

PHYSICS

NEET

CRASH COURSE

**CALORIMETRY,
THERMAL EXPANSION &
HEAT TRANSFER**

SMARTACHIEVERS
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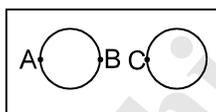
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CALORIMETRY, THERMAL EXPANSION & HEAT TRANSFER

- Q.1 The water equivalent of a 400 g copper calorimeter (specific heat = 0.1 cal/g°C)
 (1) 40 g (2) 4000 g (3) 200 g (4) 4 g
- Q.2 Heat required to convert 1 g of ice at 0°C into steam at 100°C is
 (1) 100 cal (2) 0.01 cal/°C (3) 720 cal (4) 1 kilocal
- Q.3 The thermal capacity of 40 g of aluminium (specific heat = 0.2 cal/gm°C)
 (1) 40 cal/°C (2) 160 cal/°C (3) 200 cal/°C (4) 8 cal/°C
- Q.4 The boiling water is changing into steam. Under this condition, the specific heat of water is
 (1) zero (2) one (3) infinite (4) less than one
- Q.5 One kg of ice at 0°C is mixed with 1 kg of water at 10°C. The resulting temperature will be
 (1) between 0°C and 10°C (2) 0°C
 (3) less than 0°C (4) greater than 0°C
- Q.6 If 10g of ice at 0°C is mixed with 10g of water at 40°C, the final mass of water in the mixture is
 (1) 10 g (2) 15 g (3) 18 g (4) 20 g
- Q.7 540 g of ice at 0°C is mixed with 540 g of water at 80°C. The final temperature of the mixture is
 (1) 0°C (2) 40°C (3) 80°C (4) less than 0°C

- Q.8 Two large holes are cut in a metal sheet. If this is heated, distances AB and BC, (as shown)

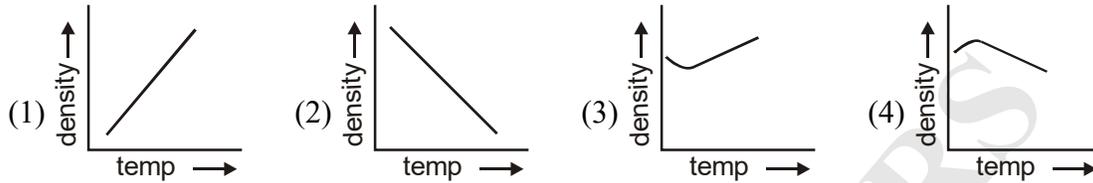


- (1) both will increase (2) both will decrease
 (3) AB increases, BC decreases (4) AB decreases, BC increases
- Q.9 Expansion during heating –
 (1) occurs only in a solid (2) increases the density of the material
 (3) decreases the density of the material (4) occurs at the same rate for all liquids and solids.
- Q.10 If a bimetallic strip is heated, it will .
 (1) bend towards the metal with lower thermal expansion coefficient.
 (2) bend towards the metal with higher thermal expansion coefficient.
 (3) twist itself into helix.
 (4) have no bending.
- Q.11 Two rods of lengths $2\sqrt{2}l_1$ and $2\sqrt{2}l_2$ are made of materials whose coefficient of linear expansions are α_1 and α_2 . If the difference between two lengths is independent of temperature -

(1) $\frac{\lambda_1}{\lambda_2} = \frac{\alpha_1}{\alpha_2}$ (2) $\frac{\lambda_1}{\lambda_2} = \frac{\alpha_2}{\alpha_1}$ (3) $2\sqrt{2}l_2^2\alpha_1 = 2\sqrt{2}l_1^2\alpha_2$ (4) $\frac{\alpha_1^2}{\lambda_1} = \frac{\alpha_2^2}{\lambda_2}$

- Q.12 If α, β, γ are linear, superficial and cubical expansivity of a solid, then -
 (1) $\alpha : \beta : \gamma = 1 : 2 : 3$ (2) $\alpha : \beta : \gamma = 3 : 2 : 1$ (3) $\alpha : \beta : \gamma = 2 : 3 : 1$ (4) $\alpha : \beta : \gamma = 3 : 1 : 3$

