Q1: Chapter 10/ States of Matter (sec 4 and 5) Multiple Choice

c 1. When a liquid becomes vapor, its gas particles begin to exert...
a. air pressure. c. vapor pressure.
b. equilibrium pressure. d. no pressure

b 2. If the rate of evaporation equals the rate of condensation…
a. there is more liquid. c. there is more vapor.
b. the system is in equilibrium. d. the system is working towards equilibrium.

b 3. When the atmospheric pressure equals the equilibrium vapor pressure occurs.
a. freezing. c. melting.
b. boiling. d. sublimation.

c 4. Liquids with weak intermolecular forces
a. freeze easily c. easily evaporate.
b. cannot diffuse. d. contain a lot of kinetic energy

c 5. Water have a low vapor pressure because
a. it has strong London dispersion forces acting between its molecules.
b. it has a weak force of attraction between its molecules.
c. it has strong hydrogen bonds acting between its molecules.
d. it is very volatile.

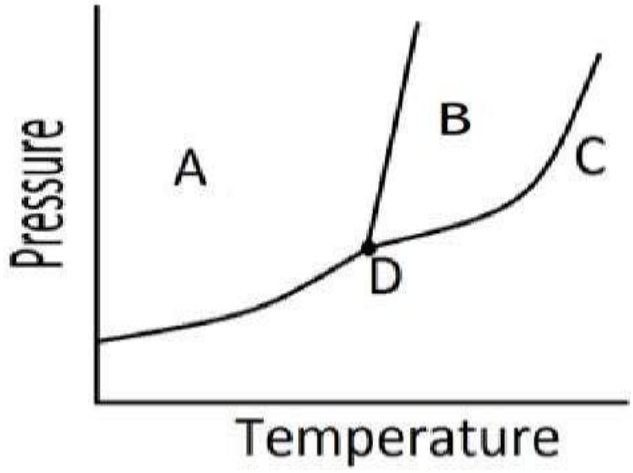
c 6. Which substance has the weakest intermolecular forces?
a. Substance A, boiling point of 75 °C.
b. Substance B, boiling point of 105 °C.
c. Substance C, boiling point of 25 °C.
d. Substance D, boiling point of 45 °C.

b 7. Based on the phase diagram of water, it exists as a at 700 mmHg and 50 °C.
a. solid. c. gas.
b. liquid. d. supercritical fluid.

a 8. Based on the phase diagram of carbon dioxide, what is true regarding CO_2 for temperatures above 31 °C?
a. It can never be liquified. c. It decomposes.
b. It has a high pressure. d. It is a plasma.

d 9. Based on the phase diagram of carbon dioxide, at 530 KPa, dry ice is heated from -100 °C to 25 °C. What changes occur?
a. freezing, then condensation. c. melting only.
b. sublimation only. d. melting, then boiling.

a 10. What state of matter is A?



a.
b. solid.
c. liquid.
c. gas.
d. supercritical fluid.

c 11. What is the approximate angle between two hydrogen-oxygen bonds in water?
a. 90°
b. 102°
c. 105°
d. 120°

c 12. The bond between oxygen and hydrogen in a water molecule is
a. ionic.
b. hydrogen.
c. polar-covalent.
d. dipole-dipole.

b 13. The molecular geometry of a water molecule is
a. linear.
b. bent.
c. trigonal planar.
d. triangular.

d 14. Liquid water forms molecular groups. How many molecules of water are there in each group?
a. one to two.
b. two to four.
c. three to six.
d. four to eight.

c 15. If water molecules were not linked by hydrogen bonds to form groups in liquid water, what would be the physical state of water at room temperature?
a. solid.
b. liquid.
c. gas.
d. a mixture of liquid and gas.

a 16. What is the reason for the relatively low density of ice?
a. empty spaces between molecules.
b. the high number of hydrogen bonds.
c. the small size of hydrogen and oxygen atoms.
d. the low molar mass of water.

a 17. Compared with nonpolar substances of comparable molecular mass, water's molar enthalpy of vaporization is
a. higher. c. similar.
b. lower. d. equal.

b 18. Water's relatively high boiling point is the result of
a. covalent bonding. c. ionic bonding.
b. hydrogen bonding. d. London forces.

