average of all proxy measurements

-b) the Little Ice Age being less prominent than the Medieval Warming period

+c) a tiny gap at the end of the proxy measurements

-d) a divergence between the tree and pollen proxy measurements

{Proxy temperatures measurements are defined as measurements made using measurements from space.}

-a) true

+b) false

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is easier to model.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed by the earth's atmosphere.}

-a) true

+b) false

{Stefan-Boltzmann radiation is called a negative feedback mechanism because if the sun's radiation increases, the Stefan-Boltzmann law ensures that this heat is retained by the planet.}

-a) true

+b) false

{The "[[:File:Greenhouse\_Effect.svg|Greenhouse effect schematic]]" in the section on "Temperature changes..." indicates that most of the energy from the Sun is absorbed at the earth's surface.}

+a) true

-b) false

{Changes in ice-albedo refers to changes in}

-a) how much ice is melted during the summer months

+b) how much the Earth's surface absorbs or reflects incoming sunlight

-c) how much CO2 is absorbed by the sun

{Water vapor contributes more to the greenhouse effect than does carbon dioxide.}

+a) true

-b) false

{The distinction between the urban heat island effect and land use changes is that the latter involves the earth's average temperature while the former involves only the temperature near weather stations where the measurements are made}

+a) true

-b) false

{The lede's graph of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" shows that since 1920, there has never been a decade of overall cooling}

-a) true

+b) false

{Greenhouse warming acts to cool the stratosphere}

+a) true

-b) false

{No direct method exists that permits an independent measurement of the heat content of the oceans, other than the fact that the air is warming}

-a) true

+b) false

{Approximately what percent of global warming can be attributed to a long-term trend (since 1978) in the sun's energy?}

-a) 30%

+b) 0%

-c) 10%

-d) 50%

{The [[:File:Mauna\_Loa\_Carbon\_Dioxide\_Apr2013.svg|Keeling curve]] shows that carbon dioxide concentrations}

-a) show a steady rise in CO2 levels, at constant slope, and regular and predictable annual fluctuations

-b) show a steady rise in CO2 levels, at constant slope, and irregular fluctuations due associated with El Ninos and La Ninas.

+c) show a steady rise in CO2 levels, with increasing slope, and regular and predictable annual fluctuations

{Anthropogenic means something that}

-a) humans cannot repair

-b) will hurt humans

+c) human caused

-d) humans can repair

{The 2007 IPCC report stated that most global warming was likely being caused by increasing concentrations of greenhouse gases produced by human activities. Among the science academies of the major industrialized nations, this finding was recognized by}

-a) all but the US academy of science

-b) 90% of the academies of science

-c) 60% of the academies of science

+d) all of the academies of science

{In the twentieth century, the rate of earth's average temperature rise was closest to}

-a) 0.7 &deg;C per decade

+b) 0.7 &deg;C per century

-c) 0.7 &deg;C per year

{Depleting the ozone layer cools the stratosphere because ozone absorbs UV energy from the sun that heats the stratosphere.}

+a) true

-b) false

{The lede's graphs of the "[[:File:Global\_Temperature\_Anomaly.svg|Global Land Ocean Temperature Index (1880-2013)]]" indicates that from 1960 to 2012 the average temperature increased by approximately}

-a) 0.16&deg; Celsius

-b) 1.6&deg; Celsius

+c) 0.6&deg; Celsius

-d) 0.06&deg; Celsius

-e) 16&deg; Celsius

{Analysis of the uncertainties associated with feedback suggests that the "worst-case" scenario is more difficult to model.}

+a) true

-b) false

{"External forcings" refer to effects that can increase, but not decrease, the Earth's temperature.}

-a) true

+b) false

{The Earth's average surface temperature rose by approximately \_\_\_\_\_\_\_ per decade over the period 1906–2005.}

+a) 0.07&deg;C

-b) 7.0&deg;C

-c) 0.7&deg;C

{The climate change community is divided between those who believe the goal should be to eliminate the earth's greenhouse effect altogether, and those who argue that we should attempt to minimize earth's greenhouse effect.}

-a) true

+b) false

{Which statement is FALSE about the lede's [[:File:GISS\_temperature\_2000-09\_lrg.png|map of the temperature anomaly]] (2000-2009)? }

-a) The United States has warmed more than Australia

-b) Central Europe has warmed more than the continental United States

+c) all portions of Antarctica have warmed

-d) Northern Asia has warmed more than southern Asia

{Computer models accurately model feedback mechanisms associated with how the soil will retain or release CO2 as the earth warms.}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet with thermal (infra-red) radiation adding to the other solar radiation onto the planet}