- Q.13 Which of the following curve represent variation of density of water with temperature best -



- Q.14 A thin copper wire of length λ increases in length by 1% when heated from 0°C to 100°C . If a thin copper plate of area $2\lambda \times \lambda$ is heated from 0°C to 100°C , the percentage increase in its area will be
 (1) 1% (2) 2% (3) 3% (4) 4%

- Q.15 A difference of temperature of 25°C is equivalent to a difference of:
 (1) 45°F (2) 72°F (3) 32°F (4) 25°F

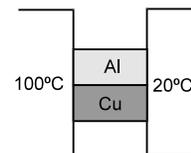
- Q.16 What is the temperature at which we get the same reading on both the centigrade and Fahrenheit scales?
 (1) -40°C or -40°F (2) -30°C or -30°F (3) -30°C or -40°F (4) -10°C or -10°F

- Q.17 Which of the following qualities suit for a cooking utensil?
 (1) High specific heat and low thermal conductivity
 (2) High specific heat and high thermal conductivity
 (3) Low specific heat and low thermal conductivity
 (4) Low specific heat and high thermal conductivity

- Q.18 Two metal cubes with 3 cm-edges of copper and aluminium are arranged as shown in figure
 ($K_{\text{Cu}} = 385 \text{ W/m-K}$, $K_{\text{Al}} = 209 \text{ W/m-K}$)
 ($K_{\text{Cu}} = 385 \text{ W/m-K}$, $K_{\text{Al}} = 209 \text{ W/m-K}$)

(i) The total thermal current from one reservoir to the other is :

- (1) $1.42 \times 10^3 \text{ W}$ (2) $2.53 \times 10^3 \text{ W}$
 (3) $1.53 \times 10^4 \text{ W}$ (4) $2.53 \times 10^4 \text{ W}$

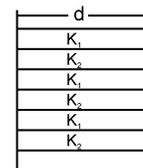


(ii) The ratio of the thermal current carried by the copper cube to that carried by the aluminium cube is :-

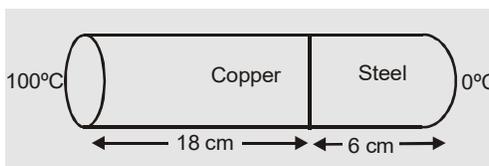
- (1) 1.79 (2) 1.69 (3) 1.54 (4) 1.84

- Q.19 A wall consists of alternating blocks with length 'd' and coefficient of thermal conductivity k_1 and k_2 . The cross sectional area of the blocks are the same. The equivalent coefficient of thermal conductivity of the wall between left and right is :-

- (1) $K_1 + K_2$ (2) $\frac{(K_1 + K_2)}{2}$ (3) $\frac{K_1 K_2}{K_1 + K_2}$ (4) $\frac{2 K_1 K_2}{K_1 + K_2}$

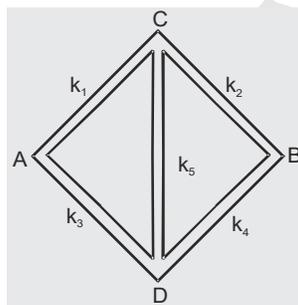


Q.20 The coefficient of thermal conductivity of copper is nine times that of steel. In the composite cylindrical bar shown in the figure, what will be the temperature at the junction of copper and steel?



- (1) 75°C (2) 67°C (3) 33°C (4) 25°C

Q.21 Five rods of same dimensions are arranged as shown in the fig. 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-

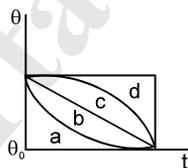


- (1) $k_1 k_4 = k_2 k_3$ (2) $k_1 = k_4$ and $k_2 = k_3$ (3) $\frac{k_1}{k_4} = \frac{k_2}{k_3}$ (4) $k_1 k_2 = k_3 k_4$

Q.22 Newton’s law of cooling is a special case of

- (1) Wien’s displacement law (2) Kirchoff’s law
 (3) Stefan’s law (4) Planck’s law

Q.23 A hot liquid is kept in a big room. Its temperature is plotted as a function of time. Which of the following curves may represent the plot ?



