Phys.12- Q2W3-H.W.-Heat

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

____ 1. What is the temperature of a system in thermal equilibrium with another system made up of ice and water at 1 atm of pressure?
a. 0°F
b. 273 K
c. 0 K
d. 100°C

____ 2. Which of the following terms describes a transfer of energy?
a. heat
b. temperature
c. internal energy
d. kinetic energy

____ 3. What happens to the internal energy of an ideal gas when it is heated from 0°C to 4°C?
a. It increases.
b. It is impossible to determine.
c. It remains constant.
d. It decreases.

____ 4. If there is no temperature difference between a substance and its surroundings, what has occurred on the microscopic level?
a. Energy has been transferred from lower-energy particles to higher-energy particles.
b. Heat has been flowing back and forth.
c. Energy has been transferred from higher-energy particles to lower-energy particles.
d. No energy has been transferred between the substance and its surroundings.

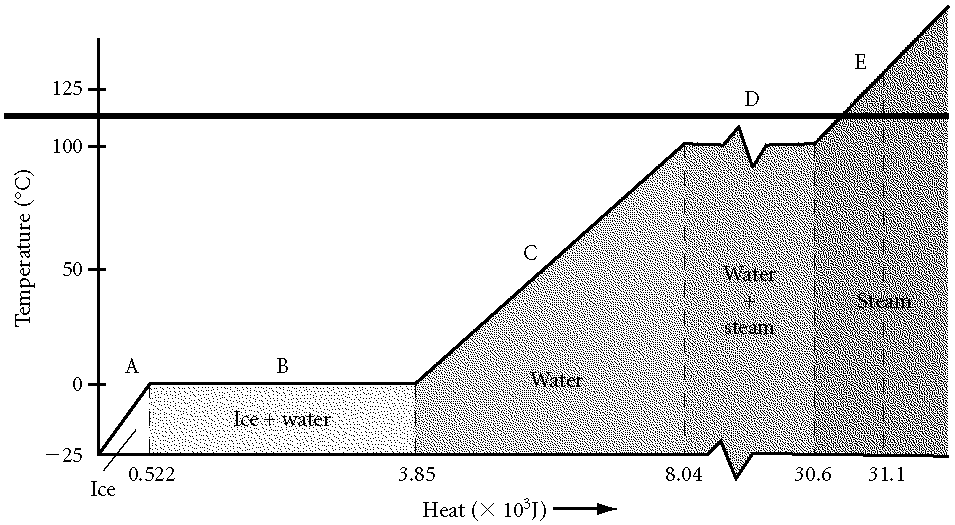
____ 5. The use of fiberglass insulation in the outer walls of a building is intended to minimize heat transfer through what process?
a. radiation
b. convection
c. conduction
d. vaporization

____ 6. As the temperature of a substance increases, its volume tends to increase due to
a. thermal expansion.
b. thermal equilibrium.
c. thermal contraction.
d. thermal energy.

____ 7. Energy transfer as heat between two objects depends on which of the following?
a. The difference in temperature of the two objects.
b. The difference in composition of the two objects.
c. The difference in volume of the two objects.
d. The difference in mass of the two objects.

____ 8. What is the temperature of a system in thermal equilibrium with another system made up of water and steam at 1 atm of pressure?
a. 0°F
b. 100°C
c. 0 K
d. 273 K

____ 9. Why does sandpaper get hot when it is rubbed against rusty metal?
a. Energy is transferred from the metal to the sandpaper.
b. Energy is transferred from the sandpaper into the metal.
c. Energy is transferred from a hand to the sandpaper.
d. Friction between the sandpaper and metal increases the temperature of both.



____ 10. At what point on the figure above does the substance undergo a phase change?
a. B
b. E
c. C
d. A

____ 11. Using the figure above, determine which value equals the latent heat required to change the liquid water into steam.
a. 31.1×10^3 J
b. 30.6×10^3 J
c. 22.6×10^3 J
d. 8.04×10^3 J

____ 12. At what point on the figure above is the amount of energy transferred as heat approximately $4.19X10^3$J
a. C
b. B
c. D
d. A

____ 13. The figure above shows how the temperature of 10.0 g of ice changes as energy is added. Which of the following statements is correct?
a. The water absorbed energy sporadically, and the temperature increased only when all of the water was in one phase.
b. The water absorbed energy continuously, and the temperature increased continuously.
c. The water absorbed energy continuously, but the temperature increased only when all of the water was in one phase.
d. The water did not absorb energy.

