

JP's Physics 101 Test Bank 4

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- _____ 1. In general, when a solid is heated,
A. it will contract at a lesser rate than a liquid.
B. it will contract at a greater rate than a liquid.
C. it will neither expand nor contract.
D. it will expand at a greater rate than a liquid.
E. it will expand at a lesser rate than a liquid.
- _____ 2. In general, when a solid is cooled,
A. it will contract at a lesser rate than a liquid.
B. it will expand at a greater rate than a liquid.
C. it will neither expand nor contract.
D. it will contract at a greater rate than a liquid.
E. it will expand at a lesser rate than a liquid.
- _____ 3. In general, when a liquid is heated,
A. it will contract at a lesser rate than a solid.
B. it will expand at a lesser rate than a solid.
C. it will neither expand nor contract.
D. it will expand at a greater rate than a solid.
E. it will contract at a greater rate than a solid.
- _____ 4. In general, when a liquid is cooled,
A. it will contract at a lesser rate than a solid.
B. it will expand at a greater rate than a solid.
C. it will contract at a greater rate than a solid.
D. it will neither expand nor contract.
E. it will expand at a lesser rate than a solid.
- _____ 5. Liquids _____ their volume with higher temperature due to _____ .
A. increase; decreased crystal structure
B. increase; less molecular motion
C. decrease; greater molecular motion
D. decrease; less molecular motion
E. increase; greater molecular motion
- _____ 6. Incandescent light bulbs are made of very thin glass because
A. thicker glass would expand less as the light bulb heats up, causing cracking.
B. thicker glass would expand more as the light bulb heats up, causing cracking.
C. thin glass has a higher specific heat capacity than thick glass.
D. thin glass has a lower specific heat capacity than thick glass.
E. thicker glass is more expensive.
- _____ 7. If a flat metal plate with a circular hole cut through it is heated,
A. the hole gets smaller.
B. the hole may get larger or smaller, depending on how much the plate is heated.
C. the hole may get larger or smaller, depending on the material of the plate.
D. the hole gets larger.
E. the hole stays exactly the same size.

- _____ 8. When a mercury thermometer is warmed, the mercury level momentarily goes down before it rises. Why?
- A. The mercury crystals must first be melted before expansion can occur.
 - B. The thermometer glass initially expands, decreasing the diameter of the mercury capillary.
 - C. The thermometer glass initially expands, increasing the diameter of the mercury capillary.
 - D. The ice crystals must first be melted before expansion can occur.
 - E. The thermometer glass initially contracts, increasing the diameter of the mercury capillary.
- _____ 9. When a mercury thermometer is warmed, the mercury level rises in the glass capillary. Why?
- A. The increased temperature makes the mercury more fluid, permitting it to flow more readily.
 - B. The glass expands, increasing the capillary diameter, but mercury expands even more and rises.
 - C. The glass contracts, increasing the capillary diameter, allowing the mercury to rise more easily.
 - D. The glass contracts, decreasing the capillary diameter and squeezing the mercury up.
 - E. The glass expands, decreasing the capillary diameter and squeezing the mercury up.
- _____ 10. Some thermometers consist essentially of a pointer attached to a coiled, bimetallic strip of metal. As the strip is heated,
- A. the two metals on each side of the strip contract at different rates.
 - B. one of the metals expands while the other metal contracts.
 - C. one of the metals contracts while the other metal remains the same length.
 - D. the two metals on each side of the strip expand at different rates.
 - E. one of the metals expands while the other metal remains the same length.
- _____ 11. Water has a higher specific heat capacity than iron. This means that
- A. water boils at a higher temperature than iron.
 - B. water is hotter than iron.
 - C. water heats more rapidly than iron.
 - D. water heats more slowly than iron.
 - E. water is more dense than iron.
- _____ 12. Water is a useful cooling agent for automobile engines because it has a relatively
- A. low density.
 - B. high specific heat capacity.
 - C. low specific heat capacity.
 - D. low temperature.
 - E. high density.
- _____ 13. Because the specific heat capacity of water is ____ that of land, water temperatures fluctuate _____ land temperatures.
- A. higher than; less rapidly than
 - B. higher than; more rapidly than
 - C. equal to; at the same rate as
 - D. lower than; less rapidly than
 - E. lower than; more rapidly than

- _____ 14. Desert sand is very hot during the day and very cool during the night because
- A. sand expands when it is hot and contracts when it is cool.
 - B. sand has a relatively low specific heat capacity.
 - C. sand expands when it is cool and contracts when it is hot.
 - D. sand has a relatively high specific heat capacity.
 - E. sand has a relatively high melting point.
- _____ 15. An object with a relatively high specific heat capacity
- A. tends to cool down rather quickly when removed from sources of heat.
 - B. tends to be fairly resistant to changes in temperature.
 - C. is always very cold.
 - D. is always very hot.
 - E. tends to warm up rather quickly when exposed to sources of heat.
- _____ 16. An object with a relatively low specific heat capacity
- A. tends to be fairly resistant to changes in temperature.
 - B. is always very cold.
 - C. is always very hot.
 - D. tends to warm up rather slowly when exposed to sources of heat.
 - E. tends to cool down rather quickly when removed from sources of heat.
- _____ 17. An object with a relatively low specific heat capacity
- A. is always very hot.
 - B. tends to be fairly resistant to changes in temperature.
 - C. tends to warm up rather quickly when exposed to sources of heat.
 - D. is always very cold.
 - E. tends to cool down rather slowly when removed from sources of heat.
- _____ 18. An object with a relatively low specific heat capacity
- A. tends to warm up quickly and cool down slowly.
 - B. tends to warm up slowly and cool down quickly.
 - C. tends to float in water.
 - D. tends to warm up slowly and cool down slowly.
 - E. tends to warm up quickly and cool down quickly.
- _____ 19. An object with a relatively high specific heat capacity
- A. tends to warm up quickly and cool down slowly.
 - B. tends to warm up slowly and cool down quickly.
 - C. tends to float in water.
 - D. tends to warm up quickly and cool down quickly.
 - E. tends to warm up slowly and cool down slowly.
- _____ 20. The specific heat capacity of water is 1 calorie per gram per degree Celsius. This means that 1 calorie will increase the temperature of 1 gram of water by _____ degree(s).
- A. 0.01
 - B. 0.1
 - C. 1
 - D. 100
 - E. 10

