

## 参考答案

### 一、选择题

题号	1	2	3	4	5
答案	B	A	C	A	B

### 二、填空题

1.  $N=MN_A/M_{\text{mol}}$

2.  $N \int_{100}^{\infty} f(v) dv$

3. 462       $2.4 \times 10^5$

4.  $6.21 \times 10^{-21}$        $1.49 \times 10^{-7}$

5.  $3 \times 10^5$

### 三、计算题

1.

$$(1) \quad f(v) = \begin{cases} \frac{a}{Nv_0} v, & (0 \leq v \leq v_0) \\ \frac{a}{N}, & (v_0 \leq v \leq 2v_0) \\ -\frac{a}{2Nv_0} v + \frac{2a}{N}, & (2v_0 \leq v \leq 4v_0) \end{cases};$$

$$(2) \quad \because \int_0^{\infty} f(v) dv = \int_0^{v_0} \frac{a}{Nv_0} v dv + \int_{v_0}^{2v_0} \frac{a}{N} dv + \int_{2v_0}^{4v_0} \left(-\frac{a}{2Nv_0} v + \frac{2a}{N}\right) dv = 1,$$

解得:  $a = \frac{2N}{5v_0}$  ;

$$(3) \quad \Delta N = \int_{v_1}^{v_2} N f(v) dv = \int_{v_0/2}^{v_0} N \frac{a}{Nv_0} v dv = \frac{3}{8} a v_0 = \frac{3}{20} N ;$$

$$(4) \quad \begin{aligned} \bar{v} &= \int_0^{\infty} f(v) v dv = \int_0^{v_0} \frac{a}{Nv_0} v^2 dv + \int_{v_0}^{2v_0} \frac{a}{N} v dv + \int_{2v_0}^{4v_0} \left(-\frac{a}{2Nv_0} v + \frac{2a}{N}\right) v dv \\ &= \frac{27}{6} \frac{a}{N} v_0^2 = \frac{9}{5} v_0 \end{aligned} .$$

2.

(1) 氧气与氢气的温度相同, 所以平均平动动能与氢气相同。  $\overline{\varepsilon_k} = 6.21 \times 10^{-21} J$

$$(2) \sqrt{v^2} = \left( 2\overline{\varepsilon_k} / m \right)^{\frac{1}{2}} = 483 \text{ m/s}$$

$$(3) T = 2\overline{\varepsilon_k} / 3k = 300 \text{ K}$$

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