NAME _____

Chemistry II Review
Stoichiometry

INSTRUCTIONS: Work each problem in the space provided. You will need your pencil, calculator, and Periodic Table handout. Show your work; answers without shown work will receive *no credit.* Be sure to circle your answers.

1. Determine the number of moles in 3.75×10^{24} molecules of Carbon dioxide.

2. How many moles are in 22.35 g of sodium chloride?

3. What is the mass of 9.22×10^{24} molecules of potassium nitrate?

4. How many grams of iron(III) oxide can be produced from 24.12 g of iron metal?

   $Fe + O_2 \rightarrow Fe_2O_3$

5. How much carbon dioxide is produced by the complete combustion of 150.00 g of hexane, C_6H_{14}?

   $C_6H_{14} + O_2 \rightarrow CO_2 + H_2O$

6. What amount of hydrogen gas is formed by the reaction of 11.38 g of zinc metal with excess hydrochloric acid?

   $Zn + HCl \rightarrow ZnCl_2 + H_2$

7. How many grams of oxygen gas will be produced by the decomposition of 44.00 g of potassium chlorate?

   $KClO_3 \rightarrow KCl + O_2$

8. What mass of lead(II) sulfide is formed by the reaction of 15.20 g of lead(II) nitrate with excess ammonium sulfide?

   $Pb(NO_3)_2 + (NH_4)_2S \rightarrow PbS + NH_4NO_3$

9. Oh, crud … I'm out of magnesium oxide. How many grams of magnesium metal do I need to use if I have to make36.00 g of the oxide for a lab?

$$Mg + O_2 \rightarrow MgO$$

10. I forgot to record how much silver I had after a reaction (this just isn't my day). I treated the silver with nitric acid and got 16.30 g of silver nitrate. Assuming a complete reaction, how much silver did I have to start with?

$$Ag + HNO_3 \rightarrow AgNO_3 + H_2$$

11. A reaction between tin(II) nitrate and sodium carbonate produced 8.44 g of tin(II) carbonate. How much tin(II) nitrate did I have to begin with?

$$Sn(NO_3)_2 + Na_2CO_3 \rightarrow SnCO_3 + NaNO_3$$

12. Melamine is a plastic that has been used for years in plates, cups, and other around-the-house applications. Its percent composition is 28.57% carbon, 4.80% hydrogen, and 66.68% nitrogen. What is the empirical formula of melamine?

13. A compound called 1,3-butadiene is an important industrial chemical in the manufacture of synthetic rubber (as in tires), plastics, and resins. Its percent composition is 88.82% carbon and 11.18% hydrogen; its formula mass is 54.09 g/mol. What is the molecular formula of 1,3-butadiene?

14. Lactic acid is a compound produced by anaerobic cellular respiration. It is also the source of "the burn" you feel when you do strenuous exercise. Its percent composition is 40.00% carbon, 6.71% hydrogen, and 53.28% oxygen, and its molecular weight is 90.08 g/mol. What is the molecular formula of lactic acid?

15. *Furan* is a highly flammable liquid produced during the distillation of pine wood. Its vapors are anesthetic and can be absorbed through the skin. Its composition is 70.57% carbon, 5.92% hydrogen, and 23.50% oxygen. What is its empirical formula?

16. Adenine is one of the infamous “nitrogenous bases” in DNA and RNA and, as such, is one of the most important compounds in existence. Its composition is 44.44% carbon, 3.73% hydrogen, and 51.83% nitrogen; its formula mass is 135.13 g/mol. What is its molecular formula?

17. Given the reaction:

$$Ti(CO_3)_2 + HCl \rightarrow TiCl_4 + CO_2 + H_2O$$

If 66.55 g of $Ti(CO_3)_2$ is reacted with 33.25 g of HCl What is the maximum number of grams of carbon dioxide that can be formed?

18. Given the reaction:

$$(NH_4)_2SO_4 + NaOH \rightarrow Na_2SO_4 + NH_3 + H_2O$$

If 0.05889 g $(NH_4)_2SO_4$ reacts with 0.02212 g of NaOH. What is the theoretical yield of Na_2SO_4 that can be formed?

19. If the reaction in #28 gives you only a 94.2% yield, what is the actual mass you will get from the reaction above?

20. The reaction between solid sodium and iron (III) oxide is one in a series of reactions that inflates an automobile bag.

$$Na + Fe_2O_3 \rightarrow Na_2O + Fe$$

If 85.0 g of Na and 95.0 g of Fe_2O_3 are used in this reaction, determine the mass of the excess that remains after the reaction is complete.