

الباب الثاني

الغرائب

الباب الثاني الغازات

: ()

1- قانون بويل :

:"

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:

$$V \propto 1/p , \quad T$$

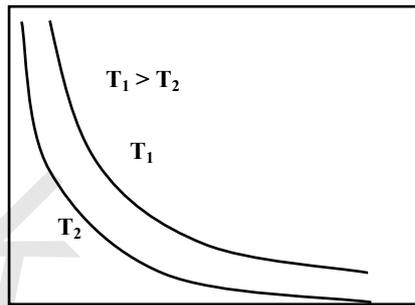
$$(K) = VP$$

T

P

V

$$P_1 V_1 = P_2 V_2 = \dots = \frac{nRT}{\dots}$$



قانون شارل :

1/273

(V₀)

$$(V_0 + V_0 t_1 / 273) = \text{°C}, t_1$$

$$V_1 = V_0 (273 + t_1 / 273) \quad :$$

:

$$= (V_0 - V_0) = (V_0 - 273 V_0 / 273) = 273 \text{°C}$$

$$\text{°}273 -$$

)

.(

$$t, T \quad (T, K = (273 + t \text{°C}))$$

(t₂)

(a)

$$V_2 = V_0 (273 + t_2 / 273)$$

$$V_1/V_2 (273 + t_1 / 273 + t_2) - T_1/T_2 \quad :$$

$$V_1/T_1 = V_2/T_2 = \quad :$$

"

."

$$P \quad V \propto T \quad V/T = \quad V = K_2 T$$

القانون العام للغازات :

$$T_2 \quad V_1 \quad P_1 \quad T_1$$

$$P_2 \quad V_2$$

:

$$V \quad V_1 \quad P_2 \quad P_1 \quad :$$

$$P_1 V_1 = P_2 V_2 \quad (T_1 = T_2)$$

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

$$V_2 / T_2 = V_1 / T_1 \quad (P_1 = P_2)$$

$$P_1 V_1 / P_2 = V_2 T_1 / T_2$$

$$P_1 V_1 / T_1 = P_2 V_2 / T_2 \quad PV / T = K'$$

(K')

ثابت الغاز:

$$(ii) \quad (i) \quad K' \quad PV = K'T$$

$$K' = \frac{PV}{T}$$

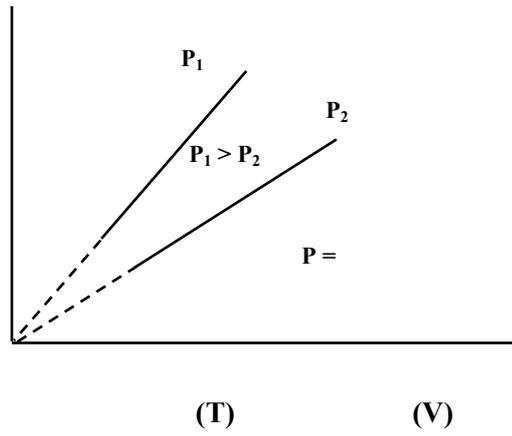
$$K' \propto n \quad (K' = nR)$$

(v)

K'

$P_2 > P_1$

$P_2 > P_1$



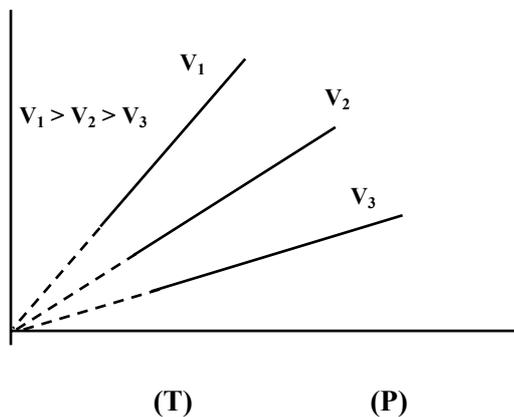
قانون الحجم الثابت :

$P \propto T$

$P / T = K$

K

$P_1 / T_1 = P_2 / T_2$



إيجاد قيمة الثابت العام للغازات :

(R)

