Chem 130.917
EXAM 4 CH.10,11,13 TAKE HOME Name:_____

1. Indicate whether the following compounds are **ionic** or **covalent**.

a) OF_2 _____ c) N_2O_5 _____

b) $SnCl_2$ _____ d) CF_4 _____

2. Draw the **Lewis Dot Formula** for each of the following **ionic** compounds.

a) Mg_3P_2 b) Li_3N

3. Which of the following make an isoelectronic pair: Cl^{-1} , O^{-2} , F , Ca^{+2} , Fe^{+3} ?

a) Ca^{+2} and Fe^{+3}
b) O^{-2} and F
c) F and Cl^{-1}
d) Cl^{-1} and Ca^{+2}
e) none of these

4. Give the electron configuration for the following **ions**.

a) Fe^{+3} _____

b) Cu^{+1}_____

5. Which compound contains both **ionic** <u>and</u> **covalent** bonding?

a) PF_3 b) KF c) NaH d) $MgSO_3$ e) C_3H_8

6. Name three common ions that are isoelectronic with neon.

a) _____

b) _____

c) _____

7. For each of the following hypothetical bonds, use an arrrow to indicate the direction in which the bonding electrons would shift.

Sb----N As----Cl N----Al I----F

QUESTIONS 8-12 MAY HAVE MORE THAN ONE POSSIBLE ANSWER

CIRCLE ALL CORRECT RESPONSES TO EACH QUESTION

8. Which of the following molecules or ions has an octahedral **electron pair arrangement**?

a) XeF_2 b) SO_2 c) ICl_4^{-1} d) PF_5 e) CO_3^{-2}

9. Which of the following molecules or ions are **nonpolar**?

a) XeF_2 b) SO_2 c) ICl_4^{-1} d) PF_5 e) CO_3^{-2}

10. Which of the following molecules or ions exhibits **resonance**?

a) XeF_2 b) SO_2 c) ICl_4^{-1} d) PF_5 e) CO_3^{-2}

11. Which of the following molecules or ions has a linear **molecular shape**?

a) XeF_2 b) SO_2 c) ICl_4^{-1} d) PF_5 e) CO_3^{-2}

12. Which of the following molecules or ions has **sp^3d^2 hybridization?**

a) XeF_2 b) SO_2 c) ICl_4^{-1} d) PF_5 e) CO_3^{-2}

13. From a consideration of the Lewis Structure of the thiocyanate ion, SCN^{-1}, in which the carbon has a double bond with both the sulfur and nitrogen atoms, the formal charges on the sulfur, carbon and nitrogen are, respectively,

a) 0,0,-1 b) -2,0,+1 c) -1,+1,-1 d) -2,+1,0 e) -1,0,0

14. A π (pi) bond is the result of the:

a) overlap of two s orbitals
b) overlap of an s orbital and a p orbital
c) overlap of two p orbitals along their axis
d) sidewise overlap of two s orbitals
e) sidewise overlap of two p orbitals

15. Which **one** of the following molecules exhibits Hydrogen bonding?

a) CH_3F b) PH_3 c) CH_3NH_2 d) OF_2 e) NaOH

16. Which of the following indicates the existence of **weak** intermolecular forces of attraction in a liquid?

a) a very high boiling point
b) a very high viscosity
c) a very high critical temperature
d) a very high vapor pressure
e) a very high heat of vaporization

17. Which of the following phase changes is(are) **exothermic**?

1. vaporization **2. sublimation** **3. condensation**

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

18. Which noble gas has the **highest** boiling point?

a) Ne b) He c) Xe d) Kr e) Ar

19. Which of the following statements concerning ionic substances is **incorrect**?

a) Typical ionic substances are NaCl, MgF_2, BaO, KI, and CsCl.
b) Ionic substances are formed between atoms that have markedly different attractions for valence electrons.
c) In ionic substances, the strong attractive forces are electrostatic attractions between ions.
d) Electrical conductance of solid ionic substances is high because of the existence of ions in the crystal structure.
e) Ionic substances are more soluble in polar than in nonpolar solvents.