- (1) a (2) c (3) d (4) b

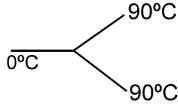
Q.24 A cup of tea cools from 80°C to 60°C in one minute. The ambient temperature is 30°C. In cooling from 60°C to 50°C it will take-

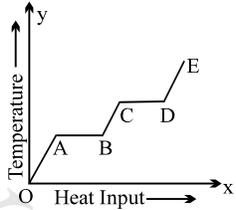
- (1) 30 seconds (2) 60 seconds (3) 96 seconds (4) 48 seconds

Q.25 A hot liquid cools from 70°C to 60°C in 5 minutes. The time needed by same liquid to cool from 60°C to 50°C will be-

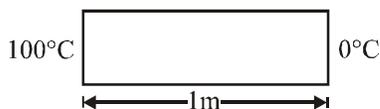
- (1) Less than 5 minutes (2) More than 5 minutes
 (3) Equal to 5 minutes (4) Less or more than 5 minutes that depends on the density of liquid

- Q.26. Water is usually heated by
 (1) Conduction (2) Convection (3) Radiation (4) All the above processes
- Q.27 In natural convection a heated portion of a liquid moves because-
 (1) Its molecular motion becomes aligned (2) Of molecular collisions within it
 (3) Its density is less than that of the surrounding fluid (4) Of currents of the surrounding fluid
- Q.28 It is hotter at the same distance over the top of a fire than it is on the side of it mainly because
 (1) heat is radiated upwards
 (2) Air conducts heat upwards
 (3) convection takes more heat upwards
 (4) Conduction, convection and radiation all contribute significantly in transferring heat upwards
- Q.29 Ventilators are provided at the top of room
 (1) to bring oxygen for breathing
 (2) so that sunlight may enter the room
 (3) to maintain convection currents to keep the air fresh in the room
 (4) To provide an outlet for carbon dioxide
- Q.30 Mode of transmission of heat in which heat is carried by moving particles is:
 (1) wave motion (2) convection (3) conduction (4) radiation
- Q.31 Temperature of a piece of metal is increased from 27°C to 327°C . The rate of emission of heat by radiation by a metal will become-
 (1) Double (2) Four times (3) Eight times (4) Sixteen times
- Q.32 Radiation emitted by a surface is directly proportional to-
 (1) Third power of its temperature (2) Fourth power of its temperature
 (3) Twice power of its temperature (4) None of above
- Q.33 If temperature of surface of sun becomes half then the energy emitted by it to earth per second will reduce to -
 (1) $1/2$ (2) $1/4$ (3) $1/16$ (4) $1/64$
- Q.34 If the distance between point sources and the screen is doubled then the intensity of light becomes-
 (1) Four times (2) Doubled (3) Half (4) One fourth
- Q.35 What is the energy of emitted radiation from Sun when the temperature is doubled-
 (1) 2 (2) 4 (3) 8 (4) 16
- Q.36 According to Kirchoff's law-
 (1) $a_{\lambda} e_{\lambda} = E_{\lambda}$ (2) $E_{\lambda} a_{\lambda} = e_{\lambda}$ (3) $a_{\lambda} = e_{\lambda} E_{\lambda}$ (4) $E_{\lambda}, a_{\lambda}, e_{\lambda} = \text{const.}$
- Q.37 What represents the colour of star-
 (1) Density (2) Distance (3) Energy (4) Temperature

