IMF Practice Test 2

____ 1. Order the intermolecular forces (dipole-dipole, London Dispersion, ionic, and hydrogen-bonding) from weakest to strongest.
A) dipole-dipole, London Dispersion, ionic, and hydrogen-bonding
B) London Dispersion, dipole-dipole, hydrogen-bonding, ionic
C) hydrogen-bonding, dipole-dipole, London Dispersion, and ionic
D) London Dispersion, ionic, dipole-dipole, and hydrogen-bonding
E) dipole-dipole, ionic, London Dispersion, and hydrogen-bonding

____ 2. Which of the following would you expect to have the highest boiling point?
A) Br_2 B) Cl_2 C) F_2 D) I_2 E) All of these have the same boiling point.

____ 3. Which of the following is most likely to be a solid at room temperature?
A) HF B) Na_2S C) H_2O D) N_2 E) NH_3

____ 4. Which of the following should have the lowest boiling point?
A) HF B) Na_2S C) H_2O D) NH_3 E) N_2

____ 5. The molecules in a sample of solid SO_2 are attracted to each other by a combination of
A) London forces and dipole-dipole interactions.
B) London forces and H-bonding.
C) covalent bonding and dipole-dipole interactions.
D) H-bonding and ionic bonding.
E) none of these

____ 6. In which of the following groups of substances would dispersion forces be the only <u>significant</u> factors in determining boiling points?
I. Cl_2 II. HF III. Ne IV. KNO_2 V. CCl_4
A) II, V B) III, IV, V C) II, IV D) I, III, V E) I, II, III

____ 7. On the basis of your knowledge of bonding in liquids and solids, arrange the following substances in order of highest to lowest melting temperature:
NaCl, Na, Cl_2, SiO_2
A) Na, NaCl, Cl_2, SiO_2
B) SiO_2, Na, NaCl, Cl_2
C) Cl_2, Na, NaCl, SiO_2
D) NaCl, SiO_2, Na, Cl_2
E) SiO_2, NaCl, Na, Cl_2

____ 8. Which of the following substances would you expect to have the lowest boiling point?

A) diamond
B) glycerine, $C_3H_5(OH)_3$
C) methane, CH_4
D) copper
E) sodium nitrate, $NaNO_3$

____ 9. Water sits in an open beaker. Assuming constant temperature and pressure, the rate of evaporation decreases as the water evaporates.

____ 10. Water sits in an open beaker. Assuming constant temperature and pressure, the vapor pressure of the water decreases as the water evaporates.

____ 11. Generally the vapor pressure of a liquid is related to

I. the amount of liquid
II. atmospheric pressure
III. temperature
IV. intermolecular forces

A) III, IV
B) I, III
C) II, III, IV
D) all information is needed
E) I, III, IV

____ 12. Assume 12,500 J of energy is added to 2.0 moles (36 grams) of H_2O as an ice sample at 0°C. The molar heat of fusion is 6.02 kJ/mol. The specific heat of liquid water is 4.18 J/mol K. The molar heat of vaporization is 40.6 kJ/mol. The resulting sample contains which of the following?

A) ice and water
B) only water
C) only ice
D) only water vapor
E) water and water vapor

____ 13. When a water molecule forms a hydrogen bond with another water molecule, which atoms are involved in the interaction?

A) A hydrogen from one molecule and a hydrogen from the other molecule.
B) A hydrogen from one molecule and an oxygen from the other molecule.
C) An oxygen from one molecule and an oxygen from the other molecule.
D) Two hydrogens from one molecule and one oxygen from the other molecule.
E) Two hydrogens from one molecule and one hydrogen from the other molecule.

____ 14. Which of the following processes must exist in equilibrium with the evaporation process when a measurement of vapor pressure is made?
A) condensation B) vaporization C) fusion D) boiling E) sublimation

15. You are given the following boiling point data:

a) water, H_2O	100°C
b) methanol, CH_3OH	64.96°C
c) ethanol, CH_3CH_2OH	78.5°C
d) diethyl ether, $CH_3OH_2–O–CH_2CH_3$	34.5°C
e) ethylene glycol, $HO–CH_2–CH_2–OH$	198°C

Which one of the above liquids would you expect to have the highest vapor pressure at room temperature?

