PHYSICS

BOOKS - UNIVERSAL BOOK DEPOT 1960 PHYSICS (HINGLISH)

TRANSMISSION OF HEAT

Conduction

1. In which case the thermal conductivity increases from left to right

A. Al, Cu, Ag

B. Ag, Cu, Al

C. Cu, Ag, Al

D. Al, Ag, Cu

Answer: A

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2. Which of the following cylindrical rods will conduct most heat, when their ends are maintained at the same steady temperature

A. Length 1 m , radius 1 cm

B. Length 2 m , radius 1 cm

C. Length 2 m , radius 2 cm

D. Length 1 m , radius 2 cm

Answer: D

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3. The heat is flowing through two cylindrical rods of same material. The diameters of the rods are in the ratio $1:2$ and their lengths are in the ratio $2:1$. If the temperature difference between their ends is the same, the ratio of rates of flow of heat through them will be

A. $1:1$

B. $2:1$

C. $1:4$

D. $1:8$

Answer: D

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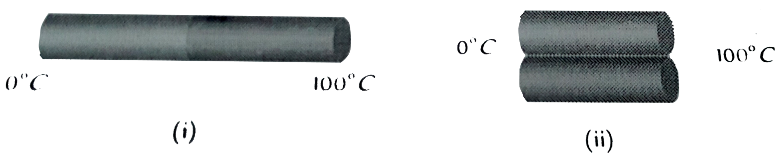
4. Two identical square rods of metal are welded end to end as shown in figure (i), 20 calories of heat flows through it in 4 minutes. If the rods are welded as shown in figure (ii), the same amount of heat will flow through the rods in



A. 1 minute

B. 2 minutes

C. 4 minutes

D. 16 minutes

Answer: A

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5. For cooking the food, which of the following type of utensil is most suitable

A. High specific heat and low conductivity

B. High specific heat and high conductivity

C. Low specific heat and low conductivity

D. Low specific heat and high conductivity

Answer: D

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6. Under steady state, the temperature of a body

A. Increases with time

B. Decreases with time

C. Does not change with time and is same at all the points of the body

D. Does not change with time but is different at different points of the body

Answer: D

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7. The coefficient of thermal conductivity depends upon

A. Temperature difference of two surfaces

B. Area of the plate

C. Thickness of the plate

D. Material of the plate

Answer: D

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8. When two ends of a rod wrapped with cotton are maintained at different temperatures and after some time every point of the rod attains a constant temperature, then

A. Conduction of heat at different points of the rod stops because the temperature is not increasing

B. Rod is bad conductor of heat

C. Heat is being radiated from each point of the rod

D. Each point of the rod is giving heat to its neighbour at the same rate at which it is receiving heat

Answer: D

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9. The length of the two rods made up of the same metal and having the same area of cross-section are 0.6 m and 0.8 m respectively. The temperature between the ends of first rod is 90° C and 60° C and that for the other rod is 150 and 110° C. For which rod the rate of conduction will be greater

A. First

B. Second

C. Same for both

D. None of the above

Answer: C

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10. The ratio of thermal conductivity of two rods of different material is $5:4$. The two rods of same area of cross-section and same thermal resistance will have the lengths in the ratio

A. $4:5$

B. $9:1$

C. $1:9$

D. $5:4$

Answer: D

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11. The thermal conductivity of a material in CGS system is 0.4. In steady state, the rate of flow of heat 10 cal/sec-cm, then the thermal gradient will be

A. $10^{\circ} C / cm$

B. $12^{\circ} C / cm$

C. $25^{\circ} C / cm$

D. $20^{\circ} C / cm$

Answer: C

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12. Two rectangular blocks A and B of different metals have same length and same area of cross-section. They are kept in such a way that their cross-sectional area touch each other. The temperature at one end of A is $100^\circ C$ and B at the other end is $0^\circ C$. If the ratio of their thermal conductivity is $1:3$, then under steady state, the temperature of the junction in contact will be

A. $25^\circ C$

B. $50^\circ C$

C. $75^\circ C$

D. $100^\circ C$

Answer: A

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13. Two vessels of different materials are similar in size in every respect. The same quantity of ice filled in them gets melted in 20 minutes and 30 minutes. The ratio of their thermal conductivities will be

A. 1.5

B. 1

C. $2/3$

D. 4

Answer: A

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14. Two rods A and B are of equal lengths. Their ends of kept between the same temperature and their area of cross-section are A_1 and A_2 and thermal conductivities K_1 and K_2. The rate of heat transmission in the two rods will be equal, if

A. $K_1 A_2 = K_2 A_1$

B. $K_1 A_1 = K_2 A_2$

C. $K_1 = K_2$

D. $K_1 A_1^2 = K_2 A_2^2$

Answer: B

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15. In variable state, the rate of flow of heat is controlled by

A. Density of material

B. Specific heat

C. Thermal conductivity

D. All the above factors

Answer: D

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16. If the ratio of coefficient of thermal conductivity of silver and copper is $10:9$, then the ratio of the length upto which wax will melt in Ingen Hauze experiment will be

A. $6:10$

B. $\sqrt{10}:3$

C. $100:81$

D. $81:100$

Answer: B

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17. The thickness of a metallic plate is 0.4 cm. The temperature between its two surfaces is $20^\circ C$. The quantity of heat flowing per second is 50 calories from $5cm^2$ area. In CGS system, the coefficient of thermal conductivity will be

A. 0.4

B. 0.6

C. 0.2

D. 0.5

Answer: C

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18. In Searle's method for finding conductivity of metals, the temperature gradient along the bar

A. Is greater nearer the hot end

B. Is greater nearer to the cold end

C. Is the same at all points along the bar

D. Increases as we go from hot end to cold end

Answer: C

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19. The dimensions of thermal resistance are

A. $M^{-1}L^{-2}T^{3}K$

B. $ML^{2}T^{-2}K^{-1}$

C. $ML^{2}T^{-3}K$

D. $ML^{2}T^{-2}K^{-2}$

Answer: A

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20. A piece of glass is heated to a high temperature and then allowed to cool. If it cracks, a probable reason for this is the following property of glass

A. Low thermal conductivity

B. High thermal conductivity

C. High specific heat

D. High melting point

Answer: A

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21. Two walls of thickness d and d and thermal conductivities k and k are in contact. In the steady state, if the temperature at the outer T_1 and T_2 , the temperature at the common wall is

A. $\dfrac{k_1T_1d_2 + k_2T_2d_1}{k_1d_2 + k_2d_1}$

B. $\dfrac{k_1T_1 + k_2d_2}{d_1 + d_2}$

C. $\left(\frac{k_1 d_1 + k_2 d_2}{T_1 + T_2}\right) T_1 T_2$

D. $\frac{k_1 d_1 T_1 + k_2 d_2 T_2}{k_1 d_1 + k_2 d_2}$

Answer: A

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22. A slab consists of two parallel layers of copper and brass of the same thichness and having thermal conductivities in the ratio $1:4$ If the free face of brass is at $100^\circ C$ anf that of copper at $0^\circ C$ the temperature of interface is .

A. $80^\circ C$

B. $20^\circ C$

C. $60^{\circ} C$

D. $40^{\circ} C$

Answer: A

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23. The temperature gradient in a rod of $0.5m$ length is $80^{\circ} C / m$. If the temperature of hotter end of the rod is $30^{\circ} C$, then the temperature of the cooler end is

A. $40^{\circ} C$

B. $-10^{\circ} C$

C. $10^{\circ} C$

D. $0^{\circ} C$

Answer: B

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24. On heating one end of a rod the temperature of the whole rod will be uniform when .

A. K = 1

B. K = 0

C. K = 100

D. $K = \infty$

Answer: D

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25. Snow is more heat insulating than ice, because

A. Air is filled in porous of snow

B. Ice is more bad conductor than snow

C. Air is filled in porous of ice

D. Density of ice is more

Answer: A

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26. Why are two thin blankets are warmer than a single blanket of double the thickness?

A. Their surface area increases

B. A layer of air is formed between these two blanket, which is bad conductor

C. These have more wool

D. They absorb more heat from outside

Answer: B

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27. Ice formed over lakes has

A. Very high thermal conductivity and helps in further ice formation

B. Very low conductivity and retards further formation of ice

C. It permits quick convection and retards further formation of ice

D. It is very good radiator

Answer: B

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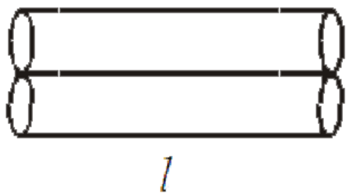
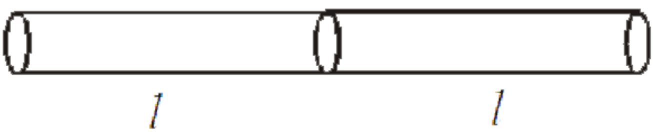
28. Two rods of same length and transfer a given amount of heat 12 second, when they are joined as shown in figure (i). But when they are joined as shwon in figure (ii), then they will transfer same heat in same conditions in





A. 24 s

B. 3 s

C. 1.5 s

D. 48 s

Answer: D

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29. Wires A and B have have identical lengths and have circular cross-sections. The radius of A is twice the radius of B i.e. $R_A = 2R_B$. For a given temperature difference between the two ends, both wires conduct heat at the same rate. The relation between the thermal conductivities is given by-

A. $K_A = 4K_B$

B. $K_A = 2K_B$

C. $K_A = K_B/2$

D. $K_A = K_B/4$

Answer: D

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30. Two identical plates of different metals are joined to form a single plate whose thickness is double the thickness of each plate. If the coefficients of conductivity of each plate are 2 and 3 respectively, Then the conductivity of composite plate will be

A. 5

B. 2.4

C. 1.5

D. 1.2

Answer: B

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31. If the radius and length of a copper rod are both doubled, the rate of flow of heat along the rod increases

A. 4 times

B. 2 times

C. 8 times

D. 16 times

Answer: B

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32. The coefficient of thermal conductivity of copper, mercury and glass are respectively K_c, K_m and K_g that $K_c > K_m > K_g$. If the same quantity of heat is to flow per second per unit of each and corresponding temperature gradients are X_c, X_m and X_g, then

A. $X_c = X_m = X_g$

B. $X_c > X_m > X_g$

C. $X_c < X_m < X_g$

D. $X_m < X_c < X_g$

Answer: C

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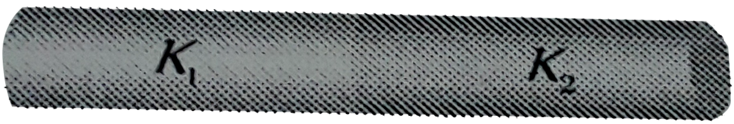
33. If two metallic plates of equal thickness and thermal conductivities K_1 and K_2 are put together face to face and a common plate is constructed, then the equivalent thermal conductivity of this plate will be



A. $\dfrac{K_1K_2}{K_1+K_2}$

B. $\dfrac{2K_1K_2}{K_1+K_2}$

C. $\dfrac{\left(K_1^2+K_2^2\right)^{3/2}}{K_1K_2}$

D. $\frac{\left(K_1^2 + K_2^2\right)^{3/2}}{2K_1K_2}$

Answer: B

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34. The quantity of heat which crosses unit area of a metal plate during conduction depends upon

A. The density of the metal

B. The temperature gradient perpendicular to the area

C. The temperature to which the metal is heated

D. The area of the metal plate

Answer: B

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35. The end of two rods of different materials with their thermal conductivities, area of cross-section and lengths all in the ratio 1:2 are maintained at the same temperature difference. If the rate of flow of heat in the first rod is $4cal / s$. Then, in the second rod rate of heat flow in cal / s will be

A. 1

B. 2

C. 8

D. 16

Answer: A

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36. Two spheres of different materials one with double the radius and one-fourth wall thickness of the other are filled with ice. If the time taken for complete melting of ice in the larger sphere is 25 minutes and for smaller one is 16 minutes, the ratio of thermal conductivities of the materials of larger sphere to that of smaller sphere is:

A. $4:5$

B. $5:4$

C. $25 : 1$

D. $1 : 25$

Answer: D

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37. The ratio of the diameters of two metallic rods of the same material is $2 : 1$ and their lengths are in the ratio $1 : 4$. If the temperature difference between their ends are equal, the rate of flow of heat in them will be in the ratio

A. $2 : 1$

B. $4 : 1$

C. $8 : 1$

D. $16 : 1$

Answer: D

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38. Two cylinders P and Q have the same length and diameter and are made of different materials having thermal conductivities in the ratio 2 : 3. These two cylinders are combined to make a cylinder. One end of P is kept at $100^\circ C$ and another end of Q at $0^\circ C$. The temperature at the interface of P and Q is

A. $30^\circ C$

B. $40^\circ C$

C. $50^{\circ} C$

D. $60^{\circ} C$

Answer: B

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39. Two identical rods of copper and iron are coated with wax uniformly. When one end of each is kept at temperature of boiling water, the length upto which wax melts are 8.4 cm and 4.2 cm respectively. If thermal conductivity of copper is 0.92, then thermal conductivity of iron is

A. 0.23

B. 0.46

C. 0.115

D. 0.69

Answer: A

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40. Mud houses are cooler in summer and warmer in winter because

A. Mud is superconductor of heat

B. Mud is good conductor of heat

C. Mud is bad conductor of heat

D. None of these

Answer: C

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41. The temperature of hot and cold end of a 20 cm long rod in thermal steady state are at $100^{\circ} C$ and $20^{\circ} C$ respectively. Temperature at the centre of the rod is

A. $50^{\circ} C$

B. $60^{\circ} C$

C. $40^{\circ} C$

D. $30^{\circ} C$

Answer: B

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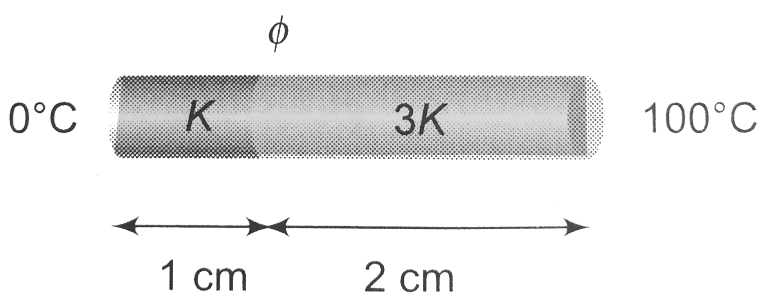
42. Two bars of thermal conductivities K and $3K$ and lengths $1cm$ and $2cm$ respectively have equal cross-sectional area, they are joined lengths wise as shown in the figure. If the temperature at the ends of this composite br is $0^{\circ}C$ and K^2/l respectively (see figure), then the temperature ϕ of the interface is



A. $50^{\circ} C$

B. $\frac{100}{3}.^{\circ} C$

C. $60^{\circ} C$

D. $\frac{200}{3}.^{\circ} C$

Answer: C

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43. 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 $400 W/m/^{\circ} C$ The two ends of this rod must be kept at a temperature difference of

A. $1^{\circ}C$

B. $10^{\circ}C$

C. $100^{\circ}C$

D. $1000^{\circ}C$

Answer: C

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44. On a cold morning, a metal surface will feel colder to touch than a wooden surface because

A. Metal has high specific heat

B. Metal has high thermal conductivity

C. Metal has low specific heat

D. Metal has low thermal conductivity

Answer: B

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45. In order that the heat flows from one part of a solid to another part, what is required

A. Uniform density

B. Density gradient

C. Temperature gradient

D. Uniform temperature

Answer: C

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46. At a common temperature, a block of wood and a block of metal feel equally cold or hot. The temperatures of block of wood and block of metal are

A. Equal to temperature of the body

B. Less than the temperature of the body

C. Greater than temperature of the body

D. Either (b) or (c)

Answer: A

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47. According to the experiment of Ingen Hausz the relation between the thermal conductivity of a metal rod is K and the length of the rod whenever the wax melts is

A. K/l = constant

B. K^2 / l= constant

C. K / l^2= constant

D. Kl = constant

Answer: C

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48. Temperature of water at the surface of lake is $-20^{\circ}C$. Then temperature of water just below the lower surface of ice layer is

A. $-4^{\circ}C$

B. $0^{\circ}C$

C. $4^{\circ}C$

D. $-20^{\circ}C$

Answer: B

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49. One end of a metal rod of length 1.0 m and area of cross section $100cm^2$ is maintained at . $100^{\circ}C$. If the other end of the rod is maintained at $0^{\circ} C$, the quantity of heat transmitted through the rod per minute is (Coefficient of thermal conductivity of material of rod = $100 W / m - K$)

A. $3 \times 10^{3} J$

B. $6 \times 10^{3} J$

C. $9 \times 10^{3} J$

D. $12 \times 10^{3} J$

Answer: B

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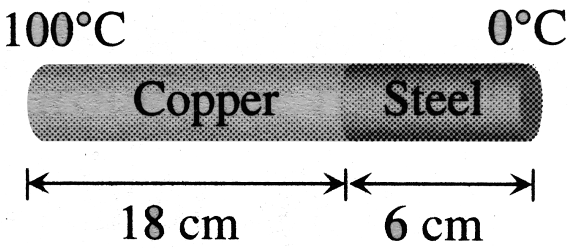

50.

