



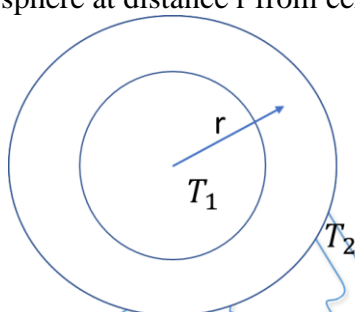
Video Solution on Website:-

<https://physicsaholics.com/home/courseDetails/68>

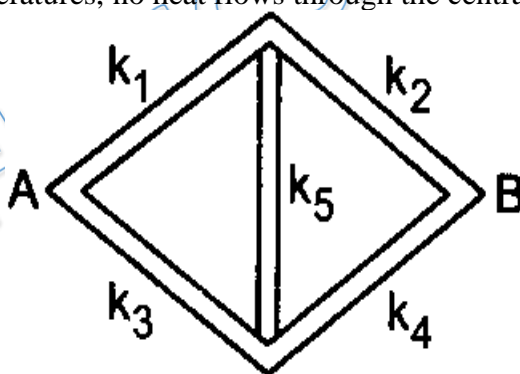
Video Solution on YouTube:-

<https://youtu.be/6LNeBN2m0dc>

- Q 1. A hollow conducting sphere has inner radius R and outer radius $2R$. Temperatures of inner cavity and surroundings are T_1 and T_2 ($T_2 < T_1$) respectively. These temperatures are not changing with time. Temperature gradient in sphere at distance r from centre is directly proportional to



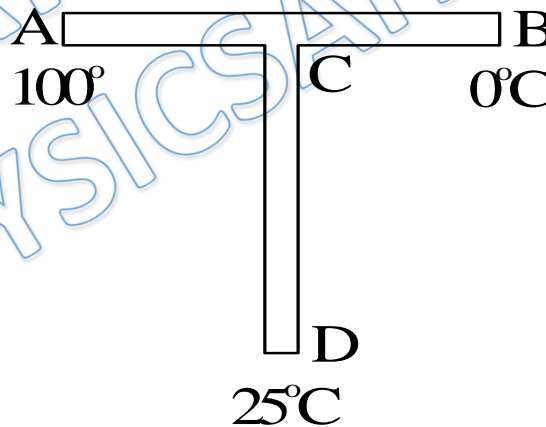
- (a) r
(b) $1/r$
(c) r^2
(d) None of the above
- Q 2. Five rods of the same dimensions are arranged as shown. They have thermal conductivities k_1, k_2, k_3, k_4 and k_5 . When points A and B are maintained at different temperatures, no heat flows through the central rod. It follows that



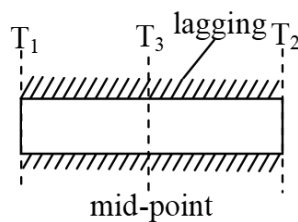
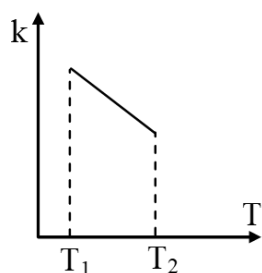
- (a) $k_1 = k_4$ and $k_2 = k_3$
(b) $k_1/k_4 = k_2/k_3$
(c) $k_1k_4 = k_2k_3$
(d) $k_1k_2 = k_3k_4$
- Q 3. Ice starts freezing in a lake with water at 0°C when the atmospheric temperature is -10°C . If the time taken for 1 cm of ice to be formed is 12 minutes the time taken for the thickness of the ice to change from 1 cm to 2 cm will be
- (A) 12 minutes
(B) less than 12 minutes
(C) more than 12 minutes but less than 24 minutes
(D) more than 24 minutes



- Q 4. A pond of water at 0°C is covered with layer of ice 4 cm thick if air temperature is -10°C (constant), how long it takes ice thickness to increase to 8 cm? $K_{\text{ice}} = 2 \text{ W/m}^\circ\text{C}$, $L_f = 80 \text{ cal/gm}$, $\rho_{\text{ice}} = 900 \text{ kg/m}^3$.
- Q 5. Water in pond is at 0°C . The temperature of ambient air is constant at -20°C . Thickness x of ice film in centimeter increases with t in second according to relation (density of ice = 0.917 g/cc , conductivity of ice = 0.005 cgs and latent heat of ice = 80 cal/gm)
- (a) $x = 2.73 \times 10^{-3} t$
 - (b) $x^2 = 2.73 \times 10^{-3} t$
 - (c) $t^2 = 2.73 \times 10^{-3} x$
 - (d) $t = 2.73 \times 10^{-3} x$
- Q 6. A hollow metallic sphere of radius 20 cm surrounds a concentric metallic sphere of radius 5 cm. The space between the two spheres is filled with a nonmetallic material. The inner and outer spheres are maintained at 50°C and 10°C respectively and it is found that 100 J of heat passes from the inner sphere to the outer sphere per second. Find the thermal conductivity of the material between the spheres.
- Q 7. For a solid cylinder of length L_0 , area A conductivity varies with temperature T as $k = k_0(1 + \alpha T)$. If one end is at $2T_0$ and other at T_0 , find rate of heat flow?
- Q 8. A rod CD of thermal resistance 5.0 K/W is joined at the middle of an identical rod AB as shown in fig. The ends A, B and D are maintained at 100°C , 0°C and 25°C respectively. Find the heat current in CD in Watt.



- Q 9. Over a certain temperature range, the thermal conductivity k of a metal is not constant but varies as indicated in figure. A lagged rod of the metal has its ends maintained at temperatures T_1 and T_2 ($T_2 > T_1$) as shown in figure. Which one of the following correctly describes how T_3 , the temperature at the mid-point of the rod, compares with T_1 and T_2 ?



- (A) $T_3 = (T_1 + T_2)/2$ (B) $T_3 = (T_1 - T_2)/2$
(C) $T_3 > (T_1 + T_2)/2$ (D) $T_3 < (T_1 + T_2)/2$

Answer Key

Q.1 d	Q.2 c	Q.3 d	Q.4 10.03 hrs.	Q.5 b
Q.6 3	Q.7 $\frac{k_0 A T_0}{L_0} \left(1 + \frac{3\alpha T_0}{2} \right)$	Q.8 4	Q.9 d	