Chapter: Chapter 02: The Earth's Global Energy Balance Chapter Quiz Test Bank
Multiple Choice

1. Electromagnetic radiation is a wavelike form of energy: A) radiated by any substance possessing heat
B) that is transmitted by convection
C) that is transmitted by conduction
D) that is radiated by magnetic substances

Ans: A
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation

2. Which of the following is ***not*** a type of electromagnetic radiation?
A) heat
B) microwaves
C) light
D) ocean waves

Ans: D
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation.

3. Which of the following is a type of electromagnetic radiation?
A) light
B) gamma rays
C) ultraviolet rays
D) all of the above

Ans: D
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

4. Visible light and infrared radiation differ in terms of their _____ .
A) wavelengths

B) wave heights
C) temperatures
D) none of the above

Ans: A
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation.

5. Which of the following types of electromagnetic radiation has the shortest wavelength?
A) ultraviolet
B) infrared
C) microwaves
D) visible light

Ans: A
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

6. Which of the following types of electromagnetic radiation has the longest wavelength?
A) ultraviolet
B) infrared
C) microwaves
D) visible light

Ans: C
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

7. Which of the following colors of visible light has the shortest wavelength?
A) blue
B) violet
C) green
D) red

Ans: B
Section Ref: Electromagnetic Radiation
Difficulty: Hard
Learning Objective: Describe different types of electromagnetic radiation.

8. Relatively hot objects, like the sun, primarily radiate _____ energy.
A) infrared
B) microwave
C) longwave
D) shortwave

Ans: D
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Relate wavelength to temperature

9. Relatively cool objects, like the Earth's surface, primarily radiate _____ energy.
A) infrared
B) microwave
C) longwave
D) shortwave

Ans: C
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Relate wavelength to temperature

10. Energy with wavelengths in the range of 3 to 5 micrometers is known as:
A) infrared
B) microwave
C) longwave
D) shortwave

Ans: C
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation

11. Energy with wavelengths in the range of 0.2 to 3 micrometers is known as:
A) infrared
B) microwave
C) longwave
D) shortwave

Ans: D
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation

12. Hot objects emit _____ energy than cold objects, and it is of _____ wavelengths.
A) more; longer
B) less; longer
C) more; shorter
D) less; shorter

Ans: C
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Relate wavelength to temperature

13. Cold objects emit _____ energy than hot objects, and it is of _____ wavelengths.
A) more; longer
B) less; longer
C) more; shorter
D) less; shorter

Ans: B
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Relate wavelength to temperature

14. The amount of energy radiated by the sun peaks in the _____ portion of the electromagnetic spectrum.
A) visible light
B) infrared
C) ultraviolet
D) gamma ray

Ans: A
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation.

15. The amount of energy radiated by the earth peaks in the _____ portion of the electromagnetic spectrum.
A) visible light
B) infrared
C) ultraviolet
D) gamma ray

Ans: B
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation

16. The process in which electromagnetic energy is transferred into heat energy when radiation strikes some form of matter is called:
A) absorption
B) scattering
C) diffusion
D) emission

Ans: A
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

17. The process in which solar radiation is deflected in different directions when it strikes some form of matter is called:
A) absorption
B) scattering
C) emission
D) none of the above

Ans: B
Section Ref: Electromagnetic Radiation

Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

18. Which of the following processes may occur when solar energy passes through the atmosphere?
A) absorption
B) scattering
C) reflection back to space
D) all of the above

Ans: D
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

19. Which of the following phenomena are powered by solar energy?
A) weather
B) the movement of sand dunes
C) ocean waves
D) all of the above

Ans: D
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

20.
The flow rate of incoming solar energy, as measured at the top of the atmosphere is called:
A) insolation
B) albedo
C) net radiation
D) none of the above

Ans: A
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

21. The flow of solar radiation from the sun to the earth as a whole:
A) varies throughout the day

B) varies from day to night
C) varies seasonally
D) is constant

Ans: D
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

22. Which of the following factors affects the amount of insolation received at a given location at a given time?
A) latitude
B) the length of day
C) the angle of the sun's rays
D) all of the above

Ans: D
Section Ref: Insolation Over The Globe
Difficulty: Easy
Learning Objective: Identify factors that affect daily insolation

23. Which of the following factors most strongly affects the amount of insolation received at a given location at a given time?
A) variations in the output of the sun
B) the angle of the sun's rays
C) variations in the composition of the atmosphere
D) none of the above

Ans: B
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Identify factors that affect daily insolation

24. In the northern hemisphere mid-latitudes, the sun will reach its highest position in the sky on the:
A) June solstice
B) vernal equinox

C) December solstice
D) autumnal equinox

Ans: A
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe how insolation varies by latitude.

25. In the southern hemisphere mid-latitudes, the sun will reach its highest position in the sky on the:
A) June solstice
B) vernal equinox
C) December solstice
D) autumnal equinox

Ans: C
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe how insolation varies by latitude.

26. At the Arctic Circle, the sun will reach its highest position in the sky on the:
A) June solstice
B) vernal equinox
C) December solstice
D) autumnal equinox

Ans: A
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe how insolation varies by latitude.

27. On the equator, the sun will reach its highest position in the sky on the:
A) June solstice
B) Equinoxes
C) December solstice
D) none of the above

Ans: B
Section Ref: Insolation Over the Globe
Difficulty: Hard
Learning Objective: Describe how insolation varies by latitude.

28. On the Tropic of Capricorn, the sun will reach its highest position in the sky on the:
A) June solstice
B) vernal equinox
C) December solstice
D) autumnal equinox

Ans: C
Section Ref: Insolation Over the Globe
Difficulty: Hard
Learning Objective: Describe how insolation varies by latitude.

29. If the earth's axis was perpendicular to the plane of the ecliptic, insolation would be:
A) larger at the poles
B) smaller at the equator
C) the same at 45^{o} north and south latitude
D) none of the above

Ans: C
Section Ref: Insolation Over the Globe
Difficulty: Hard
Learning Objective: Describe how insolation varies by latitude.

30. The tilt of the earth's axis with respect to the plane of the ecliptic cause insolation levels to be:
A) larger at the poles
B) smaller at the equator
C) the same at 45^{o} north and south latitude

D) all of the above

Ans: D
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe how insolation varies by latitude.

31. The latitudinal zones known as the tropics are separated from the equatorial zone by the _____ zones.
A) subtropic
B) mid-latitude
C) subpolar
D) none of the above

Ans: D
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe how insolation varies by latitude.

32. The latitudinal zones known as the subtropics are separated from the equatorial zone by the _____ zones.
A) tropic
B) mid-latitude
C) subpolar
D) none of the above

Ans: A
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Describe how insolation varies by latitude.

