Name: KEY
Block:

Stoichiometry Quiz

19

(1) Sodium oxide and water produces sodium hydroxide. How many moles of water are needed to produce 4.00 moles of sodium hydroxide?

(1) $Na_2O + H_2O \rightarrow \boxed{2} NaOH$

(1) $4.00 \text{ mol } NaOH \left(\frac{1 \text{ mol } H_2O}{2 \text{ mol } NaOH}\right) = \boxed{2.00 \text{ mol } H_2O}$

(2) Many cars now use methane (CH_4) to run their engines according to the following reaction:

(1) $CH_{4(g)} + \boxed{2} O_{2(g)} \dashrightarrow CO_{2(g)} + \boxed{2} H_2O_{(g)}$

a. Balance the reaction.

b. How many **moles** of oxygen will react with 4.00 moles of methane? (CH_4)

(1) $4.00 \text{ mol } CH_4 \left(\frac{2 \text{ mol } O_2}{1 \text{ mol } CH_4}\right) = \boxed{8.00 \text{ mol } CH_4}$

c. How many **grams** of carbon dioxide will be produced when 4.00 moles of methane reacts?

(2) $4.00 \text{ mol } CH_4 \left(\frac{1 \text{ mol } CO_2}{1 \text{ mol } CH_4}\right)\left(\frac{44.0 \text{ g}}{\text{mol } CO_2}\right) = \boxed{176 \text{ g}}$

3. Silicon is a very important element for the computer industry. One way to obtain pure silicon is by the following reaction:

$SiCl_{4(s)} + \boxed{2} Mg_{(s)} \dashrightarrow Si_{(s)} + \boxed{2} MgCl_{2(g)}$

How many **mole and grams** of silicon will be produced from reacting 100. g of $SiCl_4$?

(2) $100.\text{g} \left(\frac{\text{mol } SiCl_4}{170.1 \text{ g}}\right)\left(\frac{1 \text{ mol } Si}{1 \text{ mol } SiCl_4}\right) = \boxed{0.588 \text{ mol } Si}$

(1) $\left(\frac{28.1 \text{ g}}{\text{mol } Si}\right) = \boxed{16.5 \text{ g } Si}$

9

(4) In the first step of the Ostwald process for making nitric acid, ammonia is oxidized. The following reaction occurs.

$$4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(g)}$$

A) How many litres of NH_3 at S.T.P. are needed to react with 12.0 L of O_2 also at S.T.P?

(3) $12.0\,L\left(\frac{mol\ O_2}{22.4\,L}\right)\left(\frac{4\,mol\ NH_3}{5\,mol\ O_2}\right)\left(\frac{22.4\,L}{mol}\right) = \boxed{9.60\,L\ NH_3}$

(5) Hydrochloric acid reacts with zinc in a single replacement reaction. The concentration of the acid is 0.84 M. The chemist working with the reaction needs 25 mL of the acid to completely react the zinc. Calculate the number of moles in the zinc sample.

$$2HCl + Zn \rightarrow ZnCl_2 + H_2$$

(2) 0.84 M, 0.025 L

$0.021\,mol\ HCl\left(\frac{1\,mol\ Zn}{2\,mol\ HCl}\right) = \boxed{0.011\,mol\ Zn}$

$mol\ HCl = M \times L$
$= 0.021\,mol$

(6) Calculate the concentration of sodium bromide if 35.4 mL will react with 10.0 mL of 0.58 M $AgNO_3$.

$$NaBr + AgNO_3 \rightarrow NaNO_3 + AgBr$$

(2) 0.0354 L, 0.58 M
0.0058 mol, 0.010 L

$mol = (0.58)(0.010) = 0.0058\,mol$

$[NaBr] = \frac{0.0058\,mol}{0.0354\,L}$
$= \boxed{0.16\,M}$

(7) A chemist reacts 5.00 grams of $CuCl_2$ with a 0.45 M solution of silver nitrate. What volume of silver nitrate is required to completely react with the $CuCl_2$?

$$CuCl_2 + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2AgCl$$

(3) 5.00 g, 0.45 M

$5.00\,g\left(\frac{mol\ CuCl_2}{134.5\,g}\right)\left(\frac{2\,mol\ AgNO_3}{1\,mol\ CuCl_2}\right) = 0.0743\ldots\,mol\ AgNO_3$

$L = \frac{mol}{L} = \frac{0.0743\ldots\,mol}{0.45\,M} = \boxed{0.17\,M}$