____ 14. In an elastic collision between two ball bearings, kinetic energy is conserved. If there is no change in potential energy, which of the following is true?
a. ΔU cannot be determined for this event.
b. $\Delta U = 0$
c. $\Delta U < 0$
d. $\Delta U > 0$

____ 15. What temperature has the same numerical value on both the Fahrenheit and the Celsius scales?
a. 0°
b. –72.0°
c. 40.0°
d. –40.0°

____ 16. A calorimeter is used to determine the specific heat capacity of a test metal. If the specific heat capacity of water is known, what quantities must be measured?
a. metal mass, water mass, initial and final temperatures of metal and water
b. metal mass, water mass, heat added to or removed from water and metal
c. metal mass, water mass, final temperature of metal and water
d. metal volume, water volume, initial and final temperatures of metal and water

____ 17. A substance registers a temperature change from 20°C to 40°C. To what incremental temperature change does this correspond?
a. 40 K
b. 313 K
c. 36 K
d. 20 K

____ 18. If energy is transferred from a table to a block of ice moving across the table, which of the following statements is true?
a. The ice is cooler than the table.
b. The table and the ice are at thermal equilibrium.
c. Energy is being transferred from the ice to the table.
d. The ice is no longer 0°C.

____ 19. Which of the following is a form of kinetic energy that occurs within a molecule when the bonds are stretched or bent?
a. translational
b. vibrational
c. rotational
d. internal

____ 20. Energy is transferred as heat between two objects, one with a temperature of 5°C and the other with a temperature of 20°C. If two other objects are to have the same amount of energy transferred between them, what might their temperatures be?
a. 80°C and 90°C
b. 17°C and 32°C
c. 10°C and 15°C
d. 15°C and 25°C

____ 21. A nail is driven into a board with an initial kinetic energy of 150 J. If the potential energy before and after the event is the same, what is the change in the internal energy of the board and nail?
a. –150 J
b. 75 J
c. 150 J
d. 0 J

____ 22. To which of the following is high temperature related?
a. zero net energy transfer
b. large volume
c. low particle kinetic energy
d. high particle kinetic energy

____ 23. If two small beakers of water, one at 70°C and one at 80°C, are emptied into a large beaker, what is the final temperature of the water?
a. The final temperature is greater than 80°C.
b. The water temperature will fluctuate.
c. The final temperature is between 70°C and 80°C.
d. The final temperature is less than 70°C.

____ 24. In the presence of friction, not all of the work done on a system appears as mechanical energy. What happens to the rest of the energy provided by work?
a. The remaining energy is dissipated as sound.
b. The remaining energy is stored as mechanical energy within the system.
c. The remaining energy causes an increase in the internal energy of the system.
d. The remaining energy causes a decrease in the internal energy of the system.

____ 25. Which of the following is proportional to the kinetic energy of atoms and molecules?
a. temperature
b. elastic energy
c. potential energy
d. thermal equilibrium

____ 26. Which of the following best describes the relationship between two systems in thermal equilibrium?
a. No net energy is exchanged.
b. The volumes are equal.
c. The velocity is zero.
d. The masses are equal.

____ 27. How is energy transferred as heat always directed?
a. from an object at low kinetic energy to an object at high kinetic energy
b. from an object with higher mass to an object of lower mass
c. from an object at low temperature to an object at high temperature

d. from an object at high temperature to an object at low temperature

____ 28. A slice of bread contains about 4.19×10^5 J of energy. If the specific heat capacity of a person is 4.19×10^5 J/kg•°C, by how many degrees Celsius would the temperature of a 70.0 kg person increase if all the energy in the bread were converted to heat?

a. 1.00°C
b. 1.43°C
c. 2.25°C
d. 1.86°C

____ 29. Which of the following is *not* a widely used temperature scale?

a. Kelvin
b. Fahrenheit
c. Joule
d. Celsius

____ 30. What are the energies associated with atomic motion called?

a. internal energy
b. potential energy
c. bond energy
d. kinetic energy

____ 31. Which of the following is true during a phase change?

a. Temperature decreases.
b. Temperature increases.
c. There is no transfer of energy as heat.
d. Temperature remains constant.

