1. The average kinetic energy of water molecules is greatest in which of these samples?
   1) 10 g of water at 35°C
   2) 10 g of water at 55°C
   3) 100 g of water at 25°C
   4) 100 g of water at 45°C

2. Which quantity is equivalent to 50 kiloJoules?
   1) 5000 J   3) 5×10^3 J
   2) 0.05 J   4) 5×10^4 J

3. What is the total number of kiloJoules of heat energy absorbed when the temperature of 200 grams of water is raised from 10°C to 40°C?
   1) 0.126 kJ   3) 25.2 kJ
   2) 0.840 kJ   4) 33.6 kJ

4. Which phase change represents sublimation?
   1) $NH_3(\ell) \rightarrow NH_3(g)$ 3) $KI(s) \rightarrow KI(\ell)$
   2) $CO_2(s) \rightarrow CO_2(g)$ 4) $H_2O(\ell) \rightarrow H_2O(s)$

6. Which type of energy is associated with the random motion of atoms and molecules in a sample of air?
   1) chemical energy   3) nuclear energy
   2) electrical energy   4) thermal energy

7. Which phase change results in the release of energy?
   1) $H_2O(s) \rightarrow H_2O(\ell)$ 3) $H_2O(\ell) \rightarrow H_2O(g)$
   2) $H_2O(s) \rightarrow H_2O(g)$ 4) $H_2O(g) \rightarrow H_2O(\ell)$

8. Which term represents a form of energy?
   1) heat   3) kilocalorie
   2) degree   4) temperature

9. Object A at 40.°C and object B at 80.°C are placed in contact with each other. Which statement describes the heat flow between the objects?
   1) Heat flows from object A to object B.
   2) Heat flows from object B to object A.
   3) Heat flows in both directions between the objects.
   4) No heat flow occurs between the objects.

10. A person with a body temperature of 37°C holds an ice cube with a temperature of 0°C in a room where the air temperature is 20.°C. The direction of heat flow is
    1) from the person to the ice, only
    2) from the person to the ice and air, and from the air to the ice
    3) from the ice to the person, only
    4) from the ice to the person and air, and from the air to the person

11. As ice melts at standard pressure, its temperature remains at 0°C until it has completely melted. Its potential energy
    1) decreases   3) remains the same
    2) increases

12. Which unit is used to express the energy absorbed or released during a chemical reaction?
    1) kelvin   3) volt
    2) joule   4) torr

13. Which kind of energy is stored within a chemical substance?
    1) free energy   3) kinetic energy
    2) activation energy 4) potential energy

14. The temperature of a sample of matter is a measure of the
    1) total kinetic energy of the particles in the sample
    2) total potential energy of the particles in the sample
    3) average potential energy of the particles in the sample
    4) average kinetic energy of the particles in the sample

15. Which sample of water contains particles having the highest average kinetic energy?
    1) 25 mL of water at 95°C
    2) 45 mL of water at 75°C
    3) 75 mL of water at 75°C
    4) 95 mL of water at 25°C

16. In which sample of water do the molecules have the highest average kinetic energy?
    1) 20. mL at 100.°C   3) 60. mL at 60.°C
    2) 40. mL at 80.°C   4) 80. mL at 40.°C

17. The temperature of a sample of a substance changes from 95.°C to 115.°C. How many Kelvin does the temperature change?
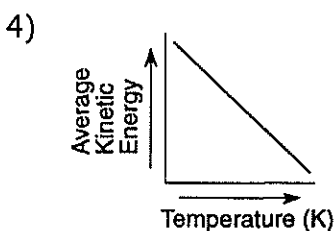   1) 10.   3) 283
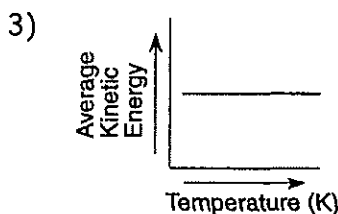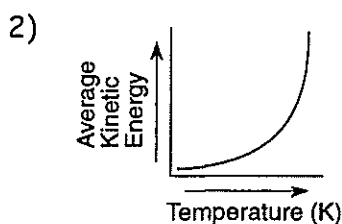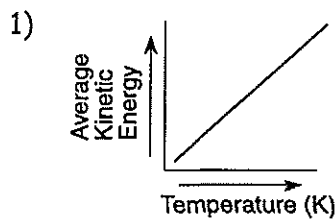   2) 20.   4) 293