33. The gas oxygen accounts for about _____ of dry air.
A) 0.035%
B) 1%
C) 21%
D) 78%

Ans: C

Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

34. The gas nitrogen accounts for about _____ of dry air.
A) 0.035%
B) 1%
C) 21%
D) 78%

Ans: D
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

35. The gas argon accounts for about _____ of dry air.
A) 0.035%
B) 1%
C) 21%
D) 78%

Ans: B
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

36. The gas carbon dioxide accounts for about _____ of dry air. A) 0.035%
B) 1%
C) 21%
D) 78%

Ans: a
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

37. _____ is a common gas in the atmosphere that does not easily react with other substances
A) Nitrogen
B) Oxygen

C) Ozone
D) none of the above

Ans: A
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Describe the composition of the atmosphere

38. _____ is a common gas in the atmosphere that is highly chemically active and combines readily with other elements.
A) Nitrogen
B) Oxygen
C) Ozone
D) none of the above

Ans: B
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Describe the composition of the atmosphere

39. _____ is a gas in the atmosphere that absorbs ultraviolet radiation from the sun.
A) Nitrogen
B) Oxygen
C) Ozone
D) none of the above

Ans: C
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

40. Of the following gases, only _____ varies significantly in terms of its concentration in the lower atmosphere
A) nitrogen
B) water vapor
C) argon
D) oxygen

Ans: B

Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

41. Ozone in the upper atmosphere is important to life on Earth because it:
A) contributes strongly to the greenhouse and global warming
B) causes respiratory problems with prolonged exposure
C) absorbs dangerous ultraviolet radiation from the sun
D) none of the above

Ans: C
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

42. The industrial chemical compounds known as chlorofluorocarbons (CFCs) are thought to have played the key role in the development of: A) global warming
B) the ozone hole
C) the greenhouse effect
D) none of the above

Ans: B
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

43. _____ is/are the air pollutant that is thought to have caused the ozone hole over Antarctica.
A) Carbon dioxide
B) Smog
C) Argon
D) Chlorofluorocarbons

Ans: D
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

44. The ozone layer in the upper atmosphere is essential for life on the planet becausethe full intensity of the sun's ultraviolet rays would:
A) cause severe respiratory problems for higher organisms
B) dramatically enhance global warming
C) destroy bacteria and damage animal tissue
D) all of the above

Ans: C
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

45. The proportion of solar radiation reflected upward from a surface is the _____ of a surface.
A) albedo
B) reflectance
C) diffusivity
D) latent heat

Ans: A
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Explain the fate of solar radiation as it passes

46. Air temperatures above low-albedo surfaces tend to be _____ than those over high-albedo surfaces.
A) lower (cooler)
B) higher (warmer)
C) the same as
D) none of the above

Ans: B
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Hard
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere.

47. Air temperatures above high-albedo surfaces tend to be _____ than those over high-albedo surfaces.
A) lower (cooler)
B) higher (warmer)
C) the same as
D) none of the above

Ans: A
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Hard
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

48. Estimates of the Earth's average albedo range between:
A) 0.03 to 0.08
B) 0.29 to 0.34
C) 0.61 to 0.66
D) 0.79 to 0.83

Ans: B
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Hard
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

49. On average, the Earth reflects about _____ of the solar radiation it receives back to space.
A) 1/10
B) 1/5
C) 1/3
D) 1/4

Ans: C
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

50. Fields, forest, and bare ground. tend to have albedos that are _____ .
A) very low (0.03 or less)
B) intermediate (0.03 to 0.25)
C) high (0.4 to 0.85)
D) very high (greater than 0.85)

Ans: B
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

51. Black pavement surfaces tend to have albedos that are _____.
A) very low (0.03 or less)
B) intermediate (0.03 to 0.25)
C) high (0.4 to 0.85)
D) very high (greater than 0.85)

Ans: A
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

52. Snow and ice tend to have albedos that are _____.
A) very low (0.03 or less)
B) intermediate (0.03 to 0.25)
C) high (0.45 to 0.85)
D) very high (greater than 0.85)
Ans: C
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

53. Diffuse radiation is caused by:
A) atmospheric scattering
B) atmospheric absorption
C) high surface albedo
D) low surface albedo

Ans: A
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

54. On a clear day, about ____ of insolation is scattered and diffused back to space before reaching the ground.
A) 42%
B) 24%
C) 17%
D) 3%

Ans: D
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

55. On a clear day, about ____ of insolation is absorbed by gas molecules and dust before reaching the ground.
A) 42%
B) 24%
C) 17%
D) 3%

Ans: C
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

56. The bright white surfaces of thick low clouds reflect about _____ of incoming

radiation back into space.
A) 5–10%
B) 10–30%
C) 30–60%
D) 60–80%

Ans: C
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

57. Clouds can absorb as much as _____ of incoming solar radiation.
A)3–20%
B) 25–40%
C) 45–60%
D) 65–80%

Ans: A
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

58. Counterradiation refers to:
A) longwave radiation moving upward from the earth's surface
B) longwave radiation moving downward towards the earth's surface
C) shortwave radiation moving upward from the earth's surface
D) shortwave radiation moving downward towards the earth's surface

Ans: B
Section Ref: Global Energy System
Difficulty: Easy
Learning Objective: Explain how the greenhouse effect arises

59. The accumulation of heat in the lower atmosphere that results from the absorption of longwave radiation from the Earth's surface is known as _____.
A) the ozone hole
B) net radiation
C) the global energy budget
D) the greenhouse effect

Ans: D
Section Ref: Global Energy System
Difficulty: Easy
Learning Objective: Explain how the greenhouse effect arises

60. The greenhouse effect results from the absorption of _____ in the atmosphere.
A) longwave radiation
B) shortwave radiation
C) visible light
D) insolation

Ans: A
Section Ref: Global Energy System
Difficulty: Medium
Learning Objective: Explain how the greenhouse effect arises

61. If the amount of insolation absorbed by the earth was consistently larger than the amount of longwave energy emitted by the earth, we would expect:
A) global temperatures to decrease
B) global temperatures to increase
C) shortwave emission from the earth to decrease
D) longwave emissions from the earth to decrease

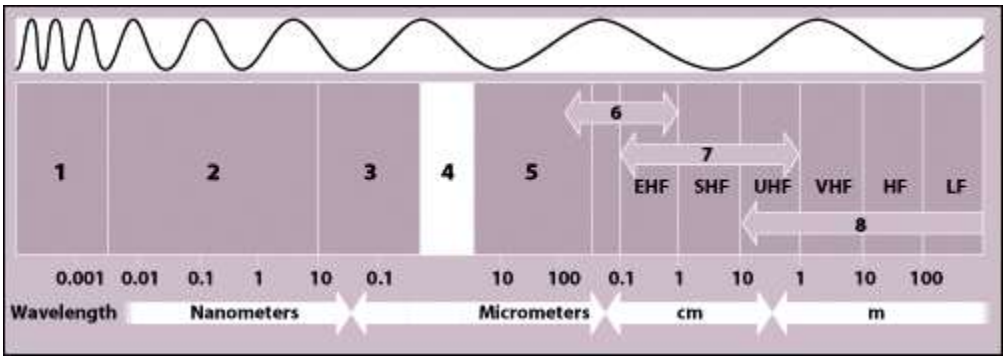
Ans: B
Section Ref: Global Energy System
Difficulty: Medium
Learning Objective: Explain how the greenhouse effect arises

62. The Earth's annual net radiation budget is:
A) positive everywhere
B) negative everywhere
C) positive from the equator to about 40^{o} north and south
D) negative from the equator to about 40^{o} north and south

