SOLUTIONS

Pop - QUIZ

1. a) What volume of O_2 and H_2 (at SATP) would you need to produce 500 ml of water?
(Hint: density of water 1kg/L)

500mL → 500g

P = 101.3 KpA
T = 25°C → 298K

① $n = \frac{m}{M}$

$n = \frac{500}{18}$

$n = 27.8 moles$

② $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$

2 mole 1 mole 2 mole

y x 27.8 mole

$x = 13.9 mole$
$y = 27.8 mole$

③ $PV = nRT$

$V = \frac{nRT}{P}$

$V = \frac{13.9(8.31)(298)}{101.3}$

$V = 339.8L$

④ $PV = nRT$

$V = \frac{nRT}{P}$

$V = \frac{27.8(8.31)(298)}{101.3}$

$V = 679.6L$

b) If the total pressure of the reactants is 600 kPa, what will be the partial pressure of O_2?

① $n_T = n_{O_2} + n_{H_2}$

$n_T = 13.9 + 27.8$

$n_T = 41.7 moles$

② $P_{O_2} = \frac{n_{O_2} \cdot P_T}{n_T}$

$P_{O_2} = \frac{13.9 \cdot 600}{41.7}$

$P_{O_2} = 200 kPa$

2. For all following questions refer to the following equation:

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

a) How many moles of each substance do you have if 33 g of methane (CH_4) is combusted at SATP

① $n_{NH_4} = \frac{m}{M}$ $\frac{33}{16} = 2.06$ moles

② 1 mole + 2 mole → 1 mole + 2 mole

2.06 mole x y z

(cross-multiply to solve)

$x = 4.12$ moles O_2
$y = 2.06$ moles CO_2
$z = 4.12$ moles H_2O

b) At SATP what volume of oxygen would be needed to react completely with 33 g of methane (CH_4).

O_2 $PV = nRT$

$V = \frac{nRT}{P}$

$V = \frac{4.12(8.31)(298)}{101.3}$

$V = 100.7\,L$

c) If the partial pressure of oxygen is 66.7 kPa, what will be the total pressure of the reactants?

① $n_T = n_{CH_4} + n_{O_2}$

$n_T = 2.06 + 4.12$

$n_T = 6.18$ moles

② $P_{O_2} = \frac{n_{O_2} \cdot P_T}{n_T}$

$66.7 = \frac{(4.12)(P_T)}{6.18}$

$P_T = 100.1$ kPa