18. The temperature of a sample of a substance changes from 50.°C to 60.°C. How many Kelvin does the temperature change?
    1) 10.   3) 283
    2) 20.   4) 293

19. Which quantity is equal to 50 kilojoules?
    1) 0.05 J   3) 5×10^3 J
    2) 500 J   4) 5×10^4 J

20. Which graph best shows the relationship between Kelvin temperature and average kinetic energy?

    1)

    2)

    3)

    4)

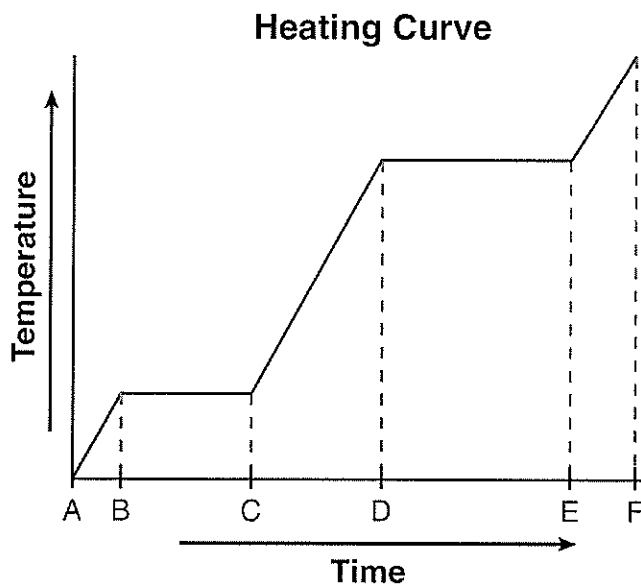21. Which substance has vibrating particles in regular, fixed positions?
    1) $Ca(s)$ 3) $Cl_2(g)$
    2) $Hg(\ell)$ 4) $CaCl_2(aq)$

22. A sample of water is cooled from 25.0°C to 20.0°C by the loss of 126 Joules of heat. What is the mass of the water?
    1) 5.00 g   3) 30.0 g
    2) 6.00 g   4) 150.0 g

23. Given the diagram representing a heating curve for a substance:

Heating Curve

During which time interval is the average kinetic energy of the particles of the substance constant while the potential energy of the particles increases?
1) *AC*   3) *CD*
2) *BC*   4) *DF*

24. Which physical changes are endothermic?
1) melting and freezing
2) melting and evaporating
3) condensation and sublimation
4) condensation and deposition

25. A 36-gram sample of water has an initial temperature of 22°C. After the sample absorbs 1200 joules of heat energy, the final temperature of the sample is
1) 8.0°C   3) 30.°C
2) 14°C   4) 55°C

26. The graph below represents the uniform heating of a sample of a substance starting as a solid below its melting point.
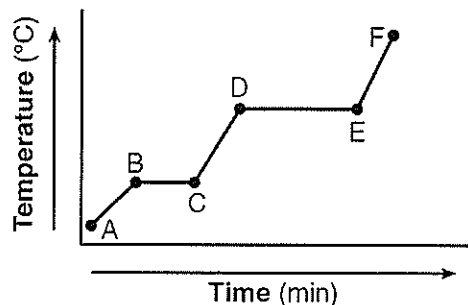
Which statement describes what happens to the energy of the particles of the sample during time interval *DE?*
1) Average kinetic energy increases, and potential energy remains the same.
2) Average kinetic energy decreases, and potential energy remains the same.
3) Average kinetic energy remains the same, and potential energy increases.
4) Average kinetic energy remains the same, and potential energy decreases

