

**Weather: Chapter 2****QUIZ**

1. The albedo of the earth refers to the \_\_\_\_\_.
  - a. distribution of continents and oceans
  - b. scattering of solar radiation as it passes through the atmosphere
  - c. the absorption of ultraviolet radiation in the stratosphere by ozone
  - d. fraction of solar radiation that is reflected back to space
  
2. The Stefan-Boltzmann law tells us that the \_\_\_\_\_.
  - a. earth radiates more energy per unit area than the sun
  - b. sun radiates primarily at longer wavelengths than the earth
  - c. earth radiates less energy per unit area than the sun but at shorter wavelengths
  - d. sun radiates at shorter wavelengths and the earth radiates at longer wavelengths
  - e. sun radiates more energy per unit area than the earth
  
3. \_\_\_\_\_ is the transfer of energy by electromagnetic waves.
  - a. Magnetism
  - b. Conduction
  - c. Convection
  - d. Radiation
  - e. Advection
  
4. According to Wien's Law, the wavelength of maximum emission of radiation \_\_\_\_\_ as temperature \_\_\_\_\_.
  - a. increases, increases
  - b. decreases, decreases
  - c. decreases, increases
  - d. disappears, increases
  
5. The albedo of the earth-atmosphere system is approximately \_\_\_\_\_.
  - a. 0.04
  - b. 0.10
  - c. 0.30
  - d. 0.50
  - e. 0.70
  
6. On a calm, sunny day, the air in the lowest inch or so of the atmosphere is heated primarily by \_\_\_\_\_.
  - a. convection
  - b. conduction
  - c. direct absorption of solar radiation
  - d. latent heat release
  - e. absorption of terrestrial radiation
  
7. A form of energy transfer between two objects that does not require the space between them to be heated is \_\_\_\_\_.
  - a. radiation
  - b. conduction
  - c. advection
  - d. convection
  - e. convection
  
8. Which of the following has the highest albedo (relative to visible light)?
  - a. freshly fallen snow
  - b. the ocean
  - c. a forest
  - d. asphalt
  
9. On average, about what percentage of the solar radiation that reaches the "top" of the earth's atmosphere is absorbed by the surface?
  - a. 10%
  - b. 25%
  - c. 50%
  - d. 75%
  - e. 90%
  
10. At the North Pole the sun rises above the horizon on March 21 and does not set again until about September 22. In spite of this long period of continuous sunshine, the atmosphere above the North Pole never becomes as warm as the tropical atmosphere, which experiences about 12 hours of sunlight followed by 12 hours of darkness day after day throughout the year. What factor contributes to the relatively cool conditions over the North Pole during the summer?
  - a. The sunlight strikes the surface at a relatively large angle (as measured from the vertical).
  - b. The sunlight has a relatively long path through the atmosphere before reaching the surface.
  - c. Much of the incident sunlight is reflected by ice, snow, or liquid water.
  - d. Much of the sun's energy is used to melt or evaporate water rather than heat the surface.
  - e. All of the above are correct.
  
11. On average, what percent of the solar radiation that reaches the "top" of the earth's atmosphere is absorbed in the atmosphere (include the contribution from clouds)?
  - a. 0%
  - b. 100%
  - c. 81%
  - d. 19%
  
12. Which of the following is a "greenhouse gas"?
  - a. nitrogen
  - b. argon
  - c. water vapor
  - d. oxygen
  - e. None of these are "greenhouse gases."
  
