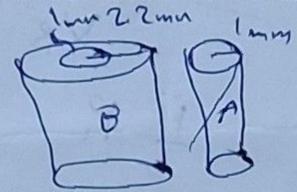
Q1: Two conductors are made of the same material and have the same length. Conductor **A** is a solid wire of radius 1.0 mm. Conductor **B** is a hollow tube of outside radius 2.2 mm and inside radius 1.0 mm. What is the resistance ratio R_A/R_B, measured between their ends?



$V = IR$

$R = \frac{V}{I}$

$\frac{\rho L}{A}$

$A = 2\pi r$

$$\frac{R_A}{R_B} = \frac{\frac{\rho L}{A_A}}{\frac{\rho L}{A_B}}$$

$$\frac{R_A}{R_B} = \frac{\rho L}{A_A} \cdot \frac{A_B}{\rho L}$$

$$\frac{R_A}{R_B} = \frac{1}{2\pi(1\times10^{-3})^2} \cdot (2\pi(2\times10^{-3})^2 - 2\pi(1\times10^{-3})^2)$$

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$$= \frac{(2\times10^{-3})^2 - (1\times10^{-3})^2}{(1\times10^{-3})^2}$$

$$= \frac{(1\times10^{-3})^2}{(1\times10^{-3})^2} = 1$$

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Q2: Switch S in Fig.1 is closed at time t = 0,to begin charging an initially uncharged capacitor of capacitance C = 49.0 μF through a resistor of resistance R = 32.0 Ω.At what time is the potential across the capacitor equal to that across the resistor?

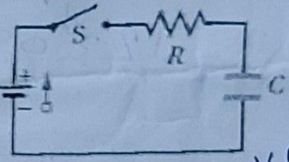

Fig.1

$V_c =^? V_R$

$V(t) = \mathcal{E}(1 - e^{-t/RC})$

$V_R = I R$

$V_R = V_c$

$I R = \mathcal{E}(1 - e^{-t/RC})$

$\frac{\mathcal{E}}{R}(R) = \mathcal{E}(1 - e^{-t/RC})$

$1 = 1 - e^{-t/RC}$

$2 = -e^{-t/RC}$

$-2 = e^{-t/RC}$

$0.69 = +t/(32 * 49 * 10^{-6})$

$t = 1.086\ ms$

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$v(t) = \mathcal{E}(1 - e^{-t/RC})$

$= \mathcal{E}$

$I_0 = \frac{R}{\mathcal{E}}$

$I(0) = \frac{R}{\mathcal{E}} e^{-t/RC}$

$= \frac{R}{\mathcal{E}}$

$V(0) = \mathcal{E}C$

$q = \mathcal{E}C$

$\mathcal{E} = \frac{q}{C}$

$V = IR$