- _____ 21. Two identical beakers are placed on a hot plate. Beaker A contains 100 grams of water while beaker B contains 500 grams of water. When the hot plate is turned on, in which beaker will the water temperature rise more rapidly?
- A. A, because it contains less water to heat.
 - B. B, because it contains more water to heat.
 - C. B, because it can absorb more heat.
 - D. Neither – the rates will be the same because the beakers are identical.
 - E. A, because it can absorb more heat.
- _____ 22. Two identical beakers are placed on a hot plate. Beaker A contains 500 grams of water while beaker B contains 100 grams of water. When the hot plate is turned on, in which beaker will the water temperature rise more rapidly?
- A. A, because it contains more water to heat.
 - B. Neither – the rates will be the same because the beakers are identical.
 - C. B, because it can absorb more heat.
 - D. B, because it contains less water to heat.
 - E. A, because it can absorb more heat.
- _____ 23. The specific heat capacity of water is 1 calorie per gram per degree Celsius. This means that it will take _____ calorie(s) to increase the temperature of 1 gram of water by 10 degrees.
- A. 10
 - B. 0.1
 - C. 0.01
 - D. 1
 - E. 100
- _____ 24. The specific heat capacity of water is 1 calorie per gram per degree Celsius. This means that it will take _____ calorie(s) to increase the temperature of 10 grams of water by 1 degree.
- A. 0.1
 - B. 0.01
 - C. 100
 - D. 1
 - E. 10
- _____ 25. The specific heat capacity of water is 1 calorie per gram per degree Celsius. This means that 10 calories will increase the temperature of 1 gram of water by _____ degree(s).
- A. 0.1
 - B. 100
 - C. 1
 - D. 0.01
 - E. 10
- _____ 26. The specific heat capacity of water is 1 calorie per gram per degree Celsius. This means that 10 calories will increase the temperature of 10 grams of water by _____ degree(s).
- A. 10
 - B. 1
 - C. 0.1
 - D. 100
 - E. 0.01

- _____ 27. The specific heat capacity of water is 1 calorie per gram per degree Celsius. This means that 100 calories will increase the temperature of 10 grams of water by _____ degree(s).
- A. 1
 - B. 0.01
 - C. 100
 - D. 10
 - E. 0.1
- _____ 28. The specific heat capacity of water is 1 calorie per gram per degree Celsius. This means that 10 calories will increase the temperature of 100 grams of water by _____ degree(s).
- A. 0.1
 - B. 1
 - C. 100
 - D. 0.01
 - E. 10
- _____ 29. The specific heat capacity of water is 1 calorie per gram per degree Celsius. This means that it will take _____ calorie(s) to increase the temperature of 10 grams of water by 10 degrees.
- A. 0.1
 - B. 1
 - C. 20
 - D. 10
 - E. 100
- _____ 30. The temperature of a gas is a measure of the _____ of a molecule in the gas.
- A. mass
 - B. shape
 - C. average kinetic energy
 - D. acceleration
 - E. gravitational potential energy
- _____ 31. A common thermometer measures temperature by means of
- A. the rotation of a solid sphere.
 - B. the expansion and contraction of a liquid.
 - C. the rising and falling of bubble of gas in water.
 - D. the changing color of a fluid.
 - E. the compression of a spring.
- _____ 32. Which of these temperature scales has its zero point located at absolute zero?
- A. the Celsius scale
 - B. the Kelvin scale
 - C. the Fahrenheit scale
 - D. the Bernoulli scale
 - E. the Archimedes scale
- _____ 33. Water reaches its highest density at a temperature of _____ degrees Celsius.
- A. -4
 - B. 0
 - C. -4
 - D. -10
 - E. 10

- _____ 34. If the density of water were greatest at its freezing point, Minnesota lakes would
- A. be warmest at the bottom.
 - B. not freeze.
 - C. freeze from the bottom up.
 - D. freeze from the top down.
 - E. be most dense at the top.
- _____ 35. Ice is _____ dense than water because of the _____ of ice.
- A. more; greater molecular motion
 - B. less; greater molecular motion
 - C. more; lower molecular motion
 - D. less; crystal structure
 - E. more; crystal structure
- _____ 36. As the temperature of water is raised from 1°C to 2°C, what happens?
- A. The water turns into a gas.
 - B. The water contracts.
 - C. The water freezes into ice.
 - D. The density of the water remains constant.
 - E. The water expands.
- _____ 37. As the temperature of water is raised from 6°C to 7°C, what happens?
- A. The density of the water remains constant.
 - B. The water freezes into ice.
 - C. The water contracts.
 - D. The water expands.
 - E. The water turns into a gas.
- _____ 38. Insulation keeps a house warm by
- A. decreasing the rate of molecular motion of the air inside.
 - B. slowing the escape of heat to the outside.
 - C. preventing heat from escaping to the outside.
 - D. slowing the flow of cold to the inside.
 - E. preventing cold from getting inside.
- _____ 39. Bare feet standing on a bathroom rug feel warmer than the same feet standing on a cold linoleum floor
- A. because the rug slows the transfer of cold from the floor to the feet.
 - B. because the rug prevents cold from flowing from the floor to the feet.
 - C. because the rug is a good conductor of heat.
 - D. because the rug prevents heat from flowing from the feet to the floor.
 - E. because the rug is a poor conductor of heat.
- _____ 40. Conduction is heat transfer by
- A. bulk fluid motions.
 - B. atomic, molecular, and/or electronic collisions.
 - C. thermal expansion.
 - D. atmospheric currents.
 - E. electromagnetic waves.