:

$$PV = n RT \quad (\quad 1 = n \quad)$$

$$PV = RT$$

$$n \quad T \quad V \quad P$$

(R)

$$R = \quad \times \quad \times \quad \times$$

:

$$R = \frac{\text{قوة}}{\text{مساحة}} \times \frac{\quad}{\quad \times}$$

$$PV = n RT \quad (R)$$

1

22.4

n = 1

$$R = \frac{1(\text{atm}) \times 22.4 \text{ litre}}{1(\text{mole}) \times 273 \text{ K}} = 0.0821 \text{ litre atm K}^{-1} \text{ mole}^{-1}$$

(R)

3

P

: (R)

$$P = 101300 \text{ N m}^{-2}$$

$$n = 1 \text{ mole}$$

$$V = 0.0224 \text{ m}^3$$

$$(1 \text{ litre} = 10^{-3} \text{ m}^3)$$

$$R = \frac{101300 \text{ N m}^{-2} \times 0.02241 \text{ m}^3}{1 \text{ mole} \times 273 \text{ K}}$$

$$= 8.3143 \text{ N m K}^{-1} \text{ mole}^{-1} = 8.3143 \text{ J K}^{-1} \text{ mole}^{-1}$$

$$J = (\text{N m})$$

4.18

$$R = 8.3143 / 4.18 = 1.987 \text{ cal K}^{-1} \text{ mole}^{-1} \approx 2 \text{ cal}$$

:

$$.95 \text{ KNm}^{-2}$$

$$^{\circ}27$$

$$^3 400$$

$$.1013 \text{ KNm}^{-2}$$

o

:

$$P_1 = 95 \text{ KNm}^{-2}$$

,

$$P_2 = 101.3 \text{ KNm}^{-2}$$

$$T_1 = 273 + 27 = 300 \text{ K}$$

$$T_2 = 273 \text{ K}$$

$$V_1 = 400 \text{ Cm}^3$$

$$V_2 = ?$$

$$P_1 V_1 / T_1 = P_2 V_2 / T_2$$

:

$$95 \text{ K } 400 / 300 = 101.3 \times V_2 / 273$$

$$V_2 = 341.36 \text{ Cm}^3$$

:

$$^{\circ}25$$

$$16$$

$$. 750$$

$$P = 750 / 760 = 0.986, R = 0.0821 \text{ L.atm K}^{-1} \text{ mole}^{-1}$$

$$n = 16 / 32 = 0.5 \text{ mole}$$

$$T = 273 + 25 = 298 \text{ K}$$

$$V = nRT/P = 0.5 \times 0.0821 \times 298 / 0.986 = 12.4$$

18

° 27

700

$$PV = n RT$$

$$n = PV / RT$$

$$n = (700/670) \times 18 / 0.0821 \times 300 = 0.673$$

7.53

2.31

$$PV = m/M RT$$

$$n = m/M = /$$

$$P = 1 \text{ atm}$$

$$V = 2.31$$

$$R = 0.0821 \text{ litre} = \text{atm K}^{-1} \text{ mole}^{-1}$$

$$T = 273 \text{ K}, m = 7.53 \text{ g}$$

$$M = 7.53 \times 0.0821 \times 273 / 1.0 \times 2.31 = 73 /$$

قانون أفوجادرو :

"

"

22.414

$$^{23}10 \times 6.023$$

. N_A

قانون دالتون للضغوط الجزئية :

:

$$P_{\text{total}} = P_1 + P_2 + P_3 + \dots + P_N$$

P_1 P_2 P_3

V

. T

n_1 n_2 n_3

:

$$P_1 = n_1 (RT/V) \quad \text{(a)}$$

$$P_2 = n_2 (RT/V) \quad \text{(b)}$$

$$P_3 = n_3 (RT/V)$$

$$P_{\text{total}} = n_1 (RT/V) + n_2 (RT/V) + n_3 (RT/V)$$

$$= (n_1 + n_2 + n_3) RT/V$$

$$= n_i (RT/V) \quad \text{(d)}$$

Where , $n_i = n_1 + n_2 + n_3$

: (d) (a b c)

$$P_1 = n_1 / n_i (P_{total})$$

$$P_2 = n_2 / n_i (P_{total})$$

$$P_3 = n_3 / n_i (P_{total})$$

$$(n_1 / n_i \quad n_2 / n_i \quad n_3 / n_i)$$

. (x)