Ans: C
Section Ref: Electromagnetic Radiation

Difficulty: Medium
Learning Objective: Describe the different types of electromagnetic radiation

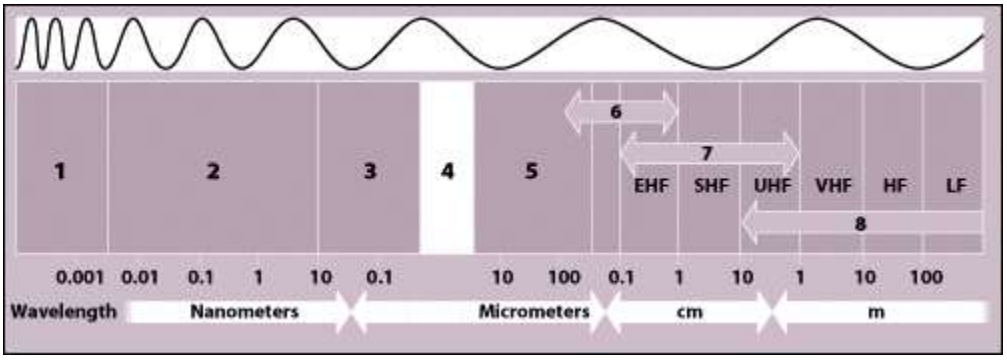
63. Which of the numbered sections on this figure corresponds with the visible light portion of the electromagnetic spectrum?



A) 3
B) 4
C) 5
D) 6

Ans: B
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation.

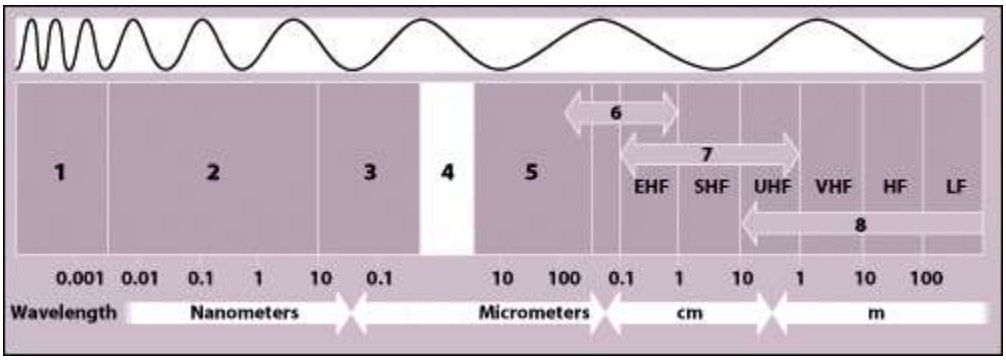
64. Which of the numbered sections on this figure corresponds with the ultraviolet portion of the electromagnetic spectrum?



A) 3
B) 4
C) 5
D) 6

Ans: A
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

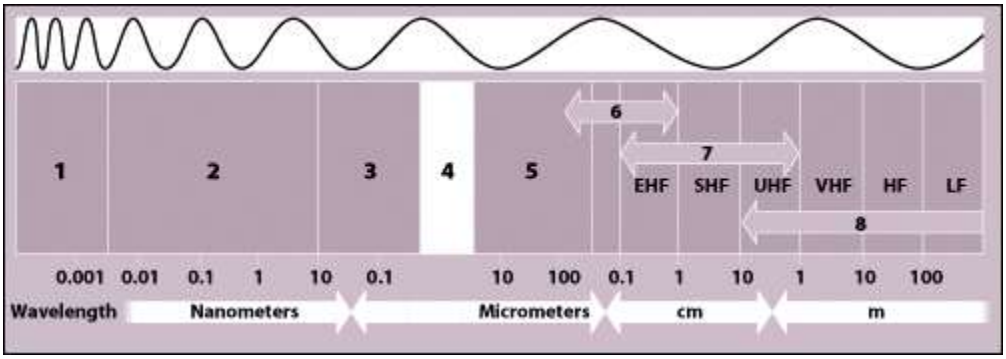
65. Which of the numbered sections on this figure corresponds with the infrared portion of the electromagnetic spectrum?



A) 3
B) 4
C) 5
D) 6

Ans: C
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

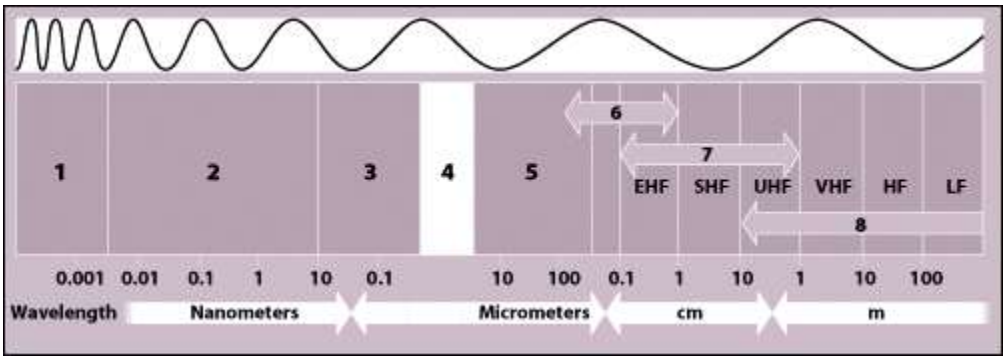
66. Which of the numbered sections on this figure corresponds with the gamma ray portion of the electromagnetic spectrum?



A) 1
B) 2
C) 3
D) 4

Ans: A
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

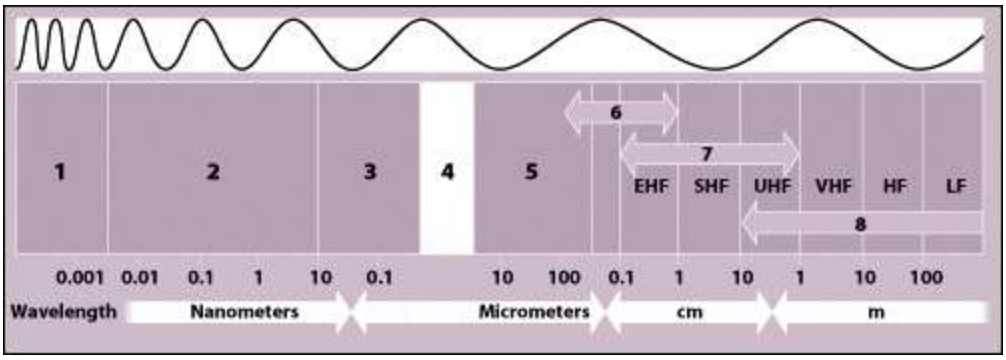
67 Which of the numbered sections on this figure corresponds with the x-ray portion of the electromagnetic spectrum?



A) 1
B) 2
C) 3
D) 4

Ans: B
Section Ref: Electromagnetic Radiation
Difficulty: Hard
Learning Objective: Describe different types of electromagnetic radiation.

