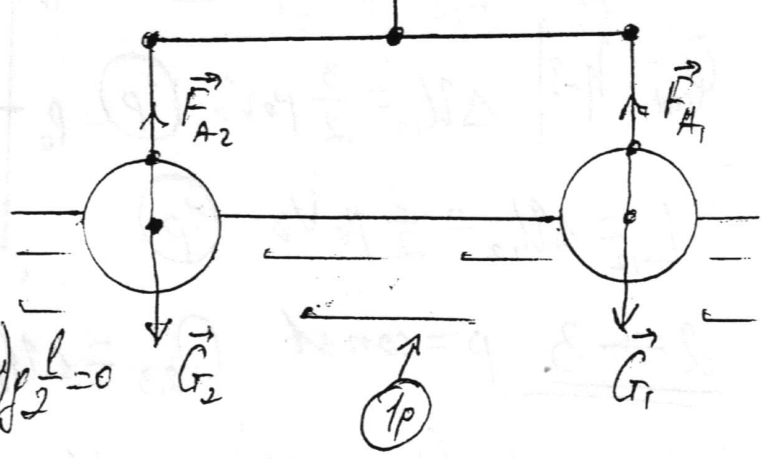


Soluziyon XI

ρ_0, ρ_1
 $V'_{BC} = \frac{1}{4}V$
 $V''_{BC} = \frac{3}{4}V$
 $\rho_2 = ?$



$(\rho_0 \frac{3}{4}V - \rho_2 V)g \frac{l}{2} - (\frac{1}{4}V \rho_0 - \rho_1 V)g \frac{l}{2} = 0$

$\rho_2 = \rho_1 + \frac{1}{2}\rho_0$

(3p)

(1p)

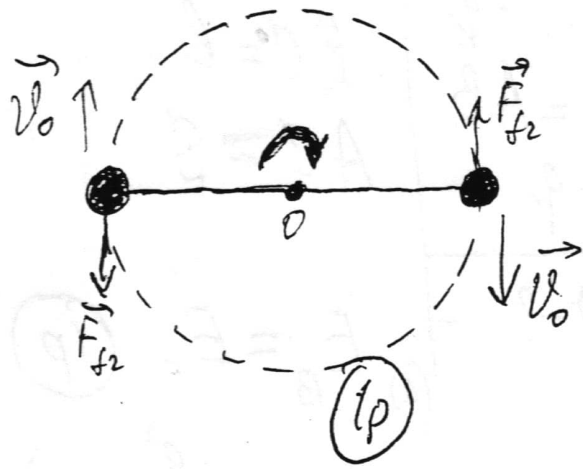
(1p)

v_0, M
 1-?

$$L = N \pi l_0 \quad (1) \quad (1p)$$

$$2 \frac{m v_0^2}{2} = 2 \mu m g L \quad (1p)$$

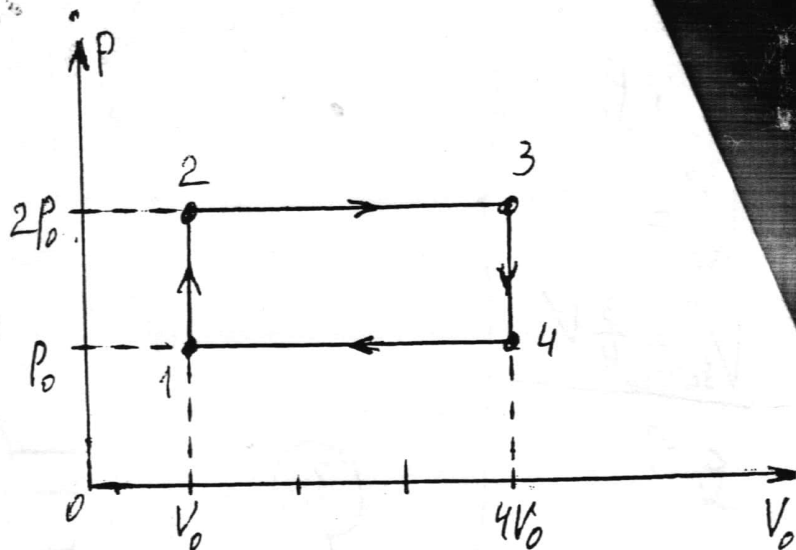
$$N = \frac{v_0^2}{2 \pi g l_0} \quad (1p)$$



$$p_0 V_0 \quad \left. \begin{array}{l} 1 \rightarrow 2 \\ V = \text{const} \\ L_{12} = 0 \end{array} \right\} \textcircled{1p}$$

$$Q_{\text{ced}} = ? \quad \eta = ? \quad \Delta U_{12} = \frac{3}{2} p_0 V_0 \quad \textcircled{1p}$$

$$L_{12} = \Delta U_{12} = \frac{3}{2} p_0 V_0 \quad \textcircled{1p}$$



$$2 \rightarrow 3 \quad p = \text{const} \quad Q_{2,3} = \Delta U_{2,3} + L_{2,3} \quad \textcircled{1p}$$