The coefficient of thermal conductivity of copper is nine times that of steel. In the composite cylindrical bar shown in Fig. what will be the temperature at the junction of copper and steel ?

A. $75^{\circ} C$

B. $67^{\circ} C$

C. $33^{\circ} C$

D. $25^{\circ} C$

Answer: A

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51. The lengths and radii of two rods made of same material are in the ratios 1 : 2 and 2 : 3 respectively. If the temperature difference between the ends for the two rods be the same, then in the steady state, the amount of heat flowing per second through them will be in the ratio

A. $1:3$

B. $4:3$

C. $8:9$

D. $3:2$

Answer: C

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52. A slab consists of two layers of different materials of the same thickness and having thermal conductivities K_1 and K_2. The equivalent thermal conductivity of the slab is

A. $K_1 + K_2$

B. $\dfrac{K_1 + K_2}{2}$

C. $\dfrac{2K_1K_2}{K_1 + K_2}$

D. $\dfrac{K_1 + K_2}{2K_1K_2}$

Answer: B

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53. There are two identical vessels filled with equal amounts of ice. The vessels are of different metals., If the ice melts in the two vessels in 20 and 35 minutes respectively, the ratio of the coefficients of thermal conductivity of the two metals is

A. $4:7$

B. $7:4$

C. $16:49$

D. $49:16$

Answer: B

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54. The temperature of water at the surface of a deep lake is $2^\circ C$. The temperature expected at the bottom is

A. $2^\circ C$

B. $3^\circ C$

C. $4^\circ C$

D. $1^\circ C$

Answer: C

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55. The heat is flowing through a rod of length 50 cm and area of cross-section $5cm^2$. Its ends are respectively at $25^\circ C$ and $125^\circ C$. The coefficient of thermal conductivity of the material of the rod is $0.092kcal/m \times s \times .^\circ C$. The temperature gradient in the rod is

A. $2^\circ C/cm$

B. $2^\circ C/m$

C. $20^\circ C/m$

D. $20^\circ C/cm$

Answer: A

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56. In the Ingen Hauz's experiment the wax melts up to lengths 10 and 25 cm on two identical rods of different materials. The ratio of thermal conductivities of the two materials is

A. $1:6.25$

B. $6.25:1$

C. $1:\sqrt{2.5}$

D. $1:25$

Answer: A

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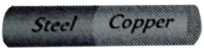
57. Heat current is maximum in which of the following (rods are of identical dimension)

A. (a) 

B. (b) 

C. (c) 

D. (d) 

Answer: A

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58. Two rods of same length and cross section are joined along the length. Thermal conductivities of first and second rod are K_1 and K_2. The temperature of the free ends of the first and seconds rods are maintained at θ_1 and θ_2 respectively. The temperature of the common junction is

A. $\dfrac{\theta_1 + \theta_2}{2}$

B. $\dfrac{K_2 K_2}{K_1 + K_2}(\theta_1 + \theta_2)$

C. $\dfrac{K_1\theta_1 + K_2\theta_2}{K_1 + K_2}$

D. $\dfrac{K_2\theta_1 + K_1\theta_2}{K_1 + K_2}$

Answer: C

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59. Consider a compound slab consisting of two different material having equal thickness and thermal conductivities K and $2K$ respectively. The equivalent thermal conductivity of the slab is

A. $\sqrt{2K}$

B. 3K

C. $\frac{4}{3}K$

D. $\frac{2}{3}K$

Answer: C

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60. Two rods having thermal conductivity in the ratio of 5 : 3 having equal lengths and equal cross-sectional area are joined by face to face. If the temperature of the free end of the first rod is $100^\circ C$ and free end of the second rod is $20^\circ C$. Then temperature of the junction is

A. $70^\circ C$

B. $50^\circ C$

C. $50^\circ C$

D. $90^\circ C$

Answer: A

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61. Woolen clothes are used in winter season because woolen clothes

A. Are good sources for producing hea

B. Absorb heat from surroundings

C. Are bad conductors of heat

D. Provide heat to body continuously

Answer: C

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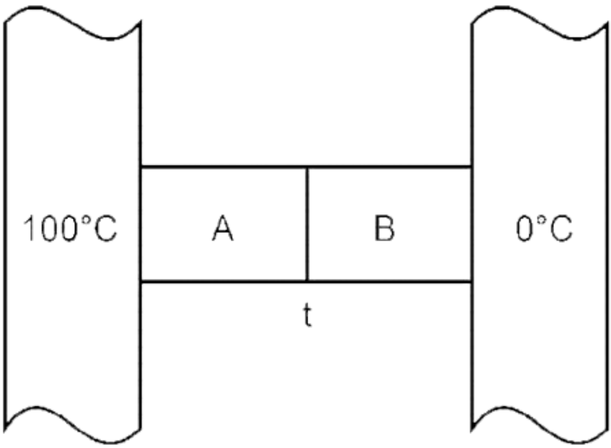
62. Two metal cubes A and B of same size are arranged as shown in Figure. The extreme ends of the combination are maintained at the indicated temperatures. The arrangement is thermally insulated. The coefficients of thermal conductivity of A and B are $300W/m^{\circ}C$ and $200W/m^{\circ}C$, respectively. After steady state is reached the temperature t of the interface will be ......



A. $45^{\circ}C$

B. $90^{\circ}C$

C. $30^{\circ}C$

D. $60^{\circ} C$

Answer: D

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63. A cylindrical rod having temperature T_1 and T_2 at its ends. The rate of flow of heat is $Q_1 cal / \sec$. If all the linear dimensions are doubled keeping temperature constant, then rate of flow of heat Q_2 will be

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64. A body of length $1m$ having cross sectional area $0.75m^2$ has heat flow through it at the rate of

$6000 \text{Joule}/\text{sec}$. Then find the temperature difference if $K = 200 J m^{-1} K^{-1}$.

A. $20^{\circ} C$

B. $40^{\circ} C$

C. $80^{\circ} C$

D. $100^{\circ} C$

Answer: B

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65. A wall has two layers A and B each made of different materials. The thickness of both the layers is the same. The thermal conductivity of A, $K_A = 3K_B$. The temperature different across the wall is $20^\circ C$ in thermal equilibrium

A. The temperature difference across A = $15^\circ C$

B. The temperature difference across A = $5^\circ C$

C. The temperature difference across A is $10^\circ C$

D. The rate pf transfer of heat through A is more than that through

Answer: B

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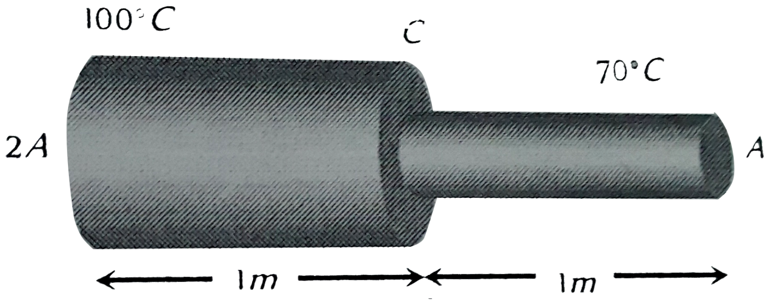
66. A metal rod of length 2 m has cross sectional areas 2 A and A as shown in figure. The ends are maintained at temperatures 100° C and 70° C . The temperature at middle point C is



A. $80^\circ C$

B. $85^\circ C$

C. $90^\circ C$

D. $95^\circ C$

Answer: C

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67. The ratio of the coefficient of thermal conductivity of two different materials is $5:3$. If the thermal resistance of the rod of same thickness resistance of the rods of same thickness of these materials is same, then the ratio of the length of these rods will be

A. $3:5$

B. $5:3$

C. $3:4$

D. $3:2$

Answer: B

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68. Which of the following circular rods. (given radius r and length l) each made of the same material as whose ends are maintained at the same temperature will conduct most heat

A. $r = 2r_0, l = 2l_0$

B. $r = 2r_0, l = l_0$

C. $r = r_0, l = l_0$

D. $r = r_0, l = 2l_0$

Answer: B

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Convection

1. Why is it hotter at the same distance over the top of a fire than in front of it?

A. Air conducts heat upwards

B. Heat is radiated upwards

C. Convection takes more heat upwards

D. Convection, conduction and radiation all contribute significantly transferring heat upwards

Answer: C

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2. One likes to sit under sunshine in winter season, becaus

A. The air surrounding the body is hot by which body gets heat

B. We get energy by sun

C. We get heat by conduction by sun

D. None of the above

Answer: A

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3. Air is bad conductor of heat or partly conducts heat, still vacuum is to be placed between the walls of the thermos flask because

A. It is difficult to fill the air between the walls of thermos flask

B. Due to more pressure of air, the thermos can get crack

C. By convection, heat can flow through air

D. On filling the air, there is no advantage

Answer: C

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4. While measuring the thermal conductivity of liquids the upper part is kept hot and lower cooled so that .

A. Convection may be stopped

B. Radiation may be stopped

C. Heat conduction is easier downwards

D. It is easier and more convenient to do so

Answer: A

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5. For proper ventilation of building, windows must be open near the bottom and top of the walls so as to let pass

A. In more air

B. In cool air near the bottom and hot air out near the roof

C. In hot air near the roof and cool air out near the bottom

D. Out hot air near the roof

Answer: B

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6. The layers of atmosphere are heated through

A. Convection

B. Conduction

C. Radiation

D. (b) and (c) both

Answer: A

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7. Mode of transmission of heat, in which heat is carried by the moving particles, is

A. Radiation

B. Conduction

C. Convection

D. Wave motion

Answer: C

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8. In a closed room, heat transfer takes place by

A. Conduction

B. Convection

C. Radiation

D. All of these

Answer: B

View Text Solution

9. Which of the following methods of flow of heat is (are) based on gravitational attraction ?.

A. Natural convection

B. Conduction

C. Radiation

D. Stirring of liquids

Answer: A

Watch Video Solution

10. When fluids are heated from the bottom, convection currents are produced because

A. Molecular motion of fluid becomes aligned

B. Molecular collisions take place within the fluid

C. Heated fluid becomes more dense than the cold fluid above it

D. Heated fluid becomes less dense than the cold fluid above it

Answer: D

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11. If a liquid is heated in weightlessness, the heat is transmitted through

A. Conduction

B. Convection

C. Radiation

D. Neither, because the liquid cannot be heated in weightlessness

Answer: A

View Text Solution

12. The rate of loss of heat from a body cooling under conditions of forced convection is proportional to its

(1) surface area

(2) excess of temperature over that of surrounding

(3) heat capacity

(4) absolute temperature

A. A , B , C are correct

B. Only A and C are correct

C. Only B and D are correct

D. Only D is correct

Answer: C

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13. In which of the following process, convection does not take place primarily

A. Sea and land breeze

B. Boiling of water

C. Warming of glass of bulb due to filament

D. Heating air around a furnace

Answer: C

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Radiation General Kirchoff S Law Black Body

1. On a clear sunny day, an object at temperature T is placed on the top of a high mountain. An identical object at the same temperature is placed at the foot of mountain. If both the objects are exposed to sun-rays for two hours in an identical manner, the object at the top of the mountain will register a temperature

A. Higher than the object at the foot

B. Lower than the object at the foot

C. Equal to the object at the foot

D. None of the above

Answer: B

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2. The velocity of heat radiation in vacuum is .

A. Equal to that of light

B. Less than that of light

C. Greater than that of light

D. Equal to that of sound

Answer: A

Watch Video Solution

3. The process in which rate of transfer of heat maximum is .

A. Conduction

B. Convection

C. Radiation

D. In all these, heat is transferred with the same velocity

Answer: C

Watch Video Solution

4. Which of the following is the correct device for the detection of thermal radiation

A. Constant volume thermometer

B. Liquid-in-glass thermometer

C. Six's maximum and minimum thermometer

D. Thermopile

Answer: D

Watch Video Solution

5. A thermos flask is polished well

A. To make attractive

B. For shining

C. To absorb all radiations from outside

D. To reflect all radiations from outside

Answer: D

Watch Video Solution

6. Heat travels through vaccum by

A. Conduction

B. Convection

C. Radiation

D. Both (a) and (b)

Answer: C

Watch Video Solution

7. The energy supply being cut-off, an electric heater element cools down to the temperature of its surrounding, but it will not cool further because

A. Supply is cut off

B. It is made of metal

C. Surroundings are radiating

D. Element & surroundings have same temp.

Answer: D

Watch Video Solution

8. We consider the radition emitted by the human body which of the following statements is true?

A. The radiation is emitted only during the day

B. The radiation is emitted during the summers and absorbed during the winters

C. The radiation emitted lies in the ultraviolet region and hence is not visible

D. The radiation emitted is in the infra-red region

Answer: D

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9. The earth radiates in the infra-red region of the spectrum. The spectrum is correctly given by

A. Wien's law

B. Rayleigh jeans law

C. Planck's law of radiation

D. Stefan's law of radiation

Answer: C

Watch Video Solution

10. Infrared radiation is detected by

A. Spectrometer

B. Pyrometer

C. Nanometer

D. Photometer

Answer: B

Watch Video Solution

11. Pick out the statement which is not true

A. IR radiations are used for long distance photography

B. IR radiations arise due to inner electron transitions in atoms

C. IR radiations are detected by using a bolometer

D. Sun is the natural source of IR radiation

Answer: B

Watch Video Solution

12. A hot and a cold body are kept in vacuum separated from each other. Which of the following cause decrease in temperature of the hot body

A. Radiation

B. Convection

C. Conduction

D. Temperature remains unchanged

Answer: A

Watch Video Solution

13. Good absorbers of heat are

A. Poor emitters

B. Non-emitters

C. Good emitters

D. Highly polished

Answer: C

Watch Video Solution

14. For a perfectly black body, its absorptive power is

A. 1

B. 0.5

C. 0

D. Infinity

Answer: A

Watch Video Solution

15. Certain substance emits only the wavelengths $\lambda_1, \lambda_2, \lambda_3$ and λ_4 when it is at a high temperature, it will absorb only the following wavelengths

A. λ_1

B. λ_2

C. λ_1 and λ_2

D. $\lambda_1, \lambda_2, \lambda_3$ and λ_4

Answer: D

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16. Compared to a person with white skin another person with dark skin will experience .

A. Less heat and more cold

B. More heat and more cold

C. More heat and less cold

D. Less heat and less cold

Answer: B

Watch Video Solution

17. Relation between emissivity e and absorptive power a is (for black body)

A. $e = a$

B. $e = \frac{1}{a}$

C. $e = a^2$

D. $a = e^2$

Answer: A

Watch Video Solution

18. Which of the following statements is wrong ?

A. Rough surfaces are better radiators than smooth surface

B. Highly polished mirror like surfaces are very good radiators

C. Black surfaces are better absorbers than white ones

D. Black surfaces are better radiators than white

Answer: B

Watch Video Solution

19. Half part of ice block is covered with black cloth and rest half is covered with white cloth and then it is kept in sunlight. After some time clothes are removed to see the melted ice. Which of the following statements is correct

A. Ice covered with white cloth will melt more

B. Ice covered with black cloth will melt more

C. Equal ice will melt under both clothes

D. It will depend on the temperature of surroundings of ice

Answer: B

Watch Video Solution

20. If between wavelength λ and $\lambda + d\lambda$, e_{λ} and a_{λ} be the emissive and absorptive powers of a body and E_{λ} be the emissive power of a perfectly black body, then according to Kirchoff's law, which is true

A. $e_{\lambda} = a_{\lambda} = E_{\lambda}$

B. $e_{\lambda}E_{\lambda} = a_{\lambda}$

C. $e_{\lambda} = a_{\lambda}E_{\lambda}$

D. $e_{\lambda}a_{\lambda}E_{\lambda}$= constant

Answer: C

Watch Video Solution

21. If 'p' calorie of heat energy is incident on a body and absorbs 'q' calories of heat absorbed then its coefficient of absorption is .

A. p/q

B. q/p

C. p^2/q^2

D. q^2/p^2

Answer: B

Watch Video Solution

22. Distribution of energy in the spectrum of a black body can be correctly represented by .

A. Wien's law

B. Stefan's law

C. Planck's law

D. Kirchhoff's law

Answer: C

Watch Video Solution

23. In rainy season, on a clear night the black seat of a bicycle becomes wet because

A. It absorbs water vapour

B. Black seat is good absorber of heat

C. Black seat is good radiator of heat energy

D. None of the above

Answer: C

Watch Video Solution

24. A polished metal plate with a rough black spot on it is heated to about $1400K$ and quickly taken into dark room Then .