- _____ 41. Which of these is an example of heat transfer by conduction?
- A. You feel the heat from a bonfire even though you are several meters away from it.
 - B. The handle of a metal spoon becomes hot when you use it to stir a pot of soup on the stove.
 - C. The air near the ceiling is normally warmer than air near the floor.
 - D. You can boil water in a microwave oven.
 - E. Smoke rises up a chimney.
- _____ 42. Which of these is an example of heat transfer by conduction?
- A. You can boil water in a microwave oven.
 - B. The air near the ceiling is normally warmer than air near the floor.
 - C. The bathroom floor feels cold when you stand on it in bare feet.
 - D. Smoke rises up a chimney.
 - E. You feel the heat from a bonfire even though you are several meters away from it.
- _____ 43. Heat transfer by conduction cannot occur
- A. in a liquid.
 - B. at night.
 - C. in a vacuum.
 - D. in a solid.
 - E. in a gas.
- _____ 44. Convection is heat transfer by
- A. electromagnetic waves.
 - B. bulk fluid motions.
 - C. molecular and electronic collisions.
 - D. direct contact.
 - E. molecular and electronic vibrations.
- _____ 45. Rising air tends to
- A. expand and become warmer.
 - B. become denser and warmer.
 - C. maintain a constant density and temperature.
 - D. become denser and cooler.
 - E. expand and become cooler.
- _____ 46. Which of these is an example of heat transfer by convection?
- A. The air near the ceiling is normally warmer than air near the floor.
 - B. The bathroom floor feels cold when you stand on it in bare feet.
 - C. You feel the heat from a bonfire even though you are several meters away from it.
 - D. The handle of a metal spoon becomes hot when you use it to stir a pot of soup on the stove.
 - E. You can boil water in a microwave oven.
- _____ 47. Which of these is an example of heat transfer by convection?
- A. You feel the heat from a bonfire even though you are several meters away from it.
 - B. Smoke rises up a chimney.
 - C. The bathroom floor feels cold when you stand on it in bare feet.
 - D. The handle of a metal spoon becomes hot when you use it to stir a pot of soup on the stove.
 - E. You can boil water in a microwave oven.

- _____ 48. Heat transfer by convection cannot occur
- A. in a pot of soup.
 - B. in the vacuum of space.
 - C. in a swimming pool.
 - D. in the air.
 - E. in the ocean.
- _____ 49. Convection does not work well in most solids because
- A. the atoms in most solids never collide with each other.
 - B. most solids are hollow inside.
 - C. most solids are opaque.
 - D. most solids melt when they get too hot.
 - E. the atoms in most solids are not free to move around.
- _____ 50. Radiation is heat transfer by
- A. atmospheric currents.
 - B. direct contact.
 - C. bulk fluid motions.
 - D. molecular and electronic collisions.
 - E. electromagnetic waves.
- _____ 51. What causes dew to form on grass overnight?
- A. Heat transfer by convection to the surrounding air cools the grass below the dew point.
 - B. Dew is just raindrops left over from an overnight shower.
 - C. Heat transfer by radiation to the cloudy night sky cools the grass below the dew point.
 - D. Heat transfer by conduction to the cold soil cools the grass below the dew point.
 - E. Heat transfer by radiation to the clear night sky cools the grass below the dew point.
- _____ 52. Which of these is *not* an example of heat transfer by radiation?
- A. Coffee in a black pot cools faster than coffee in a shiny pot.
 - B. You can boil water in a microwave oven.
 - C. You feel the cold bathroom floor with your bare feet.
 - D. You can heat a room using a roaring fire in the fireplace.
 - E. You get sunburned while playing golf.
- _____ 53. Which of these is an example of heat transfer by radiation?
- A. You feel the cold bathroom floor with your bare feet.
 - B. Smoke rises up a chimney.
 - C. You feel the heat from a bonfire even though you are several meters away from it.
 - D. The air near the ceiling is normally warmer than air near the floor.
 - E. The handle of a metal spoon becomes hot when you use it to stir a pot of soup on the stove.
- _____ 54. Which of these is an example of heat transfer by radiation?
- A. The handle of a metal spoon becomes hot when you use it to stir a pot of soup on the stove.
 - B. You feel the cold bathroom floor with your bare feet.
 - C. The sun warms the earth.
 - D. Smoke rises up a chimney.
 - E. The air near the ceiling is normally warmer than air near the floor.