- Q.38 Black body spectrum is-
- (1) Continuous spectrum with black lines (2) Continuous spectrum with black bands
 (3) Continuous spectrum (4) None of the above
- Q.39 Area of cross-section of two rods of equal lengths are A_1 and A_2 and thermal conductivities are K_1 and K_2 . Specific heats are S_1 and S_2 . condition for equal heat flow is-
- (1) $K_1 = K_2$ (2) $K_1 S_1 = K_2 S_2$ (3) $\frac{K_1}{A_1 S_1} = \frac{K_2}{A_2 S_2}$ (4) $K_1 A_1 = K_2 A_2$
- Q.40 Three rods made of the same material and having the same cross-section are joined as shown in the fig. Each rod is of same length. The left and right ends are kept at 0°C and 90°C respectively. The temperature of the junction of the three rods will be :
- 
- (1) 45°C (2) 60°C (3) 30°C (4) 20°C
- Q.41 Solar constant for earth is 2 cal/min cm^2 , if distance of mercury from sun is 0.4 times than distance of earth from sun then solar constant for mercury will be?
- (1) $12.5 \text{ cal/min cm}^2$ (2) 25 cal/min cm^2 (3) $0.32 \text{ cal/min cm}^2$ (4) 2 cal/min cm^2
- Q.42 Temp. of black body is 3000K when black body cools. Then change in wevelenght $\Delta \lambda = 9 \text{ micron}$ corresponding to maximum energy density. Now temp. of black body is -
- (1) 300 K (2) 2700 K (3) 270 K (4) 1800 K
- Q.43 10 gm of ice at -20°C is added to 10 gm of water at 50°C . Specific heat of water = $1 \text{ cal/gm-}^\circ\text{C}$, specific heat of ice = $0.5 \text{ cal/gm-}^\circ\text{C}$. Latent heat of ice = 80 cal/gm . Then resulting temperature is :-
- (1) -20°C (2) 15°C (3) 0°C (4) 50°C
- Q.44 Three liquids with masses m_1, m_2, m_3 are thoroughly mixed. If their specific heats are s_1, s_2, s_3 and their temperatures $\theta_1, \theta_2, \theta_3$ respectively, then the temperature of the mixture is :-
- (1) $\frac{s_1\theta_1 + s_2\theta_2 + s_3\theta_3}{m_1s_1 + m_2s_2 + m_3s_3}$ (2) $\frac{m_1s_1\theta_1 + m_2s_2\theta_2 + m_3s_3\theta_3}{m_1s_1 + m_2s_2 + m_3s_3}$
 (3) $\frac{m_1s_1\theta_1 + m_2s_2\theta_2 + m_3s_3\theta_3}{m_1\theta_1 + m_2\theta_2 + m_3\theta_3}$ (4) $\frac{m_1\theta_1 + m_2\theta_2 + m_3\theta_3}{s_1\theta_1 + s_2\theta_2 + s_3\theta_3}$
- Q.45 When vapour condenses into liquid :-
- (1) it absorbs heat (2) it liberates heat
 (3) its temperature increases (3) its temperature decreases
- Q.46 Steam at 100°C is added slowly to 1400 gm of water at 16°C until the temperature of water is raised to 80°C . The mass of steam required to do this is ($L_v = 540 \text{ cal/gm}$) :
- (1) 160 gm (2) 125 gm (3) 250 gm (4) 320 gm

