Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Lab Instructor\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

I. Write the correct symbol for each of the following elements: (1 pt each)

\_\_\_\_\_\_1. Tin

\_\_\_\_\_\_2. Potassium

II. Name the following elements

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_3. Hg

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_4. Si

III. Perform each of the following operations, and express your answer to the correct number of significant figures: (2 pts each)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_5. 6.525 grams / 0.00640 L

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_6. 46.85 mL – 41.70 mL

IV. Write the correct chemical formulas ( 2 pts each)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_7. Iron (III) phosphate

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_8. Barium acetate

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_9. Ammonium sulfate

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_10. Phosphorous trichloride

V. Give the correct names (2 pts each)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_11. NiS

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_12. CBr4

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_13. K2CO3

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_14. Fe(OH)3

VI. Multiple Choice (2 pts each)

\_\_\_\_\_15. When a piece of copper is placed in dilute nitric acid, the copper disappears, and a blue solution of copper(II) nitrate is formed. When solid copper sulfate is placed in dilute nitric acid, the solid disappears, and a blue solution of copper sulfate is formed. These two observations represent, respectively A) two physical changes B) two chemical changes C) a chemical change and a physical change D) a physical change and a chemical change

\_\_\_\_\_16. A syringe holds 10.0 cm3 of insulin. This volume could also be correctly expressed as

A) 0.0100 L B) 0.0100 mL C) 10.0 L D) 10,000 mL

\_\_\_\_\_17. The density of magnesium at room temperature is 1.738 g/cm3 . What is the volume of 87.50 g of this metal at room temperature? A) 0.01986 cm3 B) 50.35 cm3

C)152.1 cm3 D) 1.521 L

\_\_\_\_\_18. Which of the following compounds is considered a strong electrolyte? A) NH3

B) CO2 C) KNO3 D) NO2

\_\_\_\_\_19. Which of the following is a product in the **net ionic equation** for the

reaction between HNO3 and Ba(OH)2 ? A) BaNO3 B) Ba(NO3)2 C) H2O D) BaH2

\_\_\_\_\_20. Pure sucrose, C12H22O11 is best described as

A) an element B) a compound C) a homogeneous mixture D) a heterogeneous mixture

\_\_\_\_\_21. NaCl(aq) is best described as A) an element B) a compound

C) a homogeneous mixture D) a heterogeneous mixture

\_\_\_\_\_22. "White gold ", used in jewelry,contains gold and another metal, such as palladium. Two different samples of white gold may differ in the relative amounts of gold and palladium they contain, but both will be uniform in composition throughout. Based on the description above, white gold is best classified as

A) a pure element B) a compound C) a homogenous mixture

D) a heterogeneous mixture

\_\_\_\_\_23 The % by mass of carbon in C2H6 is

A) 12.5 % B) 33.3 % C) 75.0 % D) 80.0%

\_\_\_\_\_24. Which of the following is insoluble in water?

A) BaCl2 B) AgBr C) (NH4)2SO4  D) Fe(C2H3O2)2

\_\_\_\_\_25. Glucose, C6H12O6, has exactly the same % composition as

A) carbonic acid B) acetic acid C) ethanol (C2H5OH) D) sucrose (see Q 20)

\_\_\_\_\_\_26. How many neutrons are there on the atom with the symbol ?



A) 27 B) 32 C) 33 D) 60

\_\_\_\_\_\_27 Which best describes the particles that make up the ion with the symbol ?

A) 20 protons, 22 electrons, 21 neutrons B) 41 protons, 20 neutrons, 20 electrons

C) 20 protons, 18 electrons, 20 neutrons D) 20 protons, 18 electrons, 21 neutrons

\_\_\_\_\_\_28. When Magnesium reacts with oxygen to form magnesium oxide, each

oxygen atom A) gains one electron B) gains two electrons

C) loses one electron D) loses two electrons

\_\_\_\_\_\_29. Naturally occurring chlorine is composed almost entirely of two isotopes, 35Cl, which has a mass of 35.0 amu, and 37Cl, which has a mass of 37.0 amu. To three sig. figs, the atomic mass of chlorine is 35.5 . Naturally occurring chlorine is apparently closest to

A) 50% 35Cl, and 50%37Cl B) 75 % 35Cl, and 25 % 37Cl

C) 25 % 35Cl, and 75 % 37Cl D) 85 % 35Cl, and 15 % 37Cl

Short Fill-in items (2 pts each)

\_\_\_\_\_\_\_\_\_30. What is the molar mass of barium hydroxide?