13. The greenhouse effect, which has existed naturally ever since the Earth has had an atmosphere, keeps temperatures \_\_\_\_\_ than they would be if there were no greenhouse effect.
  - a. higher
  - b. lower
  - c. the same
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14. The Earth emits \_\_\_\_\_ energy than the sun and does so primarily at \_\_\_\_\_ wavelengths.  
a. more, shorter                      b. more, longer                      c. less, longer                      d. less, shorter
15. The human eye is sensitive to a very small range of all the wavelengths of electromagnetic radiation. What is this range of wavelengths called?  
a. ultraviolet                      b. infrared                      c. longwave                      d. visible
16. If an object absorbs more energy than it emits (and everything else remains constant), the object's temperature \_\_\_\_\_.  
a. remains constant                      b. increases                      c. decreases                      d. varies randomly
17. Which of the following is a very effective absorber of ultraviolet radiation?  
a. ozone                      b. water vapor                      c. nitrogen                      d. carbon dioxide
18. The natural greenhouse effect is a direct result of \_\_\_\_\_.  
a. ozone depletion                      b. Earth's atmosphere                      c. increasing concentrations of carbon dioxide
19. The peak in the earth's emission spectrum lies in the \_\_\_\_\_ range of wavelengths, while the peak in the sun's emission spectrum lies in the \_\_\_\_\_ range of wavelengths.  
a. visible, ultraviolet                      b. infrared, ultraviolet                      c. ultraviolet, visible                      d. infrared, visible
20. The proper ordering of electromagnetic radiation from the shortest wavelength to the longest wavelength is \_\_\_\_\_.  
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21. If there were not a long-term balance between incoming solar and outgoing infrared radiation, then \_\_\_\_\_.  
a. the mass of the atmosphere would change                      c. the sun's output would change  
b. the earth's average surface temperature would change                      d. the concentration of greenhouse gases would increase
22. The gases primarily responsible for the natural greenhouse effect are \_\_\_\_\_.  
a. oxygen and ozone                      c. nitrogen and oxygen                      e. water vapor and oxygen  
b. carbon dioxide and water vapor                      d. carbon dioxide and nitrogen
23. If the average temperature of the sun decreased, the wavelength at which the sun emits the maximum amount of radiation would \_\_\_\_\_.  
a. shift to a shorter wavelength                      c. shift to a longer wavelength  
b. remain the same                      d. It is impossible to tell from the information given.
24. In the absence of the greenhouse effect, the average surface temperature of the Earth would be about \_\_\_\_\_ than at present.  
a. 60°F higher                      b. 60°F lower                      c. 10°F higher                      d. 10°F lower
25. The atmosphere is largely transparent to \_\_\_\_\_ radiation, but opaque to \_\_\_\_\_ radiation.  
a. ultraviolet, visible                      c. ultraviolet, infrared                      e. infrared, ultraviolet  
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26. The basic cause of the natural greenhouse effect is \_\_\_\_\_.  
a. the burning of fossil fuels                      c. air pollution                      e. None of the above is correct.  
b. forest clearing in the Amazon                      d. All of the above are correct.
27. Although the losses of infrared radiation over polar regions are greater than annual gains in solar energy, polar regions do not become progressively colder each year because \_\_\_\_\_.  
a. heat energy is absorbed by the snow and ice surfaces  
b. heat energy is circulated from tropical latitudes by the atmosphere and oceans  
c. latent heat is released to the atmosphere when the polar ice melts  
d. heat energy is conducted from the interior of the earth
28. The greenhouse effect is primarily the result of \_\_\_\_\_.  
a. absorption and emission of ultraviolet radiation by the atmosphere  
b. absorption and emission of ultraviolet radiation by the Earth's surface

- c. absorption and emission of visible radiation by the atmosphere
- d. absorption and emission of infrared radiation by the atmosphere
- e. reflection of visible radiation by clouds

29. Infrared radiation is strongly absorbed by \_\_\_\_\_ while ultraviolet radiation is strongly absorbed by \_\_\_\_\_.

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- b. water vapor, nitrogen
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30. Energy transfer by the upward movement of air over a relatively warm surface is called \_\_\_\_\_.

- a. convection
- b. advection
- c. radiation
- d. transpiration
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31. Given that the "speed of light" is about 186,000 miles per second, approximately how long does it take radiation from the sun to reach the earth?

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33. In the Stefan-Boltzmann Law, temperature must be expressed in \_\_\_\_\_.

- a. °F
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34. When considering only incoming solar radiation and outgoing infrared radiation, regions within about 35° latitude of the equator undergo a net \_\_\_\_\_ and higher latitudes undergo a net \_\_\_\_\_.

- a. cooling, warming
- b. warming, cooling
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35. Air in the \_\_\_\_\_ is primarily heated by \_\_\_\_\_.

- a. troposphere, the sun
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36. An inefficient conductor of heat energy (air, for example) is also called a(n) \_\_\_\_\_.