(mole fraction)

$$P_1 = X_1 P_t \quad , \quad P_2 = X_2 P_t \quad \& \quad P_3 = X_3 P_t$$

$$r \propto (1 / \sqrt{d})$$

(d)

(r)

$$r_1 \quad r_2 :$$

:

$$d_1 \quad d_2$$

$$r_1, r_2 = \sqrt{d_2 / d_1}$$

$$r_1, r_2 = \sqrt{M_2 / M_1}$$

$$M_1 \quad M_2$$

:

$$32 \ 2$$

:

$$r_1, r_2 = \sqrt{M_2 / M_1} = \sqrt{32 / 2} = \sqrt{16} = 4$$

:

$$r_1, r_2 = \sqrt{d_2 / d_1} = t_2 / t_1 = \sqrt{M_2 / M_1}$$

:

$t_1 \ t_2$

$$r_1 \propto 1 / t_1$$

$$r_2 \propto 1 / t_2$$

:

238

235

-1

-2

(Diffusion)

(Effusion)

النظرية الحركية للغازات :

Kinetic energy

-1

-2

-3

-4

-5

-6

المعادلة الحركية للغازات :

(m)

(n)

(c)

(c)

(x y z)

(U V Z)

c

$$C^2 = U^2 + V^2 + Z^2$$

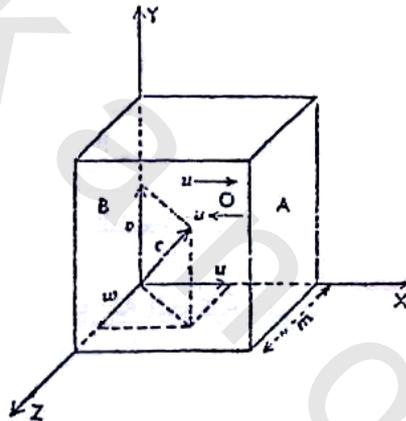
(A)

(u)

(x)

(u-)

$$mu = (x)$$



$$- mu = (x)$$

$$= mu - (-mu) = 2 mu \text{ Kgms}^{-1} \quad (A)$$

(A)

(m)

(

)

(B)

Lm2

(u/2L)

(A)

$$(2 mu) u/2L = (mu^2/L) \text{ Kgms}^{-1}$$

(B)

$$mu^2/L$$

(x)

(A B)

$$= mu^2/L + mu^2/L + 2 mu^2/L$$

: (y z)

$$2 mv^2/L, 2 mw^2/L$$

$$= 2 mu^2/L + 2 mv^2/L + 2 mw^2/L = 2m/1 (u^2 + v^2 + w^2)$$

$$= 2 mc^2/L$$

:

$$= 2 m / L (C_1^2 + C_1^2 + C_n^2)$$

$$C^2 = (C_1^2 + C_1^2 + C_n^2)/2$$

C²

$$2 mc^{-2}/L \quad : \quad n$$

:

$$P = F/A = 2 mc^{-2}/ A L$$

$$(A) \quad (P)$$

$$A = 6 L^2 \quad :$$

$$P = \frac{2 m n c^{-2}}{6 L^2 \times L} = \frac{1}{3} \frac{m n c^{-2}}{L^3} \text{ N m}^{-2}$$

:

$$v = (L^3)$$

$$P = \frac{1}{3} \frac{m n c^{-2}}{v} \text{ N m}^{-2} \quad \text{or} \quad PV = 1/3 m n c^{-2} \text{ N m}^{-2}$$

$$) 3/1 \quad (PV)$$

.