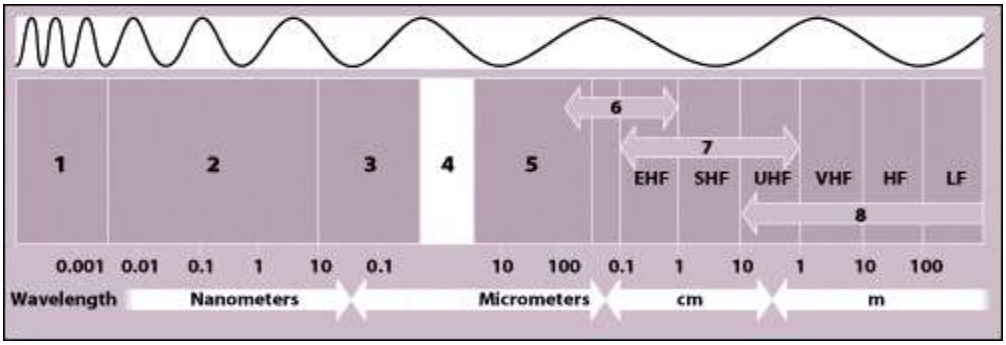
68. Which of the numbered sections on this figure corresponds with the microwave portion of the electromagnetic spectrum?



A) 5
B) 6
C) 7
D) 8

Ans: B
Section Ref: Electromagnetic Radiation
Difficulty: Hard
Learning Objective: Describe different types of electromagnetic radiation.

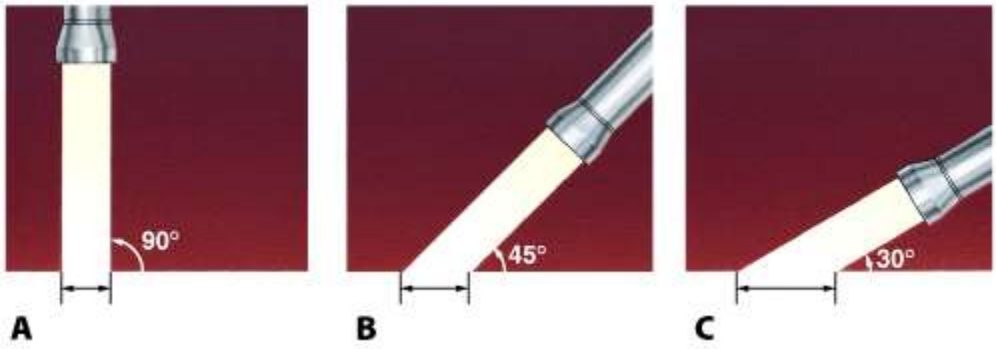
69. Which of the numbered sections on this figure corresponds with the radar portion of the electromagnetic spectrum?



A) 5
B) 6
C) 7
D) 8

Ans: C
Section Ref: Electromagnetic Radiation
Difficulty: Hard
Learning Objective: Describe different types of electromagnetic radiation.

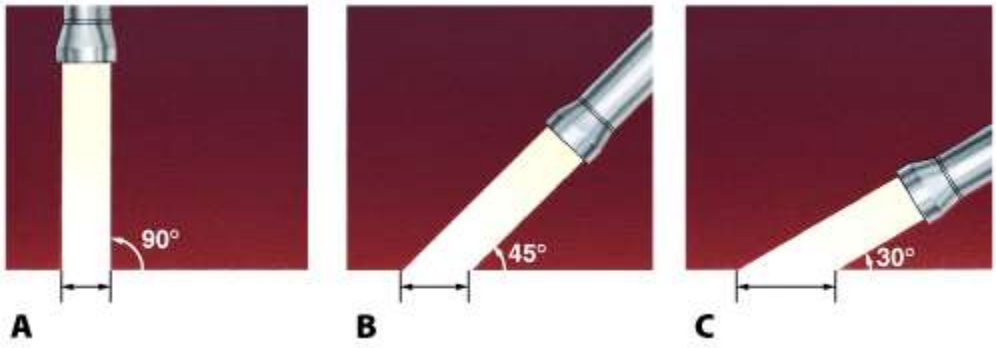
70. Which of these figures best illustrates the sun angle at the subsolar point (at solar noon)?



A) A
B) B
C) C

Ans: A
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Identify factors that effect dialy insolation

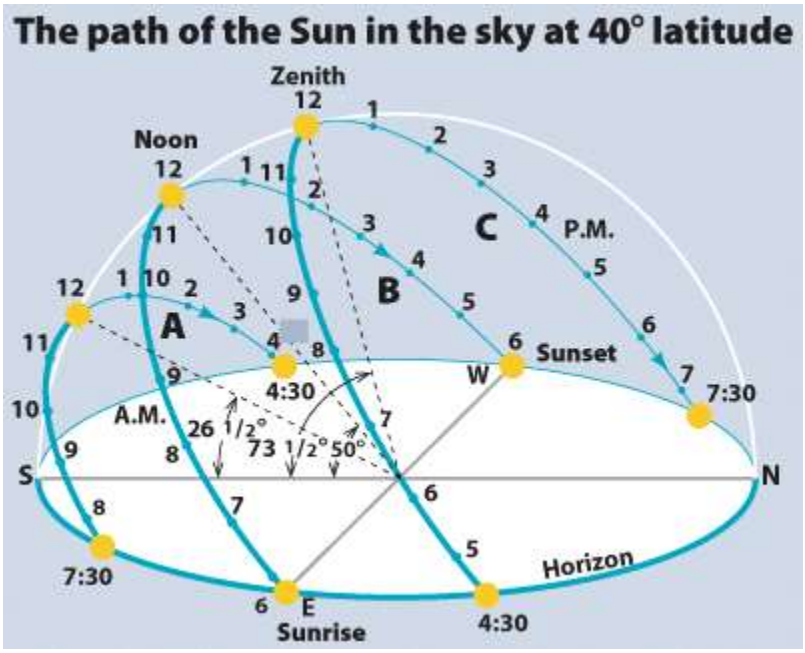
71. Which of these figures best illustrates the highest sun angle at the tropic of Cancer on the June solstice?



A) A
B) B
C) C

Ans: A
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Identify factors that effect dialy insolation

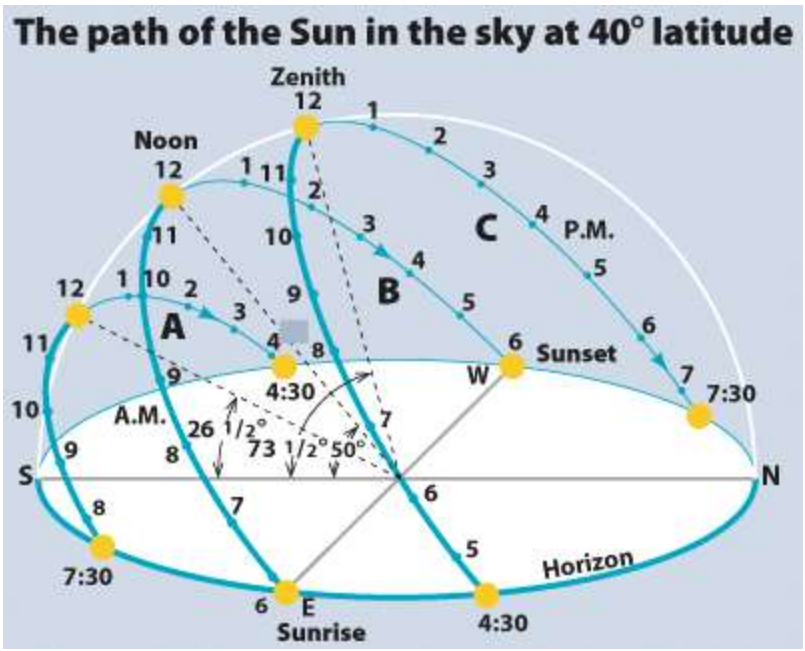
72. Which of the daily solar paths shown in this figure illustrates the situation for June solstice, at a latitude of 40^{o} north.