A. In comparison with the plate, the spot will shine more

B. In camparison with the plate, the spot will appear more black

C. The spot and the plate will be equally bright

D. The plate and the black spot can not be seen in the dark room

Answer: A

Watch Video Solution

Watch Video Solution

25. At a certain temperature for given wavelength, the ratio of emissive power of a body to emmisve power of black body in same circumstance in known as

A. Relative emissivity

B. Emissivity

C. Absorption coefficient

D. Coefficient of reflection

Answer: B

Watch Video Solution

26. The cause of Fraunhoffer lines is

A. Reflection of radiations by chromosphere

B. Absorption of radiations by chromosphere

C. Emission of radiations by chromosphere

D. Transmission of radiations by chromosphere

Answer: B

Watch Video Solution

27. Two thermometers A and B are exposed in sunlight. The bulb of A is painted black, But that of B is not painted. The correct statement regarding this case is

A. Temperature of A will rise faster than B but the final temperature will be the same in both

B. Both A and B show equal rise in beginning

C. Temperature of A will remain more than B

D. Temperature of B will rise faster

Answer: A

Watch Video Solution

28. There is a black spot on a body. If the body is heated and carried in dark room then it glows more. This can be explained on the basis of

A. Newton's law of cooling

B. Wien's law

C. Kirchoff's law

D. Stefan's

Answer: C

Watch Video Solution

29. When red glass is heated in dark room it will seem

A. Green

B. Purple

C. Black

D. Yellow

Answer: A

Watch Video Solution

30. A hot body will radiate maximum energy if its surface is

A. White & polished

B. White & rough

C. Black & polished

D. Black & rough

Answer: D

Watch Video Solution

31. A body, which emits radiations of all possible wavelengths, is known as

A. Good conductor

B. Partial radiator

C. Absorber of photons

D. Perfectly black-body

Answer: D

Watch Video Solution

32. Which of the following is the example of ideal black body?

A. Kajal

B. Black board

C. A pin hole in a box

D. None of these

Answer: C

Watch Video Solution

33. An ideal Black-body at room temperature is thrown into a furnace. It is observed that

A. Initially it is the darkest body and at later times the brightest

B. It is the darkest body at all times

C. It cannot be distinguished at all times

D. Initially it is the darkest body and at later times it cannot be distinguished

Answer: A

Watch Video Solution

34. Absorption co-efficient of an open window is...

A. Zero

B. 0.5

C. 1

D. 0.25

Answer: C

Watch Video Solution

35. Which of the prism is used to see infra-red spectrum of light

A. Rock-salt

B. Nicol

C. Flint

D. Crown

Answer: A

Watch Video Solution

36. Which of the following statement is correct

A. A good absorber is a bad emitter

B. Every body absorbs and emits radiations at every temperature

C. The energy of radiations emitted from a black body is same for all wavelengths

D. The law showing the relation of temperatures with the wavelength of maximum emission from an ideal black body is Plank's law

Answer: D

Watch Video Solution

37. A piece of blue glass heated to a high temperature and a piece of red glass at room temperature, are taken inside a dimly lit room then

A. The blue piece will look blue and red will look as usual

B. Red look brighter red and blue look ordinary blue

C. Blue shines like brighter red compared to the red piece

D. Both the pieces will look equally red.

Answer: C

Watch Video Solution

38. Which of the following law states that "good absorbers of heat are good emitters"

A. Stefan's law

B. Kirchoff's law

C. Planck's law

D. Wein's law

Answer: B

Watch Video Solution

Radiation Wein S Law

1. According to Wien's law

A. $\lambda_m T$ = constant

B. $\frac{\lambda_m}{T}$ =constant

C. $\frac{T}{\lambda_m}$ =constant

D. $T + \lambda_m$ =constant

Answer: A

Watch Video Solution

2. On investigation of light from three different stars A , B and C , it was found that in the spectrum of A the intensity of red colour is maximum, in B the intensity of blue colour is maximum and in C the intensity of yellow colour is maximum. From these observations it can be concluded that

A. The temperature of A is maximum, B is minimum and C is intermediate

B. The temperature of A is maximum, C is minimum and B is intermediate

C. The temperature of B is maximum, A is minimum and C is intermediate

D. The temperature of C is maximum, B is minimum and A is intermediate

Answer: C

View Text Solution

3. If wavelengths of maximum intensity of radiations emitted by the sun and the moon are $0.5 \times 10^{-6} m$ and $10^{-4} m$ respectively, the ratio of their temperatures is

A. 1/100

B. 1/200

C. 100

D. 200

Answer: D

Watch Video Solution

4. The wavelength of radiation emitted by a body depends upon

A. The nature of its surface

B. The area of its surface

C. The temperature of its surface

D. All the above factors

Answer: C

Watch Video Solution

5. If black wire of platinum is heated, then its colour first appear red, then yellow and finally white. It can be understood on the basis of

A. Wien's displacement law

B. Prevost theroy of heat exchange

C. Newton's law of cooling

D. None of the above

Answer: A

View Text Solution

6. The colour of a star indicates its

A. Distance from the earth

B. Size

C. Temperature

D. Mass

Answer: C

Watch Video Solution

7. The wavelength of maximum emitted energy of a body at 700 K is $4.08\mu m$. If the temperature of the body is raised to 1400 K , the wavelength of maximum emitted energy will be

A. $1.02\mu m$

B. $16.32\mu m$

C. $8.16\mu m$

D. $2.04\mu m$

Answer: D

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8. A black body at 200 K is found to exit maximum energy at a wavelength of $14\mu m$. When its temperature is raised to 1000 K , the wavelength at which maximum energy is emitted is

A. $14\mu m$

B. $70\mu F$

C. $2.8\mu m$

D. $2.8mm$

Answer: C

Watch Video Solution

9. Two stars emit maximum radiation at wavelength 3600 Å and 4800 Å respectively. The ratio of their temperatures is

A. $1:2$

B. $3:4$

C. $4:3$

D. $2:1$

Answer: C

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10. A black body emits radiations of maximum intensity at a wavelength of Å 5000 , when the temperature of the body is $1227^{\circ} C$. If the temperature of the body is increased by $1000^{\circ} C$, the maximum intensity of emitted radiation would be observed at

A. $2754.8Å$

B. $3000Å$

C. $3500Å$

D. $4000Å$

Answer: B

Watch Video Solution

11. Four pieces of iron are heated to different are respectively red, yellow orange and white respectively The one that is heated to the highest temperature will exhibit the colour .

A. White

B. Yellow

C. Orange

D. Red

Answer: A

Watch Video Solution

12. If a black body is heated at a high temperature, it seems to be

A. Blue

B. White

C. Red

D. Black

Answer: B

View Text Solution

13. If the temperature of the sun becomes twice its present temperature, then

A. Radiated energy would be predominantly in infrared

B. Radiated energy would be predominantly in ultraviolet

C. Radiated energy would be predominantly in X-ray region

D. Radiated energy would become twice the present radiated energy

Answer: B

View Text Solution

14. The maximum energy is the thermal radiation from a hot source occurs at a wavelength of $11 \times 10^{-5} cm$. According to Wien's law, the temperature of this source (on Kelvin scale) will be n times the temperature of another source (on Kelvin scale) for which the wavelength at maximum energy is $5.5 \times 10^{-5} cm$. The value of n is:

A. 2

B. 4

C. $\frac{1}{2}$

D. 1

Answer: C

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15. The wavelength of maximum energy released during an atomic axplosion was $2.93 \times 10^{-10} m$. Given that Wien's constant is $2.93 \times 10^{-3} m - K$, the maximum temperature attained must be of the order of

A. $10^{-7} K$

B. $10^{7} K$

C. $10^{-13} K$

D. $5.86 \times 10^{7} K$

Answer: B

Watch Video Solution

16. The maximum wavelength of radiation emitted at K 2000 K is $4\mu m$. What will be the maximum wavelength of radiation emitted at

A. $3.33\mu m$

B. $0.66\mu m$

C. $1\mu m$

D. 1 m

Answer: A

Watch Video Solution

17. How is the temperature of stars determined by

A. Stefan's law

B. Wein's displacement law

C. Kirchhoff's law

D. Ohm's law

Answer: B

Watch Video Solution

18. On increasing the temperature of a substance gradually, which of the following colours will be noticed by you

A. White

B. Yellow

C. Green

D. Red

Answer: A

View Text Solution

19. A black body has maximum wavelength λ_m at temperature $2000K$. Its corresponding wavelength at temperature 3000 will be

A. $\frac{3}{2}\lambda_m$

B. $\frac{2}{3}\lambda_m$

C. $\frac{4}{9}\lambda_m$

D. $\frac{9}{4}\lambda_m$

Answer: B

Watch Video Solution

20. Relation between the colour and the temperature of a star is given by

A. Wein's displacement law

B. Planck's law

C. Hubble's law

D. Fraunhofer diffraction law

Answer: A

Watch Video Solution

21. Black body at a temperature of $1640K$ has the wavelength corresponding to maximum emission equal to $1.75\mu m$ Assuming the moon to be a perfectly black body the temperature of the moon if the wavelength corresponding to maximum emission is $14.35\mu m$ is .

A. 100 K

B. 150 K

C. 200 K

D. 250 K

Answer: C

Watch Video Solution

22. The maximum wavelength of radiations emitted at 900 K is $4\mu m$. What will be the maximum wavelength of radiations emitted at 1200 K

A. $3\mu m$

B. $0.3\mu m$

C. $1\mu m$

D. 1m

Answer: A

View Text Solution

23. Solar radiation emitted by sun resembles that emitted by a body at a temperature of $6000K$ Maximum intensity is emitted at a wavelength of about $4800A^{\circ}$ If the sun was cooled down from $6000K$ to $3000K$ then the peak intensity would occure at a wavelenght of .

A. 4800Å

B. 9600Å

C. 7200Å

D. 6400Å

Answer: B

Watch Video Solution

Watch Video Solution

24. What will be the ratio of temperatures of sun and moon if the wavelengths of their maximum emission radiations rates are $140A^\circ$ and $4200A^\circ$ respectively .

A. $1:30$

B. $30:1$

C. $42:14$

D. $14:42$

Answer: B

Watch Video Solution

25. The radiation energy density per unit wavelength at a temperature T has a maximum at a wavelengthλ_0. At temperature 2T, it will have a maximum wavelength

A. 4λ

B. 2λ

C. $\lambda/2$

D. $\lambda/4$

Answer: C

Watch Video Solution

26. The absolute temperatures of two black bodies are 2000 K and 3000 K respectively. The ratio of wavelengths corresponding to maximum emission of radiation by them will be

A. $2:3$

B. $3:2$

C. $9:4$

D. $4:9$

Answer: B

Watch Video Solution

27. The temperature of sun is 5500 K and it emits maximum intensity radiation in the yellow region $(5.5 \times 10^{-7} m)$. The maximum radiation from a furnace occurs at wavelength $11 \times 10^{-7} m$ The temperature of furnace is

A. 1125 K

B. 2750 K

C. 5500 K

D. 11000 K

Answer: B

Watch Video Solution

28. A particular star (assuming it as a black body) has a surface temperature of about $5 \times 10^4 K$ The wave length in nano-meters at which its radiation becomes maximum is $(b = 0.0029mk)$.

A. 48

B. 58

C. 60

D. 70

Answer: B

Watch Video Solution

29. The maximum energy in thermal radiation from a source occurs at the wavelength 4000Å. The effective temperature of the source i

A. 7000 K

B. 80000 K

C. $10^4 K$

D. $10^6 K$

Answer: A

Watch Video Solution

30. The intensity of radiation emitted by the sun has its maximum value at a wavelength of 510 nm and that emitted by the North star has the maximum value at 350 nm. If these stars behave like black bodies, then the ratio of the surface temperatures of the sun and the north star is

A. 1.46

B. 0.69

C. 1.21

D. 0.83

Answer: B

Watch Video Solution

Radiation Stefan S Law

1. The amount of radiation emitted by a perfectly black body is proportional to .

A. Temperature on ideal gas scale

B. Fourth root of temperature on ideal gas scale

C. Fourth power of temperature on ideal gas scale

D. Source of temperature on ideal gas scale

Answer: C

Watch Video Solution

2. A metal ball of surface area $200cm^2$ and temperature $527^\circ C$ is surrounded by a vessel at $27^\circ C$. If the emissivity of the metal is 0.4, then the rate of loss of heat from the ball is $\left(\sigma = 5.67 \times 10^{-8} J/m^2 - s - k^4\right)$

A. 108 joules approx.

B. 168 joules approx.

C. 182 joules approx.

D. 192 joules approx.

Answer: C

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3. The rate of radiation of a black body at 0º C is EJ/sec .

The rate of radiation of this black body at $273(\circ)C$ will be

A. 16 E

B. 8 E

C. 4 E

D. E

Answer: A

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4. A black body radiates energy at the rate of E W/m at a high temperature TK . When the temperature is reduced to $\frac{T}{2}K$, the radiant energy will b

A. $\frac{E}{16}$

B. $\frac{E}{4}$

C. 4E

D. 16E

Answer: A

Watch Video Solution

5. An object is at a temperature of $400^\circ C$. At what temperature would it radiate energy twice as fast? The temperature of the surroundings may be assumed to be negligible

A. $200^\circ C$

B. 200 K

C. $800^\circ C$

D. 800 K

Answer: D

Watch Video Solution

6. A black body at a temperature of $227^{\circ} C$ radiates heat energy at the rate of 5 cal/cm-sec. At a temperature of $727^{\circ} C$, the rate of heat radiated per unit area in cal/cm will be

A. 80

B. 160

C. 250

D. 500

Answer: A

Watch Video Solution

7. Energy is being emitted from the surface of a black body at $127^{\circ} C$ temperature at the rate of $1.0 \times 10^{6} J / \sec - m^{2}$. Temperature of the black at which the rate of energy emission is $16.0 \times 10^{6} J / \sec - m^{2}$ will be

A. $254^{\circ} C$

B. $508^{\circ} C$

C. $527^{\circ} C$

D. $727^{\circ} C$

Answer: C

Watch Video Solution

8. In MKS system, Stefan's constant is denoted by σ. In CGS system multiplying factor of will be

A. 1

B. 10^3

C. 10^5

D. 10^2

Answer: B

Watch Video Solution

9. If temperature of a black body increases from $7^\circ C$ to $287^\circ C$, then the rate of energy radiation increases by

A. $\left(\frac{287}{7}\right)^{4}$

B. 16

C. 4

D. 2

Answer: B

Watch Video Solution

10. The temperature of a piece of iron is $27^{\circ} C$ and it is radiating energy at the rate of $QkWm^{-2}$. If its temperature is raised to $151^{\circ} C$, the rate of radiation of energy will become approximately

A. $2QkWm^{-2}$

B. $4QkWm^{-2}$

C. $6QkWm^{-2}$

D. $8QkWm^{-2}$

Answer: B

Watch Video Solution

11. The temperatures of two bodies A and B are $727^{\circ}C$ and $127^{\circ}C$. The ratio of rate of emission of radiations will be

A. $727/127$

B. $625/16$

C. $1000/400$

D. $100/16$

Answer: B

Watch Video Solution

12. The temperature at which a black body of unit area loses its energy at the rate of 1 joule/second is

A. $-65^{\circ}C$

B. $65^{\circ}C$

C. 65 K

D. None of these

Answer: C

Watch Video Solution

13. The area of a hole of heat furnace is $10^{-4}m^2$. It radiates 1.58×10^5 calories of heat per hour. If the emissivity of the furnace is 0.80, then its temperature is

A. 1500 K

B. 2000 K

C. 2500 K

D. 3000 K

Answer: C

Watch Video Solution

14. Two spheres P and Q , of same colour having radii 8cm and 2cm are maintained at temperatures of $127^\circ C$. If temperature is increased to $927^\circ C$, then it radiates energy at the rate of

A. 0.054

B. 0.0034

C. 1

D. 2

Answer: C

Watch Video Solution

15. A body radiates energy 5 W at a temperature of $127^{\circ}C$. If the temperature is increased to $927^{\circ}C$, then it radiates energy at the rate of

A. 410 W

B. 81 W

C. 405 W

D. 200 W

Answer: c

Watch Video Solution

16. A thin square steel plate with each side equal to 10 cm is heated by a blacksmith. The rate of radiated energy by the heated plate is 1134 W . The temperature of the hot steel plate is (Stefan's constant $\sigma = 5.67 \times 10^{-8}$ watt $m^{-2}K^{-4}$, emissivity of the plate = 1)

A. 1000 K

B. 1189 K

C. 2000 K

D. 2378 K

Answer: B

Watch Video Solution

17. The temperature of two bodies A and B are respectively $727^\circ C$ and $327^\circ C$. The ratio $H_A : H_B$ of the rates of heat radiated by them is

A. $727 : 327$

B. $5 : 3$

C. $25 : 9$

D. $625 : 81$

Answer: D

Watch Video Solution

18. The energy emitted per second by a black body at $27^{\circ} C$ is 10 J. If the temperature of the black body is increased to $327^{\circ} C$, the energy emitted per second will be

A. 20 J

B. 40 J

C. 80 J

D. 160 J

Answer: D

Watch Video Solution

19. The radiant energy from the Sun incident normally at the surface of earth is $20kcal/m^2$ min What would have been the radiant energy incident normally on the earth if the sun had a temperature twice of the present one ? .