20. If heat is added to ice and liquid water in a closed container and, after the addition of the heat, ice and liquid water remain,

a) the vapor pressure of the water will decrease.
b) the temperature will increase somewhat.
c) the temperature will decrease somewhat.
d) the vapor pressure of the water will rise.
e) the vapor pressure of the water will remain constant.

21. Which bonding interaction best describes the intermolecular forces in **graphite?**

a) primarily London forces
b) primarily dipole-dipole interactions
c) ionic bonding
d) metallic bonding
e) covalent bonding to form a network solid

22. Calculate the the **energy** required to heat 50.0 grams of water from 25°C to 100°C and then boil it to 50.0 grams of steam at 100°C. (ΔH_{vap} = 40.66 kJ/mol) (sp.ht. = 4.184 J/g°)

a) 15.7 kJ b) 113 kJ c) 638 kJ d) 129 kJ e) none of these

23. Which of the following properties is characteristic of substances with a **high viscosities**?

a) low vapor pressures
b) low polarity
c) low molecular weights
d) low heats of vaporization
e) none of these

24. Calculate the **molarity** of a solution that contains 85.0 grams HCl in 275 mL of solution. (MW HCl = 36.5 g/mol)

a) 7.23 M b) 7.92 M c) 8.47 M d) 8.81 M e) 9.25 M

25. What is the **mole fraction** of ethanol in a water-ethanol solution that is 50.0% water by mass? (ethanol is C_2H_5OH)

a) 1.09 b) 1.00 c) 0.259 d) 0.281 e) 0.719

26. When a liquid is dispersed in another liquid, the resulting colloid is called a(n);

a) aerosol b) foam c) sol d) emulsion e) gel

27. If 6.0 grams of urea, $CO(NH_2)_2$ (a nonvolatile solute), is dissolved in 32.0 grams of methanol, CH_3OH, what would the **resulting vapor pressure of this solution** be, given the pure vapor pressure of methanol to be 89 mm Hg.

a) 8.1 mm Hg b) 8.9 mm Hg c) 14 mm Hg d) 75 mm Hg e) 81 mm Hg

28. A solution was made by dissolving 10.0 grams of a nonvolatile nonelectrolyte compound in 100.0 grams of water froze at -0.93°C. What is the approximate **molecular weight** of the substance.
(for water..k_f= 1.86 °C/m)

a) 10 g b) 50 g c) 100 g d) 200 g e) none of these

29. When 0.100 mol of urea, a nonelectrolyte whose MW = 60.1 and whose density is 1.48 g/cm^3, is dissolved in 100.0 grams water (K_f = 1.86 °C/m), the **molality** of the solution is:

a) 1.86 m b) 1.00 m c) 0.500 m d) 0.186 m e) 0.100 m

30. Which of the following has the **highest vapor pressure** at room temperature?

a) ethylene glycol, b.p. = 198°C
b) ethanol, b.p. = 78°C
c) water, b.p. = 100°C
d) benzene, b.p. = 80°C
e) carbon disulfide, b.p. = 46°C

31. At body temperature of 37°C, what is the **osmotic pressure** of a physiological solution of saline, NaCl, (assume complete ionization) with a concentration of 0.154 M. (R = 0.0821 l-atm/mol-K)

a) 16 atm b) 1.4 atm c) 0.15 atm d) 7.8 atm e) none of these

32. What is the approximate **freezing point** of an aqueous 0.25 molal solution of glucose, $C_6H_{12}O_6$
(k_f for water = 1.86°C/m)

a) 0.93°C b) -0.93°C c) +0.46°C d) -0.46°C e) 0.23°C

33. For a 0.01 m solution of $(NH_4)_2CO_3$, the van't Hoff factor, **i**, would be approximately:

a) 6 b) 2 c) 3 d) 4 e) 8