Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ "Mole Music."

\_\_\_\_\_\_\_1. Ethanol, also known as ethyl alcohol, is extremely soluble in water because A) both substances are nonpolar molecules B) both substances are polar molecules. C) alcohol is polar while water is nonpolar D) water is polar, while alcohol is nonpolar

\_\_\_\_\_\_\_2. How many grams of KNO3 are needed to produce a saturated solution in 100 grams of water at 50.℃ ? A) 115 g B) 84 g C) 51 g D) 21 g

\_\_\_\_\_\_\_3. Carbon dioxide gas is most soluble in water under conditions of

 A) high temperature and high pressure B) low temperature and low pressure

 C) low temperature and high pressure D) high temperature and low pressure

 2 Al(s) + 3 H2SO4(aq) ➞ Al2(SO4)3 (aq) + 3 H2(g)

Base your answers to questions 4 to 7 on the reaction shown above.

\_\_\_\_\_\_\_\_\_4. What is the molar mass of sulfuric acid? (H2SO4 )

\_\_\_\_\_\_\_\_\_5. How many **grams**  of sulfuric acid must be dissolved in 500. mL of solution to produce a molarity of 4.00 molar?

\_\_\_\_\_\_\_\_\_6. How many **moles**  of sulfuric acid are required to react completely with 4.00 moles of aluminum?

\_\_\_\_\_\_\_\_7. How many **liters** of 4.00 molar sulfuric acid are required to react completely with 4.00 moles of aluminum?

\_\_\_\_\_\_8. What is the mass, in grams of 0.250 moles of NaOH?

 A) 10.0 g B) 40.0 g C) 160. g D) 0.250 g

\_\_\_\_\_\_9. How many moles of KBr are there in 150 grams of KBr?

 A) 0.80 B) 1.26 C) 2.50 D) 4.14

\_\_\_\_\_\_10. What is the molarity of a solution containing 2.00 moles of glucose in a volume of 450 mL? A) 0.225 M B) 0.0044 M C) 4.4 M D) 8.8 M

\_\_\_\_\_\_11. What is the % phosphorous, by mass, in P2O5 ? ( MM = 142)

 A) 21.8 % B) 43.6 % C) 57.3 % D) 78.2 %

\_\_\_\_\_\_12. A certain hydrocarbon has the empirical formula CH, and a molar mass of 78. The molecular formula for this hydrocarbon is A) CH B) C6H6

 C) C5H18 D) C7H7

\_\_\_\_\_\_13. A substance with an empirical formula of CH3 might have a molar mass of

 A) 7.5 B) 30 B) 42 C) 57

\_\_\_\_\_\_14. Based on table G, which substance's solubility is **least**  affected by changes in temperature? A) SO2 B) KI C) KCl D) NaCl

\_\_\_\_\_\_15. 30. grams of NH4Cl are added to **50 grams** of water. What is the minimum temperature at which the entire 30. gram sample will dissolve?

 A) 2° B) 43° C) 66° D) 88°

\_\_\_\_\_\_16. In the reaction 2 H2 + O2 → 2 H2O, in excess oxygen, how many moles of hydrogen are needed to produce 1.0 mole of water?

 A) 1.0 B) 0.50 C) 2.0 D) 4.0

\_\_\_\_\_\_17. 0.400 mol of glycerol has a mass of 36.8 grams. What is the molar mass of glycerol? A) 14.7 g B) 147 g C) 92.0 g D) 145 g

\_\_\_\_\_\_18. Equal numbers of moles of different gases at STP have the same volume. Therefore, what is the mass of a sample of SO2 gas that occupies the same volume at STP as 8.00 grams of He gas? (MM of SO2 = 64 g, He=4.0 g)

 A) 2.0 g B) 32 g C) 64 g D) 128 g

\_\_\_\_\_\_19. Enough water is added to 50.0 mL of 2.00 molar NaOH to change the molarity of the solution to 0.500 molar. What is the **new total volume**  of the solution? A) 12.5 mL B) 100 mL C) 150 mL D) 200 mL

\_\_\_\_\_\_\_\_20. A sample of tap water with a total mass of 2,000. grams is found to contain 0.250 grams of calcium ion. What is the concentration of calcium ion in the solution in parts per million, ppm? A) 12.5 B) 125

 C) 800. D) 8000.

Part II. Solve the following problems, and show work.

I. Find the % water by mass in the hydrate BaCl2⦁ 2 H2O

II. When iron is heated in chlorine, it reacts as follows: 2 Fe + 3 Cl2 → 2 FeCl3

 5.6 grams of iron are heated in excess chlorine.

A. How many moles of iron were heated?

B. How many moles of Cl2 react with the 5.6 grams of Fe?

C. How many **grams** of chlorine reacted with the 5.6 g of Fe?

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Extra Credit Page

Two numbers that mean a lot to chemists are 6.02 x 1023 and 22.4 liters.

I. The number, 6.02 x 1023 has a special name. What is that name?

II. 22.4 liters is the volume of one mole of any ideal gas at STP. What is the volume at STP of 1.204 x 1024 molecules of neon gas?

III. What is the mass of 5.60 liters of He gas at STP ?

IV. What is the empirical formula of a substance that, by mass, is

2.44 % hydrogen, 39.0 % sulfur, and 58.54 % oxygen?

V. 40.0 mL of 2.00 molar HCl, 60.0 mL of 4.00 molar HCl, and 400. mL of water are mixed. What is the molarity of HCl in the resulting solution?