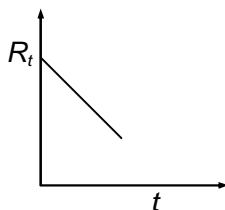


HEAT & HEAT TRANSFER

- The temperature coefficient of resistance of a wire is  $0.00125\text{ }^{\circ}\text{C}^{-1}$ . At 300 K its resistance is  $1\ \Omega$ . The resistance of the wire will be  $2\ \Omega$  at  
 A) 1154 K  
 B) 1100 K  
 C) 1400 K  
 D) 1127 K
- The faulty thermometer has its fixed points marked  $5^{\circ}$  and  $95^{\circ}$ . This thermometer reads the temperature of body as  $59^{\circ}$ . Then the correct temperature on the Celsius scale is  
 A)  $59\text{ }^{\circ}\text{C}$   
 B)  $60\text{ }^{\circ}\text{C}$   
 C)  $48.6\text{ }^{\circ}\text{C}$   
 D)  $58\text{ }^{\circ}\text{C}$
- Two thermometers one Celsius and other Fahrenheit are put in a hot bath. The reading of Fahrenheit scale is just three times the reading on Celsius thermometer. The temperature of the bath is  
 A)  $100\text{ }^{\circ}\text{C}$   
 B)  $\left(\frac{80}{3}\right)\text{ }^{\circ}\text{C}$   
 C)  $80\text{ }^{\circ}\text{C}$   
 D)  $70\text{ }^{\circ}\text{C}$
- The resistance  $R_t$  of a conductor varies with temperature is shown in fig. It may be expressed as ( $a, \beta$  being positive constants)



- A)  $R_t = R_0(1 + at + \beta t^2)$   
 B)  $R_t = R_0(1 - at - \beta t^2)$   
 C)  $R_t = R_0(1 + at)$   
 D)  $R_t = R_0(1 - at)$
- The higher and lower fixed points on a thermometer are separated by 160 mm. When the length of the mercury thread above the lower temperature is 40 mm, the temperature reading would be  
 A)  $40\text{ }^{\circ}\text{C}$   
 B)  $120\text{ }^{\circ}\text{C}$   
 C)  $32\text{ }^{\circ}\text{C}$   
 D)  $25\text{ }^{\circ}\text{C}$
  - A thin circular brass disc has a concentric hole made through it so as to make a washer. It is then heated. Owing to expansion of metal, the diameter of hole will  
 A) increase  
 B) decrease  
 C) remains same  
 D) none of the above
  - If a bimetallic strip is heated, it  
 A) bend towards the metal with lower thermal expansion coefficient  
 B) bend towards the metal with higher thermal expansion coefficient  
 C) not bend at all  
 D) twist itself into a helix

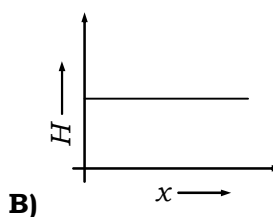
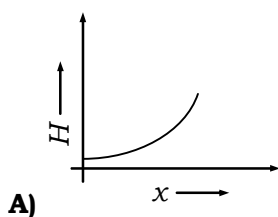
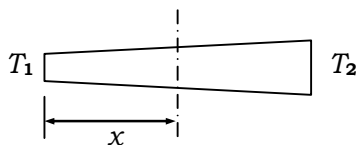


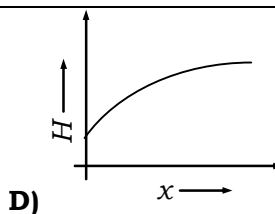
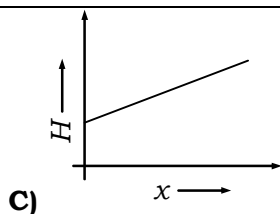




32. Two spheres of the same material have radii 1 m and 4 m and temperature 4000 K and 2000 K respectively. The energy radiated per second by the first sphere is
- greater than that by the second
  - less than that by the second
  - equal in both cases
  - the information is incomplete to draw any conclusion
33. A perfectly black body emits radiation at temperature  $T_1$  K. If it is to radiate 16 times this power, its temperature  $T_2$  K will be
- $T_2 = 16 T_1$
  - $T_2 = 8 T_1$
  - $T_2 = 4 T_1$
  - $T_2 = 2 T_1$
34. A spherical body with a radius of 12 cm radiates 450 W power at temperature 500 K. If the radius were halved and the temperature doubled; the power radiated in watt should be
- 225
  - 450
  - 900
  - 1800
35. Two identical vessels made of different materials having conductivities  $K_1$  and  $K_2$  are completely filled with ice at 0 °C. Due to temperature of surroundings, the ice in the two vessels melts in 25 min and 20 min respectively. The ratio of  $K_1$  and  $K_2$  is
- $\frac{5}{4}$
  - $\frac{4}{5}$
  - $\frac{16}{25}$
  - $\sqrt{\frac{5}{4}}$
36. Two rods of length  $l$  and  $2l$ , thermal conductivities  $2K$  and  $K$  are connected end to end. If cross-sectional areas of two rods are equal, then equivalent thermal conductivity of the system is
- $\frac{5}{6} K$
  - $1.5 K$
  - $1.2 K$
  - $\frac{8}{9} K$
37. Two rods of same length and material transfer given amount of heat in 12 s, when they are joined end to end. When they are joined length-wise, then they will transfer same amount of heat in same conditions in
- 1.5 s
  - 3 s
  - 24 s
  - 48 s
38. When a body has the same temperature as that of its surroundings, it radiates
- no heat
  - less quantity of heat than that it receives from the surroundings
  - same quantity of heat than that it receives from the surroundings
  - more quantity of heat than that it receives from the surroundings
39. A blackened metal foil is warmed by radiation from a point source at temperature  $T$  placed at a distance  $d$ . It is found that the power received by the foil is  $P$ . If both temperature and distance are doubled, power received by the foil will be
- $P$
  - $2P$
  - $4P$
  - $16P$
40. If a liquid is heated in weightlessness, the heat is transmitted through