- _____ 55. Which of these is an example of heat transfer by radiation?
- A. Smoke rises up a chimney.
 - B. The air near the ceiling is normally warmer than air near the floor.
 - C. You can boil water in a microwave oven.
 - D. You feel the cold bathroom floor with your bare feet.
 - E. The handle of a metal spoon becomes hot when you use it to stir a pot of soup on the stove.
- _____ 56. An object will be a good radiator of heat if it is _____ .
- A. hollow
 - B. dense
 - C. spherical
 - D. shiny
 - E. black
- _____ 57. An object will be a poor radiator of heat if it is _____ .
- A. dense
 - B. hollow
 - C. spherical
 - D. shiny
 - E. black
- _____ 58. The pattern formed by overlapping waves in a bow wave is in the shape of the letter ____ .
- A. V
 - B. B
 - C. U
 - D. I
 - E. T
- _____ 59. A bow wave is formed when a boat travels across the surface of the water
- A. without getting wet.
 - B. at a speed greater than the speed of sound in water.
 - C. at a speed greater than the speed of the water waves.
 - D. at a very low speed.
 - E. at a speed greater than the speed of sound in air.
- _____ 60. Sonic booms are caused by aircraft
- A. crashing into the ground.
 - B. crashing into each other.
 - C. flying faster than the speed of sound.
 - D. flying faster than the legal speed limit.
 - E. flying faster than the speed of light.
- _____ 61. Sonic booms are caused by _____ waves.
- A. standing
 - B. electromagnetic
 - C. shock
 - D. transverse
 - E. sine

- _____ 62. The Doppler effect is caused by
- A. interference of one wave with another wave of the same frequency.
 - B. relative motion between the wave source and the observer.
 - C. interference of one wave with another wave of a slightly different frequency.
 - D. standing waves.
 - E. interference of a wave with itself.
- _____ 63. The change in the frequency of the horn on a train as it approaches and then passes the observer is
- A. due to the Doppler effect.
 - B. due to resonance.
 - C. called a sonic boom.
 - D. only heard if the train is supersonic.
 - E. caused by interference.
- _____ 64. The Doppler effect causes the
- A. observed pitch of a sound to be higher if the source of sound is moving away from the observer.
 - B. observed pitch of a sound to be lower if the source of sound is approaching the observer.
 - C. speed of sound to increase if the source of sound is approaching the observer.
 - D. observed pitch of a sound to be higher if the source of sound is approaching the observer.
 - E. speed of sound to decrease if the source of sound is approaching the observer.
- _____ 65. The Doppler effect causes the
- A. speed of sound to decrease if the source of sound is moving away from the observer.
 - B. observed pitch of a sound to be lower if the source of sound is approaching the observer.
 - C. speed of sound to increase if the source of sound is moving away from the observer.
 - D. observed pitch of a sound to be lower if the source of sound is moving away from the observer.
 - E. observed pitch of a sound to be higher if the source of sound is moving away from the observer.
- _____ 66. Constructive interference is produced by
- A. water waves, but not by sound waves.
 - B. objects traveling faster than the speed of sound.
 - C. two waves arriving at the same point out of phase with each other.
 - D. two waves arriving at the same point in phase with each other.
 - E. sound waves, but not by water waves.
- _____ 67. Destructive interference is produced by
- A. two waves arriving at the same point in phase with each other.
 - B. sound waves, but not by water waves.
 - C. water waves, but not by sound waves.
 - D. objects traveling faster than the speed of sound.
 - E. two waves arriving at the same point out of phase with each other.
- _____ 68. In a longitudinal wave, the medium vibrates in a direction that is
- A. at a 60° angle to the direction the wave travels.
 - B. at a 45° angle to the direction the wave travels.
 - C. perpendicular to the direction the wave travels.
 - D. randomly oriented with respect to the direction the wave travels.
 - E. parallel to the direction the wave travels.

- _____ 69. In a transverse wave, the medium vibrates in a direction that is
- parallel to the direction the wave travels.
 - randomly oriented with respect to the direction the wave travels.
 - at a 45° angle to the direction the wave travels.
 - perpendicular to the direction the wave travels.
 - at a 60° angle to the direction the wave travels.
- _____ 70. Examples of longitudinal waves are
- light waves and S waves.
 - light waves and sound waves.
 - sound waves and S waves.
 - light waves and P waves.
 - sound waves and P waves.
- _____ 71. Examples of transverse waves are
- sound waves and S waves.
 - light waves and P waves.
 - light waves and sound waves.
 - light waves and S waves.
 - sound waves and P waves.
- _____ 72. In a _____ wave, the medium vibrates in a direction that is parallel to the direction the wave travels.
- parallel
 - light
 - longitudinal
 - water
 - transverse
- _____ 73. In a _____ wave, the medium vibrates in a direction that is perpendicular to the direction the wave travels.
- longitudinal
 - sound
 - perpendicular
 - transverse
 - normal
- _____ 74. The period of a pendulum depends on
- the mass of the pendulum and the size of the arc it swings through.
 - the length of the pendulum and the size of the arc it swings through.
 - the mass of the pendulum and the acceleration of gravity.
 - the weight of the pendulum and the material it is made from.
 - the length of the pendulum and the acceleration of gravity.
- _____ 75. Other things being equal, the pendulum that has the longest period will be
- the least massive one.
 - the shortest one.
 - the most massive one.
 - the longest one.
 - the most spherical one.

