GAS LAWS MARKING SCHEME

1. 1989 Q32 f

(i) $Na_2CO_3(s) + 2HCl(aq) \longrightarrow 2Nacl(aq) + CO_2(g) + H_2O(l)$

(ii) Moles of CO_2 = 672 = $\frac{0.034}{22400}$

Moles of HCl = 2(moles of CO_2) = 0.03 x 2 = 0.06

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

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

R.F.M of Na_2CO_3 = 106

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

0.03 moles of CO_2 will produce (0.03 x 106)g of $Na_2 CO_3$ = 3.18g

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

$P_1V_1 = P_2V_2$ OR $\frac{V1}{I_2} = \frac{V_2}{I_2}$ (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

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

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

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

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

T_2 = 62.5 K

6. 1998 Q23 P1

No. of moles of hydrogen H_2 = $^{10}/_2$ = 5 Moles
No. of moles of Nitrogen dioxide NO_2 = 46
Relative molecular mass of NO_2 = 46
1 Mole of No_2 = 5 x 46
5 Moles = 30g

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 dense than N.

9. 2000 Q18 P1

$tO_3 = \frac{V}{96}$ R.M.M. = 48 $\qquad tCO_2 = \frac{V}{t}$ R.M.M =44

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

$t = 96 \times \frac{\sqrt{48}}{\sqrt{44}}$ =91.9 or = 92sec ($^1/_2$)

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 a 1 / p , V = K/p
b) 3x1 = 2x V_2
V_2 = 3/2 litres /dm^3 or 15000cm^3

12. 2006 Q3 P1

$$\frac{\text{Time for } SO_2}{\text{Time for } O_2} = \sqrt{\frac{R.M.MSO_2}{R.M.MO_2}}$$

R.M.M of SO_2 =64
R.M.M of SO_2 = 32

$$\frac{\text{Time for } SO_2}{50} = \sqrt{\frac{64}{32}}$$

Time for SO_2 = 70.7 seconds (3marks)

13. 2006 Q3c P2

Moles of chlorine used $^{3}/_{24}$ = 0.125

Mass of Cl_2 in product formed =0.125x71 ($^{1}/_{2}$) = 8.875

Moles of D = 0.125

Mass of D 11.875-8.875 = 3g

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 is kevin.

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 K

14. 2008 Q1b P2

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

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

Mass kg = 1.76 x 1000

= 1760 g

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

=110 moles

(ii) $CH_4 + 20_2 \rightarrow CO_2 + H_2O$

110 x 24 = 2,640

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) $\sqrt{\frac{RW}{RX}} = \sqrt{\frac{RMMX}{MMWE}} \quad \sqrt{\frac{44}{16}}$

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

=7.24 cm

16. 2009 Q26 P1

(a) Temperature and pressure are directly proportional (l) IR words towards that ofeal

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

17. **2010 Q8 P1**

a) $P_1V_1 = \frac{P_2V_2}{T_2}$ $\frac{1.0 \times 10^7 \times 1}{77} = \frac{1.0 \times 10^5 \times V_2}{298}$

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

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

Mass of N_2 $= 16.1 \times 28 = 451.50g$

18. **2011 Q6 P1**

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$\frac{P_1V_1}{T_1} \times \frac{T_2}{P_2V_2}$

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

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

(if no formular 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)

$C_2H_{x(s)} + 3O_{2(g)} \longrightarrow 2CO_{2(g)} + 2H_2O_{(g)}$

Vol.	10	30	20	20
Mole ratio	1	3	2	2

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**

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ OR $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

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

$= 28cm^3$

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

RMF of CH_2Br = 94

$94n = 376$

$n = 44$

$MF = (CH_2Br)_4$

$= C_4H_8Br_4$

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

MF $C_2H_4Br_2$