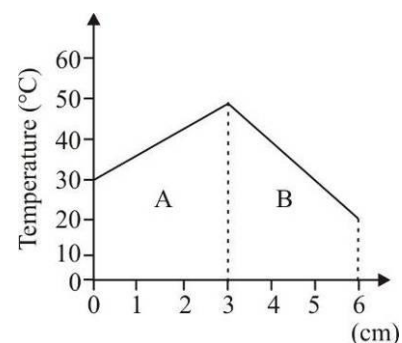


Date Planned : __ / __ / __	Daily Tutorial Sheet - 3	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level - 1	Exact Duration : _____
Topics covered : Conduction		

31. The thermal conductivity of a rod depends on :
 (A) Length (B) Mass
 (C) Area of cross section (D) Material of the rod
32. A heat flux of 4000 J/s is to be passed through a copper rod of length 10 cm and area of cross section 100 cm^2 . The thermal conductivity of copper is $400 \text{ W/m/}^\circ\text{C}$. The two ends of this rod must be kept at a temperature difference of :
 (A) 1°C (B) 10°C (C) 100°C (D) 1000°C
33. One end of a metal rod is kept in a furnace. In steady state, the temperature of the rod :
 (A) Increases (B) Decreases
 (C) Is uniform (D) is non uniform
34. Two sheets of thickness d and $3d$, are touching each other. The temperature just outside the thinner sheet is T_1 and on the side of the thicker sheet is T_3 . The interface temperature is T_2 . T_1, T_2 and T_3 are in arithmetic progression. The ratio of thermal conductivity of thinner sheet to thicker sheet is : 
 (A) $1 : 3$ (B) $3 : 1$ (C) $2 : 3$ (D) $3 : 9$
35. One end of a conducting rod is maintained at temperature 50°C and at the other end ice is melting at 0°C . The rate of melting of ice is doubled if :
 (A) The temperature is made 200°C and the area of cross-section of the rod is doubled
 (B) The temperature is made 100°C and length of the rod is made four times
 (C) Area of cross-section of rod is halved and length is doubled
 (D) The temperature is made 100°C and area of cross-section of rod and length both are doubled
36. The temperatures across two different slabs A and B are shown in the steady state (as shown in figure). The ratio of thermal conductivities of A and B is : (Assume both rods have equal areas of cross-section and equal heat current flows through them) 
 (A) $2 : 3$
 (B) $3 : 2$
 (C) $1 : 1$
 (D) $5 : 3$



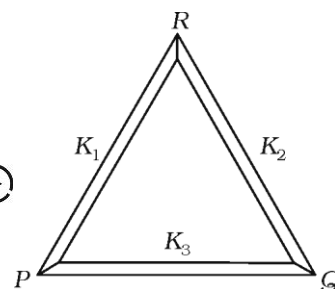
37. Three rods of same dimensions are arranged as shown in figure. They have thermal conductivities K_1 , K_2 and K_3 . Then points P and Q are maintained at different temperatures for the heat to flow at the same rate along PRQ and PQ . Which of the following options is correct?

(A) $K_3 = 1 / 2(K_1 + K_2)$

(B) $K_3 = K_1 + K_2$

(C) $K_3 = \frac{K_1 K_2}{K_1 + K_2}$

(D) $K_3 = 2(K_1 + K_2)$



38. Two rods of same length and material transfer a given amount of heat in 12 s, when they are joined end to end. But when they are joined lengthwise, they will transfer same heat in same conditions in :

(A) 24 s

(B) 3 s

(C) 1.5 s

(D) 48 s

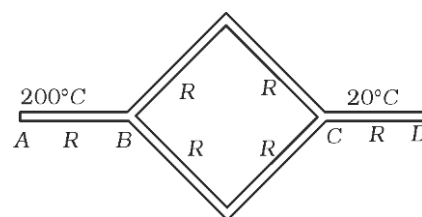
39. Six identical conducting rods are joined as shown in figure. Points A and D are maintained at temperatures 200°C and 20°C , respectively. The temperature of junction B will be :

(A) 120°C

(B) 100°C

(C) 140°C

(D) 80°C



40. A 'cold box' in the shape of a cube of edge 50 cm is made of 'thermocol' material 4.0 cm thick. If the outside temperature is 30°C , the quantity of ice that will melt each hour inside the 'cold box' is : (the thermal conductivity of the thermocol material is $0.050 \text{ W/m}^2 \text{ K}$)

(A) 1.52 kg

(B) 0.605 kg

(C) 2.520 kg

(D) 0.512 kg

41. The only possibility of heat flow in a thermos flask is through its cork which is 75 cm^2 in area and 5 cm thick. Its thermal conductivity is $0.0075 \text{ cal/cm-s}^\circ\text{C}$. The outside temperature is 40°C and latent heat of ice is 80 cal/g . Time taken by 500 g of ice at 0°C in the flask to melt into water at 0°C is :

(A) 2.47 h

(B) 4.27 h

(C) 7.42 h

(D) 4.72 h



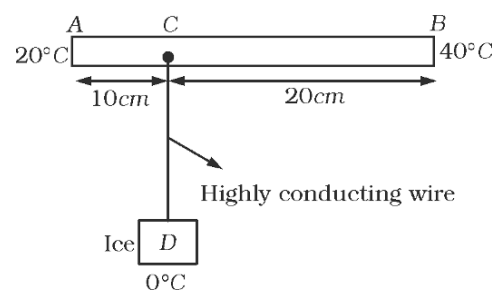
42. As shown in the figure, AB is a rod of length 30 cm and area of cross section 1.0 cm^2 and thermal conductivity 336 SI units. The ends A and B are maintained at temperature 20°C and 40°C , respectively. A point C of this rod is connected to a box D , containing ice at 0°C , through a highly conducting wire of negligible heat capacity. The rate at which ice melts in the box is : (Assume latent heat of fusion for ice $L_f = 80 \text{ cal/g}$)

(A) 84 mg/s

(B) 84 g/s

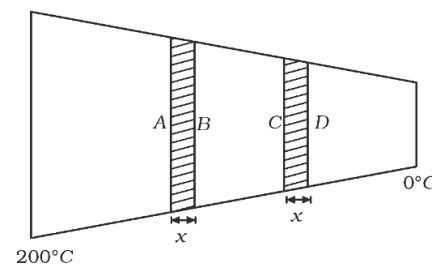
(C) 20 mg/s

(D) 40 mg/s



43. Two ends of a conducting rod of varying cross-section are maintained at 200°C and 0°C respectively. In steady state : 

- (A) Temperature difference across AB and CD are equal
- (B) Temperature difference across AB is greater than that of across CD
- (C) Temperature difference across AB is less than that of across CD
- (D) Temperature difference may be equal or different depending on the thermal conductivity of the rod



44. Three rods A , B and C have the same dimensions. Their thermal conductivities are k_A , k_B and k_C respectively. A and B are placed end to end, with their free ends kept at a certain temperature difference. C is placed separately, with its ends kept at the same temperature difference. The two arrangements conduct heat at the same rate. k_C must be equal to :

- (A) $k_A + k_B$
- (B) $\frac{k_A k_B}{k_A + k_B}$
- (C) $\frac{1}{2} (k_A + k_B)$
- (D) $2 \cdot \left(\frac{k_A k_B}{k_A + k_B} \right)$

45. Which of the following combinations of properties would be most desirable for a cooking pot?

- (A) High specific heat and low conductivity
- (B) Low specific heat and high conductivity
- (C) High specific heat and high conductivity
- (D) Low specific heat and low conductivity