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12-6

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

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

$T_1=7℃=273.15+7=280.15K$

$T_2=37℃=273.15+7=310.15K$

$\therefore P_2=4.43\times10^5Pa$

12-1 C

12-2 D

12-10

(1) $p=nkT$

$T=27.0℃=273.15+27.0=300.15K$

$k=1.38\times10^{-23}J\cdot K^{-1}$

$\therefore n=2.44\times10^{25}m^{-3}$

(2) $PV=\frac{m'}{M}RT$

$\rho=\frac{m'}{V}$

$\therefore \rho=1.30kg\cdot m^{-3}$

(3) $\overline{\varepsilon_k}=\frac{3}{2}kT$

$\therefore \overline{\varepsilon_k}=6.21\times10^{-21}J$

(4) 记分子间平均距离为d

则 $n=\frac{1}{d^3}$

$\therefore d=3.45\times10^{-9}m$

12-19

(1) $\overline{\varepsilon}_{kO_2}=\overline{\varepsilon}_{kH_2}=6.21\times10^{-21}J$

$\overline{\varepsilon}_{kO_2}=\frac{3}{2}kT$

$\therefore T=300K$

(2)

最概然速率 $v_p=1.41\sqrt{\frac{RT}{M}}=3.95\times10^2m\cdot s^{-1}$

12-3 C

12-5 B

12-17

$$T = 2.0\times10^{6}\,K$$

$$\therefore \sqrt{\overline{v^2}} = \sqrt{\frac{3RT}{M}} = 9.5\times10^{6}\ m\cdot s^{-1}$$

$$\overline{\varepsilon_k} = \frac{3}{2}kT = 4.1\times10^{-17}\ J$$

12-20

$$u \propto \sqrt{\overline{v^2}}$$

$$\sqrt{\overline{v^2}} = \sqrt{\frac{3RT}{M}}$$

$$u \propto \sqrt{\frac{1}{M}}$$

$$\therefore \frac{u_{O_2}}{u_{H_2}} = \sqrt{\frac{M_{H_2}}{M_{O_2}}} = \sqrt{\frac{2}{32}} = \frac{1}{4}$$

12-25

$$\overline{v^2} = \frac{\int_0^\infty v^2 dN}{N}$$

$$\frac{dN}{N} = 4\pi\left(\frac{m}{2\pi kT}\right)^{\frac{3}{2}} e^{-\frac{mv^2}{2kT}} v^2 dv$$

$$\overline{v^2} = \int_0^\infty 4\pi\left(\frac{m}{2\pi kT}\right)^{\frac{3}{2}} e^{-\frac{mv^2}{2kT}} v^4 dv = \frac{3kT}{m} = \frac{3RT}{M}$$

$$\therefore \sqrt{\overline{v^2}} = \sqrt{\frac{3RT}{M}}$$

$$f(v) = 4\pi\left(\frac{m}{2\pi kT}\right)^{\frac{3}{2}} e^{-\frac{mv^2}{2kT}} v^2$$

令 $\frac{df(v)}{dv} = 0$，得 $v = \sqrt{\frac{2kT}{m}} = \sqrt{\frac{2RT}{M}}$

$$\therefore v_p = \sqrt{\frac{2RT}{M}}$$

12-27

$$p = p_0 e^{-\frac{mgh}{kT}}$$

$$\therefore h = \frac{kT}{mg}\ln\frac{p_0}{p} = \frac{RT}{Mg}\ln\frac{p_0}{p} = 1.93\times10^{3}\ m$$

12-4 B