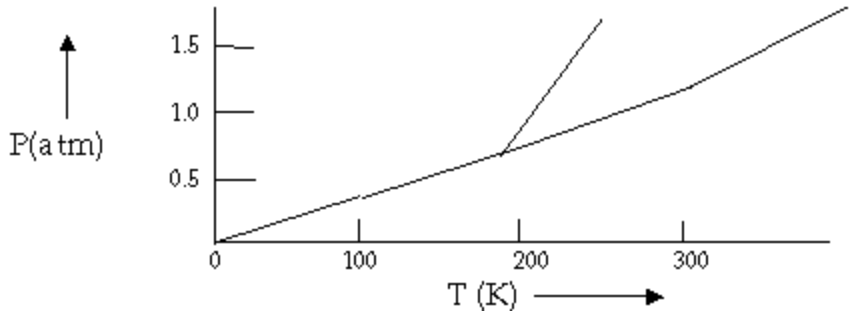
____ 16. Which best explains the following trend?

Element	b.p. (K)
He	4
Ne	25
Ar	95
Kr	125
Xe	170

A) Le Châtelier's principle
B) hydrogen bonding
C) London dispersion forces
D) dipole-dipole interaction
E) none of these

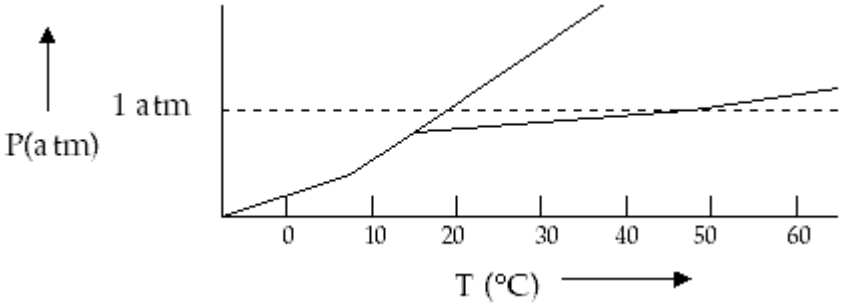
____ 17. How much energy is needed to convert 64.0 grams of ice at 0.00°C to water at 75.0°C?
specific heat (ice) = 2.10 J/(g°C)
specific heat (water) = 4.18 J/g(g°C)
heat of fusion = 333 J/g
heat of vaporization = 2258 J/g
A) 10.1 kJ B) 65.8 kJ C) 41.4 kJ D) 20.7 kJ E) 31.4 kJ

____ 18. Below is a phase diagram for compound X. You wish to purify a sample of X which was collected at P = 1.0 atm and T = 100 by subliming it. In order to sublime the sample, you should:



A) increase *T* to 300 K, keeping *P* = 1.0 atm.
B) abandon the attempt to sublime X.
C) increase *P* to 1.5 atm and then increase *T* to 300 K.
D) increase *T* to 300 K and then lower *P* to 0.5 atm.
E) lower *P* to 0.5 atm and then increase *T* to 200 K.

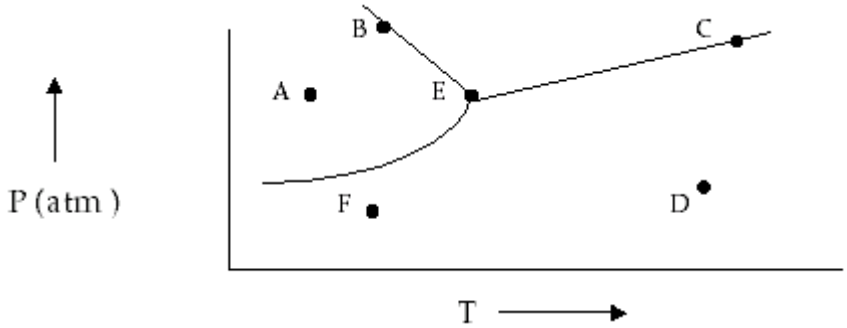
____ 19. Shown below is a phase diagram for compound X. At 25°C and 1 atm X will exist as a:



A) gas/liquid at equilibrium.
B) liquid.
C) solid.
D) gas/solid at equilibrium.
E) gas.

____ 20. Based on the phase diagram shown below, which of the following statements are correct?

I. Sublimation occurs at a point in the transformation that occurs along a straight line from point A to point F.
II. C and E represent points where the gas and liquid phases are in equilibrium.
III. ΔH_{vap} can be measured at point B.
IV. Molecules at point D have a greater average kinetic energy than those at point F.
V. The temperature at point E is called the critical temperature of the compound.



A) I, II, IV B) I, II, III C) I, III, IV D) II, V E) II, IV, V

Answer Key – IMF Practice test 2

1. B
2. D
3. B
4. E
5. A
6. D
7. E
8. C
9. False
10. False
11. A
12. B
13. B
14. A
15. d) diethyl ether, $CH_3CH_2–O–CH_2CH_3$
16. C
17. C
18. E
19. B
20. A