- Q.47 A solid material is supplied with heat at a constant rate. The temperature of material is changing with heat input as shown in the figure. What does slope DE represent.
- (1) latent heat of liquid
 (2) latent heat of vapour
 (3) heat capacity of vapour
 (4) inverse of heat capacity of vapour
- 
- Q.48 A steel tape gives correct measurement at 20°C . A piece of wood is being measured with the steel tape at 0°C . The reading is 25 cm on the tape, the real length of the given piece of wood must be:
- (1) 25 cm (2) <25 cm (3) >25 cm (4) can not say
- Q.49 If two rods of length L and $2L$ having coefficients of linear expansion α and 2α respectively are connected so that total length becomes $3L$, the average coefficient of linear expansion of the composition rod equals:
- (1) $\frac{3}{2}\alpha$ (2) $\frac{5}{2}\alpha$ (3) $\frac{5}{3}\alpha$ (4) none of these
- Q.50 A glass flask contains some mercury at room temperature. It is found that at different temperatures the volume of air inside the flask remains the same. If the volume of mercury in the flask is 300 cm^3 , then volume of the flask is (given that coefficient of volume expansion of mercury and coefficient of linear expansion of glass are $1.8 \times 10^{-4} (\text{C}^{\circ})^{-1}$ and $9 \times 10^{-6} (\text{C}^{\circ})^{-1}$ respectively)
- (1) 4500 cm^3 (2) 450 cm^3 (3) 2000 cm^3 (4) 6000 cm^3
- Q.51 A thin copper wire of length L increase in length by 1% when heated from temperature T_1 to T_2 . What is the percentage change in area when a thin copper plate having dimensions $2L \times L$ is heated from T_1 to T_2 ?
- (1) 1% (2) 2% (3) 3% (4) 4%
- Q.52 The coefficients of thermal expansion of steel and a metal X are respectively 12×10^{-6} and 2×10^{-6} per $^{\circ}\text{C}$. At 40°C , the side of a cube of metal X was measured using a steel vernier callipers. The reading was 100 mm. Assuming that the calibration of the vernier was done at 0°C , then the actual length of the side of the cube at 0°C will be
- (1) > 100 mm (2) < 100 mm
 (3) $= 100$ mm (4) data insufficient to conclude
- Q.53 A wall has two layer A and B each made of different material, both the layers have the same thickness. The thermal conductivity of the material A is twice that of B. Under thermal equilibrium the temperature difference across the wall B is 36°C . The temperature difference across the wall A is
- (1) 6°C (2) 12°C (3) 18°C (4) 72°C
- Q.54 In which case does the thermal conductivity increase from left to right
- (1) Al, Cu, Ag (2) Ag, Cu, Al
 (3) Cu, Ag, Al (4) Al, Ag, Cu

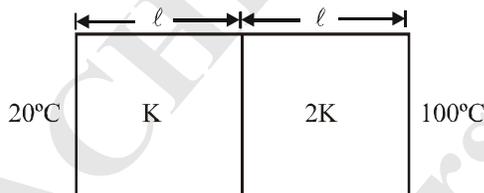
- Q.55 A rod of 1 m length and area of cross-section 1 cm^2 is connected across two heat reservoirs at temperatures 100°C and 0°C as shown. The heat flow per second through the rod in steady state will be [Thermal conductivity of material of rod = $0.09 \text{ kilocal m}^{-1}\text{s}^{-1}(\text{C}^\circ)$]



- (1) 9×10^{-4} kilocal/sec
 (2) 9 kilocal/sec
 (3) 0.09 kilocal/sec
 (4) 9×10^{-6} kilocal/sec
- Q.56 If $2\sqrt{2}l$ is the length and A is the area of cross-section of a rod and K is thermal conductivity of material, then the thermal resistance is given by

- (1) $\frac{K\lambda}{A}$ (2) $\frac{\lambda}{KA}$ (3) $\frac{\lambda K}{A}$ (4) $\frac{A}{K\lambda}$

- Q.57 Two rods are connected as shown. The rods are of same length and same cross sectional area. In steady state, the temperature (θ) of the interface will be –



- (1) 60°C (2) 73.3°C (3) 46.7°C (4) 37.3°C
- Q.58 Two rods of length d_1 and d_2 and coefficients of thermal conductivities K_1 and K_2 are kept touching each other. Both have the same area of cross-section. The equivalent thermal conductivity is:

- (1) $K_1 + K_2$ (2) $K_1d_1 + K_2d_2$ (3) $\frac{K_2d_1 + K_1d_2}{d_1 + d_2}$ (4) $\frac{d_1 + d_2}{\frac{d_1}{K_1} + \frac{d_2}{K_2}}$

- Q.59 A blackened steel plate is put in a dark room after being heated up to a high temperature. A white spot on the plate appears-

- (1) brighter than the plate. (2) as bright as the plate.
 (3) dull as compared to the plate. (4) appears to be yellow.

