Name: ___

- 1. Balance the following Chemical Equations:
- (G) <u>2</u> $C_3H_5N_3O_9 \rightarrow \underline{6}$ $CO_2 + \underline{3}$ $N_2 + \underline{5}$ $H_2O + \underline{1/2}$ O_2
- 2. Write and Balance the equations:
 - (C) Copper(II) sulfide is oxidized by molecular oxygen to produce gaseous sulfur trioxide and solid copper(II) oxide. The gaseous product then reacts with liquid water to produce liquid hydrogen sulfate as the only product. Write the two equations which represent these reactions.

$\begin{array}{l} 2 \ \text{CuS} + 4 \ \text{O}_2 \rightarrow 2 \ \text{SO}_3 + 2 \ \text{CuO} \\ \text{SO}_3 + \text{H}_2 \text{O} \rightarrow \text{H}_2 \text{SO}_4 \end{array}$

8. Write the balanced equation, then calculate the number of moles and the mass of Mg required to react with 5.00 g of HCl and produce $MgCl_2$ and H_2 .

1.67 g Mg

9. H₂ is produced by the reaction of 118.5 mL of a 0.8775-M solution of H₃PO₄ according to the following equation: $2Cr + 2H_3PO_4 \rightarrow 3H_2 + 2CrPO_4$. How many grams of H₂ are produced?

.315 g H₂

10. Automotive air bags inflate when a sample of sodium azide, NaN₃, is very rapidly decomposed.

 $2NaN_3(s) \rightarrow 2Na(s) + 3N_2(g)$

What mass of sodium azide is required to produce 2.6 ft³ (73.6 L) of nitrogen gas with a density of 1.25 g/L?

142 g NaN₃

11. Urea, $CO(NH_2)_2$, is manufactured on a large scale for use in producing urea-formaldehyde plastics and as a fertilizer. What is the maximum mass of urea that can be manufactured from the CO_2 produced by combustion of 1.00 x 10⁴ grams of CO_2 ?

 $CO_2(g) + 2NH_3(g) \rightarrow CO(NH_2)_2(s) + H_2O(I)$

13600 g urea

12. What volume of 0.750 M hydrochloric acid solution can be prepared from the HCl produced by the reaction of 25.0 g of NaCl with excess sulfuric acid? NaCl(s) + $H_2SO_4(I) \rightarrow HCl(g) + NaHSO_4(s)$

.570 L

13. A sample of 0.53 g of carbon dioxide was obtained by heating 1.31 g of calcium carbonate. What is the percent yield for this reaction? $CaCO_3(s) \rightarrow CaO(s) + CO_2(s)$

92.0 %

14. Citric acid, $C_6H_8O_7$, a component of jams, jellies, and fruity soft drinks, is prepared industrially via fermentation of sucrose by the mold *Aspergillus niger*. The equation representing this reaction is

 $C_{12}H_{22}O_{11} + H_2O + 3O_2 \longrightarrow 2C_6H_8O_7 + 4H_2O$

What mass of citric acid is produced from the reaction of 150. grams of sucrose if the yield is 92.30%?

155 g

15. The phosphorus pentoxide used to produce phosphoric acid for cola soft drinks is prepared by burning phosphorus in oxygen.

(A) What is the limiting reactant when 0.200 mol of P₄ and 0.200 mol of O₂ react according to $P_4 + 5O_2 \rightarrow P_4O_{10}$?

(B) Calculate the percent yield if $10.0 \text{ g of } P_4O_{10}$ is isolated from the reaction.

88.0 %

16. What is the limiting reactant when 1.50 g of lithium and 1.50 g of nitrogen combine to form lithium nitride, a component of advanced batteries, according to the following unbalanced equation? Li + $N_2 \rightarrow Li_3N$

Li

17. What is the concentration of NaCl in a solution if titration of 15.00 mL of the solution with 0.2503 M AgNO₃ requires 20.22 mL of the AgNO₃ solution to reach the end point?

 $AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO(aq)$

.3374 M

18. In a common medical laboratory determination of the concentration of free chloride ion in blood serum, a serum sample is titrated with a $Hg(NO_3)_2$ solution.

 $2Cl^{-}(aq) + Hg(NO_3)_2(aq) \rightarrow 2NO_3^{-}(aq) + HgCl_2(s)$

What is the Cl⁻ concentration in a 0.25-mL sample of normal serum that requires 1.46 mL of .000825 M Hg(NO₃)₂(aq) to reach the end point?

0.009636 M