- _____ 76. Other things being equal, the pendulum that has the shortest period will be
- A. the longest one.
 - B. the most massive one.
 - C. the shortest one.
 - D. the most spherical one.
 - E. the least massive one.
- _____ 77. Two pendulums have strings of the same length, but bobs with different masses. Pendulum A has a mass of 200 grams while pendulum B has a mass of 400 grams. How will their periods of oscillation compare?
- A. The period of pendulum A will be four times as long as the period of pendulum B.
 - B. The period of pendulum A will be the same as the period of pendulum B.
 - C. The period of pendulum B will be four times as long as the period of pendulum A.
 - D. The period of pendulum A will be twice as long as the period of pendulum B.
 - E. The period of pendulum B will be twice as long as the period of pendulum A.
- _____ 78. Two pendulums have strings of the same length, but bobs with different masses. Pendulum A has a mass of 200 grams while pendulum B has a mass of 100 grams. How will their periods of oscillation compare?
- A. The period of pendulum A will be twice as long as the period of pendulum B.
 - B. The period of pendulum B will be twice as long as the period of pendulum A.
 - C. The period of pendulum A will be four times as long as the period of pendulum B.
 - D. The period of pendulum A will be the same as the period of pendulum B.
 - E. The period of pendulum B will be four times as long as the period of pendulum A.
- _____ 79. When you swing standing up in a playground swing, the period of your oscillation is about 2 seconds. If you then swing sitting down, the period of this new oscillation will be
- A. 2 seconds, because the swing is the same length.
 - B. more than 2 seconds because your sitting has effectively lengthened the pendulum.
 - C. less than 2 seconds because your sitting has effectively shortened the pendulum.
 - D. less than 2 seconds because your sitting has effectively lengthened the pendulum.
 - E. 2 seconds, because your mass is still the same.
- _____ 80. When you swing sitting down in a playground swing, the period of your oscillation is about 2 seconds. If you then swing standing up, the period of this new oscillation will be
- A. 2 seconds, because the swing is the same length.
 - B. less than 2 seconds because your standing has effectively shortened the pendulum.
 - C. more than 2 seconds because your standing has effectively shortened the pendulum.
 - D. more than 2 seconds because your standing has effectively lengthened the pendulum.
 - E. 2 seconds, because your mass is still the same.
- _____ 81. Nodes in a standing wave on a plucked guitar string are
- A. points where the string was plucked.
 - B. points of compression.
 - C. points where the displacement of the string is a minimum.
 - D. points of rarefaction.
 - E. points where the displacement of the string is a maximum.
- _____ 82. Standing waves are produced by
- A. waves that reflect off a boundary and interfere with themselves.
 - B. the motion of the source away from the observer.
 - C. waves that vibrate in a vertical plane (standing upright).
 - D. the motion of the source toward the observer.
 - E. objects that travel faster than the speed of sound.

- _____ 83. _____ are produced by waves that reflect off a boundary and interfere with themselves.
- A. Transverse waves
 - B. Bow waves
 - C. Echoes
 - D. Shock waves
 - E. Standing waves
- _____ 84. The hertz is a unit of
- A. speed.
 - B. wavelength.
 - C. amplitude.
 - D. frequency.
 - E. time.
- _____ 85. The distance from the top of one wave crest to the next is called the
- A. speed.
 - B. amplitude.
 - C. period.
 - D. frequency.
 - E. wavelength.
- _____ 86. A wave that has a relatively long wavelength will also have a relatively
- A. small amplitude.
 - B. large amplitude.
 - C. short period.
 - D. low frequency.
 - E. high speed.
- _____ 87. A wave that has a relatively long wavelength will also have a relatively
- A. long period.
 - B. small amplitude.
 - C. high speed.
 - D. large amplitude.
 - E. high frequency.
- _____ 88. A wave that has a relatively short wavelength will also have a relatively
- A. large amplitude.
 - B. long period.
 - C. small amplitude.
 - D. high frequency.
 - E. low speed.
- _____ 89. A wave that has a relatively short wavelength will also have a relatively
- A. low frequency.
 - B. large amplitude.
 - C. short period.
 - D. small amplitude.
 - E. low speed.

- _____ 90. The speed of a wave is equal to the product of its
- A. amplitude and frequency.
 - B. wavelength and period.
 - C. frequency and wavelength.
 - D. period and amplitude.
 - E. period and frequency.
- _____ 91. The period of a wave is equal to 1 divided by the _____ of the wave.
- A. speed
 - B. diameter
 - C. wavelength
 - D. amplitude
 - E. frequency
- _____ 92. The speed of a wave is equal to the _____ divided by the _____ .
- A. frequency; wavelength
 - B. amplitude; frequency
 - C. wavelength; frequency
 - D. period; amplitude
 - E. wavelength; period
- _____ 93. A train of freight cars, each 10 m long, rolls by at the rate of 2 cars each second. What is the speed of the train?
- A. 20 m/s
 - B. 12 m/s
 - C. 2 m/s
 - D. 5 m/s
 - E. 10 m/s
- _____ 94. A train of freight cars, each 10 m long, rolls by at the rate of 1 car each second. What is the speed of the train?
- A. 11 m/s
 - B. 5 m/s
 - C. 10 m/s
 - D. 1 m/s
 - E. 20 m/s
- _____ 95. A train of freight cars, each 12 m long, rolls by at the rate of 3 cars each second. What is the speed of the train?
- A. 36 m/s
 - B. 15 m/s
 - C. 4 m/s
 - D. 12 m/s
 - E. 3 m/s
- _____ 96. A wave with a speed of 6 m/s and a wavelength of 3 m would have a frequency of _____ Hz.
- A. 2
 - B. 6
 - C. 3
 - D. 9
 - E. 18

