CHM151 Quiz 11 25 Pts. Fall 2010 Name:_____

q11

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question and write a SHORT justification for you answer next to the question. Then record your answers on a ***Green Scantron****. This quiz and the Scantron are due back December 8th at the beginning of class.*

____ 1. Which of the following statements concerning intermolecular forces are correct?

1. London dispersion forces exist in all molecular solids.
2. London dispersion forces increase as the number of electrons increases.
3. Dipole-dipole attractions occur in nonpolar molecules if they have polar bonds.
4. Hydrogen bonding only occurs for molecules containing OH bonds.

a. 1 only
b. 1 and 2
c. 4 only
d. 1, 2, and 4
e. 2 and 3

____ 2. Which one of the following substances will exhibit dipole-dipole intermolecular forces?

a. Kr
b. N_2
c. CO_2
d. CCl_4
e. CO

____ 3. Which of the following molecular solids will exhibit dipole-dipole intermolecular forces: NH_3, BF_3, I_2, and H_2S?

a. NH_3 and H_2S
b. NH_3, BF_3, and H_2S
c. I_2 only
d. BF_3 and I_2
e. NH_3, BF_3, I_2, and H_2S

____ 4. Which one of the following molecules will have the lowest boiling point?

a. NH_3
b. CH_3Cl
c. CH_4
d. NH_2Cl
e. $CHCl_3$

____ 5. Which intermolecular forces are present in $SO_2(s)$?

1. London dispersion
2. dipole-dipole
3. hydrogen bonding

a. 1 only
b. 2 only
c. 3 only
d. 1 and 2
e. 1 and 3

____ 6. Which is the dominant intermolecular force present in acetic acid, $CH_3CO_2H(\ell)$?
a. London dispersion
b. ionic bonding
c. dipole/induced dipole
d. dipole-dipole
e. hydrogen bonding

____ 7. Which of the following molecules would be expected to form hydrogen bonds in the liquid state or solid state: H_2SO_4, HF, CH_3OH (methanol), and CH_2O (formaldehyde)?
a. H_2SO_4, HF, and CH_3OH
b. HF and CH_3OH
c. H_2SO_4, HF, and CH_2O
d. HF, CH_3OH, and CH_2O
e. CH_3OH and CH_2O

____ 8. Which intermolecular forces are present in $CH_3F(s)$?

1. London dispersion
2. dipole-dipole
3. hydrogen bonding

a. 1 only
b. 2 only
c. 3 only
d. 1 and 2
e. 1, 2, and 3

____ 9. Arrange H_2O, H_2S, and SiH_4 in order from lowest to highest boiling point.
a. $H_2O < SiH_4 < H_2S$
b. $SiH_4 < H_2S < H_2O$
c. $H_2S < H_2O < SiH_4$
d. $H_2S < SiH_4 < H_2O$
e. $SiH_4 < H_2O < H_2S$

____ 10. Which intermolecular force or bond is responsible for the density of $H_2O(s)$ being less than that of $H_2O(\ell)$?
a. hydrogen bonding
b. London dispersion forces
c. covalent bonding
d. ionic bonding
e. dipole/induced dipole forces

____ 11. What intermolecular force or bond is responsible for the solubility of CO_2 in water?
a. London dispersion force
b. hydrogen bonding
c. ionic bonding
d. covalent bonding
e. dipole/induced dipole force

____ 12. Which of the following properties of water can be attributed to hydrogen bonding?

1. high melting point
2. high heat of vaporization
3. low vapor pressure
4. high surface tension

a. 1 and 3
b. 2 and 3
c. 2, 3, and 4
d. 1, 3, and 4
e. 1, 2, 3, and 4

____ 13. In which one of the following pure solids is it necessary to break covalent bonds to make a liquid or gas?

a. KCl
b. Ne
c. CO_2
d. NH_3
e. SiO_2

____ 14. The normal boiling point is defined as

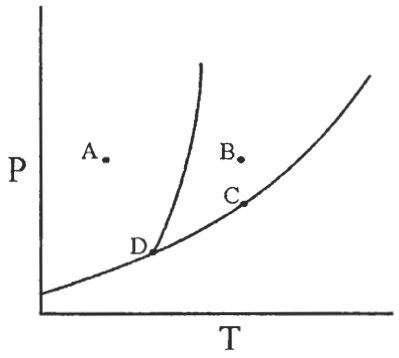
a. the pressure of a gas when its temperature reaches 373.15 K.
b. the temperature at which the vapor pressure of a substance equals 1 atm.
c. the temperature at which water boils.
d. the pressure at which a liquid boils at 273.15 K.
e. the sum of the enthalpies of vaporization and fusion at 298 K.