A) A
B) B
C) C

Ans: C
Section Ref: Insolation Over the Globe
Difficulty: Medium Learning Objective: Describe how insolation varies by latitude

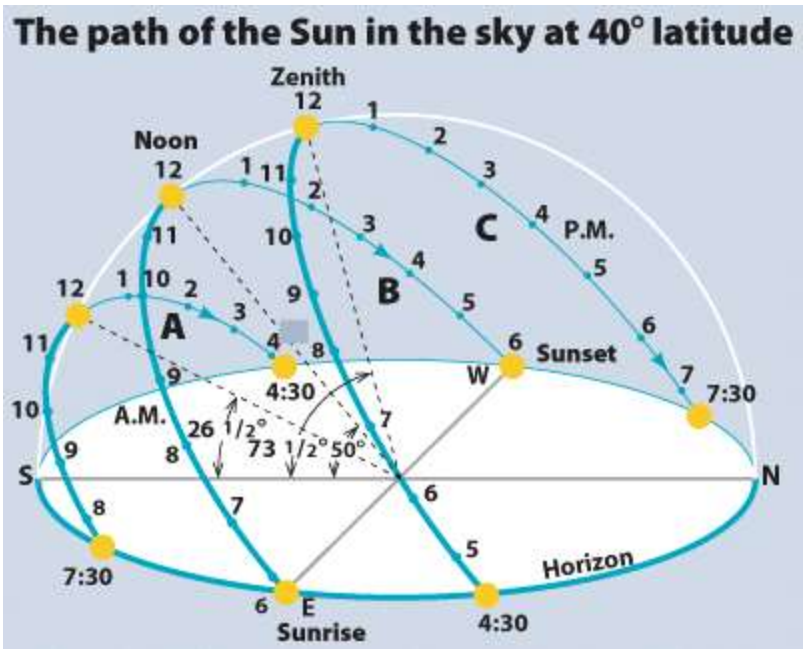
73. Which of the daily solar paths shown in this figure illustrates the situation for December solstice, at a latitude of 40^{o} north.



A) A
B) B
C) C

Ans: A
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe how insolation varies by latitude

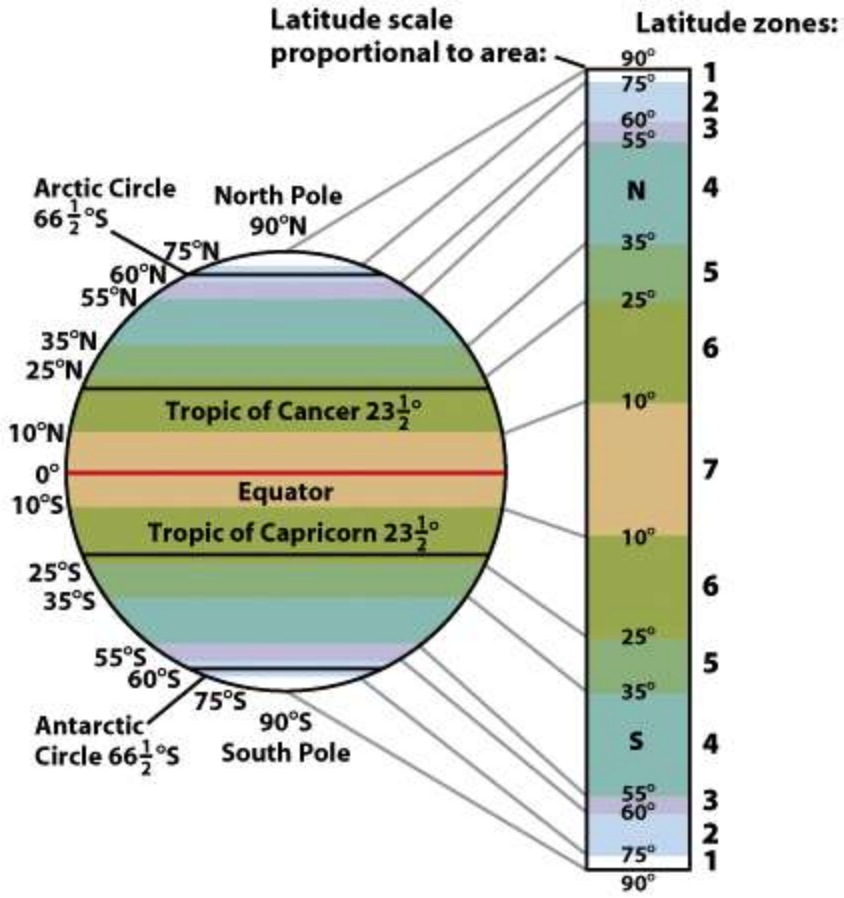
74. Which of the daily solar paths shown in this figure illustrates the situation for the equinoxes, at a latitude of 40^{o} north.



A) A
B) B
C) C

Ans: B
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Describe how insolation varies by latitude

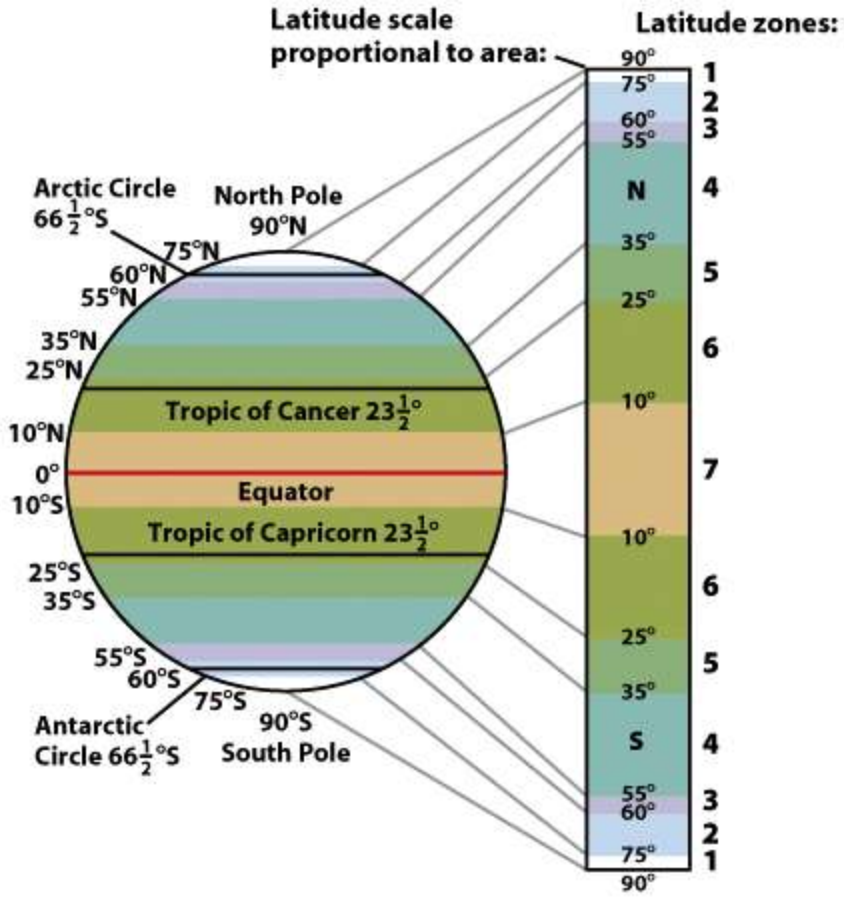
75. On this figure, the mid-latitude zones are labeled:



