CHM 110
Stoichiometry Set

SOLUTIONS

Solve the following problems Write the answer in the answer blank, and show work in the space provided.

1) What mass of TiO_2 would (given enough carbon and chlorine) be required to produce 45.0 g of $TiCl_4$ in the following reaction?

$$TiO_2(s) + C(s) + 2Cl_2(g) \rightarrow TiCl_4(g) + CO_2(g)$$

Answer: 18.9 g TiO_2

TiO_2: 79.87 g TiO_2 = mol TiO_2

$TiCl_4$: 189.67 g $TiCl_4$ = mol $TiCl_4$

mol TiO_2 = mol $TiCl_4$

$$45.0\text{ g } TiCl_4 \times \frac{\text{mol } TiCl_4}{189.67\text{ g } TiCl_4} \times \frac{\text{mol } TiO_2}{\text{mol } TiCl_4} \times \frac{79.87\text{ g } TiO_2}{\text{mol } TiO_2} =$$

2) C_2H_5OH burns in air to form CO_2 and H_2O. What mass of water can be produced when 75.0 grams of C_2H_5OH burns in sufficient oxygen?

$$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$$

Answer: 88.0 g H_2O

C_2H_5OH: 46.068 g C_2H_5OH = mol C_2H_5OH

H_2O: 18.016 g H_2O = mol H_2O

mol C_2H_5OH = 3 mol H_2O

$$75.0\text{ g } C_6H_5OH \times \frac{\text{mol } C_2H_5OH}{46.068\text{ g } C_2H_5OH} \times \frac{3\text{ mol } H_2O}{\text{mol } C_2H_5OH} \times \frac{18.016\text{ g } H_2O}{\text{mol } H_2O} =$$

3) How many mL of 6.00 M H_2SO_4 is needed to react with 50.0 mL of 2.00 M NaOH?

$$H_2SO_4 + 2NaOH \rightarrow 2H_2O + Na_2SO_4$$

Answer: 8.33 mL 6.00 M H_2SO_4

6.00 mol H_2SO_4 = L
2.00 mol NaOH = L
mol H_2SO_4 = 2mol NaOH

$$50.0\text{ mL} \times \frac{2.00\text{ mol NaOH}}{\text{L}} \times \frac{\text{mol } H_2SO_4}{2\text{mol NaOH}} \times \frac{\text{L}}{6.00\text{ mol } H_2SO_4} =$$

(since "m" isn't canceled, final answer is in mL)

4) What is the maximum mass of tungsten (W) that could be produced by reacting 150.0 g of WO_3 with 50. g of H_2 in the following reaction?

$$WO_3 + 3H_2 \rightarrow W + 3H_2O$$

Answer: 118.9 g W

W: 183.84 g W = mol W
WO_3: 231.84g WO_3 = mol WO_3
H_2: 2.016g H_2 = mol H_2
mol WO_3 = mol W
3 mol H_2 = mol W

$$150.0\text{g } WO_3 \times \frac{\text{mol } WO_3}{231.84\text{g } WO_3} \times \frac{\text{mol W}}{\text{mol } WO_3} \times \frac{183.84\text{ g W}}{\text{mol W}} = 118.9\text{g W}$$

$$50.\text{g } H_2 \times \frac{\text{mol } H_2}{2.016\text{g } H_2} \quad \frac{\text{mol W}}{3\text{ mol } H_2} \quad \frac{183.84\text{ g W}}{\text{mol W}} = 1500\text{g W}$$