Earth System Science 5 : Homework #1 (Due 4/19/2007)

Name_____ Student ID: _____

1) The temperature is lowest here:
   A) mesopause. B) stratosphere.
   C) tropopause. D) stratopause.

2) The sky is blue because:
   A) blue light is reflected off the world's oceans into the atmosphere.
   B) blue light is not easily scattered by the atmosphere.
   C) air molecules scatter blue light more readily than other colors of visible light.
   D) blue light is not easily absorbed by the atmosphere.

3) At a given point on Earth, beam depletion will be greatest at:
   A) sunset.
   B) Earth's perihelion.
   C) the time of day when the solar angle is lowest.
   D) noon.

4) The atmosphere is a mixture of:
   A) precipitation and air.
   B) gas molecules, small particulates, and moisture.
   C) moisture and cas molecules only.
   D) particulate matter and water.

5) This works primarily on shorter–wavelength radiation:
   A) nonselective scattering.
   B) Rayleigh scattering.
   C) Mie scattering.
   D) infrared absorption.

6) A "greenhouse" works because:
   A) all greenhouses face south and into the maximum angle of solar energy.
   B) of the difference in the solar constant.
   C) the windows of the greenhouse only allow green light wavelengths to pass through.
   D) short wave lengths of energy pass through the glass but longer ones can't.

7) Albedo:
   A) is high for sand and dirt.
   B) is high for ice, snow and thick clouds.
   C) is high for water.
   D) varies with latitude and not the various surfaces.
   E) is the same for all geographic features.

8) The thermosphere:
   A) is characterized by a decrease in temperature as height increases.
   B) has a low heat content.
   C) would feel very hot to an astronaut.
   D) is part of the homosphere.

9) In this atmospheric layer, the temperature is relatively constant for the first 10 kilometers, then it increases:
   A) troposphere. B) mesosphere.
   C) stratosphere. D) thermosphere.

10) According to Wien's law:
   A) the wavelength of peak radiation is proportional to temperature.
   B) the Sun's energy intensity peaks in the visible portion of the electromagnetic spectrum.
   C) wavelength is proportional to the fourth power of the intensity of radiation.
   D) the radiation emitted from Earth must be 4 micrometers or longer.

11) The largest energy transfer in the solar spectrum occurs in the:
   A) radio wave part of the spectrum.
   B) Infrared part of the spectrum.
   C) visible part of the spectrum.
   D) ultraviolet part of the spectrum.
   E) x–ray part of the spectrum.

12) The atmosphere:

A) has not changed substantially in composition since the earth formed over four billion years ago.

B) is more than 99 percent contained within the first 60 miles from the earth's surface.

C) has vertical wind speeds that are typically around one–tenth that of horizontal wind speeds.

D) is about as deep as the planet is wide.

13) Choose the correct listing of radiation from the longest wavelengths to the shortest wavelengths:

A) radio, gamma rays, ultraviolet, visible, infrared, x–rays.

B) radio, infrared, visible, ultraviolet, x–rays, gamma rays.

C) gamma rays, radio, ultraviolet, infrared, visible, x–rays.

D) x–rays, ultraviolet, infrared, gamma rays, visible, radio.

14) What do you notice concerning the percentage of permanent gasses throughout the atmosphere (all levels)?

A) It varies significantly only at the tropopause.

B) It varies significantly from the surface up.

C) It varies only in the mesosphere.

D) It is the same throughout the atmosphere from the surface up.

15) The four layers of the atmosphere from the top down are:

A) thermosphere, mesosphere, stratosphere, troposphere.

B) stratosphere, mesosphere, thermosphere, troposphere.

C) thermosphere, stratosphere, mesosphere, troposphere.

D) troposphere, stratosphere, mesosphere, thermosphere.

16) In comparing the three scales of temperature, the temperature divisions on the _____ scale and the _____ scale are both larger than the divisions on the _____ scale.

A) Celsius, Kelvin, Fahrenheit

B) Kelvin, Fahrenheit, Celsius

C) Celsius, Fahrenheit, Kelvin

D) None of the above: the divisions are equal on all three scales.

17) If the Sun increased its radiative output:

A) the earth would have a surplus of incoming radiation energy compared to outgoing radiation energy until the Sun finally burned itself out.

B) the amount of longwave energy radiated from Earth's surface would decrease.

C) the earth would undergo an uncontrollable greenhouse effect.

D) the earth would eventually reach a higher equilibrium temperature.

18) The highest temperatures are typically found in the:

A) thermosphere. B) stratosphere.

C) mesosphere. D) troposphere.

19) Ozone is found primarily in the _____ and is important because of _____.

A) mesosphere; it makes the mid–levels of the atmosphere cold

B) thermosphere; it makes the upper levels of the atmosphere very warm

C) stratosphere; its interaction with ultraviolet radiation

D) troposphere; it enhances thunderstorm development

20) Aerosols:

A) have little effect on weather.

B) include cloud droplets.

C) are formed by physical processes, not chemical processes.

D) can be either solid or liquid.

21) If object A is at 400 K, and object B is at 800 K, then the radiation intensity of object A will be this amount of that the radiation intensity of object B:

A) one–fourth. B) one–sixteenth.

C) one–half. D) one–eighth.

22) The solar declination angle:

A) moves from north to south and back again.

B) changes daily.

C) has a northern most and southern most limit of 23.5 degrees.

D) all of the above

23) This is NOT a variable gas:

A) carbon dioxide. B) argon.

C) ozone. D) water vapor.

24) The high levels of atmospheric nitrogen are due primarily to the fact that:

A) nitrogen is the major component of the gas emitted from volcanoes.

B) nitrogen is produced by many species of bacteria.

C) nitrogen has a very long residence time.

D) the earth is constantly bombarded by small, house–sized comets.

25) The Stefan–Boltzmann law:

A) is derived from Wien's law.

B) demonstrates that a cooler body will radiate with greater intensity than will a hotter body.

C) gives energy intensities in watts per square meter.

D) does not apply to black bodies.

26) The difference between the atmosphere's "permanent" gasses and "variable" gasses is that:

A) permanent gasses exchange rapidly between the atmosphere and the biosphere.

B) variable gasses are dependent on storms for world–wide dispersion.

C) permanent gasses exhibit a constant proportion from the earth's surface to higher reaches of the atmosphere.

D) variable gasses are so called because of their horizontal displacement.

27) Volcanic outgassing:

A) emits large amounts of water vapor.

B) emits very little carbon dioxide.

C) created the earth's first atmosphere.

D) has had little effect on the earth's atmosphere.

28) The troposphere:

A) has height that is relatively consistent at about ten kilometers.

B) contains a bit less than half the atmosphere's mass.

C) stays about the same temperature above three kilometers.

D) is characterized in part by vertical mixing of air.

29) At the theoretical Absolute Zero (Zero degrees Kelvin),

A) all molecular motion stops.

B) molecular motion is at a minimum.

C) metal surfaces become totally frictionless.

D) atoms implode.

30) Sunsets are red for all of the following reasons except:

A) red light has more energy than blue light.

B) Rayleigh scattering.

C) light has to travel through more atmosphere to reach the observer.

D) Mie scattering.