

CURRENT OF ELECTRICITY QUIZ

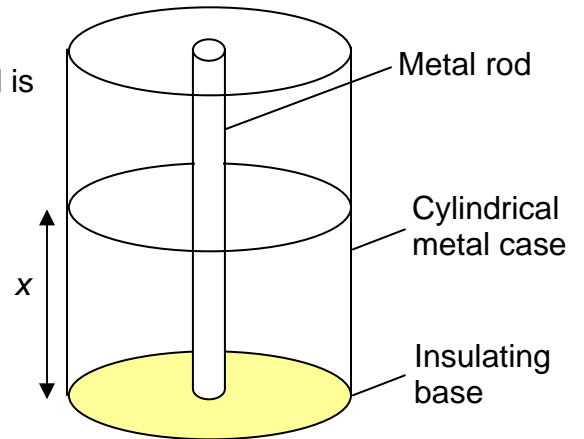
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N88/I/13

A conducting liquid fills a cylindrical metal case to a depth x as shown in the diagram.

The resistance between the case and the metal rod is

- A proportional to x^2 .
- B proportional to x .
- C independent of x .
- D inversely proportional to x .
- E inversely proportional to x^2 .

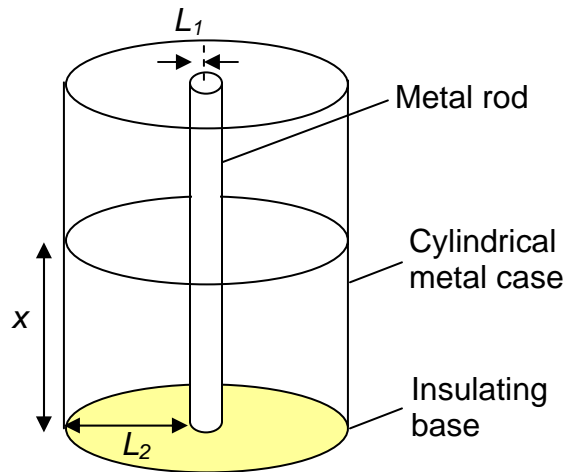
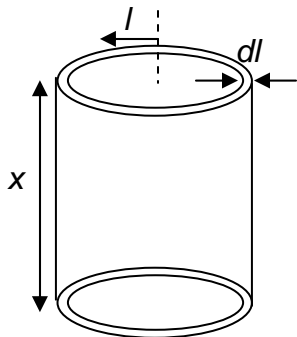


SOLUTION

Ans: D

Recall: $R = \frac{\rho L}{A}$

Consider a small strip dl



$$\text{Resistance of the small strip} = \frac{\rho dl}{2\pi lx}$$

$$\text{Total resistance, } R = \int_{L_1}^{L_2} \frac{\rho}{2\pi lx} dl = \frac{\rho}{2\pi x} \ln\left(\frac{L_2}{L_1}\right)$$