A) 3
B) 4
C) 5
D) 6

Ans: B
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe how insolation varies by latitude

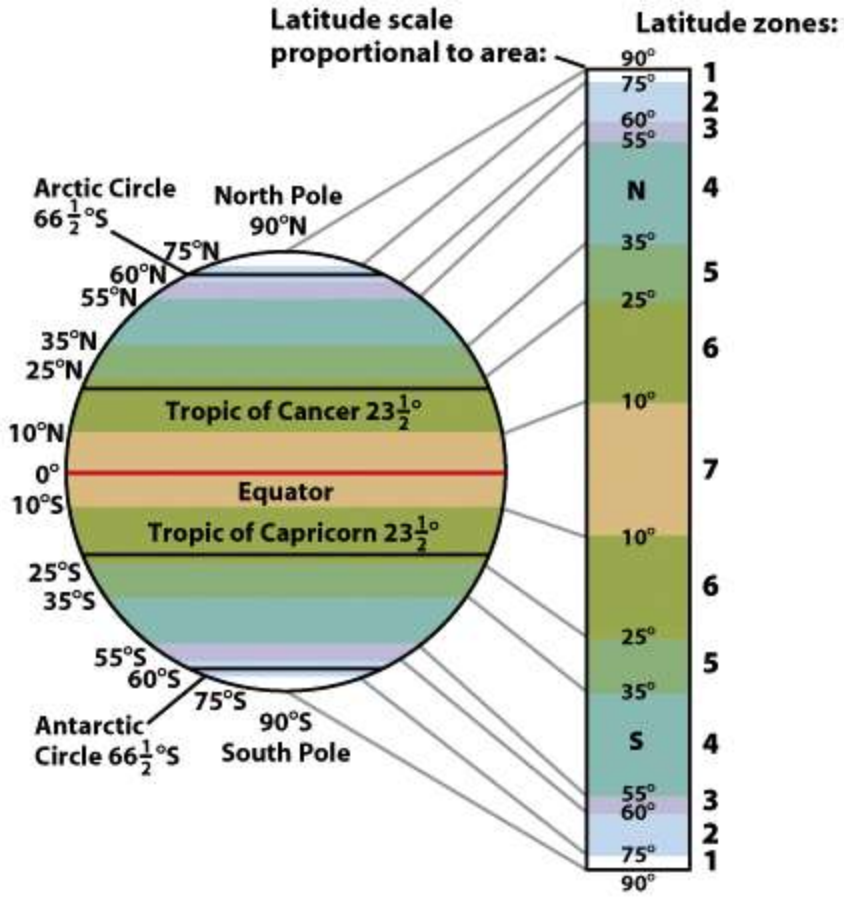
76. On this figure, the subtropical zones are labeled:



A) 3
B) 4
C) 5
D) 6

Ans: C
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe how insolation varies by latitude

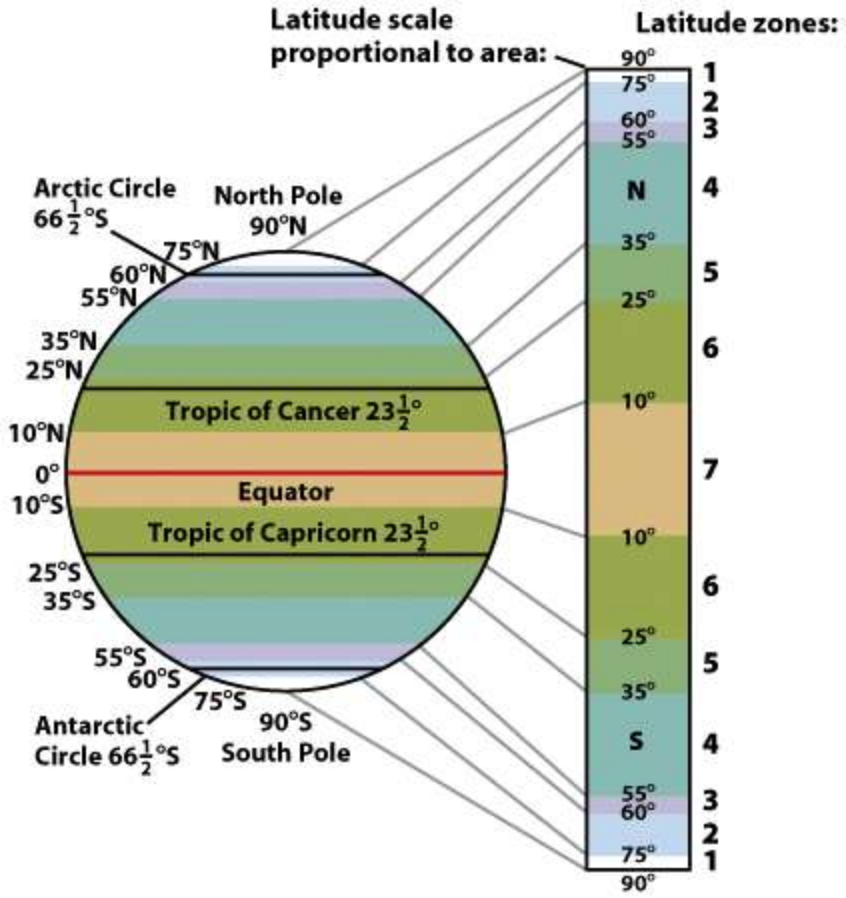
77. On this figure, the tropical zones are labeled:



A) 3
B) 4
C) 5
D) 6

Ans: D
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Describe how insolation varies by latitude