A. $160kcal/m^2 \text{ min}$

B. $40kcal/m^2 \text{ min}$

C. $320kcal/m^2 \text{ min}$

D. $80kcal/m^2 \text{ min}$

Answer: C

Watch Video Solution

20. A spherical black body with a radius of $12cm$ radiates $450W$ power at $500K$. If the radius were halved and the temperature doubled, the power radiated in watt would be

A. 225

B. 450

C. 900

D. 1800

Answer: D

Watch Video Solution

21. If the temperature of the sun (black body) is doubled, the rate of energy received on earth will be increase by a factor of

A. 2

B. 4

C. 8

D. 16

Answer: D

Watch Video Solution

22. The ratio of energy of emitted radiation of a black body at $27^\circ C$ and $927^\circ C$ is

A. $1:4$

B. $1:16$

C. $1:64$

D. $1:256$

Answer: D

Watch Video Solution

23. If the temperature of a black body be increased from $27^\circ C$ to $327^\circ C$ the radiation emitted increases by a fraction of

A. 16

B. 8

C. 4

D. 2

Answer: A

Watch Video Solution

24. The rectangular surface of area $8cm \times 4cm$ of a black body at temperature $127^\circ C$ emits energy E per section if length and breadth are reduced to half of the initial value and the temperature is raised to $327^\circ C$, the ratio of emission of energy becomes

A. $\frac{3}{8}E$

B. $\frac{81}{16}E$

C. $\frac{9}{16}E$

D. $\frac{81}{64}E$

Answer: D

Watch Video Solution

25. At temperature T , the power radiated by a body is Q watts . At the temperature 3 T the power radiated by it will be

A. 3 Q

B. 9 Q

C. 27 Q

D. 81 Q

Answer: D

Watch Video Solution

26. Two spherical black bodies of radii R_1 and R_2 and with surface temperature T_1 and T_2 respectively radiate the same power. R_1 / R_2 must be equal to

A. $\left(\frac{T_2}{T_1}\right)^2$

B. $\left(\frac{T_2}{T_1}\right)^4$

C. $\left(\frac{T_1}{T_2}\right)^2$

D. $\left(\frac{T_1}{T_2}\right)^4$

Answer: A

Watch Video Solution

27. Temperature of a black body increases from $327^\circ C$ to $927^\circ C$, the initial energy possessed is 2KJ, what is its final energy

A. 32 KJ

B. 320 KJ

C. 1200 J

D. None of these

Answer: A

Watch Video Solution

28. The original temperature of a black body is . $727^\circ C$. The temperature at which this black body must be raised so as to double the total radiant energy, is

A. 971 K

B. 1190 K

C. 2001 K

D. 1458 K

Answer: B

Watch Video Solution

29. Two black metallic spheres of radius 4m, at 2000 K and 1m at 4000 K will have ratio of energy radiation as

A. $1:1$

B. $4:1$

C. $1:4$

D. $2:1$

Answer: a

Watch Video Solution

30. The energy spectrum f a black body exhibits a maximum around a wavelength λ_0. The temperature of the black body is now changed such that the energy is maximum around a wavelength $3\lambda_0/4$. The power radiated by the black body will now increase by a factor of

A. $256/81$

B. $64/27$

C. $16/9$

D. $4/3$

Answer: a

Watch Video Solution

31. A black body is at a temperature $300K$. It emits energy at a rate, which is proportional to

A. 300

B. $(300)^2$

C. $(300)^3$

D. $(300)^4$

Answer: D

Watch Video Solution

32. The temperature of a body is increased by 50%. The amount of radiation emitted by it would be nearly

A. 125%

B. 200%

C. 300%

D. 400%

Answer: D

Watch Video Solution

33. Two identical metal balls at temperature $200^\circ C$ and $400^\circ C$ kept in air at $27^\circ C$. The ratio of net heat loss by these bodies is

A. $1/4$

B. $1/2$

C. $1/16$

D. $\dfrac{473^4 - 300^4}{673^4 - 300^4}$

Answer: D

Watch Video Solution

34. Two spheres made of same material have radii in the ratio 1: 2 Both are at same temperature. Ratio of heat radiation energy emitted per second by them is

A. $1:2$

B. $1:8$

C. $1:4$

D. $1:16$

Answer: C

Watch Video Solution

35. A black body at a temperature of $127^{\circ} C$ raidates heat at the rate of $1 cal / cm \times \sec$. At a temperature of $527^{\circ} C$ the rate of heat radiation from the body in $(cal / cm \times \sec)$ will be

A. 16

B. 10.45

C. 4

D. 2

Answer: A

Watch Video Solution

36. A black body radiates 20 W at temperature $227^\circ C$. If temperature of the black body is changed to $727^\circ C$ then its radiating power wil be

A. 120 W

B. 240 W

C. 320 W

D. 360 W

Answer: C

Watch Video Solution

37. Two spheres of same material have radius 1 m and 4 m and temperature 4000 K and 2000 K respectively. The energy radiated per second by the first sphere is

A. Greater than that by the second

B. Less than that by the second

C. Equal in both cases

D. The information is incomplete

Answer: C

Watch Video Solution

38. The radiation emitted by a star A is 10,000 times that of the sun. If the surface temperatures of the sun and the star A are 6000 K and 2000 K respectively, the ratio of the radii of the star A and the sun is

A. $300:1$

B. $600:1$

C. $900:1$

D. $1200:1$

Answer: C

Watch Video Solution

39. A black body radiates at the of W watts at a temperture T. If the temperature of the body is reduced to $T/3$, it will radiate at the rate of (in Watts)

A. $\frac{W}{81}$

B. $\frac{W}{27}$

C. $\frac{W}{9}$

D. $\frac{W}{3}$

Answer: A

Watch Video Solution

40. Star A has radius r surface temperature T while star B has radius 4 r and surface temperature T /2. The ratio of the power of two starts, P A : P B is

A. $16:1$

B. $1:16$

C. $1:1$

D. $1:4$

Answer: C

Watch Video Solution

41. Suppose the sun expands so that its radius becomes 100 times its present radius and its surface temperature becomes half of its present value. The total energy emited by it then will increase by a factor of :

A. 10

B. 625

C. 256

D. 16

Answer: B

Watch Video Solution

42. If the temperature of the sun were to increase form T to 2T and its radius from R to 2R, then the ratio of the radiant energy received on earth to what it was previously will be

A. 4

B. 16

C. 32

D. 64

Answer: D

Watch Video Solution

43. At $127^\circ C$ radiates energy is $2.7 \times 10J / s$. At what temperature radiated energy is $4.32 \times 10J / s$

A. 400 K

B. 4000 K

C. 80000 K

D. 40000 K

Answer: C

Watch Video Solution

44. If the initial temperatures of metallic sphere and disc, of the same mass, radius and nature are equal, then the ratio of their rate of cooling in same environment will be

A. $1:4$

B. $4:1$

C. $1:2$

D. $2:1$

Answer: D

Watch Video Solution

45. A black body radiates energy at the rate of $1 \times 10 J / s \times m$ at temperature of $227^{\circ} C$, The temperature to which it must be heated so that it radiates energy at rate of $1 \times 10 J / sm$, is

A. 5000 K

B. 5000 C

C. 500 K

D. 500 C

Answer: A

Watch Video Solution

46. The temperature of a body is increased from $-73^{\circ}C$ to 327ºC. Then the ratio of emissive power is –

A. $1:3$

B. $1:81$

C. $1:27$

D. $1:9$

Answer: B

Watch Video Solution

47. If the temperature of the body is increased by 10%, the percentage increase in the emitted radiation will be

A. $46\ \%$

B. $40\ \%$

C. $30\ \%$

D. $80\ \%$

Answer: A

Watch Video Solution

48. If the sun's surface radiates heat at $6.3 \times 10^7 Wm^{-2}$. Calculate the temperature of the sun assuming it to be a black body $(\sigma = 5.7 \times 10^{-8} Wm^{-2}K^{-4})$

A. $5.8 \times 10^3 K$

B. $8.5 \times 10^3 K$

C. $3.5 \times 10^8 K$

D. $5.3 \times 10^8 K$

Answer: A

Watch Video Solution

49. A sphere at temperature $600K$ is placed in an enviroment to temperature is $200K$. Its cooling rate is H. If its temperature reduced to $400K$ then cooling rate in same enviorment will become

A. $(3/16)H$

B. $(16/3)H$

C. $(9/27)H$

D. $(1/16)H$

Answer: A

Watch Video Solution

50. The value of Stefan's constant is

A. $5.67 \times 10^{-8} W / m^2 - K^4$

B. $5.67 \times 10^{-5} W / m^2 - K^4$

C. $5.67 \times 10^{-11} W / m^2 - K^4$

D. None of these

Answer: A

Watch Video Solution

51. The rate of cooling at 600 K, if surrounding temperature is 300 K is R. The rate of cooling at 900 K is

A. $\frac{16}{3}R$

B. 2R

C. 3R

D. $\frac{2}{3}R$

Answer: A

Watch Video Solution

52. A blackbody of surface area $10cm^2$ is heated to $127^\circ C$ and is suspended in a room at temperature $27^\circ C$. Calculate the initial rate of loss of heat from the body to the room.

A. 2.99 W

B. 1.89 W

C. 1.18 W

D. 0.99 W

Answer: D

Watch Video Solution

53. Two identical objects A and B are at temperature T_A and T_B respectively. Both objects are placed in a room with perfectly absorbing walls maintained at temperature $T(T_A > T > T_B)$

Statement-1: The objects A and B attain the temperature T eventually.

Statement-2: A only emits radiation while B only absorbs until radiation both attain the temperature T

A. ‘ A ’ only emits radiations while B only absorbs them until both attain temperature

B. A loses more radiations than it absorbs while B absorbs more radiations that it emits until temperature T is attained

C. Both A and B only absorb radiations until they attain temperature T

D. Both A and B only emit radiations until they attain temperature T

Answer: B

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54. When a body has the same temperature as that of its surroundings

A. It does not radiate heat

B. It radiates the same quantity of heat as it absorbs

C. It radiates less quantity of heat as it receives from surroundings

D. It radiates more quantity of heat as it receives heat from surroundings

Answer: B

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55. The ratio of radiant energies radiated per unit surface area by two bodies is $16:1$, the temperature of hotter body is 1000 K , then the temperature of colder body will be

A. 250 K

B. 500 K

C. 1000 K

D. 62.5 K

Answer: b

Watch Video Solution

56. The spectral energy distribution of star is maximum at twice temperature as that of sun. The total energy radiated by star is

A. Twice as that of the sun

B. Same as that of the sun

C. Sixteen times as that of the sun

D. One sixteenth of sun

Answer: C

Watch Video Solution

Radiation Newton S Law Of Cooling

1. Hot water cools from $60^\circ C$ to $50^\circ C$ in the first 10 min and to $42^\circ C$ in the next 10 min. The temperature of the surrounding is

A. $5^\circ C$

B. $10^\circ C$

C. $15^\circ C$

D. $20^\circ C$

Answer: B

Watch Video Solution

2. A bucket full of hot water cools from $75^\circ C$ to $70^\circ C$ in time T_1, from $70^\circ C$ to $65^\circ C$ in time T_2 and from $65^\circ C$ to $60^\circ C$ in time T_3, then

A. $T_1 = T_2 = T_3$

B. $T_1 > T_2 > T_3$

C. $T_1 < T_2 < T_3$

D. $T_1 > T_2 > T_3$

Answer: C

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3. Consider two hot bodies B_1 and B_2 which have temperature 100°C and 80°C respectively at t = 0. The temperature of surroundings is 40°C. The ratio of the respective rates of cooling R_1 and R_2 of these two bodies at $t = 0$ will be

A. $R_1 : R_2 = 3 : 2$

B. $R_1 : R_2 = 5 : 4$

C. $R_1 : R_2 = 2 : 3$

D. $R_1 : R_2 = 4 : 5$

Answer: A

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4. Newton's law of cooling is a special case of .

A. Stefan's law

B. Kirchhoff's law

C. Wien's law

D. Planck's law

Answer: A

Watch Video Solution

5. Equal masses of two liquids are filled in two similar calorimeters. The rate of cooling will

A. Depend on the nature of the liquids

B. Depend on the specific heats of liquids

C. Be same for both the liquids

D. Depend on the mass of the liquids

Answer: B

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6. In Newton's experiment of cooling, the water equivalent of two similar calorimeters is 10 gm each. They are filled with 350 gm of water and 300 gm of a liquid (equal volumes) separately. The time taken by water and liquid to cool from $70^{\circ}C$ to $60^{\circ}C$ is 3 min and 95 sec respectively. The specific heat of the liquid will b

A. $0.3 Cal / gm \times .^{\circ} C$

B. $0.5 Cal / gm \times .^{\circ} C$

C. $0.6 Cal / gm \times .^{\circ} C$

D. $0.8 Cal / gm \times .^{\circ} C$

Answer: c

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7. Newton's law of cooling is used in laboratory for the determination of the

A. Specific heat of the gases

B. The latent heat of gases

C. Specific heat of liquids

D. Latent heat of liquids

Answer: C

Watch Video Solution

8. A body cools from $60^\circ C$ to $50^\circ C$ in 10 minutes when kept in air at $30^\circ C$. In the next 10 minut es its temperature will be

A. Below $40^\circ C$

B. $40^\circ C$

C. Above $40^\circ C$

D. Cannot be predicted

Answer: C

Watch Video Solution

9. Liquid is filled in a vessel which is kept in a room with temperature 20°C. When the temperature of the liquid is 80°C, then it loses heat at the rate of 60 cal/sec. What will be the rate of loss of heat when the temperature of the liquid is 40°C ?

A. $180cal/\sec$

B. $40cal/\sec$

C. $30cal/\sec$

D. $20cal/\sec$

Answer: D

Watch Video Solution

10. Which of the following statements is true/correct

A. During clear nights, the temperature rises steadily upward near the ground level

B. Newton's law of cooling, an approximate form of Stefan's law, is valid only for natural convection

C. The total energy emitted by a black body per unit time per unit area is proportional to the square of its temperature in the Kelvin scale

D. Two spheres of the same material have radii 1m and 4m and temperatures 4000 K and 2000 K respectively. The energy radiated per second by the first sphere is greater than that radiated per second by the second sphere

Answer: B

Watch Video Solution

11. A body takes 4 minutes to cool from $100^{\circ}C$ to $70^{\circ}C$. To cool from $70^{\circ}C$ to $40^{\circ}C$ it will take (room temperture os $15^{\circ}C$)

A. 7 minutes

B. 6 minutes

C. 5 minutes

D. 4 minutes

Answer: B

Watch Video Solution

12. A cup of tea cools from $80^\circ C$ to $60^\circ C$ in one minute. The ambient temperature is $30^\circ C$. In cooling from $60^\circ C$ to $50^\circ C$ it will take

A. 30 seconds

B. 60 seconds

C. 90 seconds

D. 50 seconds

Answer: D

Watch Video Solution

13. A liquid cools down from $70^\circ C$ to $60^\circ C$ in 5 minutes. The time taken to cool it from $60^\circ C$ to $50^\circ C$ will be

A. 5 minutes

B. Lesser than 5 minutes

C. Greater than 5 minutes

D. Lesser or greater than 5 minutes depending upon the density of the liquid

Answer: C

Watch Video Solution

14. If a metallic sphere gets cooled from $62^\circ C$ to $50^\circ C$ in utesmin10 and in the next utes min10 gets cooled to $42^\circ C$, then the temperature of the surroundings is

A. $30^\circ C$

B. $36^\circ C$

C. $26^\circ C$

D. $20^{\circ} C$

Answer: C

Watch Video Solution

15. The rates of cooling of two different liquids put in exactly similar calorimeters and kept in identical surroundings are the same if

A. The masses of the liquids are equal

B. Equal masses of the liquids at the same temperature are taken

C. Different volumes of the liquids at the same temperature are taken

D. Equal volumes of the liquids at the same temperature are taken

Answer: D

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16. A body cools from $60^\circ C$ to $50^\circ C$ in 10 minutes . If the room temperature is $25^\circ C$ and assuming Newton's law of cooling to hold good, the temperature of the body at the end of the next 10 minutes will be

A. $38.5^\circ C$

B. $40^{\circ} C$

C. $42.85^{\circ} C$

D. $45^{\circ} C$

Answer: C

Watch Video Solution

17. The temperature of a liquid drops from 365 K to 361 K in 2 minutes . Find the time during which temperature of the liquid drops from 344 K to 342 K.Temperature of room is 293 K

A. 84 sec

B. 72 sec

C. 66 sec

D. 60 sec

Answer: A

Watch Video Solution

18. A body cools from $50^\circ C$ to $49^\circ C$ in 5 s. How long will it take to cool from $40^\circ C$ to $39.5^\circ C$? Assume the temperature of surroundings to be $30^\circ C$ and Newton's law of cooling to be valid:

A. 2.5 s

B. 10 s

C. 20 s

D. 5 s

Answer: D

Watch Video Solution

19. A container contains hot water at $100^{\circ} C$. If in time T_1 temperature falls to $80^{\circ} C$ and in time T_2 temperature falls to $60^{\circ} C$ from $80^{\circ} C$, then

A. $T_1 = T_2$

B. $T_1 > T_2$

C. $T_1 < T_2$

D. None

Answer: C

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20. Hot water kept in a beaker placed in a room cools from $70^\circ C$ to 60º C in 4 minutes . The time taken by it to cool from $69^\circ C$ to $59^\circ C$ will be

A. The same 4 minutes

B. More than 4 minutes

C. Less than 4 minutes

D. We cannot say definitely

Answer: B

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Watch Video Solution

21. Newton's law of cooling, holds good only if the temperature difference between the body and the surroundings is

A. Less than $10^{\circ}C$

B. More than $10^{\circ}C$

C. Less than $100^{\circ}C$

D. More than $100^{\circ}C$

Answer: A

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22. In a room where the temperature is $30^\circ C$, a body cools from $61^\circ C$ to $59^\circ C$ in 4 minutes. The time (in min.) taken by the body to cool from $51^\circ C$ to $49^\circ C$ will be

A. 4 min

B. 6 min

C. 5 min

D. 8 min

Answer: B

Watch Video Solution

23. According to 'Newton's Law of cooling', the rate of cooling of a body is proportional to the

A. Temperature of the body

B. Temperature of the surrounding

C. Fourth power of the temperature of the body

D. Difference of the temperature of the body and the surroundings

Answer: D

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24. A body cools in 7 minutes from $60^\circ C$ to $40^\circ C$ What time (in minutes) does it take to cool from $40^\circ C$ to $28^\circ C$ if the surrounding temperature is $10^\circ C$? Assume Newton's Law of cooling holds

A. 3.5

B. 11

C. 7

D. 10

Answer: C

Watch Video Solution

25. A body takes 5 minutes for cooling from $50^{\circ} C$ to $40^{\circ} C$ Its temperature comes down to $33.33^{\circ} C$ in next 5 minutes. Temperature of surroundings is

A. $15^{\circ} C$

B. $20^{\circ} C$

C. $25^{\circ} C$

D. $10^{\circ} C$

Answer: B

Watch Video Solution

26. The temperature of a body falls from $50^{\circ} C$ to $40^{\circ} C$ in 10 minutes. If the temperature of the surroundings is $20^{\circ} C$ Then temperature of the body after another 10 minutes will be

A. $36.6^{\circ} C$

B. $33.3^{\circ} C$

C. $35^\circ C$

D. $30^\circ C$

Answer: B

Watch Video Solution

27. It takes 10 minutes to cool a liquid from $61^\circ C$ to $59^\circ C$. If room temperature is $30^\circ C$ then find the time taken in cooling from $51^\circ C$ to $49^\circ C$.

