CHM 130 Exam III A Fall 2016 Ch. 10-15 Name: _____KEY_____

Directions. There is only one best answer for multiple-choice questions. All calculations must show work with units for full credit. *Good Luck*. ☺

1. Answer a-c using this balanced reaction: 2 Al(s) + 6 HCl(aq) → 2 $AlCl_3$(aq) + 3 H_2(g)

   a. How many moles of hydrogen are produced when 4.25 moles of hydrochloric acid react?

   4.25 mol HCl (3 mol H_2 / 6 mol HCl) = 2.13 mol H_2

   b. How many grams of hydrochloric acid are needed to react with 9.35 grams of aluminum?

   9.35 g Al (1 mol Al / 26.98 g Al)(6 mol HCl / 2 mol Al)(36.46 g HCl / 1 mol HCl) = 37.9 g HCl

   c. How many liters of hydrogen gas at STP are produced from reacting 12.5 grams of aluminum?

   12.5 g Al (1 mol Al / 26.98 g Al)(3 mol H_2 / 2 mol Al)(22.4 L H_2 / 1 mol H_2) = 15.6 L H_2

2. Balance and classify these reactions as (C) combination, (D) decomposition, (CB) combustion, (SR) single replacement, (DR) double replacement, and (N) acid base neutralization.

   type:__ **DR** _ ____ Na_2CO_3(aq) + ____$MgCl_2$(aq) → ____ $MgCO_3$(s) + _**2**_ NaCl(aq)

   type:__ **D**_ ____ P_4O_{10}(l) → __**4** P (s) + _**5**_ O_2(g)

   type:__ **SR**_ __**3**__ Ca(s) + __**2**_ $AlCl_3$(aq) → __**3**__ $CaCl_2$(aq) + __**2**_ Al(s)

3. Write the products, states, and then balance these reactions. Write NR if no reaction.

   a. ___C_5H_8(l) + __**7**_O_2(g) → _____**5 CO_2(g) + 4 H_2O(g)** _____

   b. ___Cu(s) + ___$MnBr_2$(aq) → _____**NR**_____

   c. __**2**_HI(aq) + ___$Sr(OH)_2$(aq) → _____**2 H_2O(l) + SrI_2 (aq)** _____

   d. _**2**__Al(s) + __**3**_$Ni(NO_3)_2$(aq) → _____**3 Ni(s) + 2 $Al(NO_3)_3$ (aq)** _____

4. Consider this reaction: $2\ AgCl(aq) + Cd(s) \rightarrow CdCl_2(aq) + 2\ Ag(s)$

   a. What is reduced? ___ **Ag in AgCl(aq)** ___

   b. What is oxidized? _____ **Cd(s)** _____

5. What holds the sulfur atom to the hydrogen atom in one molecule of hydrogen sulfide gas, H_2S, the gas partly responsible for the rotten egg smell and flatulence?

   a. Ionic bonds b. **polar covalent bonds** c. H bridge force d. dipole-dipole forces e. nonpolar covalent bonds

6. What holds HF molecules with other HF molecules?

   a. London forces b. polar covalent bonds c. **H bridge force** d. dipole-dipole forces e. nonpolar covalent bonds

7. What holds Br_2 molecules with other Br_2 molecules in liquid bromine?

   a. **London forces** b. polar covalent bonds c. H bridge force d. dipole-dipole forces e. nonpolar covalent bonds

8. Answer the following based on the comparison of liquid butane, C_4H_{10}, and liquid butanol, C_4H_9OH?

   a. Which has the higher IMF? ___**butanol**_____

   b. Which has the higher Vapor Pressure? __**butane**____

   c. Which has the lower boiling point? ___**butane**____

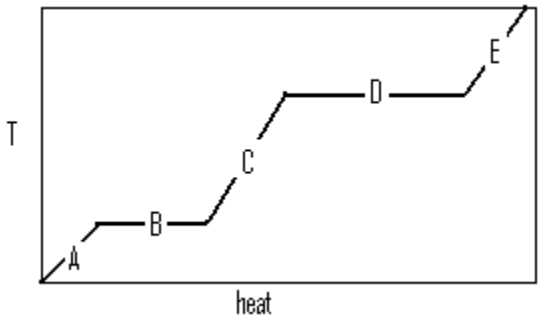
   d. Which has the higher surface tension? __**butanol**____

   e. Which has the lower viscosity? ___**butane**_____

9. What is the highest IMF you expect to see in samples of millions of molecules of:

   a. HBr _**dipole-dipole**____ b. H_2O___**H-bridging**_____ c. Cl_2 _____**London**___

10. Answer the following according to this heating curve graph below.



   a. At which point is melting or freezing occurring? ____**B**____

   b. At which point is there liquid only? _____**C**_____

   c. At which point is there solid only? _____**A**_____

   d. At which point is boiling or condensation occurring? _____**D**_____

11. A solution is defined as a _____**solute**_____ dissolved in a ___**solvent**___.

12. Which of the following is most likely to dissolve in benzene, C_6H_6 (l)?
    a. NaCl **b. N_2** c. NH_3 d. HF e. Na_2SO_4

13. Popular as a salad dressing, vinegar and oil don't mix so we call them:
    a. soluble b. insoluble c. miscible **d. immiscible** e. undissolved

14. What is the mass % if 87.45 grams of KOH is dissolved in 238 grams of water?

    % = 87.45 / (87.45 + 238) x 100 = 26.9 %

15. Calculate the molarity if 1.525 grams of $NaC_2H_3O_2$, is dissolved in 755 mL of water.

    mol = 1.525 g (1 mol / 82.04 g) = 0.018588493 mol

    L solution = 755 mL (1 L / 1000 mL) = 0.755 L

    M = 0.018588493 mol / 0.755 L = 0.0246 mol/L

16. How many moles are in 6.15 x 10^{24} atoms of calcium?

    6.15 x 10^{24} atoms Ca (1 mol / 6.02 x 10^{23} atoms) = 10.2 mol Ca

17. How many grams are in 0.8735 moles of $AgNO_3$?

    0.8735 mol $AgNO_3$ (169.88 g / mol) = 148.4 g $AgNO_3$

18. How many liters are in 55.3 grams of CO_2 gas at STP?

    55.3 g CO_2 (1 mol / 44.01 g) (22.4 L / 1 mol) = 28.1 L CO_2

Bonus: How many atoms of sodium are in 22.99 grams? (No calculations needed) **6.02 x 10^{23} atoms** _