اشتقاق قوانين الغاز المثالي من المعادلة الحركية :

: -1

:

$$1/2 m n c^{-2} \propto T \quad \text{أو} \quad 1/2 m n c^{-2} = K' T$$

(2)

(2)

K'

$$PV = 2/3 (1/2 m n c^{-2})$$

:

$$PV = 2/3 KT$$

:

$$PV =$$

: -2

$$PV = 2/3 KT$$

$$V = 2/3 K'T/P$$

$$2/3 K'/P = K''$$

$$V = K''T$$

$$V \propto T$$

: -3

:

$$P_1 V_1 = 1/3 m_1 n_1 c_1^{-2}$$

$$P_1 V_2 = 1/3 m_2 n_2 c_2^{-2}$$

$$P_1 V_1 = P_2 V_2 \quad :$$

$$m_1 n_1 c_1^{-2} = m_2 n_2 c_2^{-2} \quad :$$

$$\text{i.e. } 1/2 m_1 c_1^{-2} = 1/2 m_2 c_2^{-2}$$

$$n_1 = n_2 \quad :$$

: -4

(A)

$$PV = 1/3 m N_A c^{-2} \quad :$$

$$m N_A = M \quad N_A$$

: (M)

$$PV = \frac{1}{3} M c^{-2} \quad \text{أو} \quad c^{-2} = 3 PV/M = 3 P/d$$

(r) (M/V)

$$r \propto \sqrt{c^{-2}}$$

$$\therefore r \propto \sqrt{3P/d}$$

$$r \propto 1/\sqrt{d}$$

الجذر التربيعي لمربع السرعة :

$$1/3 m N_A c^{-2} = PV = RT$$

$$m N_A = M$$

$$1/3 m c^{-2} = PV = RT$$

$$c^{-2} = 3 PV/M = 3 RT/M$$

$$\text{أو} \quad \sqrt{c^{-2}} = \sqrt{3PV/M} = \sqrt{3RT/M}$$

$$\text{أو} \quad c_{rms} = 1.73 \sqrt{RT/M} = 1.73 \sqrt{P/d}$$

$$M = 2 \times 10^{-3} \text{ kg}$$

$$T = 273 \text{ K}$$

$$R = 8.314 \text{ JK}^{-1} \text{ mole}^{-1}$$

$$C_{rms} = \sqrt{3 \times 8.314 \times 273 / 2 \times 10^{-3}} = 1.84 \times 10^3 \text{ m s}^{-1}$$

. 27°

$$M_{\text{he}} = 4 \times 10^{-3} \text{ kg}$$

$$C_{\text{rms}} = \sqrt{3RT/M} = 1367.4 \text{ Sn}^{-1}$$
$$= \sqrt{3 \times 8031 \times 300 / 4 \times 10^{-3}} = 1367.4 \text{ Sn}^{-1}$$

$$1367.4 = 3 \times 8031 \times T / 28 \times 10^{-3} \quad T = 45.82$$

$$T = 2100 \text{ K}$$

عدد الاصطدامات :

. (z)

$$z_1 = \sqrt{2} \cdot \pi \sigma^2 n \bar{C} \quad \therefore \bar{C} = \sqrt{8RT/\pi M}$$

: η λ

$$\lambda = 3 \eta / m n c \quad c \quad m n =$$

$$= 3 \eta / d c$$

RT/M3

$$\lambda = 3 \eta / 0.921 \times dx \ 3RT/M$$

$$\lambda = \eta / 0.921 \ 3/Pd$$

$$\lambda = \frac{1}{2} \pi \sigma^2 n$$

$$z_{ii} = \frac{1}{\sqrt{2}} \pi \sigma^2 n^2 \bar{c}$$

$$n = \frac{PV}{RT}, P = 101.3 \times 10^3 \text{ N m}^{-2} \quad V = 1 \text{ cm}^3 = 10^{-6} \text{ m}^3$$

$$T = 298 \text{ K} \quad R = 8.314 \text{ N m K}^{-1} \text{ mole}^{-1}$$

$$n = \frac{101.3 \times 10^3 \times 10^{-6}}{8.314 \times 298} = \text{عدد المولات}$$

$$\text{cm}^3 \text{ (n)}$$

$$= \frac{101.3 \times 10^3 \times 10^{-6}}{8.314 \times 298 \times 6.02 \times 10^{23}} = 2.46 \times 10^{19}$$