A. 10 min

B. 11 min

C. 13 min

D. 15 min

Answer: D

Watch Video Solution

28. A calorimeter of mass $0.2kg$ and specific heat $900J/kg-K$. Containing $0.5kg$ of a liquid of specific heat $2400J/kg-K$. Its temperature falls from $60^{\circ}C$ to $55^{\circ}C$ in one minute. Find the rate of cooling.

A. 5 J/s

B. 15 J/s

C. 100 J/s

D. 115 J/s

Answer: D

Watch Video Solution

29. According to Newton's law of cooling, the rate of cooling of a body is proportional to $(\Delta\theta)^n$, where $\Delta\theta$ is the difference of the temperature of the body and the surroundings, and n is equal to

A. One

B. Two

C. Three

D. Four

Answer: A

Watch Video Solution

30. A body initially at $80^{\circ} C$ cools to $64^{\circ} C$ in 5 minutes and to $52^{\circ} C$ in 10 minutes. What is the temperature of the surroundings?

A. $26^{\circ} C$

B. $49^{\circ} C$

C. $35^{\circ} C$

D. $42^{\circ} C$

Answer: B

Watch Video Solution

31. A liquid cools from $50^{\circ} C$ to $45^{\circ} C$ in 5 minutes and from $45^{\circ} C$ to $41.5^{\circ} C$ in the next 5 minutes. The temperature of the surrounding is

A. $27^{\circ} C$

B. $40.3^{\circ} C$

C. $23.3^{\circ} C$

D. $33.3^{\circ} C$

Answer: D

Watch Video Solution

32. A cup of tea cools from 65.5°C to $62.55^{\circ}C$ in one minute in a room at $225.^{\circ}C$. How long will the same cup of tea take to cool from $46.5^{\circ}C$ to $40.5^{\circ}C$ in the same room ? (Choose the nearest value in min).

A. 1

B. 2

C. 3

D. 4

Answer: D

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33. A body takes 10 min to cool douwn from $62^{\circ}C$ to $50^{\circ}C$. If the temperature of surrounding is $26^{\circ}C$ then in the next 10 minutes temperature of the body will be

A. $42^{\circ}C$

B. $40^{\circ}C$

C. $56^{\circ}C$

D. $55^{\circ}C$

Answer: A

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34. A body takes 5 minutes to cool from $90^\circ C$ to $60^\circ C$. If the temperature of the surroundings is $20^\circ C$, the time taken by it to cool from $60^\circ C$ to $30^\circ C$ will be.

A. 5 min

B. 8 min

C. 11 min

D. 12 min

Answer: C

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35. A body is cooled in 2 min n a room at temperature of $30^{\circ} C$ from $75^{\circ} C$ to $65^{\circ} C$. If the same body Is cooled from $55^{\circ} C$ to $45^{\circ} C$ in the same room, find the time taken (in minute).

A. 4

B. 5

C. 6

D. 7

Answer: A

Watch Video Solution

36. A liquid takes 5 minutes to cool from $80^{\circ} C$ to$50^{\circ} C$.

How much time will it take to cool from $60^{\circ} C$ to $30^{\circ} C$?

The temperature of surroundings is $20^{\circ} C$.

A. 40 minutes

B. 9 minutes

C. 30 minutes

D. 20 minutes

Answer: B

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37. A cane is taken out from a refrigerator at $0^{\circ}\mathrm{C}$. The atmospheric temperature is $25^{\circ}\mathrm{C}$. If t1 is the time taken to heat from $0^{\circ}\mathrm{C}$ to $5^{\circ}\mathrm{C}$ and t_2 is the time taken from $10^{\circ}\mathrm{C}$ to $15^{\circ}\mathrm{C}$, then the wrong statements are

(1) $t_1 > t_2$

(2)$t_1 = t_2$

(3) There is no relation

(4)$t_1 < t_2$

A. $t_1 > t_2$

B. $t_1 > t_2$

C. $t_1 = t_2$

D. There is no relation

Answer: B

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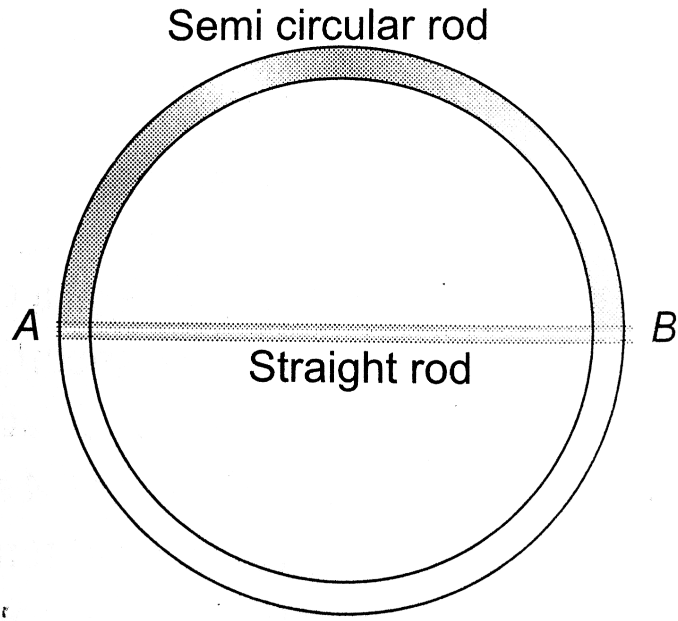
Critical Thinking

1. Two rods (one semi-circular and other straight) of same material and of same cross-sectional area are joined as shown in the figure. The point A and B are maintained at different temperature. Find the ratio of the heat transferred through a cross-section of a semi-circular rod to the heat transferred through a cross section of the straight rod in a given time.



A. $2 : \pi$

B. $1 : 2$

C. $\pi : 2$

D. $3 : 2$

Answer: A

Watch Video Solution

2. A wall has two layers A and B each made of different materials. Both the layers have the same thickness. The thermal conductivity of materials A is twice of B. Under thermal equilibrium temperature difference across the layer B is $36^\circ C$. The temperature difference across layer A is

A. $6^\circ C$

B. $12^\circ C$

C. $18^\circ C$

D. $24^\circ C$

Answer: B

Watch Video Solution

3. Ice starts forming in lake with water at $0^\circ C$ and when the atmospheric temperature is $-10^\circ C$. If the time taken for $1cm$ of ice be 7 hours. Find the time taken for the thickness of ice to change from $1cm$ to $2cm$

A. 7 hours

B. 14 hours

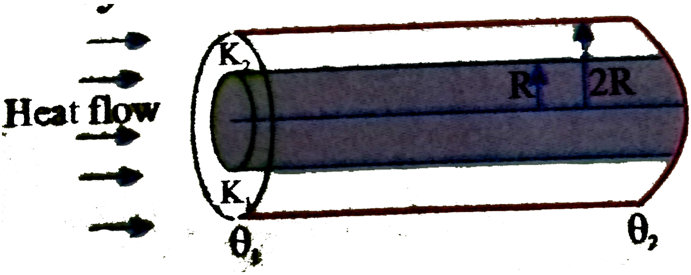
C. Less than 7 hours

D. More than 7 hours

Answer: D

Watch Video Solution

4. A cylinder of radius R made of a material of thermal conductivity K_1 is surrounded by cylindrical shell of inner radius R and outer radius $2R$ made of a material of thermal conductivity K_2 The two ends of the combined system are maintained at two different temperatures There is no loss of heat across the cylindrical surface and system is in steady state What is the effective thermal conductivity of the system



A. $K_1 + K_2$

B. $\dfrac{K_1 K_2}{K_1 + K_2}$

C. $\dfrac{K_1 + 3K_2}{4}$

D. $\dfrac{3K_1 + K_2}{4}$

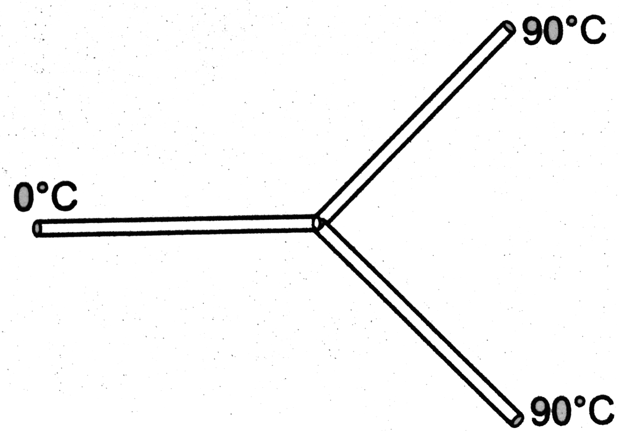
Answer: C

Watch Video Solution

5. Three rods made of the same material and having the same cross-section have been joined as shown in the figure. Each rod is of the same length. The left and right ends are kept at $0^{\circ} C$ and $90^{\circ} C$, respectively. The temperature of junction of the three rods will be

(a) $45^{\circ} C$ (b) $60^{\circ} C$

(c) $30^{\circ} C$ (d) $20^{\circ} C$.



A. $45^{\circ} C$

B. $60^\circ C$

C. $30^\circ C$

D. $20^\circ C$

Answer: B

Watch Video Solution

6. A room at $20^\circ C$ is heated by a heater of resistence 20 ohm connected to 200 VV mains. The temperature is uniform throughout the room and the heati s transmitted through a glass window of area $1m^2$ and thickness 0.2 cm. Calculate the temperature outside.

Thermal conductivity of glass is $0.2cal/mC^{\circ}$ s and mechanical equivalent of heat is $4.2J/cal.$

A. $15.24^{\circ}C$

B. $15.00^{\circ}C$

C. $24.15^{\circ}C$

D. None of the above

Answer: A

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7. There is formation of layer of snow x cm thick on water, when the temperature of air is $-\theta^{\circ}C$ (less than freezing point). The thickness of layer increases from x to y in the time r, then the value of t is given by

A. $\frac{(x+y)(x-y)\rho L}{2k\theta}$

B. $\frac{(x-y)\rho L}{2k\theta}$

C. $\frac{(x+y)(x-y)\rho L}{k\theta}$

D. $\frac{(x-y)\rho Lk}{2\theta}$

Answer: A

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8. A composite metal bar of uniform section is made up of length 25 cm of copper, 10 cm of nickel and 15 cm of aluminium. Each part being in perfect thermal contact with the adjoining part. The copper end of the composite rod is maintained at $100^\circ \mathrm{C}$ and the aluminium end at $0^\circ \mathrm{C}$. The whole rod is covered with belt so that there is no heat loss occurs at the sides. If $K_{Cu} = 2K_{Al}$ and $\mathrm{K}_{Al} = 3\mathrm{K}_{Ni}$, then what will be the temperatures of $Cu - Ni$ and $Ni - Al$ junctions respectively

A. $23.33^\circ C$ and $78.8^\circ C$

B. $83.33^\circ C$ and $20^\circ C$

C. $50^\circ C$ and $30^\circ C$

D. $30^\circ C$ and $50^\circ C$

Answer: B

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9. Three rods of identical cross-sectional area and made from the same metal from the sides of an isosceles triangle ABC, right-angled at B. The point A and B are maintained at temperatures T and $\sqrt{2}$ T respectively. In the steady state, the temperature of the point C is T_c. Assuming that only heat conduction takes places, T_c/T is

A. $\frac{1}{\left(\sqrt{2}+1\right)}$

B. $\frac{3}{\left(\sqrt{2}+1\right)}$

C. $\frac{1}{2\left(\sqrt{2}-1\right)}$

D. $\dfrac{1}{3\left(\sqrt{2}-1\right)}$

Answer: B

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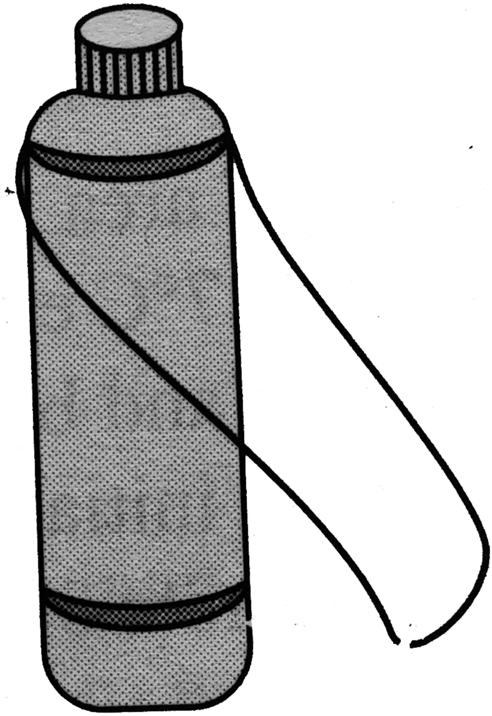

10.

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 $0.0075 cal / cm - s -^\circ C$. The outside temperature is $40^\circ C$ and latent heat of ice is

$80 cal / g$. Time taken by 500 g of ice at $0^{\circ} C$ in the flask to melt into water at $0^{\circ} C$ is `

A. 2.47 hr

B. 4.27 hr

C. 7.42 hr

D. 4.72 hr

Answer: A

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11. A sphere a cube and thin circular plate, all made of the same material and having the same mass are initially heated to a temperature of $1000^\circ C$. Which one of these will cool first?

A. Plate

B. Sphere

C. Cube

D. None of these

Answer: A

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12. Two identical conducting rods are first connected independently to two vessels, one containing water at $100^\circ C$ and the other containing ice at $0^\circ C$. In the second case, the rods are joined end to end and connected to the same vessels. Let q_1 and q_2 gram per second be the rate of melting of ice in the two cases respectively. The ratio $\frac{q_1}{q_2}$ is

(a) $\frac{1}{2}$ (b) $\frac{2}{1}$ (c) $\frac{4}{1}$ (d) $\frac{1}{4}$

A. $\frac{1}{2}$

B. $\frac{2}{1}$

C. $\frac{4}{1}$

D. $\frac{1}{4}$

Answer: C

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13. A solid cube and a solid sphere of the same material have equal surface area. Both are at the same temperature $120^\circ C$, then

A. Both the cube and the sphere cool down at the same rate

B. The cube cools down faster than the sphere

C. The sphere cools down faster than the cube

D. Whichever is having more mass will cool down faster

Answer: B

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14. Two bodies A and B have thermal emissivities of 0.01 and 0.81 respectively. The outer surface areas of the two bodies are same. The two bodies emit total radiant power at the same rate. The wavelength λ_B corresponding to maximum spectral radiancy from B is shifted from the wavelength corresponding to maximum spectral radiancy in the radiation from A by 1.0 μm. If the temperature of A is 5802 K, calculate (a) the temperature of B, (b) wavelength λ_B.

A. The temperature of B is 1934 K

B. $\lambda_B = 1.5\mu m$

C. The temperature of B is 11604 K

D. The temperature of B is 2901 K

Answer: A::B

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15. A black body is at a temperature of 2880 K. The energy of radiation emitted by this object with wavelength between 499 nm and 500 nm is U_1, between 999 nm and 1000 nm is U_2 and between 1499 nm and 1500 nm is U_3. The Wein's constant $b = 2.88 \times 10^6 \text{nm K}$. Then

A. $U_1 = 0$

B. $U_3 = 0$

C. $U_1 > U_2$

D. $U_2 > U_1$

Answer: d

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16. A black metal foil is warmed by radiation from a small sphere at temperature T and at a distance d it is found that the power received by the foil is P If both the temperature and the distance are doubled the power received by the foil will be .