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23. If the average temperature of the sun decreased, the wavelength at which the sun emits the maximum amount of radiation would \_\_\_\_\_.  
a. shift to a shorter wavelength                      c. shift to a longer wavelength  
b. remain the same                      d. It is impossible to tell from the information given.
24. In the absence of the greenhouse effect, the average surface temperature of the Earth would be about \_\_\_\_\_ than at present.  
a. 60°F higher                      b. 60°F lower                      c. 10°F higher                      d. 10°F lower
25. The atmosphere is largely transparent to \_\_\_\_\_ radiation, but opaque to \_\_\_\_\_ radiation.  
a. ultraviolet, visible                      c. ultraviolet, infrared                      e. infrared, ultraviolet  
b. visible, infrared                      d. infrared, visible
26. The basic cause of the natural greenhouse effect is \_\_\_\_\_.  
a. the burning of fossil fuels                      c. air pollution                      e. None of the above is correct.  
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a. heat energy is absorbed by the snow and ice surfaces  
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c. latent heat is released to the atmosphere when the polar ice melts  
d. heat energy is conducted from the interior of the earth
28. The greenhouse effect is primarily the result of \_\_\_\_\_.  
a. absorption and emission of ultraviolet radiation by the atmosphere  
b. absorption and emission of ultraviolet radiation by the Earth's surface

- c. absorption and emission of visible radiation by the atmosphere
- d. absorption and emission of infrared radiation by the atmosphere
- e. reflection of visible radiation by clouds

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- b. water vapor, nitrogen
- c. carbon dioxide, ozone
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30. Energy transfer by the upward movement of air over a relatively warm surface is called \_\_\_\_\_.

- a. convection
- b. advection
- c. radiation
- d. transpiration
- e. conduction

31. Given that the "speed of light" is about 186,000 miles per second, approximately how long does it take radiation from the sun to reach the earth?

- a. instantly
- b. 8 seconds
- c. 8 minutes
- d. an hour

32. The \_\_\_\_\_ an object, the \_\_\_\_\_ the wavelengths of radiation it emits.

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- c. colder, shorter
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33. In the Stefan-Boltzmann Law, temperature must be expressed in \_\_\_\_\_.

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34. When considering only incoming solar radiation and outgoing infrared radiation, regions within about 35° latitude of the equator undergo a net \_\_\_\_\_ and higher latitudes undergo a net \_\_\_\_\_.

- a. cooling, warming
- b. warming, cooling
- c. warming, warming
- d. cooling, cooling

35. Air in the \_\_\_\_\_ is primarily heated by \_\_\_\_\_.

- a. troposphere, the sun
- b. troposphere, the Earth's surface
- c. stratosphere, the Earth's surface
- d. lithosphere, the Earth's surface

36. An inefficient conductor of heat energy (air, for example) is also called a(n) \_\_\_\_\_.

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- b. clouds trap the heat, not allowing it to escape the evil clutches of the lower atmosphere
- c. clouds emit less visible radiation than the clear sky
- d. clouds emit more infrared radiation than the clear sky

**Weather: Chapter 2****QUIZ**

1. The albedo of the earth refers to the \_\_\_\_\_.
  - a. distribution of continents and oceans
  - b. scattering of solar radiation as it passes through the atmosphere
  - c. the absorption of ultraviolet radiation in the stratosphere by ozone
  - d. fraction of solar radiation that is reflected back to space
  
2. The Stefan-Boltzmann law tells us that the \_\_\_\_\_.
  - a. earth radiates more energy per unit area than the sun
  - b. sun radiates primarily at longer wavelengths than the earth
  - c. earth radiates less energy per unit area than the sun but at shorter wavelengths
  - d. sun radiates at shorter wavelengths and the earth radiates at longer wavelengths
  - e. sun radiates more energy per unit area than the earth
  
3. \_\_\_\_\_ is the transfer of energy by electromagnetic waves.
  - a. Magnetism
  - b. Conduction
  - c. Convection
  - d. Radiation
  - e. Advection
  
4. According to Wien's Law, the wavelength of maximum emission of radiation \_\_\_\_\_ as temperature \_\_\_\_\_.
  - a. increases, increases
  - b. decreases, decreases
  - c. decreases, increases
  - d. disappears, increases
  
5. The albedo of the earth-atmosphere system is approximately \_\_\_\_\_.
  - a. 0.04
  - b. 0.10
  - c. 0.30
  - d. 0.50
  - e. 0.70
  