- A) conduction  
 B) convection  
 C) radiation  
 D) neither, because liquid cannot be heated in weightlessness
41. An anisotropic material has coefficients of linear thermal expansion  $\alpha_1$ ,  $\alpha_2$  and  $\alpha_3$  along  $x$ ,  $y$  and  $z$ -axis respectively. Coefficient of cubical expansion of the material will be  
 A)  $\alpha_1 + \alpha_2 + \alpha_3$   
 B)  $\alpha_1 + 2\alpha_2 + 3\alpha_3$   
 C)  $\sqrt{\alpha_1\alpha_2\alpha_3}$   
 D)  $\frac{\alpha_1 + \alpha_2 + \alpha_3}{3}$
42. If a bar is made of copper whose coefficient of linear expansion is one and half times that of iron, the ratio of force developed in the copper bar to the iron bar of identical lengths and cross-sections, when heated through the same temperature range (Young's modulus of copper and iron is supposed to be equal) is  
 A)  $\frac{3}{2}$   
 B)  $\frac{2}{3}$   
 C)  $\frac{9}{4}$   
 D)  $\frac{4}{9}$
43. Two identical calorimeters  $A$  and  $B$  contain equal quantity of water at  $20^\circ\text{C}$ . A  $5\text{ gm}$  piece of metal  $X$  of specific heat  $0.2\text{ cal gm}^{-1}\text{C}^{-1}$  is dropped into  $A$  and a  $5\text{ gm}$  piece of metal  $Y$  into  $B$ . The equilibrium temperature in  $A$  is  $22^\circ\text{C}$  and in  $B$  is  $23^\circ\text{C}$ . The initial temperature of both the metals is  $40^\circ\text{C}$ . The specific heat of metal  $Y$  in  $\text{cal gm}^{-1}\text{C}^{-1}$  is  
 A)  $\frac{17}{85}$   
 B)  $\frac{27}{85}$   
 C)  $\frac{14}{95}$   
 D)  $\frac{17}{95}$
44. Radius of a conductor increases uniformly from left end to right end as shown in figure. Material of the conductor is isotropic and its curved surface is thermally isolated from surrounding. Its ends are maintained at temperatures  $T_1$  and  $T_2$  ( $T_1 > T_2$ ): If, in steady state, heat flow rate is equal to  $H$ , then which of the following graphs is correct





45. An iron tyre of diameter 2 m is to be fixed on to a wooden wheel of diameter 2.01 m. The temperature to which the tyre must be heated if  $\alpha = 11 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$  and room temperature is  $20 \text{ }^\circ\text{C}$  will be  
 A)  $475.5 \text{ }^\circ\text{C}$  B)  $490.5 \text{ }^\circ\text{C}$   
 C)  $440.5 \text{ }^\circ\text{C}$  D)  $460.5 \text{ }^\circ\text{C}$
46. Let steel rails 40 m long be laid on a day when the temperature is  $10^\circ\text{C}$ . The space that must be left between the rails to allow for expansion at a temperature of  $60^\circ\text{C}$  is ( $\alpha = 12 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$ )  
 A) 0.012 m B) 0.024 m  
 C) 0.014 m D) 0.048 m
47. The density of a substance at  $100 \text{ }^\circ\text{C}$  is  $7.25 \text{ g/c.c.}$  and at  $0 \text{ }^\circ\text{C}$  is  $7.5 \text{ g/c.c.}$  Coefficient of linear expansion is  
 A)  $111 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$  B)  $111 \times 10^{-5} \text{ }^\circ\text{C}^{-1}$   
 C)  $111 \times 10^{-4} \text{ }^\circ\text{C}^{-1}$  D)  $111 \times 10^{-3} \text{ }^\circ\text{C}^{-1}$
48. Two absolute scales  $A$  and  $B$  have triple points of water defined to be  $200A$  and  $350B$ . The relation between  $T_A$  and  $T_B$  is  
 A) 7 : 4 B) 4 : 5  
 C) 4 : 7 D) 5 : 4
49. The thermal capacity of a body of mass 10 g is  $8 \text{ cal/}^\circ\text{C}$ . The specific heat of the body is  
 A) 0.8 B) 1.25  
 C) 0.4 D) 01
50. The densities of two substances are in the ratio of 5 : 3 and their specific heat in the ratio 3 : 5 respectively. Their thermal capacities per unit volume will be in the ratio of  
 A) 2 : 3 B) 25 : 18  
 C) 1 : 1 D) 18 : 25

### Answer to Heat and Heat transfer

|        |        |        |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 01. D) | 02. B) | 03. B) | 04. D) | 05. D) | 06. A) | 07. A) | 08. B) | 09. D) | 10. C) |
| 11. A) | 12. B) | 13. B) | 14. D) | 15. B) | 16. B) | 17. B) | 18. B) | 19. B) | 20. B) |
| 21. C) | 22. B) | 23. B) | 24. C) | 25. D) | 26. C) | 27. A) | 28. D) | 29. B) | 30. A) |
| 31. D) | 32. C) | 33. D) | 34. D) | 35. B) | 36. C) | 37. B) | 38. C) | 39. C) | 40. A) |
| 41. A) | 42. A) | 43. B) | 44. B) | 45. A) | 46. B) | 47. A) | 48. C) | 49. A) | 50. C) |