$$\therefore \bar{C} = \sqrt{\frac{8RT}{\pi M}} = \sqrt{\frac{8 \times 8.314 \times 298}{3.14 \times 32 \times 10^{-3}}}$$

$$= 4.44 \times 10^2 \text{ m s}^{-1} = 4.44 \times 10^4 \text{ cm s}^{-1}$$

$$\sigma = 1.81 \times 10^{-8} \text{ cm}$$

$$z_{ii} = \frac{1}{\sqrt{2}} \pi (1.81 \times 10^{-8})^2 (2.46 \times 10^{19})^2 (4.44 \times 10^4)$$

$$= 1.96 \times 10^{28} \text{ تصادم s}^{-1} \text{ cm}^{-3}$$

$$10^3 \times 121.3 \quad -1 \quad -1 \quad 10^{-6} \times 8.41$$

$$\lambda = 3\eta/cd$$

$$\eta = 8.41 \times 10^{-6} \text{ kg m}^{-1} \text{ s}^{-1}$$

$$\bar{c} = \sqrt{8 \times 8031 \times 273 / 3.14 \times 2 \times 10^{-3}} = 1.70 \times 10^3 \text{ m s}^{-1}$$

$$d = 2 \times 10^{-3} / 0.0224 = 8.9 \times 10^{-2} \text{ kg m}^{-3}$$

$$\lambda = 3 \times 8.41 \times 10^{-6} / 1.7 \times 10^3 \times 8.9 \times 10^{-2} = 1.67 \times 10^{-7} \text{ m}$$

الحدود عن سلوك الغاز المثالي :

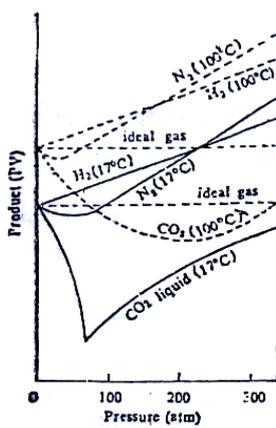
(PV)

PV

P

P

PV



أولاً : عند ضغط منخفض :

PV

PV

PV

ثانياً : عند ضغط مرتفع :

PV

PV

PV

ثالثاً : تأثير درجة الحرارة على سلوك الغاز :

P PV

°17

°100

°17

-

°100

°100

55

°17

P

PV

أسباب الجيود عن المثالية – معادلة فان درفال :

(Actual volume)

$$V \quad (PV = RT)$$

$$(V_{\text{free}})$$

$$V_{\text{free}}$$

$$V$$

$$(V_{\text{molecules}})$$

$$V$$

$$, V$$

$$V_{\text{free}} = V - V_{\text{molecules}}$$

$$V_{\text{molecules}} = \text{zero} :$$

$$(v)$$

$$(b)$$

$$(V - b)$$

$$4$$

:

(

(A)

$$P_1$$

$$P$$

$$P = P_1 - P$$

$$P = P_1 - P$$

$$P' \propto 1/V_2$$

$$P' = a/V_2$$

(a)

$$P = P + a/V_2$$

$$P + a/V_2$$

$$(v - b) = RT$$

()

(n)

$$(P + n a / V_2) (v - n b) = n RT$$

(a b)

b a

(b)	(a)	
2.66×10^{-2}	0.244	هيدروجين
2.37×10^{-2}	0.034	هيليوم
2.18×10^{-2}	1.350	أكسجين
3.91×10^{-2}	1.390	نيتروجين
4.27×10^{-2}	3.590	ثاني أكسيد الكربون
3.71×10^{-2}	4.170	أمونيا