A. 16P

B. 4P

C. 2P

D. P

Answer: B

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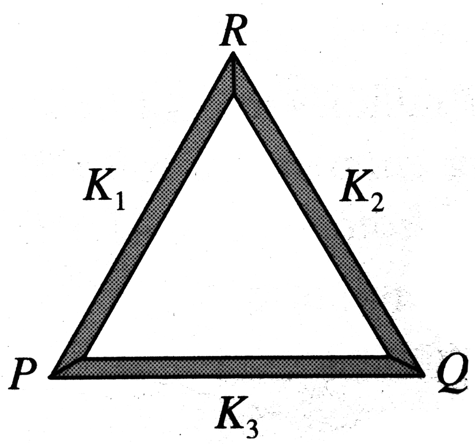
17.



Three rods of same dimensions are arranged as shown in Fig. They have thermal conductivities K_1,K_2 and K_3. The points P and Q are maintained at different temeperature for the heat to flow at the same rate along PRQ and PQ. Whi of the following options correct?

A. $K_3 = \frac{1}{2}(K_1 + K_2)$

B. $K_3 = K_1 + K_2$

C. $K_3 = \frac{K_1 K_2}{K_1 + K_2}$

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

Answer: C

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18. Two metallic spheres S_1 and S_2 are made of the same material and have got identical surface finish. The mass of S_1 is thrice that of S_2. Both the spheres are heated to the same high temperature and placed in the same room having lower temperature but are thermally insulated from each other. the ratio of the initial rate of cooling of

S_1 to that of S_2 is

$(a)\frac{1}{3}(b)\frac{1}{\sqrt{3}}(c)\frac{\sqrt{3}}{1}(d)\left(\frac{1}{3}\right)^{\frac{1}{3}}$

A. $1/3$

B. $(1/3)^{1/3}$

C. $1/\sqrt{3}$

D. $\sqrt{3}/1$

Answer: B

Watch Video Solution

19. Three discs, A, B and C having radii 2m, 4m and6m respectively are coated with carbon black on their outer surfaces. The wavelengths corresponding to maximum intensity are $300nm, 400nm$ and $500nm$, respectively. The power radiated by them are $Q_A, Q_B \text{ and } Q_C$ respectively

(a) Q_A is maximum (b) Q_B is maximum (c) Q_C is maximum (d) $Q_A = Q_B = Q_C$

A. Q_a is maximum

B. Q_b is maximum

C. Q_c is maximum

D. $Q_a = Q_b = Q_c 21$

Answer: B

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20. The total energy radiated from a block body source at constant temperature is collected for one minute and is used to heat a quantity of water. The temperature of water is found to increase from $20^\circ C$ to $20.5^\circ C$. If the absolute temperature of the blackbody is doubled and the experiment is repeated with the same quantity of water of $20^\circ C$, the temperature of water will be:

A. $21^\circ C$

B. $22^\circ C$

C. $24^{\circ} C$

D. $28^{\circ} C$

Answer: D

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21. A solid sphere and a hollow sphere of the same material and of equal radii are heated to the same temperature

A. The hollow sphere will cool at a faster rate for all values of T

B. The solid sphere will cool at a faster rate for all values of T

C. Both spheres will cool at the same rate for all values of T

D. Both spheres will cool at the same rate only for small values of T

Answer: A

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22. A solid copper cube of edges 1 cm is suspended in an evacuated enclosure. Its temperature is found to fall from $100^\circ C$ to $99^\circ C$ in 100 s. Another solid copper cube of edges 2 cm, with similar surface nature, is suspended in a similar manner. The time required for this cube to cool from $100^\circ C$ to $99^\circ C$ will be approximately

A. 25 s

B. 50 s

C. 200 s

D. 400 s

Answer: C

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23. A body initially at 80° C cools to 64° C in 5 minutes and to 52°C in 10 minutes. The temperature of the body after 15 minutes will be

A. $42.7^{\circ} C$

B. $35^{\circ} C$

C. $47^{\circ} C$

D. $40^{\circ} C$

Answer: A

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24. A $5cm$ thick ice block is there on the surface of water in a lake. The tmeperature of air $-10^{\circ} C$, how muct time it will take to double the thickness of the block?

$\left(L = 80cal/g, K_{ice} = 0.004cal/s - K, d_{ice} = 0.92gcm^{-3}\right)$

A. 1 hour

B. 191 hours

C. 19.1 hours

D. 1.91 hours

Answer: C

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25. A square is made of four rods of same material one of the diagonal of a square is at temperature difference $100^\circ C$, then the temperature difference of second diagonal:

A. $0^\circ C$

B. $\frac{100}{1}.^{\circ}C$, where / is the length of each rod

C. $\frac{100}{2l}.^{\circ}C$

D. $100^{\circ}C$

Answer: a

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26. A cylindrical rod with one end in a steam chamber and the other end in ice results in melting of 0.1 g of ice per second. If the rod is replaced by another with half the length and double the radius of the first and if the thermal conductivity of material of second rod is 1/4 that of first, the rate at which ice melts in g/s will be

A. 3.2

B. 1.6

C. 0.2

D. 0.1

Answer: C

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27. One end of a copper rod of length 1.0 m and area of cross-section 10^{-3} is immersed in boiling water and the other end in ice. If the coefficient of thermal conductivity of copper is $92cal/m-s-.^{\circ}C$ and the latent heat of ice is $8 \times 10^4 cal/kg$, then the amount of ice which will melt in one minute is

A. $9.2 \times 10^{-3} kg$

B. $8 \times 10^{-3} kg$

C. $6.9 \times 10^{-3} kg$

D. $5.4 \times 10^{-3} kg$

Answer: C

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28. An ice box used for keeping eatables cool has a total wall area of $1m^2$ and a wall thichness of 5.0 cm. The thermal cunductivity of the ice box is $K = 0.01 J/m^{\circ}C$.

It is filled with large amount of ice at $0^{\circ} C$ along with eatables on a dfay when the temperature is $30^{\circ} C$ The latent heat of fusion of ice is $334 \times 10^{3} J / kg$. The amount of ice melted in one day is (1 day $= 86,000 s$)

A. 776 gms

B. 7760 gms

C. 11520 gms

D. 1152 gms

Answer: D

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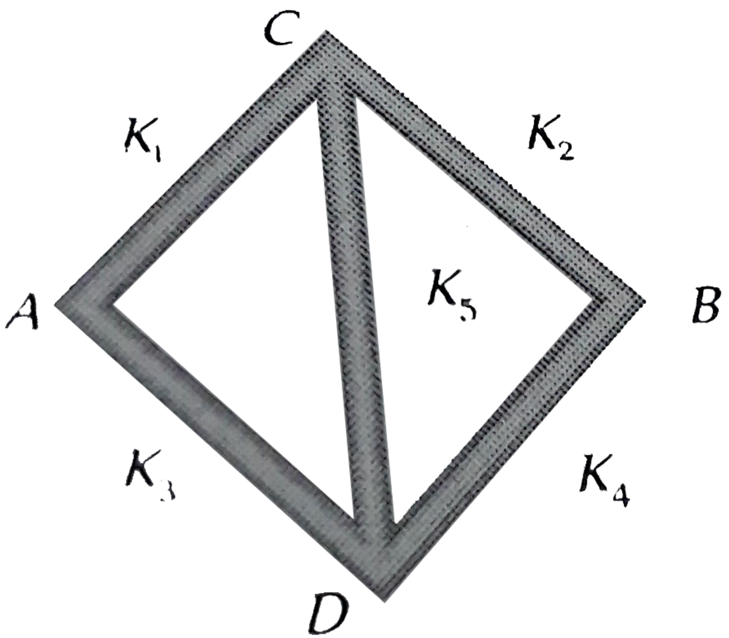
29. Five rods of same dimensions are arranged as shown in the figure. They have thermal conductivities K_1, K_2, K_3, K_4 and K_5 . When points A and B are maintained at different temperatures, no heat flows through the central rod if



A. $K_1 = K_4$ and $K_2 = K_3$

B. $K_1K_4 = K_2K_3$

C. $K_1K_2 = K_3K_4$

D. $\frac{K_1}{K_4} = \frac{K_2}{K_3}$

Answer: B

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30. A hot metallic sphere of radius r radiates heat. It's rate of cooling is

A. Independent of r

B. Proportional to r

C. Proportional to r^2

D. Proportional to $1/r$

Answer: D

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31. A solid copper sphere (density rho and specific heat c) of radius r at an initial temperature $200K$ is suspended inside a chamber whose walls are at almost $0K$. The time required for the temperature of the sphere to drop to 100K is ....

A. $\frac{72}{7}\frac{r\rho c}{\sigma}$

B. $\frac{7}{72}\frac{r\rho c}{\sigma}$

C. $\frac{27}{7}\frac{r\rho c}{\sigma}$

D. $\frac{7}{27}\frac{r\rho c}{\sigma}$

Answer: B

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32. One end of a copper rod of uniform cross-section and of length 3.1 m is kept in contact with ice and the other end with water at $100^\circ C$. At what point along it's length should a temperature of $200^\circ C$ be maintained so that in steady state, the mass of ice melting be equal to that of the steam produced in the same interval of time. Assume that the whole system is insulated from the surroundings. Latent heat of fusion of ice and vaporisation of water are 80 cal/gm and 540 cal/gm respectively

A. 21.3 cm from $100^{\circ} C$ end

B. 40 cm from $0^{\circ} C$ end

C. 125 cm from $100^{\circ} C$ end

D. 125 cm from $0^{\circ} C$ end

Answer: A

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33. A sphere and a cube of same material and same volume are heated up to same temperature and allowed to cool in the same sorroundings. The radio of the amounts of radiations emitted in equal time intervals will be

A. $1:1$

B. $\frac{4\pi}{3}:1$

C. $\left(\frac{\pi}{6}\right)^{1/3}:1$

D. $\frac{1}{2}\left(\frac{4\pi}{3}\right)^{2/3}:1$

Answer: C

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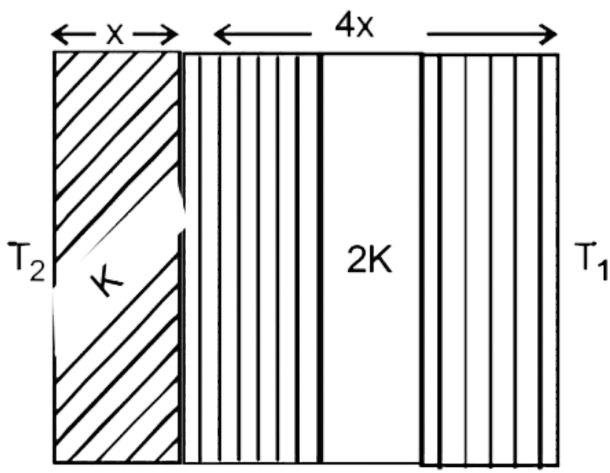
34. The temperature of the two outer surfaces of a composite slab, consisting of two materials having coefficients of two materials having coefficients of thermal conductivity K and 2K and thickness x and 4x, respectively, are T_2 and $T_1 (T_1 > T_1)$. The rate of heat transfer through the slab, in a steady state is $\left(\frac{A(T_2 - T_1)K}{2}\right) f$, with f equal to



A. 1

B. $\frac{1}{2}$

C. $\frac{2}{3}$

D. $\frac{1}{3}$

Answer: D

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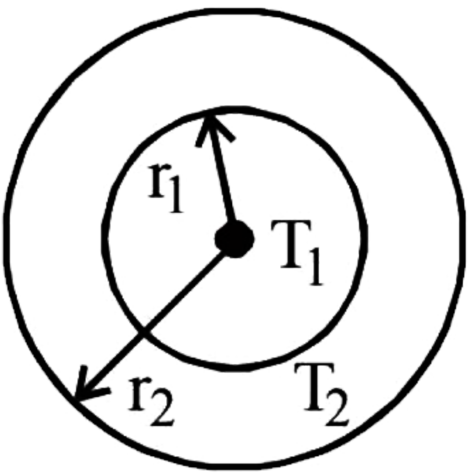
35. The figure shows a system of two concentric spheres of radii r_1 and r_2 are kept at temperature T_1 and T_2, respectively. The radial rate of flow of heat in a substance between the two concentric spheres is proportional to



A. $\dfrac{r_1 r_2}{(r_1 - r_2)}$

B. $(r_2 - r_1)$

C. $(r_2 - r_1)(r_1 r_2)$

D. $\ln\left(\dfrac{r_2}{r_1}\right)$

Answer: A

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36. Four rods of identical cross-sectional area and made from the same metal form the sides of square. The temperature of two diagonally opposite points are T and $\sqrt{2}T$ respectively in the steady state. Assuming that only heat conduction takes place, what will be the temperature difference between other two points

A. $\frac{\sqrt{2}+1}{2}T$

B. $\frac{2}{\sqrt{2}+1}T$

C. 0

D. None of these

Answer: C

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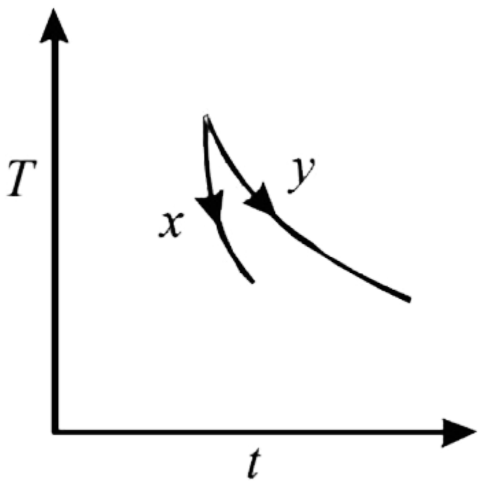
Graphical Questions

1. The graph, shown in the adjacent diagram, represents the variation of temperature (T) of two bodies, x and y having same surface area, with time (t) due to the emission of radiation. Find the correct relation between the emissivity and absorptivity power of the two bodies



A. $e_x > e_y \;\; \& \;\; a_x < a_y$

B. $e_x < e_y \;\; \& \;\; a_x > a_y$

C. $e_x > e_y \;\; \& \;\; a_x > a_y$

D. $e_x < e_y \quad \& \quad a_x < a_y$

Answer: C

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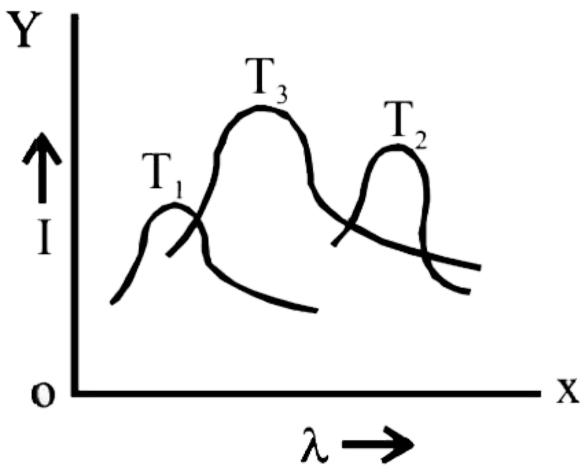
2. The plots of intensity versus wavelength for three black bodies at temperature T_1, T_2 and T_3 respectively are as shown. Their temperatures are such that



A. $T_1 > T_2 > T_3$

B. $T_1 > T_3 > T_2$

C. $T_2 > T_3 > T_1$

D. $T_3 > T_2 > T_1$

Answer: B

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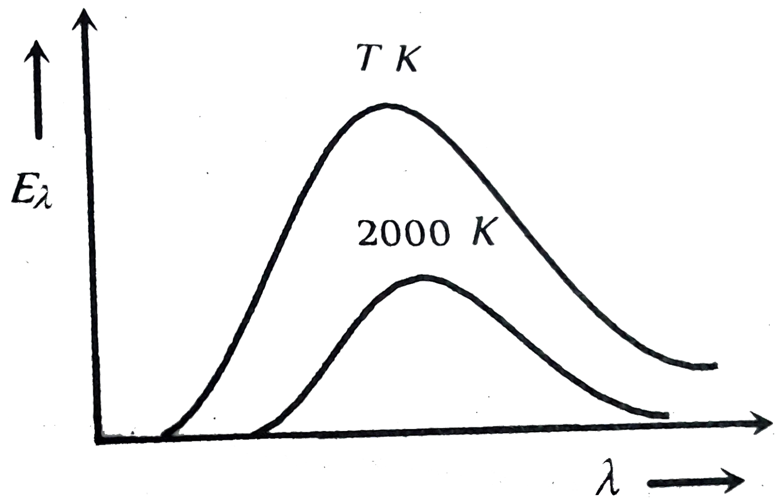
3. The adjoining diagram shows the spectral energy density distribution E_λ of a black body at two different temperatures. If the areas under the curves are in the ratio 16 : 1, the value of temperature T is



A. 32,000 K

B. 16,000 K

C. 8,000 K

D. 4,000 K

Answer: D

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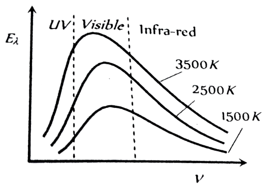
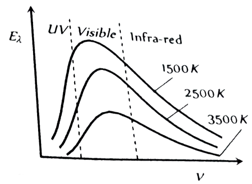
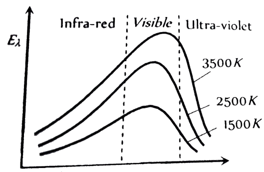
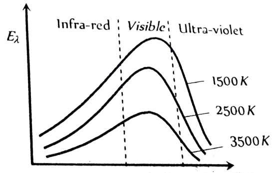
4. Following graph shows the correct variation in intensity of heat radiations by black body and frequency at a fixed temperature

A. 