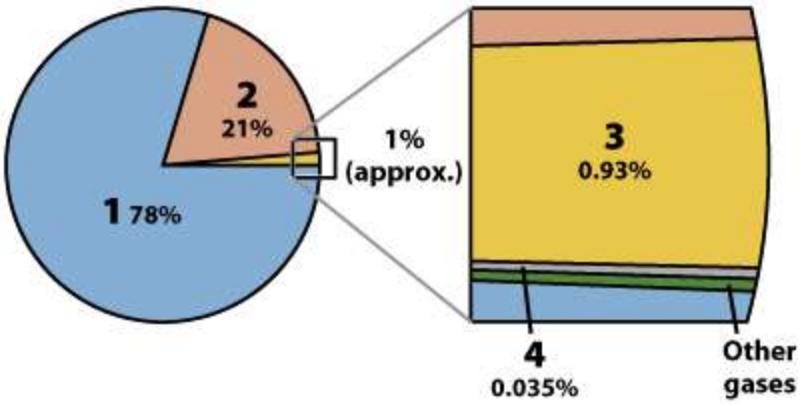
78. On this figure, the subarctic zones are labeled:



A) 3
B) 4
C) 5
D) 6

Ans: A
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Describe how insolation varies by latitude

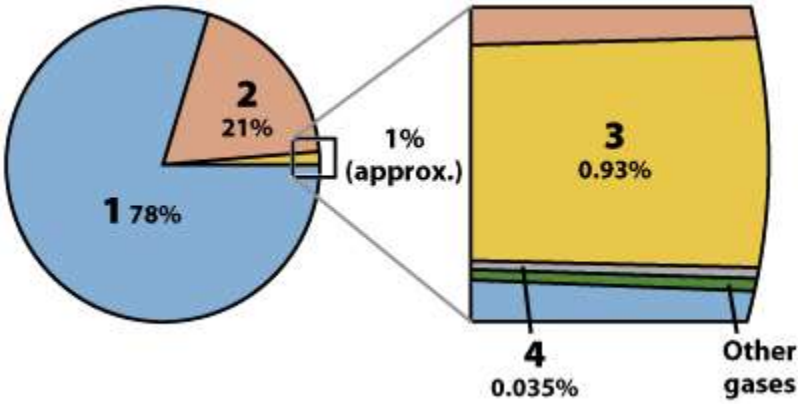
79. In the pie chart below, the proportion of nitrogen in the atmosphere is labeled:



A) 1
B) 2
C) 3
D) 4

Ans: A
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

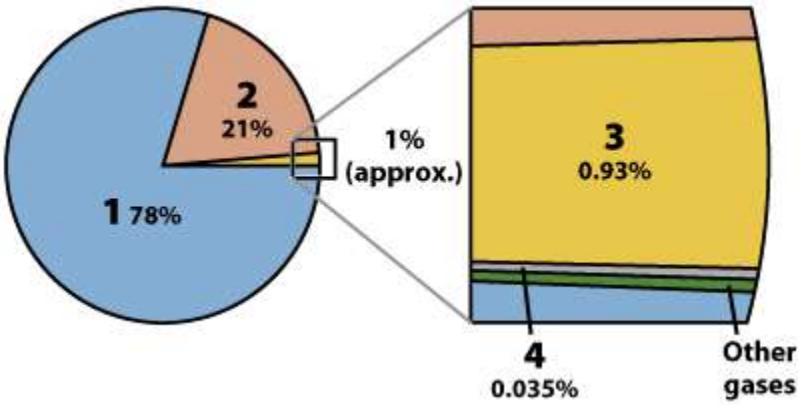
80. In the pie chart below, the proportion of argon in the atmosphere is labeled:



A) 1
B) 2
C) 3
D) 4

Ans: C
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

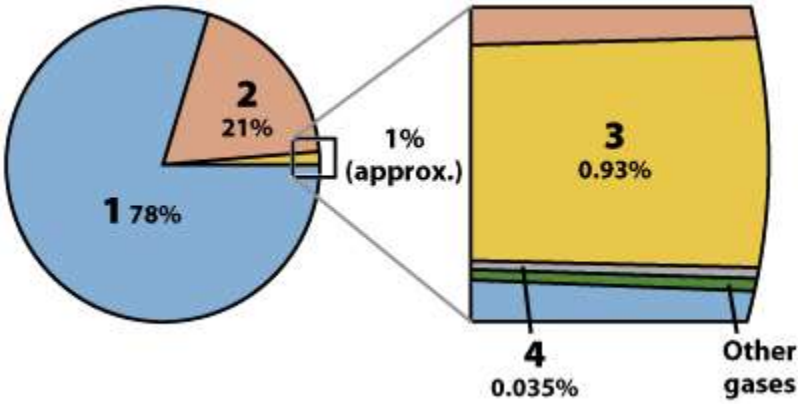
81. In the pie chart below, the proportion of oxygen in the atmosphere is labeled:



A) 1
B) 2
C) 3
D) 4

Ans: B
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

82. In the pie chart above, the proportion of carbon dioxide in the atmosphere is labeled:



A) 1
B) 2
C) 3
D) 4

Ans: D
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy

Learning Objective: Describe the composition of the atmosphere

True/False

83. Gamma rays and X-rays are two forms of longwave radiation emitted by the earth.

Ans: False
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation.

84. Hotter objects radiate energy at shorter wavelengths.

Ans: True
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Relate wavelength to temperature

85. The energy radiated by the sun is referred to as longwave radiation.

Ans: False
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation.

86. Most of the energy radiated by the earth is in the form of thermal infrared radiation.

Ans: True
Section Ref: Electromagnetic Radiation
Difficulty: Hard
Learning Objective: Describe different types of electromagnetic radiation.

87. Ultraviolet radiation and visible light are examples of shortwave radiation.

Ans: True
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

88. Electromagnetic energy in the range from 0.2 to 3 micrometers is called shortwave radiation.

Ans: True
Section Ref: Electromagnetic Radiation
Difficulty: Hard
Learning Objective: Describe different types of electromagnetic radiation.

89. As a general rule, the hotter an object is the more energy it will radiate.

Ans: True
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Solar Energy and the Earth's Atmosphere

90. As solar energy passes through the atmosphere, some of it is absorbed which helps to warm the atmosphere.

Ans: True
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

91. The process in which incoming solar radiation is deflected in different directions by atmospheric molecules and particles is called scattering.

Ans: True
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

92. The largest portion of the sun's energy output occurs in the ultraviolet portion of the spectrum.

Ans: False
Section Ref: Electromagnetic Radiation
Difficulty: Hard
Learning Objective: Describe different types of electromagnetic radiation

93. Energy from the sun is responsible for powering many of the natural phenomena on the earth's surface, including wind, waves, weather, and living organisms.

Ans: True
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Identify factors that affect daily insolation

94. Insolation refers to the average amount of longwave radiation emitted by the earth.

Ans: False
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Identify factors that affect daily insolation

95. Insolation is the flow rate of incoming solar energy, as measured at the top of the atmosphere.
Ans: True
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Identify factors that affect daily insolation

96. Daily insolation levels at a given location are strongly influenced by the length of day.

Ans: True
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Identify factors that affect daily insolation

97. Daily insolation in New York City will be larger at the equinoxes than at the June solstice.

Ans: False
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Describe how insolation varies by latitude

98. Daily insolation levels tend to vary with latitude because the angle of the sun's rays and day length both vary with latitude.

Ans: True
Section Ref: Insolation Over the Globe
Difficulty: Hard
Learning Objective: Identify factors that affect daily insolation

99. The north and south polar regions receive lower annual isolation levels with the earth's axis tilted than they would if the axis were perpendicular to the plane of the ecliptic.