27. The graph below represents the uniform heating of a substance, starting below its melting point, when the substance is solid.
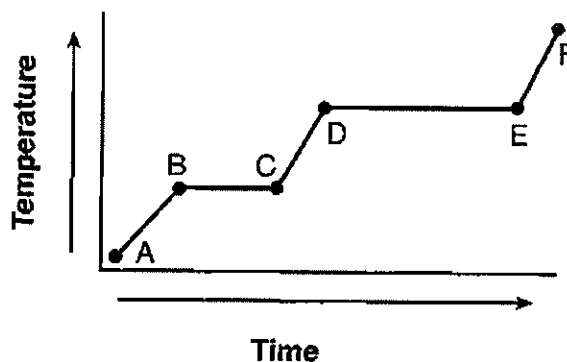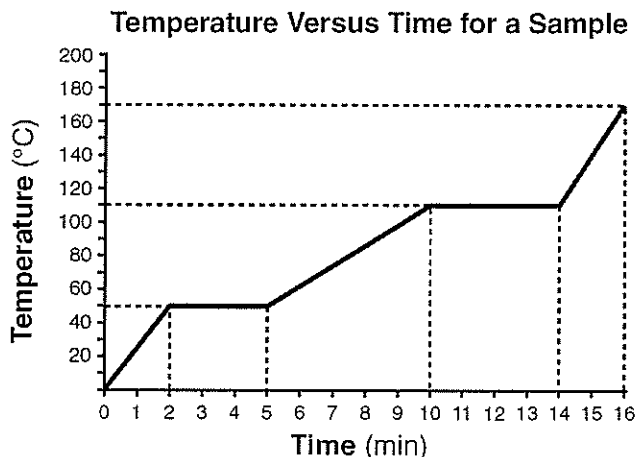

Which line segments represent an increase in average kinetic energy?
1) $\overline{AB}$ and $\overline{BC}$ 3) $\overline{BC}$ and $\overline{DE}$
2) $\overline{AB}$ and $\overline{CD}$ 4) $\overline{DE}$ and $\overline{EF}$

28. Starting as a solid, a sample of a substance is heated at a constant rate. The graph below shows the changes in temperature of this sample.

Temperature Versus Time for a Sample

What is the melting point of the sample and the total time required to completely melt the sample after it has reached its melting point?
1) 50°C and 3 min
2) 50°C and 5 min
3) 110°C and 4 min
4) 110°C and 14 min

29. An 80.0-gram sample of water at 10.0°C absorbs 1680 Joules of heat energy. What is the final temperature of the water?
1) 50.0°C
2) 15.0°C
3) 5.00°C
4) 4.00°C

30. When 200 grams of water cools from 50.°C to 25°C, the total amount of heat energy released by the water is
1) 42 kJ
2) 21 kJ
3) 34 J
4) 17 J

31. A sample of water is heated from 10.0°C to 15.0°C by the addition of 126 Joules of heat. What is the mass of the water?
1) 5.00 g
2) 6.00 g
3) 30.0 g
4) 150.0 g

32. What is the minimum amount of heat required to completely melt 20.0 grams of ice at its melting point?
1) 20.0 J
2) 83.6 J
3) 6,680 J
4) 45,200 J

33. At which Celsius temperature does lead change from a solid to a liquid?
1) 874°C
2) 601°C
3) 328°C
4) 0°C

34. The heat of vaporization of a liquid is 1,340 Joules per gram. What is the minimum number of Joules needed to change 40.0 grams of the liquid to vapor at the boiling point?
1) 33.5
2) 1,340
3) 3,280
4) 53,600

35. When 10 grams of a compound was dissolved in 100 grams of water, the temperature of the water rose from 25°C to 30°C. For each gram of compound dissolved, how many calories of heat were absorbed by the water?
1) 5 cal
2) 10 cal
3) 50 cal
4) 100 cal

1. 2
2. 4
3. 3
4. 2
5. Essay
6. 4
7. 4
8. 1
9. 2
10. 2
11. 2
12. 2
13. 4
14. 4
15. 1
16. 1
17. 2
18. 1
19. 4
20. 1
21. 1

22. 2
23. 2
24. 2
25. 3
26. 3
27. 2
28. 1
29. 2
30. 2
31. 2
32. 3
33. 3
34. 4
35. 3

Regents Chemistry