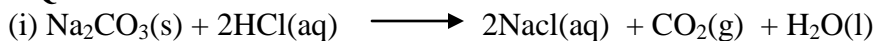


GAS LAWS MARKING SCHEME

1. 1989 Q32 f



$$(ii) \text{Moles of CO}_2 = 672 = \frac{0.034}{22400}$$

$$\text{Moles of HCl} = 2(\text{moles of CO}_2) = 0.03 \times 2 = 0.06$$

0.06 moles are in 30cm^3 , moles that will be contained in 1000cm^3

$$\text{HCL solution} = \frac{1000 \times 0.06}{30} = 2\text{M}$$

$$\text{R.F.M of Na}_2\text{CO}_3 = 106$$

(iii) 1mole of Na_2CO_3 produce 1mole of CO_3^{2-} ,

0.03 moles of CO_2 will produce $(0.03 \times 106)\text{g}$ of $\text{Na}_2\text{CO}_3 = 3.18\text{g}$

2. 1991 Q1 P1

$$\sqrt{\frac{32}{A}} = \frac{20}{24} = \frac{5}{6}$$

$$\frac{32}{A} = \frac{25}{26}$$

$$A = \frac{32 \times 36}{25}$$

$$A = 46.08$$

3. 1995 Q19 P1

Hydrogen, because it is lighter/ less denser / diffuses faster

(2marks)

4. 1996 Q2 P1

$$P_1V_1 = P_2V_2 \text{ OR } \frac{V_1}{I_2} = \frac{V_2}{I_1}$$

(Charles' Law)

$$V_2 = \frac{P_1V_1T_1}{T_1P_2}$$

$$V_2 = \frac{250 \times 315}{300}$$

$$= \frac{750 \times 250 \times 315}{300 \times 750} = 262.5$$

5. 1997 Q16 ,27 P1

$$\frac{0.5 \times 100}{T_2} = \frac{4000 \times 1}{500} \quad T_2 = \frac{50 \times 500}{400} = 62.5\text{K}$$

$$P_1V_1 = P_2V_2$$

$$\frac{T_1}{T_2}$$

$$\frac{1 \times 400}{500} = \frac{0.5 \times 100}{T_2}$$

$$T_2 = \frac{0.5 \times 100 \times 500}{400}$$

$$T_2 = 62.5 \text{ K}$$

6. 1998 Q23 P1

$$\text{No. of moles of hydrogen H}_2 = \frac{10}{2} = 5 \text{ Moles}$$

$$\text{No. of moles of Nitrogen dioxide NO}_2 = 46$$

$$\text{Relative molecular mass of NO}_2 = 46$$

$$1 \text{ Mole of NO}_2 = 5 \times 46$$

$$5 \text{ Moles} = 30\text{g}$$

7. 1999 Q20

With gas M there is reduction in pressure in the porous pot because air moves out faster than gas M enters. M is denser than air / Air is less dense than M. With gas N there is increase in pressure inside the porous because gas N enters the porous pot faster than air comes out, gas N is less dense than air / Air is denser than N.

9. 2000 Q18 P1

$$t_{\text{O}_3} = \frac{V}{96} \text{ R.M.M.} = 48$$

$$t_{\text{CO}_2} = \frac{V}{t} \text{ R.M.M.} = 44$$

$$\frac{V}{96} \div \frac{V}{t} = \frac{\sqrt{48}}{\sqrt{44}}$$

$$t = 48$$

$$96 = 44$$

$$t = 96 \times \frac{\sqrt{48}}{\sqrt{44}} = 91.9 \text{ or } = 92\text{sec } (^{1/2})$$

10. 2003 Q14 P1

The entire solution turns pink/ purple; Potassium permanganate particles have diffused into water molecules or color spreads.

11. 2003 Q25 P1

a) At a constant temperature the volume is inversely proportional to pressure OR $V \propto 1/p$,

$$V = K/p$$

$$\text{b) } 3 \times 1 = 2 \times V_2$$

$$V_2 = 3/2 \text{ litres /dm}^3 \text{ or } 15000\text{cm}^3$$

12. 2006 Q3 P1

$$\frac{\text{Time for SO}_2}{\text{Time for O}_2}$$

$$= \sqrt{\frac{\text{R.M.M SO}_2}{\text{R.M.MO}_2}}$$

$$\text{R.M.M of SO}_2 = 64$$

$$\text{R.M.M of O}_2 = 32$$

$$\frac{\text{Time for SO}_2}{50}$$

$$= \sqrt{\frac{64}{32}}$$

$$\text{Time for SO}_2 = 70.7 \text{ seconds}$$

(3marks)

