

Name: \_\_\_\_\_

Period: \_\_\_\_\_

Seat#: \_\_\_\_\_

**Directions:** Any worksheet that is labeled with an \* means it is suggested extra practice. We do not always have time to assign every possible worksheet that would be good practice for you to do. You can do this worksheet when you have extra time, when you finish something early, or to help you study for a quiz or a test. If and when you choose to do this Extra Practice worksheet, please do the work on binder paper. You will include this paper stapled into your Rainbow Packet when you turn it in, even if you didn't do any of this. We want to make sure we keep it where it belongs so you can do it later if you want to (or need to). If you did the work on binder paper you can include that in your Rainbow Packet after this worksheet. If we end up with extra class time then portions of this may turn into required work. If that happens you will be told which problems are turned into required. Remember there is tons of other extra practice on the class website...and the entire internet! See me if you need help finding practice on a topic you are struggling with.

- Show work for ANY math problem and include ALL units.
- Use a SINGLE DIMENSIONAL ANALYSIS line method set ups for ALL conversions.

- 33.00 grams of oxygen react with 77.79 grams of iron. What is the limiting reactant?  $2\text{Fe} + \text{O}_2 \rightarrow 2\text{FeO}$
- 72 grams of HCl react with 80 grams of NaOH. What is the limiting reactant?  $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- 162.5 grams of Zn react with 648 grams of HCl. What is the limiting reactant?  $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
- If 75.0g of CO react to produce 68.4g  $\text{CH}_3\text{OH}$  what is the percent yield of  $\text{CH}_3\text{OH}$ ?  $\text{CO} + 2\text{H}_2 \rightarrow \text{CH}_3\text{OH}$
- If 3.45 moles of oxygen reacts with 2.36 moles of iron.  
 $2\text{Fe} + \text{O}_2 \rightarrow 2\text{FeO}$ 
  - Which reactant is limiting?
  - How many grams of rust are theoretically produced?
  - What is the % yield if 160. grams of rust are produced?
- When 25.0 g of lead (II) nitrate reacts with 15.0 g sodium iodide, sodium nitrate and lead (II) iodide are formed.
  - Balance the following equation:  
 $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{NaI}(\text{aq}) \rightarrow \text{PbI}_2(\text{s}) + \text{NaNO}_3(\text{aq})$
  - What is the limiting reagent in the reaction?
  - How many grams of sodium nitrate can be formed?
  - How many grams of lead (II) iodide is formed?
  - How much of the non-limiting reagent will be left over from the reaction?
  - If 6 grams of sodium nitrate are formed in the reaction, what is the percent yield of this reaction?
- A chemist burns 160.0 g of Al with 200.0 g of  $\text{O}_2$  to produce aluminum oxide,  $\text{Al}_2\text{O}_3$ .
  - Write a balanced equation for the reaction.  
 $\text{Al} + \text{O}_2 \rightarrow \text{Al}_2\text{O}_3$
  - Determine the theoretical yield of  $\text{Al}_2\text{O}_3$ .
  - Determine how many g of the excess reagent are left o
- Certain salts of benzoic acid have been used as food additives for decades. The potassium salt of benzoic acid, potassium benzoate, can be made by the action of potassium permanganate on toluene.  
 $\text{C}_7\text{H}_8 + \text{KMnO}_4 \rightarrow \text{KC}_7\text{H}_5\text{O}_2 + \text{MnO}_2 + \text{KOH} + \text{H}_2\text{O}$   
toluene potassium benzoate  
If the yield of potassium benzoate cannot realistically be expected to be more than 68%, what is the minimum number of grams of toluene needed to achieve this yield while producing 10.0 g of  $\text{KC}_7\text{H}_5\text{O}_2$ ? 8.45 g
- Aluminum dissolves in an aqueous solution of NaOH according to the following reaction:  
 $\text{NaOH} + \text{Al} + \text{H}_2\text{O} \rightarrow \text{NaAlO}_2 + \text{H}_2$   
If 84.1 g of NaOH and 51.0 g of Al react:
  - Which is the limiting reagent? Al
  - How much of the other reagent remains? 8.49 g NaOH
  - What mass of hydrogen is produced? 5.73 g
- Dimethylhydrazine,  $(\text{CH}_3)_2\text{NNH}_2$ , was used as a fuel for the Apollo Lunar Descent Module, with  $\text{N}_2\text{O}_4$  being used as the oxidant. The products of the reaction are  $\text{H}_2\text{O}$ ,  $\text{N}_2$ , and  $\text{CO}_2$ .
  - Write a balanced chemical eq for the combustion rxn
  - If 150 kg of  $(\text{CH}_3)_2\text{NNH}_2$  react with 460 kg of  $\text{N}_2\text{O}_4$ , what is the theoretical yield of  $\text{N}_2$ ? 210 Kg
  - If a 30 kg yield of  $\text{N}_2$  gas represents a 68% yield, what mass of  $\text{N}_2\text{O}_4$  would have been used up in the rxn? 96600 g
- Mg metal reacts with oxygen to give magnesium oxide, MgO. If 5.00 g of Mg and 5.00 g of  $\text{O}_2$  are allowed to react, what weight of MgO is formed, and what weight of which reactant is left in excess? 1.71 g  $\text{O}_2$  / 8.29 g MgO
- Adipic acid,  $\text{C}_6\text{H}_{10}\text{O}_4$ , is a raw material for the making of nylon and it can be prepared in the laboratory by the following reaction between cyclohexene,  $\text{C}_6\text{H}_{10}$ , and sodium dichromate,  $\text{Na}_2\text{Cr}_2\text{O}_7$  in sulphuric acid.  
 $\text{C}_6\text{H}_{10}(\text{l}) + \text{Na}_2\text{Cr}_2\text{O}_7(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{C}_6\text{H}_{10}\text{O}_4(\text{aq}) + \text{Cr}_2(\text{SO}_4)_3(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) + \text{H}_2\text{O}$   
There are side reactions. These plus losses of product during its purification reduce the overall yield. A typical yield of purified adipic acid is 68.6%. To prepare 12.5 grams of adipic acid in 68.6% yield requires how many grams of cyclohexene? 10.2 g
- An organic chemist reacted 10 g  $\text{CH}_4$  with excess  $\text{Cl}_2$  and obtained 10 g of  $\text{CH}_3\text{Cl}$  and hydrogen.
  - What should have been the theoretical yield. 31.5 g
  - What was their percentage yield? 31.8%
- An inorganic chemist reacted 100 g of  $\text{PbCl}_4$  with excess  $\text{NH}_4\text{Cl}$ , obtaining an 87% yield of ammonium chloroplumbate(IV),  $(\text{NH}_4)_2\text{PbCl}_6$ . How many grams did they obtain? 113.65 g
- 4000 grams of heptane ( $\text{C}_7\text{H}_{16}$ ) is combusted with 7000 grams of oxygen to produce carbon dioxide and water.
  - What is the limiting reactant?
  - How many grams of carbon dioxide are produced?
  - How many grams of excess reactant are left?