$$(a) \quad -1 \quad - \quad -^2 \quad a \quad -1 \quad b$$

1

°25

$$PV = n RT$$

$$P = n RT / v = 1 \times 0.0821 \times 298 / 1$$

$$= 24.46 \text{ atm}$$

$$n = 1 \text{ mole}$$

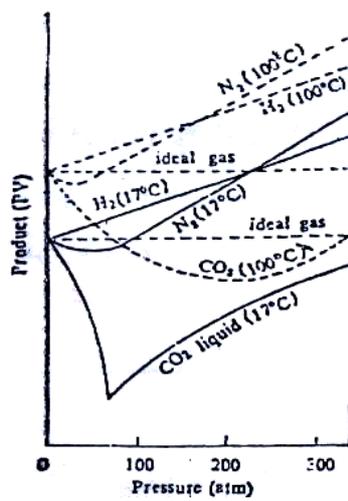
$$b = 3.71 \times 10^{-2}$$

$$a = 4.17$$

$$(P + na/2)(v - b) = n RT$$

$$(P + 1 \times 4.17 / 1 \times 1)(1 - 0.0371) = 0.0821 \times 298$$

$$p = 21.42 \text{ atm}$$



$$PV = Pb + a/v - ab/v^2 = RT = P_1 V_1$$

$$P \quad V_1$$

$$PV - Pb + a/v - ab/v^2 = P_1 V_1$$

$$P \quad (V)$$

$$a/v \quad ab/v^2 \quad Pb$$

$$PV + a/v = P_1 V_1$$

$$pv = P_1 V_1 - a/v$$

$$(PV)$$

P PV

(ab/v)

V P
(Pb) ((ab/v² a/v))

PV = Pb = P₁V₁ , PV = P₁V₁ + Pb
P₁V₁ PV

(b)

(a/v)

Pb

Pb
(a/v)

(ab/v²) (a/v) (b) (Pb)

PV = RT

"أمثلة محلولة"

: (1)

$$\begin{array}{ccc} 1 \text{ atm} & & 2 \\ \frac{1}{2} \text{ atm} & & \end{array}$$

$$\begin{array}{ccc} P_1 = 1 \text{ atm} & , & V_1 = 2 \text{ liter} \\ = P_2 \frac{1}{2} \text{ atm} & , & V_2 = ? \end{array}$$

$$\therefore P_1 V_1 = P_2 V_2 \qquad 2 \times 1 = \frac{1}{2} \times V_2$$

$$\therefore V_2 = \frac{2L \times 1 \text{ atm}}{\frac{1}{2} \text{ atm}} = 4L$$

$$4 \cdot \frac{1}{2} \text{ atm} \qquad \therefore$$

: (2)

$$\begin{array}{ccc} 100 & \cdot & 15 \\ & & 90 \end{array}$$

: n V

$$\therefore \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$\therefore T_2 = \frac{V_1 P_2}{P_1} = \frac{(15^\circ + 273) \times 100}{90} = \frac{288^\circ \times 100}{90} = 320^\circ \text{K} = 47^\circ \text{C}$$

: (3)

$$\begin{array}{ccc} T & P & \\ 2.25 & & 1.5 \\ & & 0.0588 \end{array}$$

:

$$\therefore V_m = \frac{V}{n} \quad (V_m = \quad)$$

$$\therefore \quad = \frac{1.5 \text{ L}}{0.0588 \text{ mole}} = 25.5 \text{ L mol}^{-1}$$

$$T \quad P \quad V_m$$

:

$$n = \frac{V}{V_m} = \frac{2.25 \text{ L}}{25.5 \text{ mole}^{-1}} = 0.0882 \text{ mol.}$$

$$\begin{aligned} \therefore \quad (\text{He}) &= 0.0882 \text{ mol} \times 6.022 \times 10^{23} \\ &= 5.31 \times 10^{22} \text{ He atom.} \end{aligned}$$

: (4)

$$\begin{array}{ccc} 745 & 25 & 152 \\ \text{(STP)} & & \end{array}$$

:

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

$$\therefore V_2 = \frac{P_1 V_1 T_2}{T_1 P_2} = \frac{745 \times 152 \times 273}{298 \times 760}$$

$$= 136.5 \text{ ml} = 0.1365 \text{ L}$$

: (5)

$$600 \quad ^\circ 27 \quad 1$$

$$\therefore PV = nRT \quad \therefore \frac{600}{760} \times V = 1 \times 0.082 \times 300$$

$$\therefore V = \frac{760 \times 0.082 \times 300}{600} = 31.16 \text{ L}$$

: (6)

$$\left(\frac{1}{0.958} \right)$$

$$d_{\text{gas}} = \frac{PM}{RT} = \frac{1 \times 18}{0.082 \times 373} = 0.5885 \text{ L}^{-1}$$

