Mid–Term Exam (26 February 2008)

Name_____ Student ID_____

1) Since 1860, the earth's global mean temperature has risen about 1) _____
A) 0.8 °C B) 14.5 °C C) 1.8 °C D) 0.2 °C

2) Since 1980, the Northern Hemisphere (NH) has warmed more that the Southern Hemisphere (SH). A primary reason is that 2) _____
A) The SH has more ocean, which changes more slowly.
B) The NH has more people, who exhale carbon dioxide.
C) NH vegetation holds heat beneath it.
D) SH ocean plankton takes up carbon dioxide, creating warming holes.

3) Errors in estimating hemispheric temperature suggest that changes smaller than ___ are too small to be significant. 3) _____
A) 0.2 °C B) 1.8 °C C) 4.8 °C D) 7.2 °C

4) Which of these components of the cryosphere contains most of the cryosphere's water? 4) _____
A) Ice sheets B) Snow cover
C) Mountain glaciers D) Frozen ground

5) Over roughly the last decade of the twentieth century, the largest contributor to rising sea level appears to have been 5) _____
A) thermal expansion of sea water.
B) melting of glaciers and ice caps.
C) melting of the Antarctic ice sheet.
D) melting of the Greenland ice sheet.

6) Why is Antarctica possibly contributing to lowered sea level? 6) _____
A) Ice is getting thicker in some parts.
B) The South Pole is too far away to experience warming.
C) It is creating more icebergs as glacier flow increases.
D) Land under its ice sheet is rising

7) The largest source of uncertainty in sea-level rise over the past 40+ years appears to be 7) _____
A) Antarctica B) Greenland
C) Thermal expansion D) Glaciers and ice caps

8) The greenhouse effect is created by 8) _____
A) infrared radiation absorbed and re-emitted by the atmosphere.
B) solar radiation absorbed by the earth.
C) clouds reflecting more solar radiation as aerosols increase.
D) all of the above.

9) Carbon dioxide in the atmosphere has a larger annual cycle of variability in 9) _____
A) the Northern Hemisphere.
B) the Southern Hemisphere.
C) neither hemisphere; they are tightly linked.

10) Decreasing atmospheric oxygen levels indicate 10) _____
A) increased fossil-fuel burning.
B) higher population levels.
C) increased phytoplankton metabolism.
D) more oxygen absorption by warmer ocean waters.

11) Changes in atmospheric carbon-13 indicate 11) _____
A) more carbon-12 entering the atmosphere from below the surface.
B) reduced carbon-13 production by solar radiation.
C) release of ancient carbon-12 by melting ice sheets.
D) all of the above

12) What fraction of carbon dioxide released to the atmosphere each year recently stays in the atmosphere? 12) _____
A) about 50% B) almost none
C) all of it D) an unknown amount

13) If all human-produced aerosols were immediately and forever removed from the atmosphere, global average temperature would over the following few years would 13) _____
A) increase by about 0.5 deg B) drop into an ice age
C) decrease by about 1 deg D) not change at all

14) Scientists can infer temperatures from pre-thermometer eras by 14) _____
A) tree rings B) changes in isotope ratios
C) changes in pollen distributions D) all of the above

15) Compared to methane amounts from ice cores covering the past 700,00 years, current amounts are about 15) _____
A) 2-3 time greater. B) 10-20 times greater.
C) about half the earlier amounts. D) the same as previous interglacials.

16) Relatively warm periods, interglacials, have occurred in the past about 16) _____
A) every 100,000 years. B) 2,000 years.
C) every 20,000 years. D) 50,000 years.

17) Atmospheric carbon dioxide during interglacials has tended to be about _____ greater than during ice ages. 17) _____
A) 100 ppm B) 300 ppb C) 370 ppm D) 1750 ppb

18) The North Atlantic's Meridional Overturning Circulation is characterized by 18) _____
A) an inflow of warm, saline upper-ocean waters into high latitudes.
B) water that gradually increases in density as it moves north.
C) water the freshens in polar seas.
D) all of the above

19) The most important greenhouse gas in the atmosphere is 19) _____
A) water vapor. B) carbon dioxide.
C) methane. D) nitrous oxide.

20) Warmer conditions are often associated with reduced ozone in the lower atmosphere. 20) _____
A) False B) True

21) Parameterization is the means by which climate models 21) _____
A) include processes unresolved by their grid.
B) compute parallel metrics for model evaluation.
C) implement specific details pertaining to the metric system.
D) ingest metadata for parameter optimization.

22) Negative feedbacks 22) _____
A) stabilize the climate system.
B) produce negative temperature changes.
C) feed increased water vapor into warmer temperatures.
D) all of the above

23) The annual range of temperature in the extratropics is larger over land than ocean because 23) _____
A) land has lower heat capacity than ocean.
B) the urban heat island effects warms cities.
C) polar air moves equatorward more easily over land.
D) all of the above

24) The land in the tropics has more variable temperatures throughout the year than land in the polar regions. 24) _____
A) False B) True

25) GCM biases in the annual range of temperature tend to be smallest in magnitude (absolute value) over 25) _____
A) tropical oceans.
B) Antarctica.
C) the Amazon basin in South America.
D) Siberia.

26) The uncertainty of aerosol radiative forcing over the past 255 years means that aerosol radiative forcing potentially could 26) _____
A) cancel that due to carbon dioxide.
B) warm the climate.
C) account for the effects of all human activities.
D) remove cloud albedos.

27) The net radiative forcing by long-lived greenhouse gases over the past 255 years is about 27) _____
A) 2.4 - 2.9 W/(square meter).
B) 0.6 - 2.4 W/(square meter).
C) 1.6 W/(square meter).
D) 1.4 - 1.8 W/(square meter).

28) The net radiative forcing by the sun over the past 255 years is smaller than many human-caused forcings. 28) _____
A) False
B) True

29) The peer-reviewed literature on global warming has been increasing rapidly since about 29) _____
A) 1990.
B) 1860.
C) 1920.
D) 1950.

30) The increase in dissolved carbon dioxide in the ocean is 30) _____
A) making the ocean more acidic.
B) making the ocean more alkaline.
C) having no clear effect on pH.
D) creating more cloud nuclei.

Answer Key
Testname: MID–TERM–SP09

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A
11) A
12) A
13) A
14) D
15) A
16) A
17) A
18) D
19) A
20) A
21) A
22) A
23) A
24) A
25) A
26) A
27) A
28) B
29) A
30) A