c 19. The molar enthalpy of fusion of ice is
a. equal to the enthalpy of many other solids.
b. approximately the same as the enthalpy of many other solids.
c. larger than the enthalpy of many other solids.
d. smaller than the enthalpy of many other solids.

a 20. Compared with the boiling point of nonpolar substances of comparable molar mass at 1 atm, the boiling point of water at 1 atm is
a. higher. c. equal.
b. lower. d. approximately the same.

a 21. The strength of intermolecular forces varies between liquids, therefore they will have
a. different equilibrium vapor pressure.
b. different temperatures.
c. the same equilibrium vapor pressure.
d. the same amount of kinetic energy.

b 22. The lower the boiling point, the the intermolecular forces.
a. stronger. b. weaker.

a 23. As the atmospheric pressure decreases, boiling point
a. decreases. b. increases.

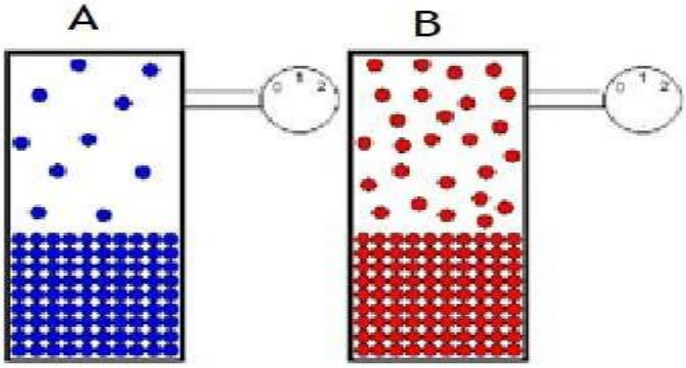
c 24. What is the normal boiling point of water?
a. 0^oC. c. 100^oC.
b. 50^oC. d. 100^oF

d 25. Why does a liquid with a lower vapor pressure have a higher boiling point?

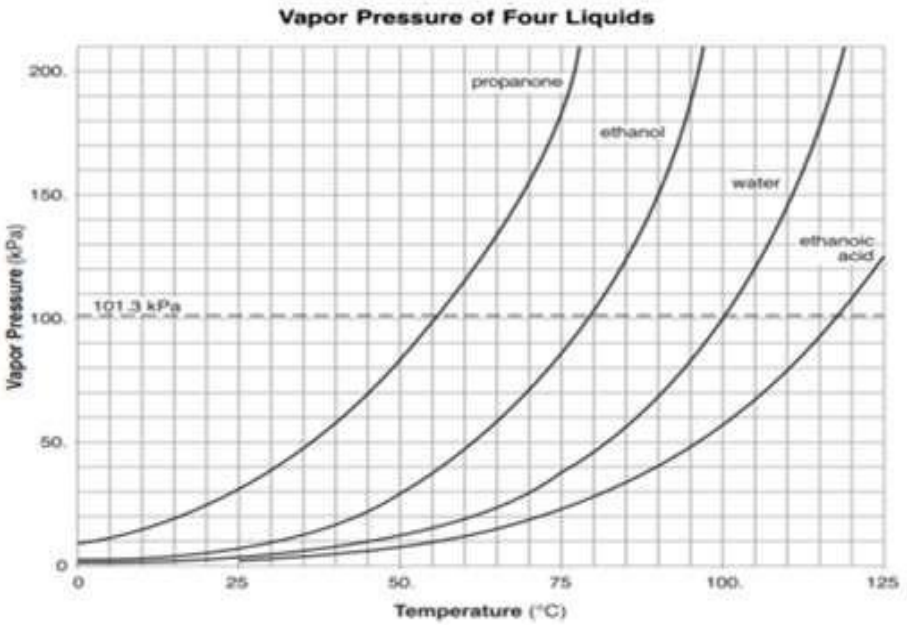
a. the molecules need more energy to break free of their attractions to other molecules and change phase from liquid to gas.
b. the liquid has low volatility.
c. the forces of attraction between the molecules of the liquid are strong.
d. all of the answers are correct.

a 26. Which model represents a LOWER Vapor Pressure?

a. A b. B.