Ans: False
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Identify factors that affect daily insolation

100. The equatorial region receives lower annual isolation levels with the earth's axis tilted than they would if the axis were perpendicular to the plane of the ecliptic.

Ans: True
Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Identify factors that affect daily insolation

101. The subtropical latitude zones separate the equatorial zone from the tropics.

Ans: False

Section Ref: Insolation Over the Globe
Difficulty: Medium
Learning Objective: Identify factors that affect daily insolation

102. The most common gas in the atmosphere is oxygen.

Ans: False
Section Ref: Solar Energy and the Earth’s Atmosphere
Difficulty: Medium
Learning Objective: Describe the composition of the atmosphere

103. Taken together, nitrogen and oxygen account for about 99% of the gases in our atmosphere.

Ans: True
Section Ref: Solar Energy and the Earth’s Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

104. In its gas form, oxygen does not react with other elements very easily.

Ans: False
Section Ref: Solar Energy and the Earth’s Atmosphere
Difficulty: Hard
Learning Objective: Describe the composition of the atmosphere

105. The ozone layer in the upper atmosphere absorbs dangerous infrared radiation from the sun.

Ans: False
Section Ref: Solar Energy and the Earth’s Atmosphere
Difficulty: Medium
Learning Objective: Describe the composition of the atmosphere

106. The ozone layer in the upper atmosphere absorbs dangerous ultraviolet radiation from the sun.

Ans: True
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

107. Unlike nitrogen and oxygen, the proportion of water vapor found in the atmosphere varies significantly from place to place and over time.

Ans: True
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Describe the composition of the atmosphere

108. The 'ozone hole' that occurs over the continent of Antarctica is thought to be caused largely by human emissions of carbon dioxide.

Ans: False
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

109. On a clear day, about 80% of incoming solar radiation passes through the atmosphere to reach the earth's surface.

Ans: True
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

110. On a cloudy day, generally less than 50% of the incoming solar radiation will pass through the atmosphere and reach the earth's surface.

Ans: True
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

111. As solar radiation passes through the atmosphere some of it gets scattered in all directions to create diffuse radiation.

Ans: True
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

112. The albedo of an object is the proportion incident longwave energy that it will reflect.

Ans: False
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

113. The albedo of light surfaces like snow and ice is relatively low, while that of dark surfaces like asphalt is relatively high.

Ans: False
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

114. The greenhouse effect is caused by counter-radiation of longwave energy from gases like carbon dioxide and water vapor.

Ans: True
Section Ref: Global Energy System
Difficulty: Easy
Learning Objective: Explain how the greenhouse effect arises

115. Counterradiation is the longwave energy that the earth radiates in to space to balance the shortwave energy it receives from the sun.

Ans: False
Section Ref: Global Energy System

Difficulty: Hard
Learning Objective: Explain how the greenhouse effect arises

Essay

116. Contrast the average type of radiation emitted from the sun with that from the earth.

Ans: The sun emits far more energy because of its substantially warmer temperature. It also emits mostly shortwave energy in the range of 0.2 to 3 microns. Peak energy emission is in the visible portion of the spectrum. In contrast, the earth gives off less energy. It emits longwave radiation (from about 3 to 50 microns) with peak emission at about 10 microns in the thermal infrared portion of the spectrum.
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

117. Describe and explain the two key factors that affect daily insolation.

Ans: Daily insolation depends in part on the angle at which the sun's rays strike the earth. When the sun's rays are more perpendicular to the earth's surface, they are concentrated on a smaller area and insolation is higher. As the angle of incidence becomes smaller the rays are spread over a larger area so that there is a decrease in insolation per unit area. The second major factor is the length of daylight. The longer the day, the more insolation other factors held constant.
Section Ref: Insolation Over the Globe
Difficulty: Easy
Learning Objective: Identify factors that affect daily insolation

118. Explain how and why the greenhouse effect occurs.

Ans: The greenhouse effect results from counter-radiation. Longwave radiation emitted from the earth's surface is absorbed by greenhouse gases like carbon dioxide and water vapor. Some of this energy is then counter-radiated back to the Earth's surface where it is reabsorbed raising the surface temperature.

Section Ref: Global Energy System
Difficulty: Easy
Learning Objective: Explain how the greenhouse effect arises

119. Explain how annual net radiation varies with latitude and identify the importance of this variation for latitudinal energy budgets and energy transfers.

Ans: The earth receives more energy through insolation than it radiates from the equator to about 40^{o} north and south latitude, and less energy from these latitudes to the poles. Thus there is a positive energy budget in the low latitudes and a negative energy budget in the high latitudes. These imbalances are corrected by massive latitudinal transfers of heat via ocean and atmospheric circulations that help to drive our weather and shape our climates.
Section Ref: Solar radiation and the Earth's atmosphere
Difficulty: Medium
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

Fill-in-the-Blank

120. _____ radiation is a wavelike form of energy radiated by any substance possessing heat.

Ans: Electromagnetic
Section Ref: Electromagnetic Radiation
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation.

121. Most of the electromagnetic radiation emitted by the sun is _____ radiation.

Ans: shortwave
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

122. The electromagnetic radiation emitted by the Earth is _____ radiation.

Ans: longwave
Section Ref: Electromagnetic Radiation
Difficulty: Medium
Learning Objective: Describe different types of electromagnetic radiation.

123. The flow of solar energy intercepted by an exposed surface is known as _____.

Ans: insolation
Section Ref: Insolation Over The Globe
Difficulty: Easy
Learning Objective: Describe different types of electromagnetic radiation.

124. The key factor that causes variation in insolation during the course of a day is the _____ of the Sun's rays

Ans: Angle
Section Ref: Insolation Over The Globe
Difficulty: Medium
Learning Objective: Identify the factors that affect daily insolation

125. Annual insolation amounts are _____ at the poles than the equator.

Ans: lower
Section Ref: Insolation Over The Globe
Difficulty: Medium
Learning Objective: Identify the factors that affect daily insolation

126. The latitude zones immediately north and south of the equatorial zone are called the _____ zones.

Ans: Tropical

Section Ref: Insolation Over The Globe
Difficulty: Easy
Learning Objective: Describe how insolation varies by latitude

127. The most common gas in the atmosphere is _____.

Ans: nitrogen
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Describe the composition of the atmosphere

128. Ultraviolet radiation from the sun is mostly absorbed by _____ in the upper atmosphere.

Ans: ozone
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Describe the composition of the atmosphere

129. Some forms of air pollution, such as chlorofluorocarbons (CFCs), have caused damage to the _____ layer.

Ans: ozone
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Medium
Learning Objective: Describe the composition of the atmosphere

130. The proportion of solar radiation that is reflected by an object is that object's _____.

Ans: Albedo
Section Ref: Solar Energy and the Earth's Atmosphere
Difficulty: Easy
Learning Objective: Explain the fate of solar radiation as it passes through the atmosphere

131. Longwave radiation that moves downward through the atmosphere towards the Earth's surface is called _____.

Ans: Counterradiation
Section Ref: Global Energy System
Difficulty: Hard
Learning Objective: Explain how the greenhouse effect arises