- Q.60 If the temperature of a black body is increased by 50% then the amount of radiation emitted by it will–

- (1) Increase by 400% (2) Decrease by 400%
 (3) Decrease by 50% (4) Increase by 50%

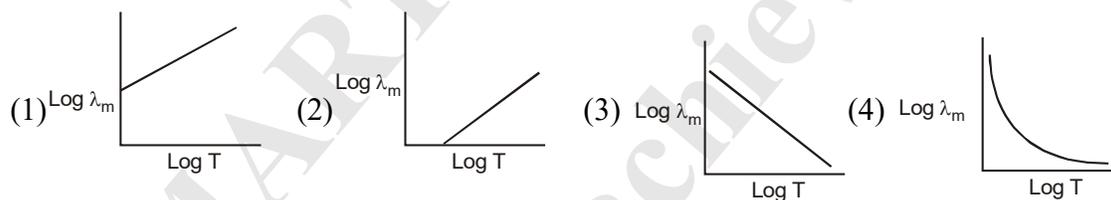
- Q.61 A body at temperature T (K) is kept in the surroundings at T_0 (K) . If $T \gg T_0$, then the rate of emission of heat by the body to the surroundings is proportional to-

- (1) $(T - T_0)^4$ (2) $T^4 - T_0^4$ (3) $(T - T_0)^{1/4}$ (4) T / T_0

- Q.62 If a body at 27°C emits 0.3 watt of heat then at 627°C , it will emit heat equal to –
 (1) 24.3 watt (2) 0.42 watt (3) 2.42 watt (4) 0.9 watt
- Q.63 A body takes 4 minutes to cool from 100°C to 70°C . If the room temperature is 15°C then how many minutes will it need to cool from 70°C to 40°C –
 (1) 4 (2) 5 (3) 6 (4) 7
- Q.64 A liquid takes 10 minutes to cool from 80°C to 50°C . The temperature of the surroundings is 20°C . Assuming that the Newton's law of cooling is obeyed, the cooling constant will be –
 (1) $0.056/\text{mt}$ (2) $0.042/\text{mt}$ (3) $0.081/\text{mt}$ (4) $0.069/\text{mt}$
- Q.65 Increasing the temperature of a black body –
 (1) Frequency and wavelength both increase for maximum radiation.
 (2) Frequency and wavelength both decrease for maximum radiation.
 (3) Wavelength increases while frequency decreases for maximum radiation.
 (4) Frequency increases while wavelength decreases for maximum radiation.

- Q.66 Two stars A and B radiate maximum energy at wave lengths 4000\AA and 5000\AA respectively. The ratio of their temperature will be –
 (1) 1 : 2 (2) 2 : 1 (3) 4 : 5 (4) 5 : 4

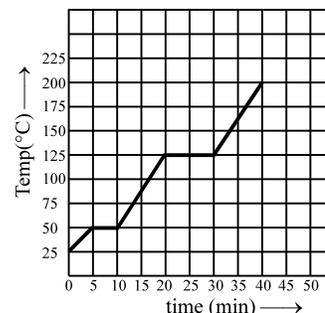
- Q.67 Wein's displacement law is shown by the following relation $\lambda_m T = b$ then the curve drawn between $\log T$ and $\log \lambda_m$ will be –

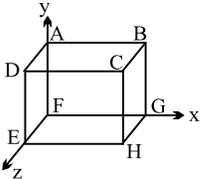


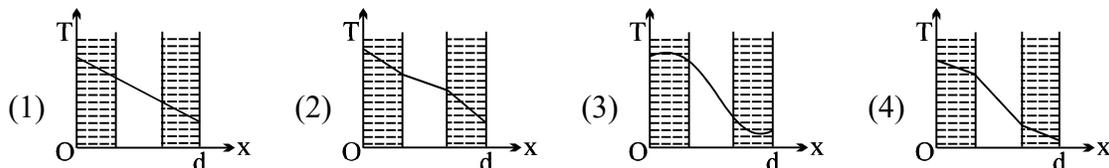
- Q.68 A continuous flow water heater (geyser) has an electrical power rating = 2 kW and efficiency of conversion of electrical power into heat = 80%. If water is flowing through the device at the rate of 100 cc/sec, and the inlet temperature is 10°C , the outlet temperature will be
 (1) 12.2°C (2) 13.8°C (3) 20°C (4) 16.5°C