Use the following graph to answer the questions from 7 to 10.



b 27. What is the vapor pressure of propanone at 50°C?

a. 37 kPa c. 50 kPa.
b. 83 kPa. d. 101 kPa

c 28. Which compound has the lowest vapor pressure at 50°C?

a. propanone c. ethanoic acid.
b. water. d. ethanol

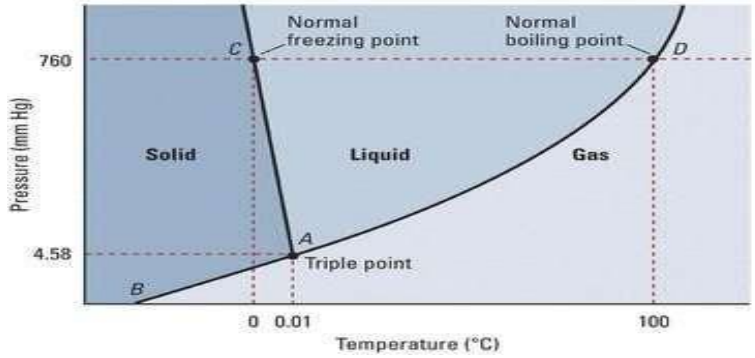
c 29. At which temperature is the vapor pressure of ethanol equal to the vapor pressure of propanone at 35°C?

a. 35°C c. 60°C.
b. 82°C. d. 95°C

c 30. Which statement concerning propanone and water at 50°C is true?

a. Propanone has a higher vapor pressure and stronger intermolecular forces than water.
b. Propanone has a lower vapor pressure and stronger intermolecular forces than water.
c. Propanone has a higher vapor pressure and weaker intermolecular forces than water.
d. Propanone has a lower vapor pressure and weaker intermolecular forces than water.

Use the phase diagram of water to answer the questions from 11 to 13.



c 31. Based on the phase diagram of water, it exists as a at 750 mmHg and 110 °C.

a. solid.
b. liquid.
c. gas.
d. supercritical fluid.

a 32. What phase changes may occur at pressures below 4.58 mmHg?

a. sublimation/deposition.
b. all phase changes are possible at these pressures.
c. melting/freezing.
d. vaporization/condensation.

a 33. The pressure is increased on a sample of water at 0 °C from 0 mmHg to 800 mmHg. In order, what changes occur?

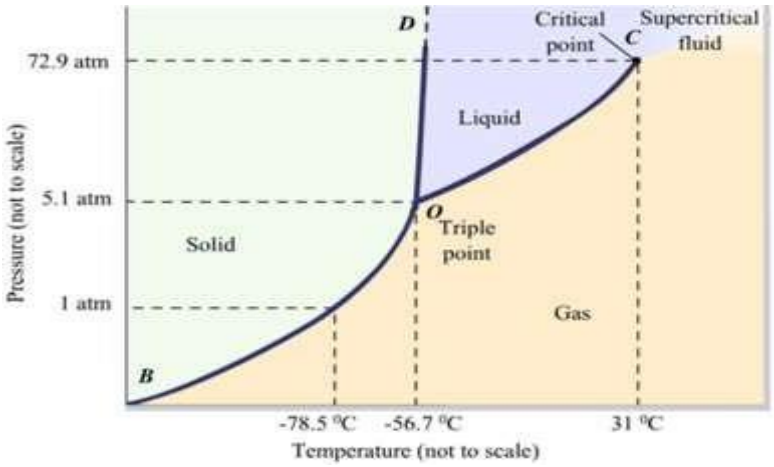
a. deposition, melting.
b. condensation, freezing.
c. sublimation, melting.
d. deposition, freezing.

d 34. The of a substance indicates the temperature and pressure conditions at which the solid, liquid, and vapor of the substance can coexist at equilibrium.

a. boiling point.
b. freezing point.
c. critical point.
d. triple point.

d 35. What is the normal melting point of CO_2?

a. -78.5 °C.
b. 31 °C.
c. -56.7 °C
d. It doesn't have a normal melting point.



d 36. What is likely to happen to a liquid mixture of water and rubbing alcohol in an open flask as temperature is increased while pressure stays the same?

a. Both liquids will vaporize at the same rate.
b. Water will vaporize faster.
c. Vaporization and condensation will reach equilibrium.
d. Rubbing alcohol will vaporize faster.