13. 2006 Q3c P2Moles of chlorine used $\frac{3}{24} = 0.125$ Mass of Cl_2 in product formed $= 0.125 \times 71 \left(\frac{1}{2}\right) = 8.875$ Moles of D $= 0.125$ Mass of D $11.875 - 8.875 = 3\text{g}$ R.A.M of D $= 24$ (3marks)**13. 2007 Q12 P1**

a) The volume of a fixed mass of gas is directly proportional to its temperature in Kelvin.

b) $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$$T_2 = \frac{291 \times (1.0 \times 10^5) \times 2.8 \times 10^{-2}}{(1.0 \times 10^5) \times 3.5 \times 10^{-2}}$$

$$= 2328 \text{ K}$$

14. 2008 Q1b P2

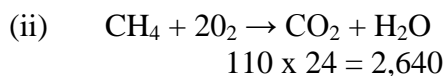
(i) Mass = $\frac{\text{KH4} \times 35.2 \times 1000}{1000} = 1.76 \text{ kg}$

No. of moles methane $= \frac{35.2 \times 5 \times 1000}{100 \times 16}$

Mass kg $= 1.76 \times 1000$
 $= 1760 \text{ g}$

Molar mass of methane $= \frac{1760}{16}$

$= 110 \text{ moles}$

**15. 2008 Q20 P1**

(a) At constant temperature and pressure, the rate of diffusion of a gas is inversely proportional to the square root of its density.

(b) $\sqrt{\frac{R_W}{R_X}} = \sqrt{\frac{R_{M_X}}{M_{W_E}}} = \sqrt{\frac{44}{16}}$

$$\frac{12.0}{R_X} = \frac{44}{4} ; \quad \frac{12.0 \times 4}{44} = \frac{48}{6.63}$$

$$= 7.24 \text{ cm}$$

16. 2009 Q26 P1

(a) Temperature and pressure are directly proportional (1) IR words towards that of ideal

(b) With increase in temperature, the gas particles gain more Kinetic energy (1) They move faster and collide with the walls of the container more frequently hence increasing pressure.

17. 2010 Q8 P1

$$a) \quad P_1 V_1 = \frac{P_2 V_2}{T_2} \quad \frac{1.0 \times 10^7 \times 1}{77} = \frac{1.0 \times 10^5 \times V_2}{298}$$

$$V_2 = \frac{1.0 \times 10^7 \times 298}{1.0 \times 10^5 \times 77} \quad V_2 = 387.0 \text{ dm}^3$$

$$b) \quad \text{No of moles } N_2 = \frac{387.0}{24.0} = 16.1 \text{ moles (No mark)}$$

$$\text{Mass of } N_2 = 16.1 \times 28 = 451.50 \text{ g}$$

18. 2011 Q6 P1

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{P_1 V_1 \times T_2}{T_1} = P_2 V_2$$

$$\frac{98,648.5 \times 0.15 \times 273}{293 \times 101,325}$$

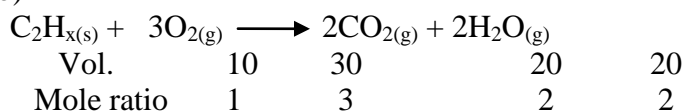
$$V_2 = 0.136 \text{ dm}^3 \text{ (go to minimum of 2 d.p)}$$

(if no formula but went ahead and substituted give 1 ½ marks. Wrong units penalize ½ mark)

19. 2011 Q25 P1

(a) When gases combine together at constant temp and pressure they do so in volumes which bear a simple ratio to each other, and to the volumes of the products if gaseous.

(b)



Therefore $x = 4$

20. 2012 Q5 P1

Water contained impurities

Or presence of impurities raises bpt.

Or water contains ions or hard water

21. 2012 Q11 P1

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad \text{OR} \quad \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$V_2 = \frac{56 \times 1 \times 273}{548}$$

$$= 28 \text{ cm}^3$$

$$\frac{0.47 \times 22400}{28} = 376$$

$$\text{RMF of } CH_2Br = 94$$

$$94n = 376$$

$$n = 4$$

$$\text{MF} = (CH_2Br)_4$$

$$= C_4H_8Br_4$$

NB; If 56 cm^3 is used $n = 2$

$$\text{MF } C_2H_4Br_2$$