- _____ 97. A wave with a speed of 6 m/s and a frequency of 3 Hz would have a wavelength of _____ m.
A. 9
B. 6
C. 2
D. 18
E. 3
- _____ 98. A wave with a speed of 6 m/s and a frequency of 2 Hz would have a wavelength of _____ m.
A. 2
B. 6
C. 3
D. 12
E. 9
- _____ 99. A wave with a speed of 6 m/s and a wavelength of 2 m would have a frequency of _____ Hz.
A. 12
B. 8
C. 3
D. 6
E. 2
- _____ 100. A wave with a wavelength of 6 m and a frequency of 2 Hz would have a speed of _____ m/s.
A. 18
B. 3
C. 12
D. 2
E. 6
- _____ 101. A wave with a wavelength of 6 m and a frequency of 3 Hz would have a speed of _____ m/s.
A. 2
B. 12
C. 18
D. 6
E. 3
- _____ 102. Beats occur in sound waves
A. when two sources vibrate at exactly the same frequency.
B. when waves from two sources of slightly different frequencies are heard together.
C. when waves from two sources are exactly in phase.
D. when waves from two sources are exactly out of phase.
E. when an echo is heard at the same time as the original sound.
- _____ 103. The beat frequency is
A. the sum of the frequencies of two different sound waves.
B. the quotient of the frequencies of two different sound waves.
C. the product of the frequencies of two different sound waves.
D. the difference between the frequencies of two different sound waves.
E. the average of the frequencies of two different sound waves.

- _____ 104. When two vibrating objects are perfectly in tune with each other, the beat frequency should be
- A. 1 beats per second.
 - B. 0 beats per second.
 - C. 2 beats per second.
 - D. equal to the frequency of vibration of either object.
 - E. 5 beats per second.
- _____ 105. Sound waves with frequencies of 250 hertz and 256 hertz would combine to produce a beat frequency of _____ hertz.
- A. 253
 - B. 506
 - C. 6
 - D. 64,000
 - E. 1024
- _____ 106. A vibrating string is being tuned to match a tuning fork with a frequency of 256 Hz. When 3 beats per second are heard, the vibration frequency of the string must be
- A. 259 Hz.
 - B. 256 Hz.
 - C. 3 Hz.
 - D. 253 Hz.
 - E. either 253 or 259 Hz.
- _____ 107. A vibrating string is being tuned to match a tuning fork with a frequency of 384 Hz. When 2 beats per second are heard, the vibration frequency of the string must be
- A. either 382 or 386 Hz.
 - B. 2 Hz.
 - C. 382 Hz.
 - D. 384 Hz.
 - E. 386 Hz.
- _____ 108. Sound waves with frequencies of 500 hertz and 504 hertz would combine to produce a beat frequency of _____ hertz.
- A. 4
 - B. 1.008
 - C. 502
 - D. 252,000
 - E. 1004
- _____ 109. An echo is caused by
- A. reflection of sound waves.
 - B. resonance of sound waves.
 - C. refraction of sound waves.
 - D. changes in the speed of sound with temperature.
 - E. interference of sound waves with each other.
- _____ 110. Reflection of sound waves produces the phenomenon known as
- A. an echo.
 - B. a sonic boom.
 - C. beats.
 - D. the Doppler effect.
 - E. a bow wave.

- _____ 111. Constructive interference of sound waves occurs
- A. when two waves arrive at the same point out of phase with each other.
 - B. whenever there is an echo.
 - C. when two waves arrive at the same point in phase with each other.
 - D. whenever sound waves are reflected off distant buildings.
 - E. whenever sound waves are refracted by air layers of different temperatures.
- _____ 112. Destructive interference of sound waves occurs
- A. when two waves arrive at the same point out of phase with each other.
 - B. whenever sound waves are refracted by air layers of different temperatures.
 - C. whenever sound waves are reflected off distant buildings.
 - D. when two waves arrive at the same point in phase with each other.
 - E. whenever there is an echo.
- _____ 113. Which of these is caused by interference?
- A. echo
 - B. shock wave
 - C. sonic boom
 - D. standing wave
 - E. resonance
- _____ 114. Sound waves with frequencies below 20 hertz are called _____ .
- A. infrasonic
 - B. hypersonic
 - C. ultrasonic
 - D. subsonic
 - E. supersonic
- _____ 115. Sound waves with frequencies above 20,000 hertz are called _____ .
- A. supersonic
 - B. hyposonic
 - C. ultrasonic
 - D. subsonic
 - E. infrasonic
- _____ 116. The ear of a young person is normally sensitive to pitches corresponding to the range of frequencies between about _____ hertz.
- A. 20 and 20,000
 - B. 2 and 2,000
 - C. 2,000 and 2,000,000
 - D. 1 and 100
 - E. 200 and 200,000
- _____ 117. The ear of a young person is normally sensitive to pitches corresponding to the range of frequencies between about _____ hertz.
- A. 3,000 and 3,000,000
 - B. 20 and 20,000
 - C. 600 and 600,000
 - D. 0.1 and 100
 - E. 5 and 5,000

