Extra Practice Stoichiometry of Gases

Name: SOLUTIONS

1. Hydrogen gas and NaOH is produced when sodium is added to water. What mass of sodium is needed to produce 20 L of H_2 at STP?

② $2\,Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}$

2 moles : 1 mole

x : 0.89 moles

$x = 1.78$ moles Na

① $PV = nRT$

$\frac{PV}{RT} = n$

$\frac{(101.3)(20)}{(8.31)(273)} = n$

$n = 0.89$ moles H_2

③ $n = \frac{m}{M}$

$1.78 = \frac{m}{23}$

$m = 41\,g$

2. Methane gas (CH_4) burns in O_2, producing CO_2 and H_2O. If 42 L of methane are burned, what volume of water vapour is produced?

$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$

1 mole : 2 mole

42 L : x

$x = 84\,L$

3. When methanol (CH_3OH) burns, CO_2 and H_2O are produced. What volume of oxygen is needed to completely burn 15g of methanol at STP?

① $2\,CH_3OH_{(\ell)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 4H_2O_{(g)}$

2 mole 3 mole

$n = \frac{m}{M}$ $n = \frac{m}{M}$

$2 = \frac{m}{32}$ $3 = \frac{m}{32}$

$m = 64g$ $m = 96g$

$15g$ x

$x = 22.5g$

② $PV = \frac{m}{M}RT$

$V = \frac{mRT}{MP}$

$V = \frac{(22.5)(8.31)(273)}{(32)(101.3)}$

$V = 15.7\,L$