: (7)

$$\text{NH}_3 \quad 3.4 \text{ g} \quad 2 \text{ atm} \quad 27^\circ$$

$$n = \frac{g}{M} = \frac{3.4}{17} = 0.2 \text{ mol}$$

$$V = \frac{nRT}{P} = \frac{0.2 \times 0.082 \times 300}{2} \quad \therefore V = 2.46 \text{ L}$$

: (8)

$$2.84 \text{ L} \quad 10 \text{ g}$$

$$. 2 \text{ atm} \quad 27^\circ$$

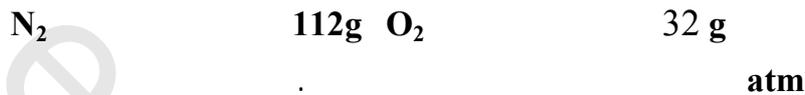
:

$$\therefore PV = \frac{g}{M} RT \quad \therefore 2 \times 2.8 \frac{10}{M} \times 0.0821 \times 300$$

$$\therefore M = \frac{10 \times 0.0821 \times 300}{2 \times 2.8} = 44 \text{ g/mol}$$

$$44 = \quad \therefore$$

: (9)



:

$$\therefore n_{O_2} = \frac{32}{32} = 1 \text{ mole}, \quad n_{N_2} = \frac{112}{28} = 4 \text{ mole}$$

$$\therefore N = n_{O_2} + n_{N_2} = 1 + 4 = 5 \text{ mole}$$

$$\therefore x_{O_2} = \frac{n_{O_2}}{N} = \frac{1}{5}$$

$$\therefore x_{N_2} = \frac{n_{N_2}}{N} = \frac{4}{5}$$

$$\therefore P_{O_2} = x_{O_2} P = \frac{1}{5} \times 1 = \frac{1}{5} \text{ atm.}$$

$$P_{N_2} = x_{N_2} P = \frac{4}{5} \times 1 = \frac{4}{5} \text{ atm.}$$

: (10)



$$. (O = 16) . \text{mn Hg } 750$$

:

$$P = \frac{750}{760} = 0.986 \text{ atm}$$

$$n = \frac{16}{32} = 0.5 \text{ mole}$$

$$T = 273 + 25 = 298 \text{ K} \quad PV = nRT$$

$$V = \frac{nRT}{P} = \frac{0.5 \times 0.082 \times 298}{0.986} = 12.4 \text{ L}$$

: (11)

() - 1
C°100 () C°20 () STP

:

$$P = 1 \text{ atm} \quad T = 273 \text{ K} \quad : \text{STP} \quad ()$$

$$PV = nRT$$

$$V = \frac{nRT}{P} = \frac{1 \times 0.082 \times 273}{1} = 22.4 \text{ L/mole}$$

: 20°C ()

$$V = \frac{1 \times 0.082 \times 293}{1} = 24.4 \text{ L/mol}$$

: 100°C ()

$$V = \frac{1 \times 0.082 \times 373}{1} = 30.61 \text{ L/mol}$$

: (12)

18

. °27

760

:

$$PV = nRT$$

$$n = \frac{PV}{RT} = \frac{1 \times 18}{0.082 \times 300} = 0.732 \text{ moles}$$

$$n \times =$$

$$0.732 \times 6.023 \times 10^{23} =$$

$$4.41 \times 10^{23} =$$

: (13)

g 7.53

L/2.3

:

$$P = 1 \text{ atm ;}$$

$$T = 273 \text{ k}$$

$$PV = nRT$$

$$PV = \frac{m}{M} RT$$

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

: M m

$$1 \times 2.31 = \frac{7.53}{M} \times 0.082 \times 273$$

$$M = \frac{7.53 \times 0.082 \times 273}{1 \times 2.31} = 73 \text{ g}$$

: (14)