- _____ 118. Which of the following is true concerning the range of sound waves in air?
- A. The range of sound waves in air is limited only by the curvature of the Earth.
 - B. High-frequency sound waves travel farther than low-frequency sound waves.
 - C. Sound waves of different frequencies all have the same range in air.
 - D. The range of sound waves in air is unlimited.
 - E. Low-frequency sound waves travel farther than high-frequency sound waves.
- _____ 119. Foghorns on ships have _____ frequencies because _____ .
- A. low; these frequencies are easier to produce on a ship.
 - B. high; these frequencies are easier to produce on a ship.
 - C. low; ships' captains generally cannot hear high frequencies anymore.
 - D. low; these frequencies travel farther in air.
 - E. high; these frequencies travel farther in air.
- _____ 120. Pushing a person on a swing at the same rate as the natural frequency of the swing/pendulum is an example of
- A. the Doppler effect.
 - B. constructive interference.
 - C. resonance.
 - D. destructive interference.
 - E. refraction.
- _____ 121. Tuning your radio to make its electronics oscillate at the same frequency as the waves from your favorite radio station is an example of
- A. resonance.
 - B. refraction.
 - C. the Doppler effect.
 - D. constructive interference.
 - E. destructive interference.
- _____ 122. A trombone player vibrates his lips at a particular frequency, causing the air column inside the trombone to vibrate at the same frequency. This is an example of
- A. refraction.
 - B. destructive interference.
 - C. resonance.
 - D. the Doppler effect.
 - E. constructive interference.
- _____ 123. Resonance occurs when
- A. the frequency of forced vibrations matches an object's natural frequency.
 - B. sound waves bounce off a distant surface and return to the source.
 - C. sound travels more rapidly through air layers with different temperatures.
 - D. an object moves through air faster than the speed of sound.
 - E. several waves arrive at the same point out of phase with each other.
- _____ 124. In general, sound travels most rapidly in _____, less rapidly in _____, and even less rapidly in _____ .
- A. solids; gases; liquids
 - B. solids; liquids; gases
 - C. gases; liquids; solids
 - D. liquids; gases; solids
 - E. liquids; solids; gases

- _____ 125. Compared to _____, sound travels about 4 times faster in _____, and about 15 times faster in _____.
- A. water; steel; air
 - B. water; air; steel
 - C. air; steel; water
 - D. steel; water; air
 - E. air; water; steel
- _____ 126. Sound travels
- A. at the same speed in all materials.
 - B. faster in cold air than in warm air.
 - C. faster in a vacuum than in air.
 - D. faster in warm air than in cold air.
 - E. at the same speed in air of all temperatures.
- _____ 127. Sound travels faster in air at
- A. lower temperatures because the molecules are closer together and collide more frequently.
 - B. lower temperatures because the molecules move faster and collide more frequently.
 - C. higher temperatures because the molecules are closer together and collide more frequently.
 - D. lower temperatures because the air is more solid then.
 - E. higher temperatures because the molecules move faster and collide more frequently.
- _____ 128. The speed of sound in air at room temperature is about _____.
- A. 110 m/s
 - B. 1100 m/s
 - C. 340 m/s
 - D. 34,000 m/s
 - E. 300,000 km/s
- _____ 129. In air, sound takes about _____ to travel the length of a football stadium.
- A. 30 seconds
 - B. 3 seconds
 - C. 3 minutes
 - D. 1/30 second
 - E. 1/3 second
- _____ 130. Compared to a 200-Hz sound, a 400-Hz sound would have
- A. a shorter wavelength and the same speed.
 - B. a longer wavelength and a lower speed.
 - C. a shorter wavelength and a lower speed.
 - D. a shorter wavelength and a higher speed.
 - E. a longer wavelength and a higher speed.
- _____ 131. Compared to a 300-Hz sound, a 500-Hz sound would have
- A. a shorter wavelength and the same speed.
 - B. a longer wavelength and a higher speed.
 - C. a shorter wavelength and a higher speed.
 - D. a shorter wavelength and a lower speed.
 - E. a longer wavelength and the same speed.

- _____ 132. Compared to a 400-Hz sound, a 200-Hz sound would have
- A. a shorter wavelength and a lower speed.
 - B. a longer wavelength and a higher speed.
 - C. a shorter wavelength and the same speed.
 - D. a longer wavelength and a lower speed.
 - E. a longer wavelength and the same speed.
- _____ 133. Compared to a 500-Hz sound, a 300-Hz sound would have
- A. a shorter wavelength and a lower speed.
 - B. a longer wavelength and a lower speed.
 - C. a longer wavelength and a higher speed.
 - D. a longer wavelength and the same speed.
 - E. a shorter wavelength and the same speed.
- _____ 134. The musical sound produced by a brass instrument such as a trombone is caused by
- A. a vibrating air column in the player's throat, which is amplified by the instrument's metal tubing.
 - B. standing sound waves in the air inside the tube, which are excited by the player's vibrating lips.
 - C. air rushing through the tube from the open end to the mouthpiece.
 - D. the metal tubing of the instrument vibrating at the resonant frequency of the player's lips.
 - E. air rushing through the tube from the mouthpiece to the open end.
- _____ 135. The intensity of a sound wave depends on
- A. the number of waves that pass by every second.
 - B. the speed of the wave.
 - C. the amplitude of the wave.
 - D. the wavelength of the wave
 - E. the frequency of the wave.
- _____ 136. Intensity of sound waves is measured in _____ .
- A. decibels
 - B. newtons
 - C. meters per second
 - D. meters
 - E. hertz
- _____ 137. The physiological sensation directly related to the _____ of a sound is called _____ .
- A. intensity; loudness
 - B. loudness; amplitude
 - C. speed; pitch
 - D. pitch; frequency
 - E. frequency; intensity
- _____ 138. The threshold of hearing is set at a sound level of ____ dB.
- A. 100
 - B. 2000
 - C. 0
 - D. 10
 - E. -10

