

**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.
- equal to
  - larger than
  - smaller than
  - is in the opposite direction of
- \_\_\_\_\_ 2. A heat transfer process in the atmosphere that depends upon the movement of air is:
- conduction
  - absorption
  - reflection
  - convection
  - radiation
- \_\_\_\_\_ 3. The temperature of a rising air parcel:
- always cools due to expansion
  - always warms due to expansion
  - always cools due to compression
  - always warms due to compression
  - remains constant
- \_\_\_\_\_ 4. The proper order from shortest to longest wavelength is:
- visible, infrared, ultraviolet
  - infrared, visible, ultraviolet
  - ultraviolet, visible, infrared
  - visible, ultraviolet, infrared
  - ultraviolet, infrared, visible
- \_\_\_\_\_ 5. How do red and blue light differ?
- blue light has a higher speed of propagation
  - the wavelength of red light is longer
  - red light has a higher intensity
  - 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:
- shift to a shorter wavelength
  - shift to a longer wavelength
  - remain the same
  - impossible to tell from given information
- \_\_\_\_\_ 7. Solar radiation reaches the earth's surface as:
- visible radiation only
  - ultraviolet radiation only
  - infrared radiation only
  - visible and infrared radiation only
  - ultraviolet, visible, and infrared radiation

Name: \_\_\_\_\_

- \_\_\_\_\_ 8. Electromagnetic radiation with wavelengths between 0.4 and 0.7 micrometers is called:
- ultraviolet light
  - visible light
  - infrared light
  - microwaves
- \_\_\_\_\_ 9. The sun emits a maximum amount of radiation at wavelengths near \_\_\_\_\_, while the earth emits maximum radiation near wavelengths of \_\_\_\_\_.
- 0.5 micrometers, 30 micrometers
  - 0.5 micrometers, 10 micrometers
  - 10 micrometers, 30 micrometers
  - 1 micrometer, 10 micrometers
- \_\_\_\_\_ 10. The blueness of the sky is mainly due to:
- the scattering of sunlight by air molecules
  - the presence of water vapor
  - absorption of blue light by the air
  - emission of blue light by the atmosphere
- \_\_\_\_\_ 11. Which of the following determine the kind (wavelength) and amount of radiation that an object emits?
- temperature
  - thermal conductivity
  - density
  - latent heat
- \_\_\_\_\_ 12. One micrometer is a unit of length equal to:
- one million meters
  - one millionth of a meter
  - one tenth of a millimeter
  - one thousandth of a meter
- \_\_\_\_\_ 13. Evaporation is a \_\_\_\_\_ process.
- cooling
  - heating
  - can't tell - it depends on the temperature
  - both a and c
- \_\_\_\_\_ 14. Which of the following has a wavelength shorter than that of violet light?
- green light
  - blue light
  - infrared radiation
  - red light
  - ultraviolet radiation
- \_\_\_\_\_ 15. If the absolute temperature of an object doubles, the maximum energy emitted goes up by a factor of:
- 2
  - 4
  - 8
  - 16
  - 32
- \_\_\_\_\_ 16. The earth's radiation is often referred to as \_\_\_\_\_ radiation, while the sun's radiation is often referred to as \_\_\_\_\_ radiation.
- shortwave, longwave
  - shortwave, shortwave
  - longwave, shortwave
  - longwave, longwave

Name: \_\_\_\_\_

- \_\_\_\_\_ 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.
- increase, shorter
  - increase, longer
  - decrease, shorter
  - decrease, longer
- \_\_\_\_\_ 18. Without the atmospheric greenhouse effect, the average surface temperature would be:
- higher than at present
  - lower than at present
  - the same as it is now
  - much more variable than it is now
- \_\_\_\_\_ 19. The earth's atmospheric window is in the:
- ultraviolet region
  - visible region
  - infrared region
  - polar regions
- \_\_\_\_\_ 20. The atmospheric greenhouse effect is produced mainly by the:
- absorption and re-emission of visible light by the atmosphere
  - absorption and re-emission of ultraviolet radiation by the atmosphere
  - absorption and re-emission of infrared radiation by the atmosphere
  - absorption and re-emission of visible light by clouds
  - absorption and re-emission of visible light by the ground
- \_\_\_\_\_ 21. At night, low clouds:
- enhance the atmospheric greenhouse effect
  - weaken the atmospheric greenhouse effect
  - are often caused by the atmospheric greenhouse effect
  - have no effect on the atmospheric greenhouse effect
- \_\_\_\_\_ 22. Of the gases listed below, which is not believed to be responsible for enhancing the earth's greenhouse effect?
- chlorofluorocarbons (CFCs)
  - molecular oxygen (O<sub>2</sub>)
  - nitrous oxide (N<sub>2</sub>O)
  - carbon dioxide (CO<sub>2</sub>)
  - methane (CH<sub>4</sub>)
- \_\_\_\_\_ 23. The combined albedo of the earth and the atmosphere is approximately:
- 4%
  - 10%
  - 30%
  - 50%
  - 90%
- \_\_\_\_\_ 24. An increase in albedo would be accompanied by \_\_\_\_\_ in radiative equilibrium temperature.
- an increase
  - a decrease
  - no change
  - unstable oscillations

Name: \_\_\_\_\_

- \_\_\_\_\_ 25. Sinking air warms by this process:
- compression
  - expansion
  - condensation
  - friction
- \_\_\_\_\_ 26. The sun emits its greatest intensity of radiation in:
- the visible portion of the spectrum
  - the infrared portion of the spectrum
  - the ultraviolet portion of the spectrum
  - the x-ray portion of the spectrum
- \_\_\_\_\_ 27. The earth emits radiation with greatest intensity at:
- infrared wavelengths
  - radio wavelengths
  - visible wavelengths
  - 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:
- higher than last night's minimum temperature
  - lower than last night's minimum temperature
  - the same as last night's minimum temperature
  - above freezing
- \_\_\_\_\_ 29. Which of the following is known primarily as a selective absorber of ultraviolet radiation?
- carbon dioxide
  - ozone
  - water vapor
  - clouds
- \_\_\_\_\_ 30. The albedo of the moon is 7%. This means that:
- 7% of the sunlight striking the moon is reflected
  - 7% of the sunlight striking the moon is absorbed
  - the moon emits only 7% as much energy as it absorbs from the sun
  - 93% of the sunlight striking the moon is reflected

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**Answer Section**

**MULTIPLE CHOICE**

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

B   8.        A   17.        A   25.

  B   1.        B   9.        A   26.

  B   18.

  D   2.        A   10.        A   27.

  C   19.

  A   3.        A   11.        A   28.

  C   20.

  B   12.        B   29.

  C   4.        A   21.

  A   13.        A   30.

  B   5.        B   22.

  E   14.

  A   6.        C   23.

  D   15.

  E   7.        B   24.

  C   16.