Name: _____ Student ID Number _____

ESS55: Earth's Atmosphere / Homework #2 (due 4/16/2009)

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. A change of one degree on the Celsius scale is _____ a change of one degree on the Fahrenheit scale.
   a. equal to
   b. larger than
   c. smaller than
   d. is in the opposite direction of

____ 2. A heat transfer process in the atmosphere that depends upon the movement of air is:
   a. conduction
   b. absorption
   c. reflection
   d. convection
   e. radiation

____ 3. The temperature of a rising air parcel:
   a. always cools due to expansion
   b. always warms due to expansion
   c. always cools due to compression
   d. always warms due to compression
   e. remains constant

____ 4. The proper order from shortest to longest wavelength is:
   a. visible, infrared, ultraviolet
   b. infrared, visible, ultraviolet
   c. ultraviolet, visible, infrared
   d. visible, ultraviolet, infrared
   e. ultraviolet, infrared, visible

____ 5. How do red and blue light differ?
   a. blue light has a higher speed of propagation
   b. the wavelength of red light is longer
   c. red light has a higher intensity
   d. red and blue light have different directions of polarization

____ 6. If the average temperature of the sun increased, the wavelength of peak solar emission would:
   a. shift to a shorter wavelength
   b. shift to a longer wavelength
   c. remain the same
   d. impossible to tell from given information

____ 7. Solar radiation reaches the earth's surface as:
   a. visible radiation only
   b. ultraviolet radiation only
   c. infrared radiation only
   d. visible and infrared radiation only
   e. ultraviolet, visible, and infrared radiation

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____ 8. Electromagnetic radiation with wavelengths between 0.4 and 0.7 micrometers is called:
   a. ultraviolet light
   b. visible light
   c. infrared light
   d. microwaves

____ 9. The sun emits a maximum amount of radiation at wavelengths near _____, while the earth emits maximum radiation near wavelengths of _____.
   a. 0.5 micrometers, 30 micrometers
   b. 0.5 micrometers, 10 micrometers
   c. 10 micrometers, 30 micrometers
   d. 1 micrometer, 10 micrometers

____ 10. The blueness of the sky is mainly due to:
   a. the scattering of sunlight by air molecules
   b. the presence of water vapor
   c. absorption of blue light by the air
   d. emission of blue light by the atmosphere

____ 11. Which of the following determine the kind (wavelength) and amount of radiation that an object emits?
   a. temperature
   b. thermal conductivity
   c. density
   d. latent heat

____ 12. One micrometer is a unit of length equal to:
   a. one million meters
   b. one millionth of a meter
   c. one tenth of a millimeter
   d. one thousandth of a meter

____ 13. Evaporation is a _____ process.
   a. cooling
   b. heating
   c. can't tell - it depends on the temperature
   d. both a and c

____ 14. Which of the following has a wavelength shorter than that of violet light?
   a. green light
   b. blue light
   c. infrared radiation
   d. red light
   e. ultraviolet radiation

____ 15. If the absolute temperature of an object doubles, the maximum energy emitted goes up by a factor of:
   a. 2
   b. 4
   c. 8
   d. 16
   e. 32

____ 16. The earth's radiation is often referred to as _____ radiation, while the sun's radiation is often referred to as _____ radiation.
   a. shortwave, longwave
   b. shortwave, shortwave
   c. longwave, shortwave
   d. longwave, longwave

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____ 17. If the earth's average surface temperature were to increase, the amount of radiation emitted from the earth's surface would _____ and the wavelength of peak emission would shift toward _____ wavelengths.
a. increase, shorter
b. increase, longer
c. decrease, shorter
d. decrease, longer

____ 18. Without the atmospheric greenhouse effect, the average surface temperature would be:
a. higher than at present
b. lower than at present
c. the same as it is now
d. much more variable than it is now

____ 19. The earth's atmospheric window is in the:
a. ultraviolet region
b. visible region
c. infrared region
d. polar regions

____ 20. The atmospheric greenhouse effect is produced mainly by the:
a. absorption and re-emission of visible light by the atmosphere
b. absorption and re-emission of ultraviolet radiation by the atmosphere
c. absorption and re-emission of infrared radiation by the atmosphere
d. absorption and re-emission of visible light by clouds
e. absorption and re-emission of visible light by the ground

____ 21. At night, low clouds:
a. enhance the atmospheric greenhouse effect
b. weaken the atmospheric greenhouse effect
c. are often caused by the atmospheric greenhouse effect
d. have no effect on the atmospheric greenhouse effect

____ 22. Of the gases listed below, which is <u>not</u> believed to be responsible for enhancing the earth's greenhouse effect?
a. chlorofluorocarbons (CFCs)
b. molecular oxygen (O_2)
c. nitrous oxide (N_2O)
d. carbon dioxide (CO_2)
e. methane (CH_4)

____ 23. The combined albedo of the earth and the atmosphere is approximately:
a. 4%
b. 10%
c. 30%
d. 50%
e. 90%

____ 24. An increase in albedo would be accompanied by _____ in radiative equilibrium temperature.
a. an increase
b. a decrease
c. no change
d. unstable oscillations

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____ 25. Sinking air warms by this process:
- a. compression
- b. expansion
- c. condensation
- d. friction

____ 26. The sun emits its greatest intensity of radiation in:
- a. the visible portion of the spectrum
- b. the infrared portion of the spectrum
- c. the ultraviolet portion of the spectrum
- d. the x-ray portion of the spectrum

____ 27. The earth emits radiation with greatest intensity at:
- a. infrared wavelengths
- b. radio wavelengths
- c. visible wavelengths
- d. ultraviolet wavelengths

____ 28. Suppose last night was clear and calm. Tonight low clouds will be present. From this you would conclude that tonight's minimum temperature will be:
- a. higher than last night's minimum temperature
- b. lower than last night's minimum temperature
- c. the same as last night's minimum temperature
- d. above freezing

____ 29. Which of the following is known primarily as a selective absorber of ultraviolet radiation?
- a. carbon dioxide
- b. ozone
- c. water vapor
- d. clouds

____ 30. The albedo of the moon is 7%. This means that:
- a. 7% of the sunlight striking the moon is reflected
- b. 7% of the sunlight striking the moon is absorbed
- c. the moon emits only 7% as much energy as it absorbs from the sun
- d. 93% of the sunlight striking the moon is reflected