$$L_{2,3} = 2p_0(4V_0 - V_0) = 6p_0V_0 \quad \Delta U_{2,3} = \frac{3}{2} L_{2,3} = 9p_0V_0 \quad \textcircled{2p}$$

$$Q_{2,3} = 15p_0V_0$$

$$3 \rightarrow 4 \quad V = \text{const} \quad L_{34} = 0 \quad Q_{34} = \Delta U_{3,4} \quad \textcircled{1p}$$

$$Q_{34} = \Delta U_{34} = \frac{3}{2} (4V_0 p_0 - 8V_0 p_0) = -6p_0V_0 \quad \textcircled{1p}$$

$$4 \rightarrow 1 \quad p = \text{const} \quad Q_{41} = \Delta U_{41} + L_{41} \quad \textcircled{1p}$$

$$L_{41} = p_0(V_0 - 4V_0) = -3p_0V_0; \quad \Delta U_{41} = \frac{3}{2} L_{41} = -4.5p_0V_0; \quad Q_{41} = -7.5p_0V_0 \quad \textcircled{1p}$$

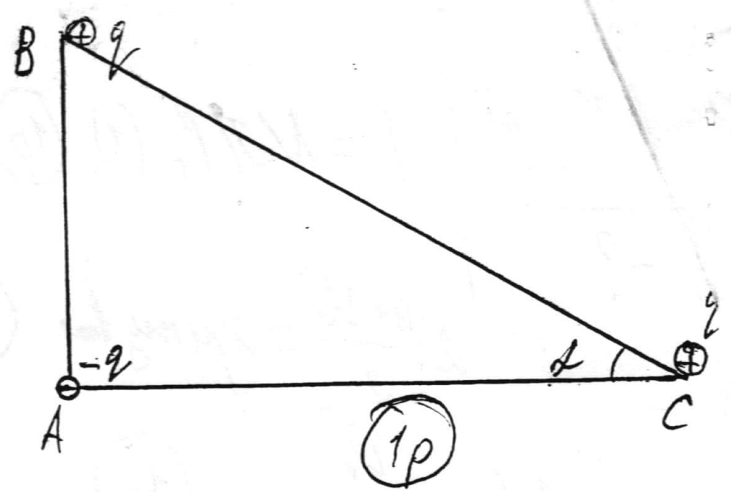
$$Q_{\text{prim}} = Q_{12} + Q_{23} = 16.5p_0V_0; \quad Q_{\text{ced}} = Q_{34} + Q_{41} = -13.5p_0V_0 \quad \textcircled{1p}$$

$$L = L_{12} + L_{23} + L_{34} + L_{41} = 3p_0V_0$$

$$\eta = \frac{L}{Q_{\text{prim}}} \cdot 100\% = \frac{3p_0V_0}{16.5p_0V_0} \cdot 100\% \approx 18.2\% \quad \textcircled{1p}$$

$M, +q$
 $h = AB$
 $-q$

$BC = l$
 $AC = S$



$v = ?$

(a) $E_B = E_C$ (1p)

$$E_B = mgh - K \frac{q^2}{h} \quad (1) \quad (2p)$$

$$E_C = E_{kin} + E_{pot} = \frac{mv^2}{2} + \frac{J\omega^2}{2} - K \frac{q^2}{S} \quad (2) \quad (2p)$$

$\omega = \frac{v}{r} \quad (3) \quad S = h \cot \alpha \quad (4) \quad (1p) \quad (3), (4), (5) \rightarrow (A)$

$$J = \frac{2}{5} m r^2 \quad (5)$$

$$E_C = \frac{7}{10} m v^2 - K \frac{q^2 \cot \alpha}{h} \quad (6) \quad (1p)$$

(1), (5) \rightarrow (a):

$$mgh - K \frac{q^2}{h} = \frac{7}{10} m v^2 - K \frac{q^2 \cot \alpha}{h}$$

$$v = \sqrt{\frac{gh}{\frac{7}{10}} + K \frac{q^2}{h} (\cot \alpha - 1) \frac{1}{\frac{7}{10} m}} \quad (1p)$$

$$\frac{r, \sigma, \rho}{Q-?}$$

$$h = \frac{2\sigma}{\rho g r} \quad (1p) \quad L = F_s h = 2\sigma r \sigma \frac{2\sigma}{\rho g r} = \frac{4\sigma^2}{\rho g} \quad (2p)$$

$$E_p = m g \frac{h}{2} = \rho \pi r^2 g h \frac{h}{2} = \frac{1}{2} \pi g \rho r^2 \frac{4\sigma^2}{\rho^2 g^2 r^2} = \frac{2\sigma^2}{\rho g} \quad (2p)$$

$$Q = L - E_p = \frac{4\sigma^2}{\rho g} - \frac{2\sigma^2}{\rho g} = \frac{2\sigma^2}{\rho g} \quad (2p)$$