B. 

C. 

D. 

Answer: C

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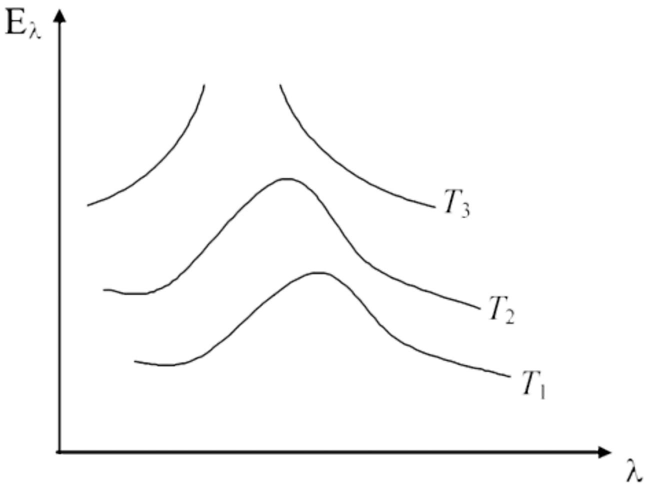
5. Variation of radiant energy emitted by sun, filament of tungsten lamp and welding arc as a function of its wavelength is shown in figure. Which of the following option is the correct match?



A. Sun- T_1, tungsten filament $-T_2$, welding arc -T_3

B. Sun $-T_2$, tungsten filament $-T_1$, welding arc $-T_3$

C. Sun $-T_3$,tungsten filament $-T_2$, welding arc $-T_1$

D. Sun $-T_1$, tungsten filament $-T_3$, welding arc $-T_2$

Answer: C

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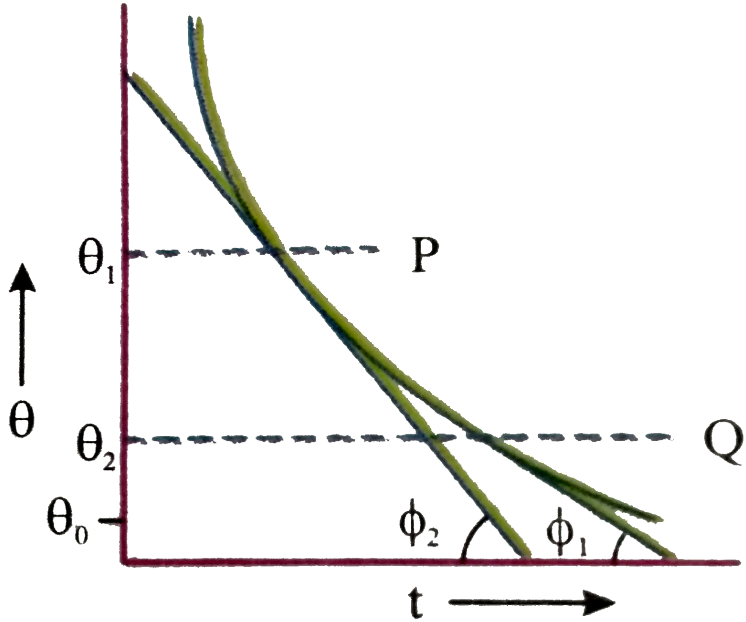
6. A body cools in a surrounding which is at a constant temperature of θ_0 Assume that it obeys Newton's law of cooling Its temperature θ is plotted against time t Tangents are drawn to the curve at the points $P(\theta = \theta_1)$ and $Q(\theta = \theta_2)$ These tangents meet the time axis at angle of ϕ_2 andϕ_1 as shown



A. $\dfrac{\tan\phi_2}{\tan\phi_1} = \dfrac{\theta_1 - \theta_0}{\theta_2 - \theta_0}$

B. $\dfrac{\tan\phi_2}{\tan\phi_1} = \dfrac{\theta_2 - \theta_0}{\theta_1 - \theta_0}$

C. $\dfrac{\tan\phi_1}{\tan\phi_2} = \dfrac{\theta_1}{\theta_2}$

D. $\dfrac{\tan\phi_1}{\tan\phi_2} = \dfrac{\theta_2}{\theta_1}$

Answer: B

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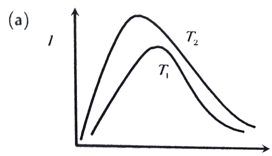
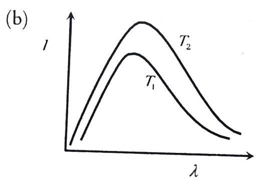
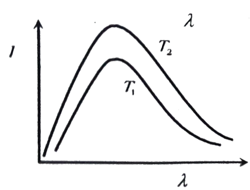
7. Shown below are the black body radiation curves at temperature T_1 and $T_2 (T_2 > T_1)$. Which of the following plots is correct?

A. 

B. 

C. 

D.

Answer: A

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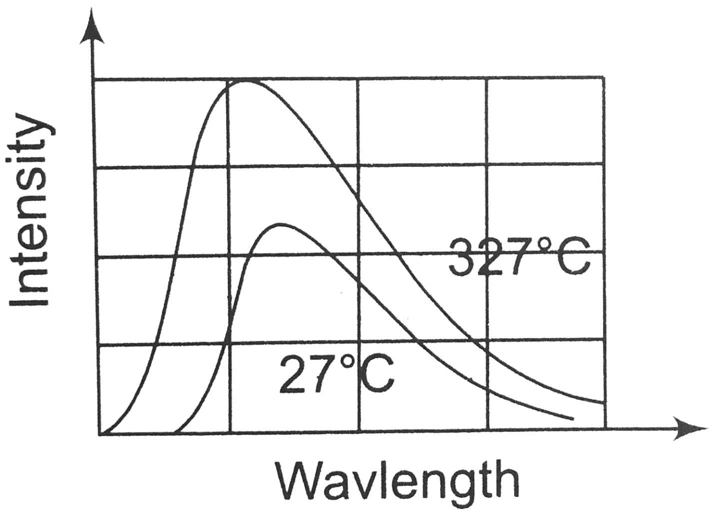
8. The spectrum of a black body at two temperatures $27^{\circ}C$ and $327^{\circ}C$ is shown in the figure. Let A_1 and A_2 be the areas under the two curves respectively. Find the value of $\frac{A_2}{A_1}$



A. $1:16$

B. $4:1$

C. $2:1$

D. $16:1$

Answer: D

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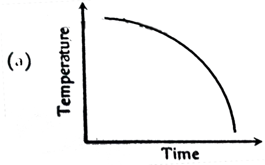
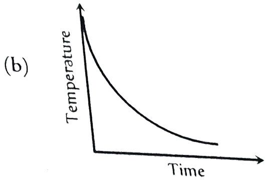
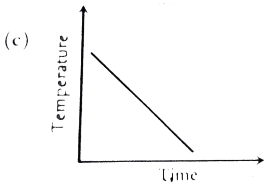
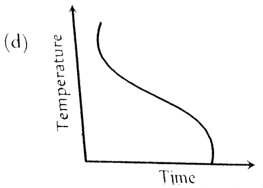
9. A block of metal is heated to a temperature much higher than the room temperature and allowed to cool in a room free from air currents. Which of the following curves correctly represents the rate of cooling

A. 

B. 

C. 

D. 

Answer: B

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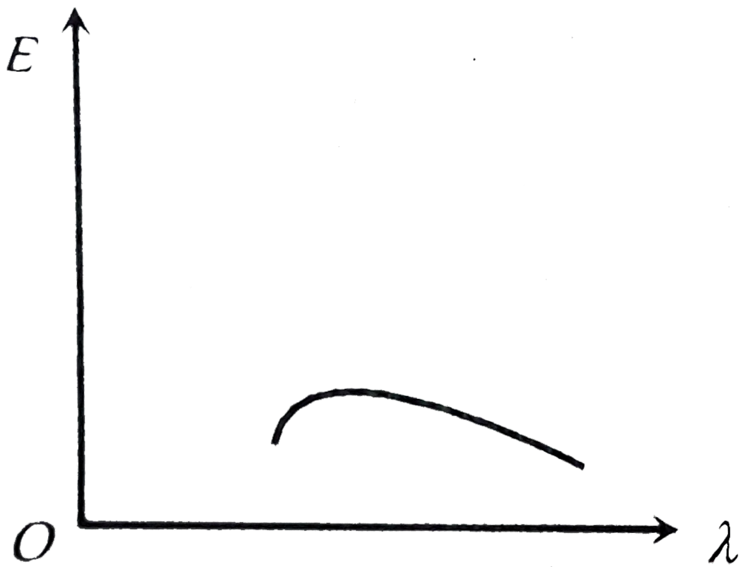
10. The energy distribution E with the wavelength (λ) for the black body radiation at temperature Kelvin T is shown in the figure. As the temperature is increased the maxima will



A. Shift towards left and become higher

B. Rise high but will not shift

C. Shift towards right and become higher

D. Shift towards left and the curve will become broader

Answer: A

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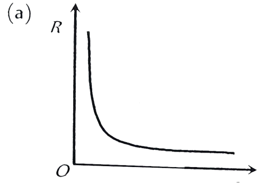
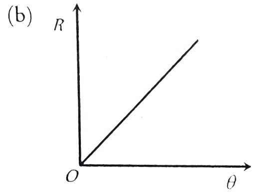
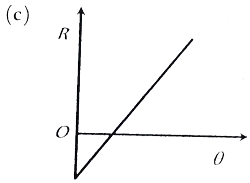
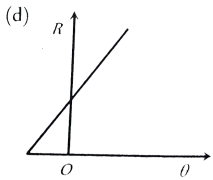
11. For a small temperature difference between the body and the surroundings the relation between the rate of loss heat R and the temperature of the body is depicted by

A. 

B. 

C. 

D. 

Answer: C

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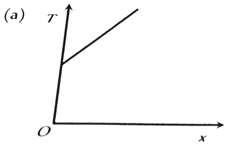
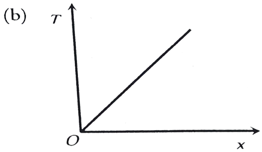
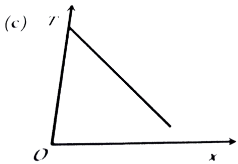
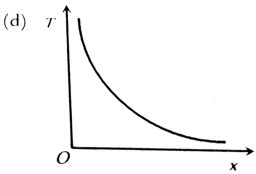
12. Heat is flowing through a conductor of length l from x = 0 to x = l . If its thermal resistance per unit length is uniform, which of the following graphs is correct

A. 

B. 

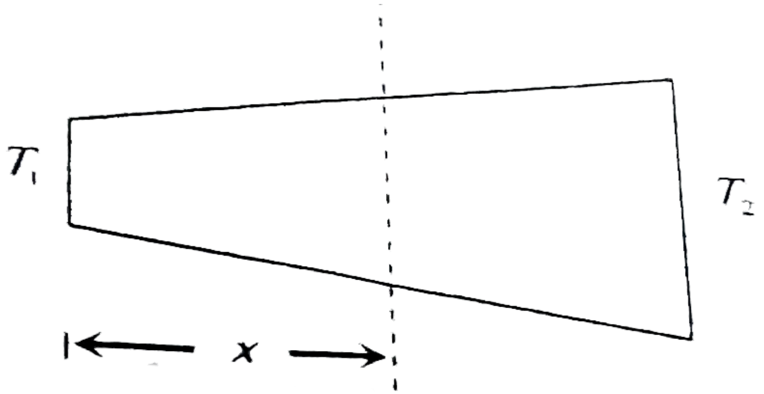
C. 

D. 

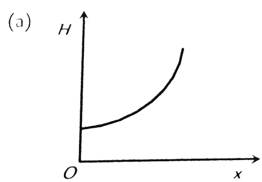
Answer: C

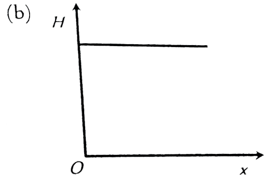
View Text Solution

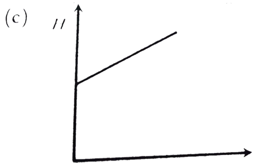
13. Radius of a conductor increases uniformly from left end to right end as shown in fig.

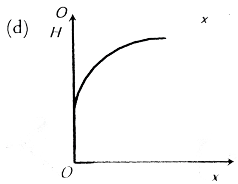


Material of the conductor is isotropic and its curved surface is thermally isolated from surrounding. Its ends are maintained at temperatures T_1 and $T_2 (T_1 > T_2)$: If, in steady state, heat flow rate is equal to H , then which of the following graphs is correct

A. 

B. 

C. 

D. 

Answer: B

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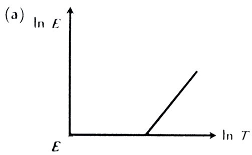
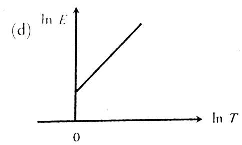
14. Which of the following graphs correctly represents the relation between ln E and ln T where E is the amount of radiation emitted per unit time from unit area of a body and T is the absolute temperature

A. 

B. 

C. 

Answer: D

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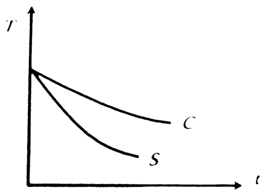
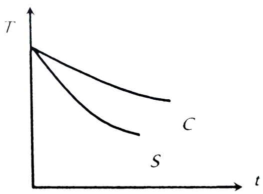
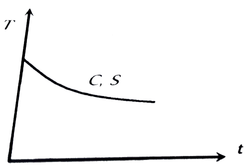
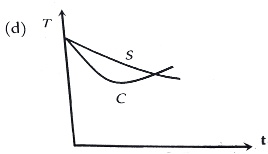
15. A hollow copper sphere S and a hollow copper cube C, both of negligible thin walls of same area, are filled with water at $90^{\circ}C$ and allowed to cool in the same environment. The graph that correctly represents their cooling is

A. 

B. 

C. 

D. 

Answer: C

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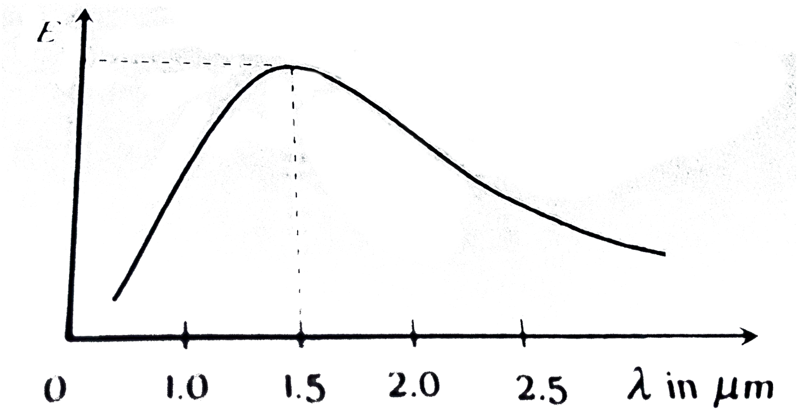
16. In the figure, the distribution of energy density of the radiation emitted by a black body at a given temperature is shown. The possible temperature of the black body is



A. 1500 K

B. 2000 K

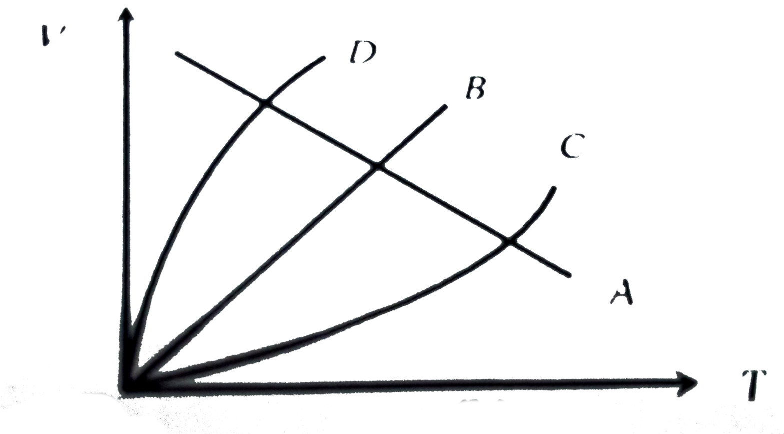
C. 2500 K

D. 3000 K

Answer: B

Watch Video Solution

17. Which of the following is the v_m = T graph for a perfectly black body (v_m =maximum frequency of radiation)



A. A

B. B

C. C

D. D

Answer: B

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Assertion Reason

1. Assertion : A body that is a good radiator is also a good absorber of radiation at a given wavelength.

Reason : According to Kirchhoff's law the absorptivity of a body is equal to its emissivity at a given wavelength

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

2. Assertion : For higher temperature, the peak emission wavelength of a black body shifts to lower wavelengths.

Reason : Peak emission wavelength of a black body is proportional to the fourth power of temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: C

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3. Assertion : Temperature near the sea-coast are moderate.

