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12-1 (C) 12-2 (D) 12-3 (C) 12-4 (B) 12-5 (B)

12-6

由 $\frac{P_1}{T_1}=\frac{P_2}{T_2}$ 得 $P_2=4.43\times10^5\ Pa$

12-7 $P_1=P_0+\rho gh=5.913\times10^5\ Pa$

$T_1=4+273K=277K$, $T_2=17+273K=290K$

$\frac{P_1V_1}{T_1}=\frac{P_0V_2}{T_2}$ 得 $V_2=6.11\times10^5\ m^3$

12-10

解: (1) $P=nkT$ 得 $n=2.44\times10^{25}\ 个/m^3$

(2) $PM=\rho RT$ 得 $\rho=1.296\times10^3\ g/m^3=1.30\ kg\cdot m^{-3}$

(3) $\bar{\varepsilon}_k=\frac{3}{2}kT$ 得 $\bar{\varepsilon}_k=6.21\times10^{-21}\ J$

(4) $d=\sqrt[3]{\frac{1}{n}}=3.45\times10^{-9}m$

12-11

解: $PM=\rho RT$ $\rho=\frac{m}{V}$ 且有 $\bar{\varepsilon}_k=\frac{3}{2}kT$ 得 $\bar{\varepsilon}_k=3.89\times10^{-22}\ J$

12-12 $\bar{\varepsilon}(0^\circ C)=\frac{3}{2}kT=5.65\times10^{-21}\ J$ $\bar{\varepsilon}(100^\circ C)=\frac{3}{2}kT=7.72\times10^{-21}\ J$

$\bar{\varepsilon}=\frac{3}{2}kT=1eV$ 得 $T=7739K$

12-13 有 $m=\frac{PVM}{RT}$ 故 $\frac{m(H_2)}{m(He)}=.1$

$\frac{E(H_2)}{E(He)}=\frac{\frac{5}{2}pV}{\frac{3}{2}pV}=\frac{5}{3}$

12-14 (1) $\bar{\varepsilon}_k=\frac{3}{2}kT=2.07\times10^{-15}\ J$

(2) $\sqrt{\bar{v}^2}=\sqrt{\frac{3RT}{M}}=1.58\times10^6\ m/s$

12-18 (1) $E=\frac{5}{2}pV$ 得 $P=1.35\times10^5\ Pa$

(2) 由 $PV=\nu RT\Rightarrow PV\cdot N_A=NRT$ 得 $T=362.2K$

则 $\bar{\varepsilon}_k=\frac{3}{2}kT=7.50\times10^{-21}\ J$

12-19 (1) 知 $\bar{\varepsilon}_k(O_2) = 6.21\times10^{-21}\ J$ $\bar{\varepsilon}_k = \frac{3}{2}kT$ 得 $T = 300\ K$

(2) $v_p = \sqrt{\frac{2RT}{M}} = 395\ m/s$

12-24

(1) 总数 N (2). $\int_0^{2v_0} Nf(v)\cdot dv = \int_0^{v_0} \frac{a}{v_0}\cdot v\cdot dv + \int_{v_0}^{2v_0} a\cdot dv = N$

即 $a = \frac{2N}{3v_0}$ (3) $N(\frac{v_0}{2} - \frac{3}{2}v_0) = \int_{\frac{v_0}{2}}^{v_0} \frac{a}{v_0} v\cdot dv + \int_{v_0}^{\frac{3}{2}v_0} a\,dv = \frac{7}{12}N$

(4) $\overline{v^2} = \int_0^{\infty} Nf(v)\cdot v^2\cdot dv \cdot \frac{1}{N} = \frac{1}{N}\cdot(\frac{62Nv_0^2}{360}) = \frac{62v_0^2}{360}$

$\bar{\varepsilon}_k = \frac{1}{2}m\bar{v}^2 = \frac{31mv_0^2}{360}$

12-27. $h = \frac{RT}{Mg}\ln\frac{p_0}{p}$ 得 $h = 1931.6\ m$

12-29

由 $p = nkT$ 得 $n_1 = 3.21\times10^{9}\ m^{-3}$ $n_2 = 3.21\times10^{17}\ m^{-3}$

且有 $\bar{\lambda} = \frac{kT}{\sqrt{2}\pi d^2 p}$ 故 $\bar{\lambda}_1 = 7.78\times10^{8}\ m$ $\bar{\lambda}_2 = 7.78\ m$

12-30

$\bar{z} = \sqrt{2}\pi d^2 \bar{v} n_1 = \sqrt{2}\pi d^2\sqrt{\frac{8kT}{\pi m}}\cdot\frac{p}{kT} = 3.81\times10^{6}\ s^{-1}$

12-31

(1) $\bar{\lambda} = \frac{kT}{\sqrt{2}\pi d^2 p}$ $\frac{\bar{\lambda}_{Ar}}{\bar{\lambda}_{N_2}} = \frac{d_{N_2}^2}{d_{Ar}^2}$ 故 $\frac{d_{Ar}}{d_{N_2}} = \frac{5}{3}$

(2) 由 $\bar{\lambda} = \frac{kT}{\sqrt{2}\pi d^2 p}$ 故 $\bar{\lambda}_{N_2}' = 2\bar{\lambda}_{N_2} = 5.5\times10^{-7}\ m$

$\bar{z} = \frac{\bar{v}}{\bar{\lambda}} = \frac{1}{\bar{\lambda}}\cdot\sqrt{\frac{8RT}{\pi M}} = 8.56\times10^{8}\ s^{-1}$