

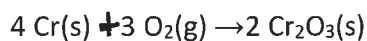
NAME KEY

CHEM1301 Stoichiometry Homework #11

Due: Friday, October 31

Show your work!

1. For the reaction shown, find the limiting reactant for each of the initial quantities of reactants.



- a) 1 mol Cr; 1 mol O₂

LR! $\frac{1 \text{ mol Cr}}{1 \text{ mol O}_2} \left(\frac{2 \text{ mol Cr}_2\text{O}_3}{4 \text{ mol Cr}} \right) = .5 \text{ mol Cr}_2\text{O}_3 \leftarrow \text{Theor. Yield}$

$\frac{1 \text{ mol O}_2 \left(\frac{2 \text{ mol Cr}_2\text{O}_3}{3 \text{ mol O}_2} \right) = .67 \text{ mol Cr}_2\text{O}_3$

- b) 4 mol Cr; 5 mol O₂

LR $\frac{4 \text{ mol Cr}}{5 \text{ mol O}_2} \left(\frac{2 \text{ mol Cr}_2\text{O}_3}{4 \text{ mol Cr}} \right) = \frac{2 \text{ mol Cr}_2\text{O}_3}{3.3 \text{ mol Cr}_2\text{O}_3}$

$\frac{5 \text{ mol O}_2 \left(\frac{2 \text{ mol Cr}_2\text{O}_3}{3 \text{ mol O}_2} \right) = 3.3 \text{ mol Cr}_2\text{O}_3$

← TY

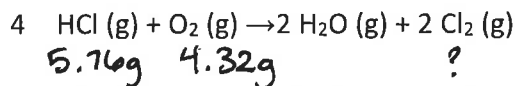
- c) 12.4 mol Cr; 10.3 mol O₂

LR $\frac{12.4 \text{ mol Cr}}{10.3 \text{ mol O}_2} \left(\frac{2 \text{ mol Cr}_2\text{O}_3}{4 \text{ mol Cr}} \right) = \frac{6.2 \text{ mol Cr}_2\text{O}_3}{6.9 \text{ mol Cr}_2\text{O}_3}$

$\frac{10.3 \text{ mol O}_2 \left(\frac{2 \text{ mol Cr}_2\text{O}_3}{3 \text{ mol O}_2} \right) = 6.9 \text{ mol Cr}_2\text{O}_3$

← TY

2. Consider the reaction below.



5.76g 4.32g ?

a) If 5.76 g HCl and 4.32g O₂ react, what is the theoretical yield of Cl₂ and which is the limiting reactant?

$$\frac{5.76 \text{ g HCl}}{\text{LR}} \left(\frac{1 \text{ mol HCl}}{36.46 \text{ g HCl}} \right) \left(\frac{2 \text{ mol Cl}_2}{4 \text{ mol HCl}} \right) \left(\frac{70.9 \text{ g Cl}_2}{1 \text{ mol Cl}_2} \right) = \boxed{5.60 \text{ g Cl}_2}$$

Ty r

$$4.32 \text{ g O}_2 \left(\frac{1 \text{ mol O}_2}{32.00 \text{ g O}_2} \right) \left(\frac{2 \text{ mol Cl}_2}{1 \text{ mol O}_2} \right) \left(\frac{70.9 \text{ g Cl}_2}{1 \text{ mol Cl}_2} \right) = 19.1 \text{ g Cl}_2$$

.079 mol Cl₂

If put those → .27 mol Cl₂
 here in case you
 stopped at mol Cl₂.
 Still gives the same
 answer!

b) You run the experiment with the masses given in part a). If the percent yield for Cl₂ is 55.4% for the reaction above, how much Cl₂ would you expect to recover in the lab?

$$\% Y = \frac{AY}{TY} \times 100\%$$

$$.544 = \frac{AY}{5.60 \text{ g Cl}_2}$$

$$AY = 3.05 \text{ g Cl}_2$$