6. On a calm, sunny day, the air in the lowest inch or so of the atmosphere is heated primarily by \_\_\_\_\_.
  - a. convection
  - b. conduction
  - c. direct absorption of solar radiation
  - d. latent heat release
  - e. absorption of terrestrial radiation
  
7. A form of energy transfer between two objects that does not require the space between them to be heated is \_\_\_\_\_.
  - a. radiation
  - b. conduction
  - c. advection
  - d. convection
  - e. convection
  
8. Which of the following has the highest albedo (relative to visible light)?
  - a. freshly fallen snow
  - b. the ocean
  - c. a forest
  - d. asphalt
  
9. On average, about what percentage of the solar radiation that reaches the "top" of the earth's atmosphere is absorbed by the surface?
  - a. 10%
  - b. 25%
  - c. 50%
  - d. 75%
  - e. 90%
  
10. At the North Pole the sun rises above the horizon on March 21 and does not set again until about September 22. In spite of this long period of continuous sunshine, the atmosphere above the North Pole never becomes as warm as the tropical atmosphere, which experiences about 12 hours of sunlight followed by 12 hours of darkness day after day throughout the year. What factor contributes to the relatively cool conditions over the North Pole during the summer?
  - a. The sunlight strikes the surface at a relatively large angle (as measured from the vertical).
  - b. The sunlight has a relatively long path through the atmosphere before reaching the surface.
  - c. Much of the incident sunlight is reflected by ice, snow, or liquid water.
  - d. Much of the sun's energy is used to melt or evaporate water rather than heat the surface.
  - e. All of the above are correct.
  
11. On average, what percent of the solar radiation that reaches the "top" of the earth's atmosphere is absorbed in the atmosphere (include the contribution from clouds)?
  - a. 0%
  - b. 100%
  - c. 81%
  - d. 19%
  
12. Which of the following is a "greenhouse gas"?
  - a. nitrogen
  - b. argon
  - c. water vapor
  - d. oxygen
  - e. None of these are "greenhouse gases."
  
13. The greenhouse effect, which has existed naturally ever since the Earth has had an atmosphere, keeps temperatures \_\_\_\_\_ than they would be if there were no greenhouse effect.
  - a. higher
  - b. lower
  - c. the same
  - d. more variable

14. The Earth emits \_\_\_\_\_ energy than the sun and does so primarily at \_\_\_\_\_ wavelengths.  
a. more, shorter                      b. more, longer                      c. less, longer                      d. less, shorter
15. The human eye is sensitive to a very small range of all the wavelengths of electromagnetic radiation. What is this range of wavelengths called?  
a. ultraviolet                      b. infrared                      c. longwave                      d. visible
16. If an object absorbs more energy than it emits (and everything else remains constant), the object's temperature \_\_\_\_\_.  
a. remains constant                      b. increases                      c. decreases                      d. varies randomly
17. Which of the following is a very effective absorber of ultraviolet radiation?  
a. ozone                      b. water vapor                      c. nitrogen                      d. carbon dioxide
18. The natural greenhouse effect is a direct result of \_\_\_\_\_.  
a. ozone depletion                      b. Earth's atmosphere                      c. increasing concentrations of carbon dioxide
19. The peak in the earth's emission spectrum lies in the \_\_\_\_\_ range of wavelengths, while the peak in the sun's emission spectrum lies in the \_\_\_\_\_ range of wavelengths.  
a. visible, ultraviolet                      b. infrared, ultraviolet                      c. ultraviolet, visible                      d. infrared, visible
20. The proper ordering of electromagnetic radiation from the shortest wavelength to the longest wavelength is \_\_\_\_\_.  
a. visible, ultraviolet, infrared                      c. infrared, visible, ultraviolet                      e. ultraviolet, visible, infrared  
b. infrared, ultraviolet, visible                      d. ultraviolet, infrared, visible
21. If there were not a long-term balance between incoming solar and outgoing infrared radiation, then \_\_\_\_\_.  
a. the mass of the atmosphere would change                      c. the sun's output would change  
b. the earth's average surface temperature would change                      d. the concentration of greenhouse gases would increase
22. The gases primarily responsible for the natural greenhouse effect are \_\_\_\_\_.  
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