

A1  $S = k \cdot \text{area} \cdot \text{time} = 35 \text{ n}$  (4)

A2  $F_1 l_1 = F_2 l_2 \Rightarrow l_1 = \frac{F_2 l_2}{F_1} = 0,2 \text{ n}$  (2)

A3 (3)

A4  $m g = 91 \cdot 10 = 1 \text{ n}$  (3)

A5  $P = \rho g h = 10^3 \cdot 10 \cdot 6 = 60 \cdot 10^3 \text{ Pa}$  (2)

A6  $\frac{m_2 v_2}{m_1 v_1} = 1,5 \Rightarrow m_2 = \frac{m_1 v_1}{v_2} \cdot 1,5 = 3000 \text{ n}$  (1)

A7  $\lambda = \frac{v}{f} = \frac{500}{2} = 250 \text{ (nm)}$  (2)

A8

$$\begin{cases} F \cos \alpha - m g \sin \alpha - F_g = 0 \\ n - F \sin \alpha = 0 \\ F_g = m g \end{cases}$$

$\Rightarrow F = \frac{m g}{\cos \alpha - \sin \alpha}$  (4)

A9  $m v \sin \alpha = (m + M) u \Rightarrow u = \frac{m v \sin \alpha}{M + m} = \frac{4 \cdot 10 \cdot 0,95}{20} = 1 \text{ m/s}$  (1)

A10  $P = \frac{Q}{M} R T \Rightarrow M = \frac{P R T}{Q} = \frac{2 \cdot 8,31 \cdot 240}{1,68 \cdot 10^5} = 24 \cdot 10^{-3} \text{ kg/mol}$  (3)

A11  $t_{\text{air}} = 22^\circ \text{C}$   $\Delta t = 22 - 17 = 5^\circ \text{C}$   
 $\Rightarrow \varphi = 81\%$  (2)

A12 (2)  $t^\circ \text{C} = T - 273 = 10 - 273$

A13 (1)

A14  $\Delta U = Q - A = Q + A' = 300 + 500 = 800$  (4)

A15  $\frac{P V_1}{T_1} = \frac{P_2 V_2}{T_2} \Rightarrow T_2 = \frac{P_2 V_2}{P_1 V_1} T_1 = \frac{3 \cdot 4}{1 \cdot 7} T_1 = 4 T_1$  (1)

A16  $q = c u = \frac{288 S}{d} \cdot u \Rightarrow \frac{288 S}{d} E d = 288 S E$  (3)

A17  $F = k \frac{q_1 q_2}{r^2} \Rightarrow$  (4)

A18 (2)

A19  $\frac{R_2}{R_3} = \frac{r_2^2 R_2}{r_3^2 R_3} = \frac{\left(\frac{u}{R_1 + R_2}\right)^2 R_2}{\left(\frac{u}{R_3 + R_4}\right)^2 R_3} = \frac{(R_3 + R_4)^2 R_2}{(R_1 + R_2)^2 R_3} = 0,9$  (3)

A20  $w = \frac{v^2}{2} = \frac{3 \cdot 10^{-4} \cdot 6^2}{2} = 5,4 \cdot 10^{-3} \text{ J}$  (3)

A21  $v_4 < v_3 < v_2 \Rightarrow$  (4)

A22 (1)

A23  $q v B = \frac{m v^2}{R} \Rightarrow v = \frac{q B R}{m} \Rightarrow \frac{m_1 v_1^2}{2} = \frac{m_1}{2} \frac{q_1^2 B^2 R^2}{m_1^2} = \frac{q_1^2 B^2 R^2}{2 m_1} = \frac{q_2^2 B^2 R^2}{2 m_2} \Rightarrow \frac{m_2}{m_1} = \left(\frac{q_2}{q_1}\right)^2 \left(\frac{R_2}{R_1}\right)^2 = 1$  (1)

A24  $E = E_C - E_A = k \frac{q q}{r^2} - k \frac{q}{r^2} = k \frac{q}{r^2}$  (3)

A25  ${}^6_4 \text{Be} \Rightarrow z = p = e = 4 \Rightarrow$  (1)

A26 (3)  $E = A + E_{\text{kin}} \Rightarrow E_{\text{kin}} = E - A$

A27 (4)

A28 (3)

A29  ${}^{232}_{90} \text{Th} \rightarrow 2 \cdot {}^4_2 \alpha + 2 \cdot {}^0_{-1} \beta + {}^A_Z \text{X} \Rightarrow z = 90 - 2 \cdot 2 - 2 \cdot (-1) = 89$   
 $A = 232 - 2 \cdot 4 = 224$  (4)

A30 (2)

B1  $c = \frac{288 S}{d}$   $v = 2\pi \sqrt{lc}$  ;  $\nu = \frac{1}{T}$  ;  $\lambda = v T$

A	B	B
2	3	2

B2  $x = A \sin \frac{2\pi}{T} t$   $E = \frac{k x^2}{2}$   $E_{\text{max}} = \frac{k A^2}{2}$   $E = \frac{1}{2} E_{\text{max}} \Rightarrow x^2 = \frac{A^2}{2} \Rightarrow x = \frac{A}{\sqrt{2}}$   
 $\Rightarrow \sin \frac{2\pi}{T} t = \frac{1}{\sqrt{2}} \Rightarrow \frac{2\pi}{T} t = \frac{\pi}{4} \Rightarrow t = \frac{T}{8} = \frac{1}{8} = 0,125 \text{ (s)}$

B3  $P V = \frac{m}{M} R T \Rightarrow M = \frac{m R T}{P V} = \frac{2 \cdot 8,31 \cdot 320}{10^5 \cdot 1,68} = 0,032 \text{ (kg/mol)} = 32 \text{ (g/mol)}$

B4  $\frac{R_2}{R_3} = 0,45$  ;  $u = 8 - 0,225 \cdot 2 \Rightarrow 4,5 = 8 - 0,45 \cdot 2 \Rightarrow 2 = \frac{8}{0,45}$  ;  $4,5 = 8 - \frac{0,225}{0,45} \cdot 8 = 0,5 \cdot 8 \Rightarrow 8 = 9 \text{ (B)}$