-a) true

+b) false

{A rise in the sea level is associated with global warming because}

-a) water tends to expand as it warms

+b) both of these are true

-c) ice and snow melts

{ in 2013, the IPCC stated that the largest driver of global warming is carbon dioxide (CO2) emissions from fossil fuel combustion. Other important sources of CO2 are}

-a) cement production and waste disposal

+b) cement production and land use changes

-c) population growth

-d) population growth and waste disposal

{The lede's "[[:File:Global\_Warming\_Observed\_CO2\_Emissions\_from\_fossil\_fuel\_burning\_vs\_IPCC\_scenarios.svg|CO2 Emissions per Year]]" graph (1990-2010) shows solid straight lines that represent}

+a) estimates made in the year 2000 of what would happen in the future

-b) estimates of the contributions from everything except fossil fuels

-c) estimates of the impact on land temperatures

-d) estimates of the contributions from fossil fuels alone

{Depleting the ozone layer cools the stratosphere because ozone allows UV radiation to penetrate.}

-a) true

+b) false

{What happens when water is heated?}

+a) it expands at temperatures above 3.98&deg;C and contracts below 3.98&deg;C

-b) it absorbs CO2

-c) it expands at temperatures below 3.98&deg;C and contracts above 3.98&deg;C

{In the arctic, soot tends to warm the earth.}

+a) true

-b) false

{Ocean temperatures are increasing more slowly than land temperatures because oceans have more heat capacity and because evaporation cools the water.}

+a) true

-b) false

{It is expected that carbon emissions will begin to diminish in the 21st century as fossil fuel reserves begin to dwindle.}

-a) true

+b) false

{The [[w:cryosphere|cryosphere]] refers to}

-a) the north and south poles

-b) the highest mountains

+c) two of these are true

-d) the upper atmosphere

{Proxy temperatures measurements are defined as indirect inferences gathered from ice cores, tree rings, and so forth}

+a) true

-b) false

{Computer modeling has conclusively established that anthropogenic warming has occurred since 1910.}

-a) true

+b) false

{Carbon dioxide contributes more to the greenhouse effect than does water vapor.}

-a) true

+b) false

{Greenhouse warming acts to warm the stratosphere}

-a) true

+b) false

{The largest temperature increases (from 2000-2009) have occurred }

-a) on the ocean surface

-b) in the western hemisphere

+c) near the poles

-d) near the equator

{"External forcings" refer to effects that can either increase or decrease, the Earth's temperature.}

-a) true

+b) false

{The Stefan-Boltzmann law plays a central role in establishing a planets temperature as the sun heats the planet until the thermal (infra-red) radiation away the planet rises to match the solar radiation onto the planet}

+a) true

-b) false

{Compared with the first half of the twentieth century, the rate of earth's average temperature rise during the second (latter) half was }

-a) about the same

-b) half as much

+c) twice as much

{Ocean temperatures are increasing more slowly than land temperatures because the oceans are absorbing less heat energy from the sun}

-a) true

+b) false

{Soot tends to warm the earth when it accumulates in atmospheric brown clouds.}

-a) true

+b) false

{While computer modeling indicate that the warming since 1970 is dominated by man-made greenhouse gas emissions, they are unable to conclusively ascertain whether the warming from 1910 to 1945 was anthropogenic.}

+a) true

-b) false

{The [[w:carbon cycle|carbon cycle]] }

-a) is an effort to store carbon in underground caves.

-b) is a proposal to trade carbon credits.

+c) describes how carbon is absorbed and emitted by the oceans, soil, plants, etc.

{The urban heat island effect refers to the fact that urban areas tend to be hotter than rural areas. The urban heat island effect is estimated to account for approximately \_\_\_\_\_ of the temperature rise over the past century.}

-a) 0%

-b) 0.3%

+c) 3%

-d) 30%

{Emissions scenarios are}

+a) estimates of changes in future emission levels of greenhouse gases

-b) estimates of how greenhouse gasses are absorbed and emitted by the world's oceans

-c) estimates of how greenhouse gasses are absorbed and emitted by nature

-d) estimates of how greenhouse gasses are absorbed and emitted by agriculture

{Compared with the second half of the twentieth century, the rate of earth's average temperature rise during the first half was}

+a) half as much

-b) about the same

-c) twice as much

{Since 1971, 90% of earth's increased energy caused by global warming has been stored in the \_\_\_\_\_\_\_\_\_\_\_\_\_, mostly \_\_\_\_\_\_\_\_\_\_\_\_\_}

-a) land; near the equators

+b) sea; in the top kilometer

-c) air; in the water vapor

-d) sea; in the bottom kilometer

-e) land; near the poles

</quiz>