____ 32. What three properties of a substance affect the amount of energy transferred as heat to or from the substance?

a. mass, temperature change, latent heat
b. mass, temperature change, specific heat capacity
c. density, temperature change, specific heat capacity
d. volume, temperature change, specific heat capacity

____ 33. Which of the following describes a substance in which the temperature and pressure remain constant while the substance experiences an inward transfer of energy?

a. liquid
b. substance undergoing a change of state
c. solid
d. gas

____ 34. A substance registers a temperature change from 20°C to 40°C. To what incremental temperature change does this correspond?

a. 20°F
b. 313°F
c. 36°F
d. 40°F

____ 35. Which of the following is a direct cause of a substance's temperature increase?

a. Kinetic energy is added to the particles of the substance.
b. Energy is removed from the particles of the substance.
c. The number of atoms and molecules in a substance changes.
d. The volume of the substance decreases.

Problems

1.The temperature of an object is measured as 489.5 K. What is this temperature in degrees Celsius?

A. 214.4°C B. 216.4°C C. 218.4°C D. 220.4°C

2.What is the increase in the internal energy per kilogram of water at the bottom of a 115 m waterfall, assuming that all of the initial potential energy is transferred as heat to the water? (g = 9.81 m/s^2)

A. 1.07×10^3 J/kg
B. 1.09×10^3 J/kg
C. 1.11×10^3 J/kg
D. 1.13×10^3 J/kg

3.The body temperature of a certain human being is 98.27°F. What does this temperature equal in kelvins?

A. 309.97 K B. 311.97 K C. 313.97 K D. 315.97 K

4.A metal bolt with a mass of 6.80×10^{-2} kg and a temperature of 83.3°C is placed in a container of water. The mass of the water is 0.220 kg, and its temperature is 25.6°C. What is the specific heat capacity of the bolt if the final temperature of the bolt and water is 27.4°C? ($c_{p,w}$ = 4186 J/kg•°C)

A. 4.1` $\times 10^2$ J/kg•°C B. 4.2×10^2 J/kg•°C C. 4.3×10^2 J/kg•°C D. 4.4×10^2J/kg•°C

5.What is the temperature increase of 6.4 kg of water when it is heated by a 7.7 x10^2 W immersion heater for exactly 18.8 min? (c_p = 4186 J/kg•°C)

A. 32°C B. 34°C C. 36°C D. 38°C

6.A falling stone with a mass of 0.398 kg strikes the ground. Assuming that the stone is initially at rest when it begins falling, how high must the stone be above the ground for the internal energy of the stone and ground to increase by 1670 J? (g = 9.81 m/s^2)

A. 422 m B. 424 m C. 428 m D. 432 m

7.A hammer drives a nail at a speed of 0.42 m/s into a piece of wood. The wood does not move during this action. If the mass of the nail is 78.2 g and half of its mechanical energy is transferred to the wood as heat, how much does the internal energy of the wood change?

A. 3.1×10^{-3} J B. 3.2×10^{-3} J C. 3.4×10^{-3} J D. 3.6×10^{-3} J

8.The temperature of an oxygen tank is at 279 K, and the temperature of a nitrogen tank is 15°C. How much greater is the temperature of the nitrogen tank? (Express the answer in kelvins.)

A. 9 K B. 11 K C. 13 K D. 15 K

9.A warm day has a high temperature of 38.1°C. What is this temperature in degrees Fahrenheit?

A. 94.6°F B. 96.6°F C. 98.6°F D. 100.6°F

10. A mixture of 49.9 g of sand and 73.3 g of water has a temperature of 11.9°C. What mass of water at 78.2°C must be added to raise the final temperature of the mixture to 27.3°C?
($c_{p.w}$ = 4.19 J/g•°C and $c_{p.s}$ = 0.835 J/g•°C)

A. 21.2 g B. 23.2 g C. 25.2 g D. 27.2 g

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