No.

Date

24. 气体动理论

1. B

2. D ($\frac{1}{2}m\bar{v}^2=\frac{3}{2}kT$, $\bar{v}_x^2=\frac{1}{3}\bar{v}^2=\frac{kT}{m}$)

3. A. ($p=nkT$)

~~4. C.~~ 不要求

5. 由 $v_p=\sqrt{\frac{2RT}{M}}$，得

① $T_2>T_1$ ② 曲线①为 O_2

6. $\nu_{H_2}=\frac{2g}{2g}=1mol$, $\nu_{He}=\frac{2g}{4g}=\frac{1}{2}mol$

$T_{H_2}=T_{He}$, $V_{H_2}=V_{He}$

1) $\bar{\varepsilon}_k=\frac{3}{2}kT \rightarrow \bar{\varepsilon}_{kH_2}:\bar{\varepsilon}_{kHe}=1:1$

2) $PV=\nu RT \rightarrow \frac{P_{H_2}}{P_{He}}=\frac{\nu_{H_2}}{\nu_{He}}=\frac{2}{1}$

3) $E=\nu\cdot\frac{i}{2}RT$

$\rightarrow \frac{E_{H_2}}{E_{He}}=\frac{\nu_{H_2}\cdot\frac{5}{2}RT}{\nu_{He}\cdot\frac{3}{2}RT}=\frac{10}{3}$

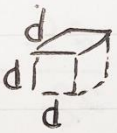
7. 1) $P=nkT \Rightarrow n=\frac{P}{kT}=4.83\times10^{25}/m^3$

2) $PV=\frac{m'}{M}RT \Rightarrow \rho=\frac{m'}{V}=\frac{PM}{RT}=2.57\ kg/m^3$

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

4) 单位体积（$1\ m^3$）内分子数为 n.

平均每个分子占有体积：$\frac{1}{n}(m^3)$

分子间距为 d：  $\Rightarrow d^3$

每个分子占有体积：d^3

$d^3=\frac{1}{n}$

$\Rightarrow d=(\frac{1}{n})^{\frac{1}{3}}=2.75\times10^{-9}\ m$

Date

8. $\nu = \frac{2g}{2g} = 1mol$, $T = 273 + 127 = 400K$

1) $\bar{\varepsilon}_k = \frac{3}{2}kT = 8.28 \times 10^{-21} J$

2) $\bar{\varepsilon}_{总} = \frac{i}{2}kT = \frac{5}{2}kT = 1.38 \times 10^{-20} J$

3) $E = \nu \cdot \frac{i}{2}RT = \frac{5}{2}RT = 8.31 \times 10^3 J$

9.

10 空气: $\rho = 1.29 kg/m^3$, $M = 28.96 g/mol$

$V = 45 m^3$, $T = 273 + 20 = 293 K$

1) $N\bar{\varepsilon}_k = N \cdot \frac{3}{2}kT = \nu N_A \cdot \frac{3}{2}\frac{R}{N_A}T$

$= \nu \cdot \frac{3}{2}RT = \frac{m'}{M} \cdot \frac{3}{2}RT = \frac{\rho V}{M} \cdot \frac{3}{2}RT$

$= 7.32 \times 10^6 J$

2) 空气: 看成双原子分子: $i = 5$.

$E = \nu \cdot \frac{i}{2}RT = \frac{5}{2}\nu RT = \frac{5}{2} \cdot \frac{\rho V}{M}RT$

$\Delta E = \frac{5}{2} \cdot \frac{\rho V}{M}R \cdot \Delta T = 4.17 \times 10^4 J$

3) $\sqrt{\overline{v^2}} = \sqrt{\frac{3RT}{M}}$, $T_1 = ~~400~~ 293 K$, $T_2 = ~~401~~ 294 K$

$\sqrt{\overline{v_2^2}} - \sqrt{\overline{v_1^2}} = \sqrt{\frac{3R}{M}}(\sqrt{T_2} - \sqrt{T_1}) = 0.856 m/s$

9、

解：1) $pV = \nu RT, \quad E = \nu \frac{i}{2} RT,$

$$\Rightarrow E = \frac{i}{2} PV = \frac{5}{2} PV \Rightarrow P = \frac{2E}{5V} = 1.35 \times 10^5 \text{ Pa}$$

2) $$pV = \nu RT = \frac{N}{N_A} RT = NkT$$

$$\Rightarrow T = \frac{PV}{Nk} = 3.62 \times 10^2 \text{ K}$$

$$\bar{\varepsilon}_k = \frac{3}{2} kT = 7.49 \times 10^{-21} \text{ J}$$