Reason : Water has a high thermal conductivity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

4. Assertion : It is hotter over the top of a fire than at the same distacne of the side.

Reason : Air surrounding the fire conducts more heat upward

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

5. Assertion : Bodies radiate heat at all temperatures.

Reason : Rate of radiation of heat is proportional to the fourth power of absolute temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If assertion is false but reason is true.

Answer: D

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6. Assertion : Woollen clothes keep the body warm in winter

Reason : Air is a bad conductor of heat.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

7. Assertion : The equivalent thermal conductivity of two plates of same thickness in contact (series) is less than the smaller value of thermal conductivity.

Reason : For two plates of equal thickness in contact (series) the equivalent thermal conductivity is given by

$$\frac{1}{K} = \frac{1}{K_1} + \frac{1}{K_2}$$

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: D

Watch Video Solution

8. Assertion : A hollow metallic closed container maintained at a uniform temperature cab act as a source of black body radiation.

Reason : All metals act as a black body.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

9. Assertion : If the temperature of a star is doubled then the rate loss of heat from it becomes $16 \times$.

Reason : Specific heat varies with temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

10. Assertion : The radiation from the sun's surface varies as the fourth power of its absolute temperature.

Reason : The sun is not a black body.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

11. Assertion : Blue star is at high temperature than red star.

Reason : Wein's displacement law states that $T \propto (1/\lambda_m)$.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

12. Assertion : The S.I. unit of thermal conductivity is watt $m^{1}1K^{1}$.

Reason : Thermal conductivity is a measure of ability of the material to allow the passage of heat through it.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

13. Assertion : A brass tumbler feels much colder than a wooden tray on a chilly day.

Reason : The thermal conductivity of brass is less than that of wood.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

14. Assertion: Like light radiation, thermal radiations are also electromagnetic radiation.

Reason: The thermal radiations require no medium for propagation.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

15. Assertion : Snow is better insulator than ice.

Reason : Snow contain air packet and air is good insulator of heat.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

16. Assertion : Water can be boiled inside satellite by convection.

Reason : Convection is the process in which heat is transmitted from a place of higher temperature to a place of lower temperature by means of particles with their migrations from one place to another.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: D

View Text Solution

17. Assertion : The absorbance of a perfect black body is unity.

Reason : A perfect black body when heated emits radiations of all possible wavelengths at that temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

18. Assertion : A man would feel iron or wooden balls equally hot at $98.4^{\circ}F$.

Reason : At $98.4^{\circ}F$ both iron and wood have same thermal conductivity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

19. Statement-1 : As temperature of a black body is raised, wavelenght corresponding to which energy emitted is maximum, reduces.

Statement-2 : Higher temperature would mean higher energy and hence higher wavelength.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

20. Assertion : All black coloured objects are considered black bodies.

Reason : Black colour is a good absorber of heat

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

21. Assertion : Greater is the coefficient of thermal conductivity of a material, smaller is the thermal resistance of a rod of that material.

Reason : Thermal resistance is the ratio of temperature difference between the ends of the conductor and rate of flow of heat.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

22. Assertion : Radiation is the speediest mode of heat transfer.

Reason : Radiation can be transmitted in zig-zag motion.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

23. Assertion : Two thin blankets put together are warmer than a single blanket of double the thickness.

Reason : Thickness increases because of air layer enclosed between the two blankets.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

24. Assertion : Animals curl into a ball, when they feel very cold.

Reason : Animals by curling their body reduces the surface area.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion

C. If assertion is true reason is false

D. If the assertion and reason both are false.

Answer: A

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Et Self Evaluation Test

1. A rod of 40 cm in length and temperature difference of $80^{\circ} C$ at its two ends. Another rod B of length 60cm and of temperature difference $90^{\circ} C$, having the same area of cross-section. If the rate of flow of heat is the same, then the ratio of their thermal conductivities will be

A. $3:4$

B. $4:3$

C. $1:2$

D. $2:1$

Answer: A

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2. Two vessels of different materials are similar in size in every respect. The same quantity of ice filled in them gets melted in 20 minutes and 40 minutes respectively. The ratio of thermal conductivities of the materials is

A. $5:6$

B. $6:5$

C. $3:1$

D. $2:1$

Answer: D

Watch Video Solution

3. In a steady state of thermal conduction, temperature of the ends A and B of a 20 cm long rod are $100^\circ C$ and $0^\circ C$ respectively. What will be the temperature of the rod at a point at a distance of 6 cm from the end A of the rod

A. $-30^\circ C$

B. $70^\circ C$

C. $5^\circ C$

D. None of the above

Answer: B

Watch Video Solution

4. Four rods of silver, copper, brass and wood are of same shape. They are heated together after wrapping a paper on it, the paper will burn first on

A. Silver

B. Copper

C. Brass

D. Wood

Answer: D

Watch Video Solution

5. The two opposite faces of a cubical piece of iron (thermal conductivity = 0.2 CGS units) are at $100^{\circ} C$ and $0^{\circ} C$ in ice. If the area of a surface is $4 cm^2$, then the mass of ice melted in 10 minutes will b

A. 30 gm

B. 300 gm

C. 5 gm

D. 50 gm

Answer: B

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6. Wein's constant is 2892×10^{-6} MKS unit and the value of λ_m from moon is 14.46 microns. What is the surface temperature of moon

A. 100 K

B. 300 K

C. 400 K

D. 200 K

Answer: D

Watch Video Solution

7. If at temperature $T_1 = 1000K$ the wavelength is $1.4 \times 10^{-6} m$ then at what temperature the wavelength will be m $2.8 \times 10^{-6} m$

A. 2000 K

B. 500 K

C. 250 K

D. None of these

Answer: A

Watch Video Solution

8. The wavelength of maximum intensity of radiation emitted by a star is 289.8 nm . The radiation intensity for the star is : (Stefan's constant $5.67 \times 10^{-8} W m^{-2} K^{-4}$, constant $b = 2898 \mu m K$)-

A. $5.67 \times 10^{8} W / m^{2}$

B. $5.67 \times 10^{12} W / m^{2}$

C. $10.67 \times 10^{7} W / m^{2}$

D. $10.67 \times 10^{14} W / m^{2}$

Answer: A

Watch Video Solution

9. Two friends A and B are waiting for another friend for tea. A took the tea in a cup and mixed the cold milk and then waits. B took the tea in the cup and then mixed the cold milk when the friend comes. Then the tea will be hotter in the cup of

A. A

B. B

C. Tea will be equally hot in both cups

D. Friend's cup

Answer: A

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10. There are two spherical balls A and B of the same material with same surface, but the diameter of A is half that of B . If A and B are heated to the same temperature and then allowed to cool, then

A. Rate of cooling is same in both

B. Rate of cooling of A is four times that of B

C. Rate of cooling of A is twice that of B

D. Rate of cooling of A is $\frac{1}{4}$ times that of B

Answer: C

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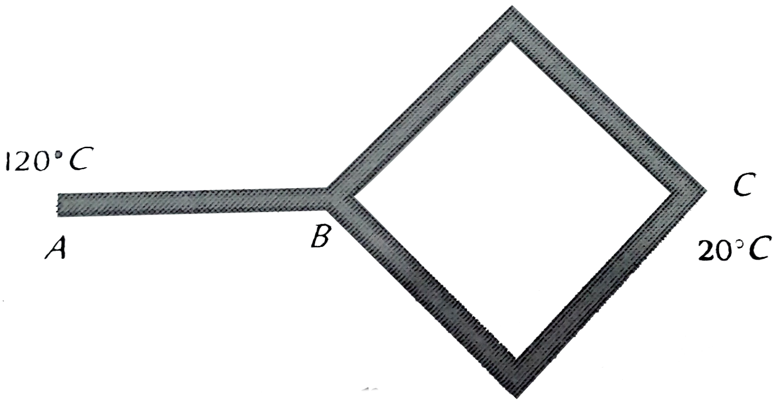
11. Five identical rods are joined as shown in figure. Point A and C are maintained at temperature $120^{\circ}C$ and $20^{\circ}C$ respectively. The temperature of junction B will be



A. $100^{\circ}C$

B. $80^{\circ}C$

C. $70^\circ C$

D. $0^\circ C$

Answer: C

Watch Video Solution

12. We cannot boil water inside the earth's satellite. Explain.

A. Yes

B. No

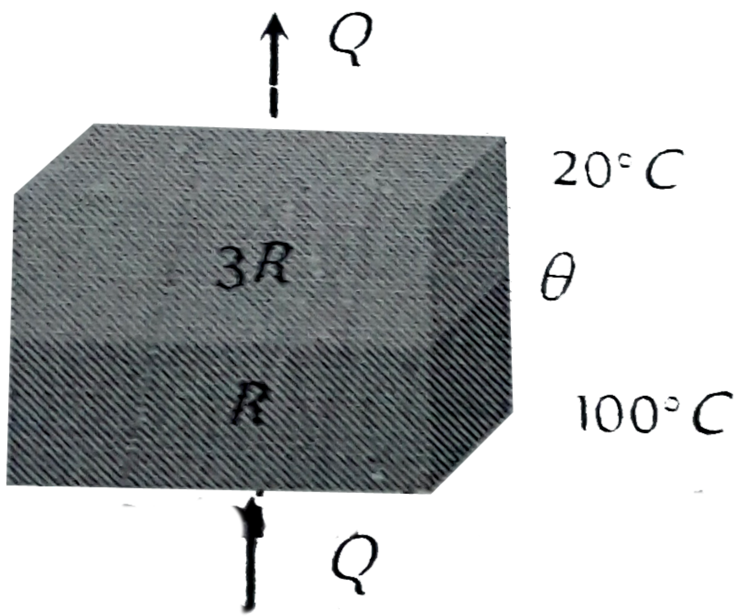
C. Nothing can be said

D. In complete information is given

Answer: B

Watch Video Solution

13. In the following figure, two insulating sheets with thermal resistances R and 3 R as shown in figure. The temperature θ is



A. $20^{\circ} C$

B. $60^{\circ} C$

C. $75^{\circ} C$

D. $80^{\circ} C$

Answer: D

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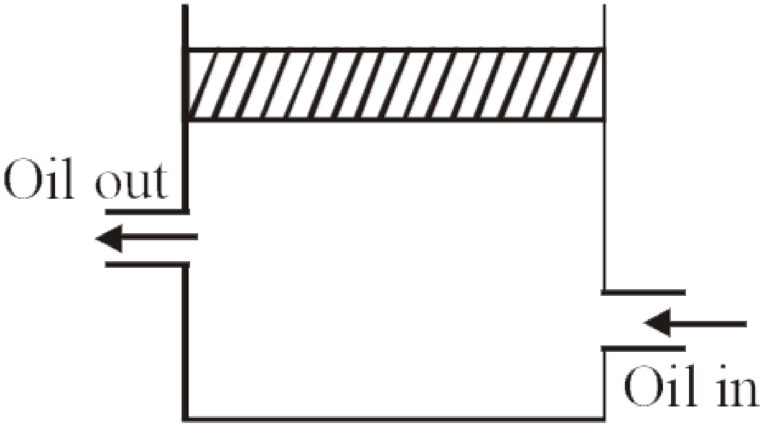
14. The top of an insulated cylindrical container is covered by a disc having emissivity 0.6 and conductivity 0.167 $\mathrm{WK}^{-1} m^{-1}$ and thickness 1 cm. The temperature is maintained by circulating oil as shown in figure. Find the radiation loss to the surrounding in $\mathrm{Jm}^{-2} s^{-1}$if temperature of the upper surface of the disc is $127^{\circ} \mathrm{C}$

and temperature of the surrounding is $27^{\circ} \mathrm{C}$.



A. $595 J / m \times \sec$

B. $595 cal / m \times \sec$

C. $991.0 J / m \times \sec$

D. $440 J / m \times \sec$

Answer: D

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15.

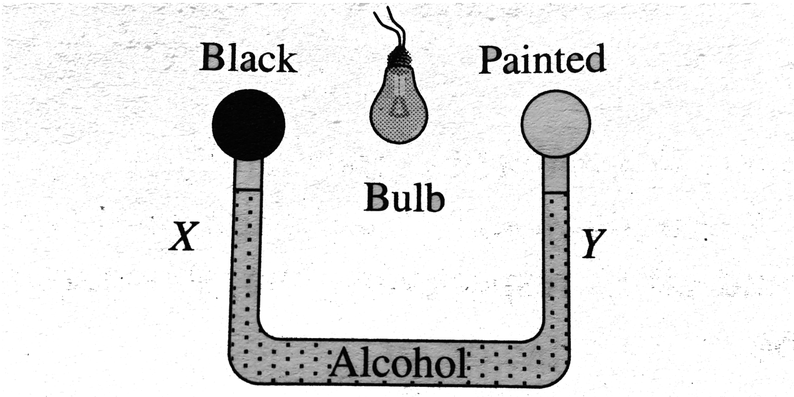


Fig. 1.79

Figure. Shows two air filled bulbs connected by a U-tube partly filled with alcohol. What happens to the levels of alcohol in the limbs X and Y when an electric bulb placed midway between the bulbs is lighted?

A. The level of alcohol in limb X falls while that in limb Y rises

B. The level of alcohol in limb X rises while that in limb Y falls

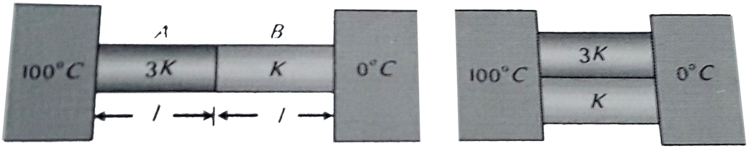
C. The level of alcohol falls in both limbs

D. There is no change in the levels of alcohol in the two limbs

Answer: A

Watch Video Solution

16. Two conducting rods A and B of same length and cross-sectional area are connected (i) In series (ii) In parallel as shown. In both combination a temperature difference of $100^\circ C$ is maintained. If thermal conductivity of A is 3 K and that of B is K then the ratio of heat current flowing in parallel combination to that flowing in series combination is



A. $\frac{16}{3}$

B. $\frac{3}{16}$

C. $\frac{1}{1}$

D. $\frac{1}{3}$

Answer: A

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17. The area of the glass of a window of a room is $10m^2$ and thickness 2 mm . The outer and inner temperature are $40^\circ C$ and $20^\circ C$ respectively. Thermal conductivity of glass in MKS system is 0.2. The heat flowing in the room per second will be

A. 3×10^4 joules

B. 2×10^4 joules

C. 30 joules

D. 45 joules

Answer: B

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18. The spectrum from a black body radiation is a

A. Line spectrum

B. Band spectrum

C. Continuous spectrum

D. Line and band spectrum both

Answer: C

Watch Video Solution

19. The Wien's displacement law express relation between

A. Frequency and temperature

B. Temperature and amplitude

C. Wavelength and radiating power of black body

D. Wavelength corresponding to maximum energy and temperature

Answer: D

Watch Video Solution

20. A black body is heated from $27^{\circ} C$ to $127^{\circ} C$. The ratio of their energies of radiation emitted will be

A. $3:4$

B. $9:16$

C. $27 : 64$

D. $81 : 256$

Answer: D

Watch Video Solution

21. A body takes T minutes to cool from $62^\circ C$ to $61^\circ C$ when the surrounding temperature is $30^\circ C$. The time taken by the body to cool from $46^\circ C$ to $45.5^\circ C$ is

A. Greater than T minutes

B. Equal to T minutes

C. Less than T minutes

D. Equal to T/2 minutes

Answer: B

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22. A partition wall has two layers of different materials A and B in contact with each other. They have the same thickness but the thermal conductivity of layer A is twice that of layer B. At steady state the temperature difference across the layer B is 50 K, then the corresponding difference across the layer A is

A. 10 K

B. 20 K

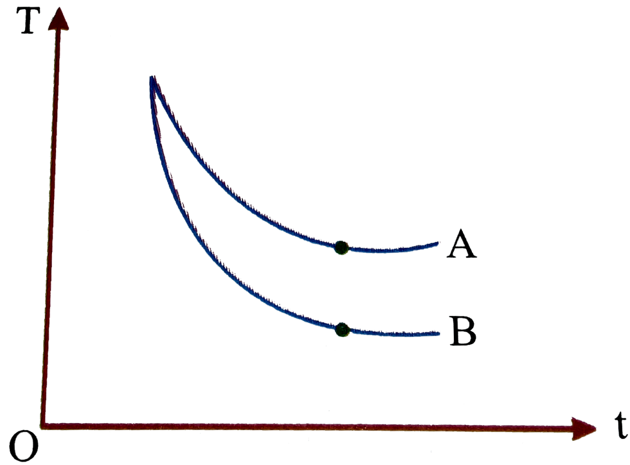
C. 30 K

D. 40 K

Answer: B

Watch Video Solution

23. Water and turpentine oil (of specific heat less than that of water) are both heated to same temperature. Equal amounts of these placed in indentical claorimeters are then left in air.



A. Their cooling curves will be identical

B. A and B will represent cooling curves of water and oil respectively

C. B and A will represent cooling curves of water and oil respectively

D. None of the above

Answer: B

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