- _____ 139. An intensity of 50 decibels is _____ times as intense as an intensity of 30 decibels.
- A. 50
 - B. 100
 - C. 1.67
 - D. 30
 - E. 20
- _____ 140. An intensity of 60 decibels is _____ times as intense as an intensity of 30 decibels.
- A. 30
 - B. 90
 - C. 1000
 - D. 2
 - E. 60
- _____ 141. An intensity of 60 decibels is _____ times as intense as an intensity of 40 decibels.
- A. 100
 - B. 2400
 - C. 20
 - D. 60
 - E. 1.5
- _____ 142. 40 decibels represents sound intensity _____ times greater than the threshold of hearing.
- A. 40
 - B. 1600
 - C. 10
 - D. 1,000,000
 - E. 10,000
- _____ 143. The pitch of a musical tone relates directly to the _____ of the sound wave.
- A. frequency
 - B. loudness
 - C. amplitude
 - D. intensity
 - E. speed
- _____ 144. Sound waves with higher pitch will have _____.
- A. longer wavelengths.
 - B. higher speeds.
 - C. lower frequencies.
 - D. lower speeds.
 - E. higher frequencies.
- _____ 145. The "highness" or "lowness" of a musical tone is called the _____.
- A. loudness
 - B. rhythm
 - C. intensity
 - D. scale
 - E. pitch

- _____ 146. For a musical tone composed of several partial tones, the pitch refers to
- the lowest frequency involved.
 - the frequency of the partial tone with the lowest intensity.
 - the average of the various frequencies involved.
 - the frequency of the partial tone with the highest intensity.
 - the highest frequency involved.
- _____ 147. Decreasing the length of a vibrating column of air or a vibrating string will generally result in
- a sound with a longer wavelength.
 - a sound with a lower pitch.
 - a sound wave traveling at a lower speed.
 - a sound wave traveling at a higher speed.
 - a sound with a higher pitch.
- _____ 148. Increasing the length of a vibrating column of air or a vibrating string will generally result in
- a sound with a lower pitch.
 - a sound with a higher pitch.
 - a sound with a shorter wavelength.
 - a sound wave traveling at a higher speed.
 - a sound wave traveling at a lower speed.
- _____ 149. A tuning fork has the number 320 stamped on it. What does this indicate?
- The speed of sound in the tuning fork is 320 m/s.
 - The wavelength of sound produced by this tuning fork is 320 m.
 - The wavelength of sound produced by this tuning fork is 320 cm.
 - This tuning fork vibrates at a frequency of 320 Hz.
 - The speed of sound in the tuning fork is 320 cm/s.
- _____ 150. A tuning fork has the number 256 stamped on it. What does this indicate?
- The wavelength of sound produced by this tuning fork is 256 cm.
 - This tuning fork vibrates at a frequency of 256 Hz.
 - The wavelength of sound produced by this tuning fork is 256 m.
 - The speed of sound in the tuning fork is 256 m/s.
 - The speed of sound in the tuning fork is 256 cm/s.
- _____ 151. A tuning fork has the number 512 stamped on it. What does this indicate?
- The wavelength of sound produced by this tuning fork is 512 m.
 - The wavelength of sound produced by this tuning fork is 512 cm.
 - This tuning fork vibrates at a frequency of 512 Hz.
 - The speed of sound in the tuning fork is 512 cm/s.
 - The speed of sound in the tuning fork is 512 m/s.
- _____ 152. The quality of a musical tone depends on
- the relative intensities of the partial tones.
 - the harmonics present in the tone.
 - the frequencies of the partial tones.
 - the instrument that created the tone.
 - all of the above.

- ____ 153. Partial tones whose frequencies are whole number multiples of the fundamental frequency are called
- A. integers.
 - B. tonics.
 - C. noise.
 - D. radicals.
 - E. harmonics.
- ____ 154. The first harmonic is also called the
- A. tonic.
 - B. basic.
 - C. full tone.
 - D. low note.
 - E. fundamental.
- ____ 155. The lowest possible frequency of vibration of an air pipe (such as a trombone or a penny whistle) is called the
- A. tonic.
 - B. full tone.
 - C. low note.
 - D. fundamental.
 - E. basic.
- ____ 156. When a string vibrates at its fundamental frequency, it will produce sounds with
- A. the most noise.
 - B. the longest wavelength.
 - C. the lowest speed.
 - D. the highest pitch.
 - E. the most harmonics.
- ____ 157. When a string vibrates at its fundamental frequency, it will produce sounds with
- A. the shortest wavelength.
 - B. the most harmonics.
 - C. the lowest speed.
 - D. the most noise.
 - E. the lowest pitch.
- ____ 158. A guitar string vibrates at a fundamental frequency of 110 Hz. The frequency of the first harmonic for this string would be ____ Hz.
- A. 110
 - B. 440
 - C. 120
 - D. 111
 - E. 220
- ____ 159. When a guitar string vibrates at its fundamental frequency, it will have a node at each end and _____ in between.
- A. no nodes
 - B. four nodes
 - C. three nodes
 - D. one node
 - E. two nodes

- _____ 160. When a guitar string vibrates at the frequency of its second harmonic, it will have a node at each end and _____ in between.
- A. four nodes
 - B. no nodes
 - C. two nodes
 - D. one node
 - E. three nodes
- _____ 161. When a guitar string vibrates at the frequency of its third harmonic, it will have a node at each end and _____ in between.
- A. four nodes
 - B. one node
 - C. no nodes
 - D. three nodes
 - E. two nodes
- _____ 162. A guitar string vibrates at a fundamental frequency of 110 Hz. The frequency of the second harmonic for this string would be ____ Hz.
- A. 330
 - B. 440
 - C. 120
 - D. 220
 - E. 112
- _____ 163. A guitar string vibrates at a fundamental frequency of 110 Hz. The frequency of the third harmonic for this string would be ____ Hz.
- A. 130
 - B. 220
 - C. 113
 - D. 440
 - E. 330