b 37. A solid's molar enthalpy of fusion is the energy that is

a. released when a solid melts.
b. absorbed when a solid melts.
c. needed to transform a solid to a gas.
d. required for equilibrium.

a 38. A sample of carbon dioxide gas is in equilibrium with solid dry ice. If the temperature of the system increases,

a. vapor pressure increases.
b. vapor pressure decreases.
c. more dry ice forms.
d. carbon dioxide gas condenses.

a 39. A phase diagram relates the state of matter, pressure, and

a. temperature.
b. volume.
c. mass.
d. weight.

d 40. On a phase diagram, the point at which all equilibrium lines join is the

a. melting point.
b. boiling point.
c. critical point.
d. triple point.

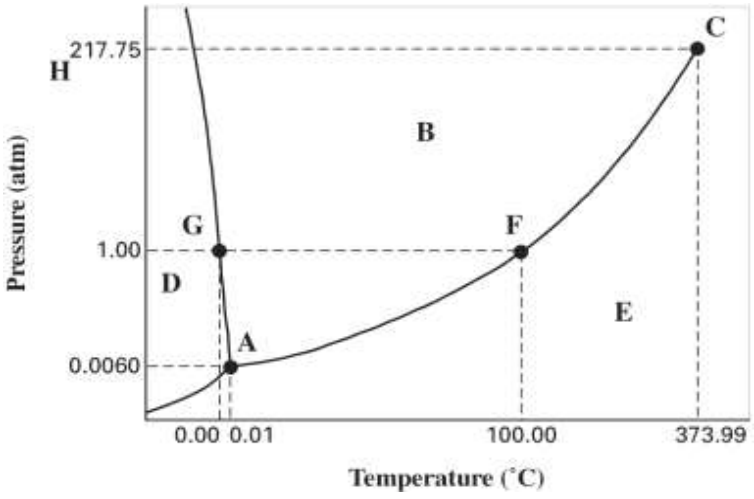
b 41. When energy as heat is applied to a liquid-vapor system at equilibrium, a new equilibrium state will have
a. a higher percentage of liquid.
b. a higher percentage of vapor.
c. equal amounts of liquid and vapor.
d. all liquid

c 42. If water molecules were nonpolar, water would probably
a. be a solid at room temperature.
b. has stronger hydrogen bonding.
c. be a gas at room temperature.
d. be flammable

a 43. The amount of energy required to melt 1 mol of a solid at its melting point is its _____.
a. molar enthalpy of fusion.
b. molar enthalpy of vaporization.
c. molar entropy of fusion.
d. molar entropy of vaporization.

Q44-51: Match the letter on the diagram with the term for that point or region.

Phase Diagram for H_2O



A. Critical point
B. Vapor
C. Normal freezing point
D. Triple point
E. Solid
F. Normal boiling point
G. Liquid
H. Critical pressure

44. Point F -------F--------
45. Point E --------B-------
46. Point B -------G--------
47. Point A -------D--------
48. Point D ------E---------
49. Point C --------A-------
50. Point H -------H--------
51. Point G ------C---------

A. Equilibrium vapor pressure.

B. Increases in equilibrium vapor pressure at higher temperatures

C. Boiling point depressions of substances at elevations higher than sea level.

52. is the pressure exerted by a vapor in equilibrium with its corresponding liquid at a given temperature. ----------A
53. increases its average kinetic energy. ----------B
54. there is lowered atmospheric pressure. ----------C`

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Q2) a. Define the term equilibrium vapor pressure.

Equilibrium vapor pressure is the pressure exerted by a vapor in equilibrium with its corresponding liquid at a given temperature.

b. Use it to explain the following two phenomena.

1. Boiling point depressions of substances at elevations higher than sea level.

A liquid boils when its equilibrium vapor pressure is equal to atmospheric pressure. At high elevations, there is lowered atmospheric pressure. This means that the equilibrium vapor pressure will equal the lowered atmospheric pressure at a lower temperature.

2. Increases in equilibrium vapor pressure at higher temperatures

Increasing the temperature of a liquid increases its average kinetic energy. That in turn increases the number of molecules that have enough energy to escape from the liquid phase into the vapor phase. This increased evaporation rate increases the concentration of molecules in the vapor phase, which increases the equilibrium vapor pressure.

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