Chemistry 201
Practice Quiz
Stoichiometry

Note: $V = \frac{nRT}{P} = \frac{(1)(0.0821)(273)}{1} = 22.4L$
molar volume of an ideal gas

On an actual quiz each of these problems would be worth 5 points for a total of 20 points.

1. For the reaction: $3C_{(s)} + 2SO_{2(g)} \rightarrow CS_{2(s)} + 2CO_{2(g)}$, how many liters of carbon dioxide are formed at STP from the reaction of 6.00 grams of carbon with excess sulfur dioxide?

$6.00g\,C \times \frac{1\,mol\,C}{12.01g\,C} \times \frac{2CO_2}{3C} = 0.333\,mol\,CO_2$

For all ideal gases 1.000 mol occupies a volume of 22.4L at STP.

$0.333mol \times 22.4\,L/mol = 7.46L\,CO_2$ (3 s.f.)

2. For the reaction: $2Al_{(s)} + 3Br_{2(l)} \rightarrow 2AlBr_{3(s)}$, if 4.0 grams of aluminum are combined with 2.0 grams of bromine:

   a. How many grams of aluminum bromide are produced?

$4.0g\,Al \times \frac{1mol}{26.98} \times \frac{2AlBr_3}{2Al} \times \frac{266.68g\,AlBr_3}{mol}$: $2.0g\,Br_2 \times \frac{1mol}{159.8} \times \frac{2AlBr_3}{3Br_2} \times \frac{266.68g}{mol} =$

   b. Which reactant is the limiting reactant?

Aluminum will be present in excess and Bromine will be limiting.

$2.2g\,AlBr_{3(s)}$ (2 s.f.)

3. For the reaction: $CO_{(g)} + 2H_{2(g)} \rightarrow CH_3OH_{(l)}$

8.00mL of methanol (CH_3OH d=0.7918g/mL) are produced from 14.0 grams of carbon monoxide reacting with excess hydrogen gas. What is the percent yield for this reaction?

$8.00mL\,CH_3OH \times \frac{0.7918g}{mL} \times \frac{1mol}{32.05} \times \frac{1CO}{1CH_3OH} \times \frac{28.01g}{mol} = 5.53g\,CO$

theoretical amount needed / actual amount needed → $\frac{5.53g\,CO}{14.0g\,CO} \times 100\% = 39.5\%$ yield (3 s.f.)

{This is another way of thinking about % yield}
compare to: $\frac{\text{actual yield}}{\text{theoretical yield}} \times 100\%$

4. For the reaction: $2KClO_{3(s)} \rightarrow 2KCl_{(s)} + 3O_{2(g)}$

How many grams of potassium chlorate would need to be decomposed to produce 6.00 L of oxygen gas at STP?

$6.00L\,O_2 \times \frac{1mol}{22.4L} = 0.268mol\,O_2 \times \frac{2KClO_3}{3O_2} \times \frac{122.55g\,KClO_3}{mol} =$

↑ ideal gas volume @ STP

$21.9g\,KClO_3$ 3 s.f.