\_\_\_\_\_\_\_\_\_\_31. How many moles are there in 9.60 grams of NaOH ? (MM = 40g/mol)

\_\_\_\_\_\_\_\_\_\_\_\_\_32. What is the mass of 0.800 mol of H2SO4 ? (MM = 98 g/mol)

\_\_\_\_\_\_\_\_\_\_\_\_\_33. 0.400 mol of propanone has a mass of 23.2 grams. What is the molar mass of propanone?

\_\_\_\_\_\_\_\_\_\_\_\_\_34. Cyclohexane has the empirical formula CH2. If it has a molar

mass of 84. g/mol, what is the molecular formula of cyclopentane?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_35. What is the molarity of a solution containing 2.00 mol of HCl in a volume of 400. mL ?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_36. How many grams of NaOH must be dissolved to a total volume of 200. mL, if the desired molarity is 0.200 molar?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_37. 150. mL of pure water is added to 250.0 mL of 2.00 molar NaCl. What is the molarity of the new solution?

Longer Items. There is part credit. There will also be deductions for failure to include units, and large significant figure error. If asked to show work, you MUST show work. No credit will be awarded in such cases for a correct answer without the work. ANSWER THESE QUESTIONS IN THE ESSAY BOOKLET PROVIDED!

I. Aluminum is a more active metal than silver.

A. Complete and balance the following equation: (3 pts)

Al(s) + AgNO3(aq) ⭢

B. Write the balanced net ionic equation for the reaction in part A. (3 pts)

II. Write the NET IONIC equation for the reaction that occurs when aqueous solutions of Na2CO3 and Ba(NO3)2 are mixed. (2 pts)

III. In the reaction N2 + 3 H2 ⭢ 2 NH3, how many grams of N2 are needed, in excess hydrogen, in order to produce 28.0 grams of NH3? ( 3 pts)

IV. In the reaction 2 Al(s) + 6 HI(aq) → 2 AlI3(aq) + 3H2(g)

(Be careful not to confuse the "l" of aluminum with the "I" of iodine)

5.40 grams of aluminum are added to a solution containing 64.0 grams of HI.

(MM of Al is 27.0, HI is 128)

A. Which is the limiting factor? (2 pts) (show work)

B. How many **moles** of H2 are produced? (3 pts)

C. How many **moles** of the reactant in excess remain unreacted? (3 pts)

D. In the same reaction, 2 Al(s) + 6 HI(aq) → 2 AlI3(aq) + 3H2(g)

how many moles of aluminum are needed to react completely with

150.0 mL of 3.00 molar HCl ? ( 3 pts)

V. Carbon dioxide can be prepared by reacting HCl with CaCO3 in the reaction

2 HCl(aq) + CaCO3(s)  H2O (ℓ) + CO2(g) + CaCl2(aq)

A. When a student reacts 50.0 mL of 1.00 molar HCl with excess CaCO3 the student is able to collect 1.00 gram of CO2(g) . What is the % yield? (show work) ( 3 pts)

B. Identify the spectator ion or ions in the reaction. (1 pt)

VI. Ketones contain carbon, hydrogen and oxygen. When 3.60 grams of a certain ketone is burned, it produces 8.80 grams of CO2 and 3.60 grams of H2O.

Show Work! Find the empirical formula of the ketone ( 4 pts)

VII. When nitric acid reacts with Iron(III) hydroxide, the net ionic equation is

Fe(OH)3(s) + 3 H+(aq) ➞ Fe3+(aq) + 3 H2O*ℓ*

A solid that contains 0.200 mole of Fe(OH)3 is titrated with nitric acid, until all

of the solid has reacted. How many mL of 0.200 molar nitric acid would be required for complete reaction? ( 3 pts)

Extra Credit: (2 pts)

How many ounces of 0.200 molar sulfuric acid are needed to completely neutralize 25.00 ounces of 0.800 molar NaOH?

Extra Credit (1 point) Rutherford's home country honors him by putting his portrait on its currency. Which country is it?