____ 15. Which of the following are valid reasons why vegetable oil has a greater viscosity than diethyl ether, CH_3OCH_3?

1. Oil molecules are not held together by hydrogen bonds.
2. Oil molecules have long chains that become entangled.
3. Intermolecular forces are greater for the larger oil molecules.

a. 1 only
b. 2 only
c. 3 only
d. 1 and 3
e. 2 and 3

____ 16. Which of the following statements concerning the phase diagram below are correct?



1. Moving from point A to B results in a phase transition from solid to liquid.
2. Point D lies at the critical point.
3. At point C, liquid and gas phases coexist at equilibrium.

a. 1 only
b. 2 only
c. 3 only
d. 1 and 3
e. 2 and 3

____ 17. Ideally, collligative properties depend only on

a. the identity of the solute in a solution.
b. the number of solute particles per solvent molecule in a solution.
c. the temperature of a solution.
d. the charge of the ions dissolved in solution.
e. the gas pressure above the surface of a solution.

____ 18. To prepare approximately 1 liter of a solution that is 4.75% by mass NaCl, one should

a. dissolve 4.75 g NaCl in water up to a total volume of 1.00 L.
b. dissolve 47.5 g NaCl in 1.00×10^3 g water.
c. dissolve 47.5 g NaCl in 952.5 g water.
d. dissolve 952.5 g NaCl in 47.5 g water.
e. dissolve 46.5 g NaCl in 1.00 kg water.

____ 19. Which of the following liquids are likely to be miscible with water: 1-propanol, carbon tetrachloride, cyclohexane, and formic acid (HCO_2H)?

a. 1- propanol and cyclohexane
b. carbon tetrachloride and cyclohexane
c. cyclohexane and formic acid
d. carbon tetrachloride and formic acid
e. 1-propanol and formic acid

____ 20. Which of the following actions will increase the equilibrium concentration of a gas in water?

1. increasing the temperature of the water
2. increasing the volume water
3. increasing the pressure of the gas above the liquid

a. 1 only
b. 2 only
c. 3 only
d. 1 and 3
e. 1, 2, and 3

____ 21. Which of the following aqueous solutions should have the lowest freezing point?
a. pure H_2O
b. 1 *m* $CaBr_2$
c. 1 *m* NH_3
d. 1 *m* $NaNO_3$
e. 1 *m* $C_6H_{12}O_6$

____ 22. Which of the following aqueous solutions should have the lowest boiling point?
a. 0.4 *m* $MgBr_2$
b. 0.5 *m* Na_2SO_4
c. 0.75 *m* NaCl
d. 1 *m* KI
e. 2 *m* LiBr

____ 23. The freezing point depression constant for water is -1.86°C/*m*. At what temperature will 3.50 g $Ca(NO_3)_2$ and 26.5 g H_2O freeze? Assume that no ion-pairing occurs between Ca^{2+} and NO_3^-.
a. -5.46°C
b. -4.49°C
c. -1.50°C
d. -1.39°C
e. -0.65°C

____ 24. What is the molar mass of a nonelectrolyte if 6.02 grams dissolved in 30.0 grams of benzene freezes at -1.55°C? The freezing point of pure benzene is 5.50°C and the freezing point depression constant, K_{fp}, is -5.12°C/*m*.
a. 146 g/mol
b. 201 g/mol
c. 261 g/mol
d. 276 g/mol
e. 376.2 g/mol

____ 25. What is the boiling point of a solution containing 2.33 g of caffeine, $C_8H_{10}N_4O_2$, dissolved in 15.0 g of benzene? The boiling point of pure benzene is 80.1°C and the boiling point elevation constant, K_{bp}, is 2.53°C/*m*.
a. 78.1°C
b. 80.9°C
c. 81.8°C
d. 82.1°C
e. 84.5°C