Phy 2 2012/07

Q1.

$$p_A = p_B = p_0 + \rho_m g h_2 = 1.01 \times 10^5 + 13600 \times 9.8 \times 0.1 = 1.14 \times 10^5 \text{ (Pa)}$$
$$p = p_A - \rho_w g h_1 = 1.14 \times 10^5 - 1000 \times 9.8 \times 0.2 = 1.12 \times 10^5 \text{ (Pa)}$$

Q2.

$$R_v = Av = \pi r^2 v \rightarrow v = \frac{R_v}{\pi r^2} = \frac{3}{60\pi \times 0.06^2} = 4.42 \text{ (m/s)}$$

Q3.

We have:

$$\Delta A = A_0 \alpha_A \Delta T \rightarrow 0.05 = 10^2 \times (2\alpha) \times 70 \rightarrow \alpha = 3.57 \times 10^{-6} \text{ (°C}^{-1}\text{)}$$

Q4.

We have:

$$P'_{cond} = k\left(\frac{1}{2}A\right)\frac{T_H - T_L}{2L} = \frac{1}{4}kA\frac{T_H - T_L}{L} = \frac{1}{4}P_{cond}$$
$$\rightarrow P'_{cond} = \frac{1}{4}P_{cond} \rightarrow \frac{Q'}{t'} = \frac{Q}{4t} \rightarrow t' = \frac{Q'(4t)}{Q} = \frac{1200(4 \times 1)}{600} = 8 \text{ (min)}$$

Q5.

For a closed cycle: $\Delta E = 0 \rightarrow W_{net} = Q_{net} = 4.5\ (J)$

a)

$$W_{CA} = p(V_A - V_C) = 10(1.5 - 3.2) = -17 \text{ (J)}$$

b)

Since, we have: $W_{AB} = 0$ (J) (isochoric process)

Therefore,

$$W_{BC} = W_{net} - W_{AB} - W_{CA} = 4.5 - 0 - (-17) = 21.5 \text{ (J)}$$