120 s

O₂

100 Cm³

. 170 s

:

$$\frac{r_{O_2}}{r_X} = \sqrt{\frac{M_X}{M_{O_2}}}$$
$$O_2 = \frac{100}{170} = \frac{100}{120}$$

$$\frac{\text{معدل انتشار الغاز } O_2}{\text{معدل انتشار الغاز } X} = \frac{100/120}{100/170} = \sqrt{\frac{M_X}{32}}$$

$$\left(\frac{170}{120}\right)^2 = \frac{M_X}{32}$$

$$M_X = \frac{32 \times (170)^2}{(120)^2} = 64.2 \text{ g} \approx 64 \text{ g}$$

SO₂

: (15)

:

. (H = 1) -

. (O = 32) -

$$N_A = 6.023 \times 10^{23} \text{ molecules/mole}$$

:

$$H_2 = \frac{2}{6.02 \times 10^{23}} = 3.32 \times 10^{-24} \text{ g}$$

$$O_2 = \frac{32}{6.02 \times 10^{23}} = 5.31 \times 10^{-23} \text{ g}$$

: (16)

7 g

(N = 14)

$$\begin{aligned} N_2 &= \frac{\text{Wt.of } N_2}{\text{Mol.Wt } N_2} = \frac{7}{28} = 0.25 \text{ mol} \\ &= 0.25 \times 6.02 \times 10^{23} \\ \text{جزیئات} &= 1.50 \times 10^{23} \end{aligned}$$

$$m_{O_2} = \frac{32(\text{gm / mole})}{6.02 \times 10^{23} (\text{molecules / mole})} = 5.30 \times 10^{-23} \text{ g/molecule}$$

$$\bar{V} = \sqrt{\frac{3.kT}{m}} = \sqrt{\frac{3 \times 8.31 \times 10^7 \times 298}{6.02 \times 10^{23} \times 5.3 \times 10^{-23}}} = 4.82 \times 10^4 \text{ cm/sec.}$$

: (17)

C^o27 H₂

$$m_{H_2} = \frac{2(\text{gm / mole})}{6.02 \times 10^{23} (\text{molecules / mole})} = 3.35 \times 10^{-24} \text{ g/molecule}$$

$$K = \frac{R}{N} = \frac{8.31 \times 10^7}{6.02 \times 10^{23}} = 1.38 \times 10^{-16} \text{ erg.mol}^{-1} \text{ deg}^{-1}$$

$$\begin{aligned} \bar{V} &= \sqrt{\frac{3.kT}{m}} \\ &= \sqrt{\frac{3 \times 1.38 \times 10^{-16} \times 300}{3.35 \times 10^{-24}}} = 1.93 \times 10^5 \text{ cm/sec.} \end{aligned}$$

"الأسئلة"

-1

-2

-3

-4

STP

-5

-6

-7

-8

-9

-10

. (RV = nRT)

50 l -11

5 l

(10.5 mmHg) -12

. 27°C

: -13

4 g (R) -

27°C 985 ml

Ar = 40 (2.5 atm)

5.2 atm 25°C -

O₂ 1.6 g -

. (p = 1 atm) °

N₂ 0.0225 -

100 57.2 -14

. 273K 760

-15

(Ar = 40)

20°C UF₆ -16

. (U = 238, F = 19)

/ 110 **XeF₆** -17
· **XeF₆** ·

80 -18

710 °100 **(NH₃)**
· **(H = 1, N = 14)**

2 °27 -19

14 ·
· 1/2 ·

· 0.32 -20

· 12 3 ·

-21

· 10 °25

· °90

3.03 50 -22

· °23

(C₃H₈) -23

· 1 ·

(CH₄) -24

· / 1600 ·

24.47	1	°25		-25
	0.25			
°20		15		-26
800	°300		460	
	°10	1		-27
	°30	$\frac{1}{4}$		
18	N ₂	50		-28
		°25		
	O ₂	8		-29
	1.55	³ 560		-30
				-31
°27		⁵ 10 × 1.2		
		³ 100		
740	CO	3 N ₂	2	-32

³ 300

H₂

-33

:

()

()