- Q.69 The graph shown in the figure represent change in the temperature of 5 kg of a substance as it absorbs heat at a constant rate of 42 kJ min^{-1} . The latent heat of vapourization of the substance is :

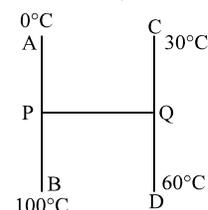
- (1) 630 kJ kg^{-1}
 (2) 126 kJ kg^{-1}
 (3) 84 kJ kg^{-1}
 (4) 12.6 kJ kg^{-1}



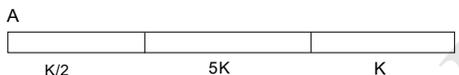
- Q.70 Find the amount of heat supplied to decrease the volume of an ice water mixture by 1 cm^3 without any change in temperature. ($\rho_{\text{ice}} = 0.9 \rho_{\text{water}}$, $L_{\text{ice}} = 80 \text{ cal/gm}$).
- (1) 360 cal (2) 500 cal (3) 720 cal (4) none of these
- Q.71 A 2100 W continuous flow geyser (instant geyser) has water inlet temperature = 10°C while the water flows out at the rate of 20 g/sec. The outlet temperature of water must be about
- (1) 20°C (2) 30°C (3) 35°C (4) 40°C
- Q.72 A block of ice with mass m falls into a lake. After impact, a mass of ice $m/5$ melts. Both the block of ice and the lake have a temperature of 0°C . If L represents the heat of fusion, the minimum distance the ice fell before striking the surface is
- (1) $\frac{L}{5g}$ (2) $\frac{5L}{g}$ (3) $\frac{gL}{5m}$ (4) $\frac{mL}{5g}$
- Q.73 A rod of length 2m at 0°C and having expansion coefficient $\alpha = (3x + 2) \times 10^{-6} \text{ }^\circ\text{C}^{-1}$ where x is the distance (in cm) from one end of rod. The length of rod at 20°C is :
- (1) 2.124 m (2) 3.24 m (3) 2.0120 m (4) 3.124 m
- Q.74 A cuboid ABCDEFGH is anisotropic with $\alpha_x = 1 \times 10^{-5} /^\circ\text{C}$, $\alpha_y = 2 \times 10^{-5} /^\circ\text{C}$, $\alpha_z = 3 \times 10^{-5} /^\circ\text{C}$. Coefficient of superficial expansion of faces can be
- (1) $\beta_{\text{ABCD}} = 5 \times 10^{-5} /^\circ\text{C}$ (2) $\beta_{\text{BCGH}} = 4 \times 10^{-5} /^\circ\text{C}$
 (3) $\beta_{\text{CDEH}} = 3 \times 10^{-5} /^\circ\text{C}$ (4) $\beta_{\text{EFGH}} = 2 \times 10^{-5} /^\circ\text{C}$
- 
- Q.75 A thin walled cylindrical metal vessel of linear coefficient of expansion $10^{-3} \text{ }^\circ\text{C}^{-1}$ contains benzene of volume expansion coefficient $10^{-3} \text{ }^\circ\text{C}^{-1}$. If the vessel and its contents are now heated by 10°C , the pressure due to the liquid at the bottom.
- (1) increases by 2% (2) decreases by 1% (3) decreases by 2% (4) remains unchanged
- Q.76 The reading of air thermometer at 0°C and 100°C are 50 cm and 75 cm of mercury column respectively. The temperature at which its reading is 80 cm of mercury column is :
- (1) 105°C (2) 110°C (3) 115°C (4) 120°C
- Q.77 On which of the following scales of temperature, the temperature is never negative :
- (1) Celsius (2) Fahrenheit (3) Reaumur (4) Kelvin
- Q.78 The wall with a cavity consists of two layers of brick separated by a layer of air. All three layers have the same thickness and the thermal conductivity of the brick is much greater than that of air. The left layer is at a higher temperature than the right layer and steady state condition exists. Which of the following graphs predicts correctly the variation of temperature T with distance d inside the cavity?



- Q.79 Three identical rods AB, CD and PQ are joined as shown. P and Q are mid points of AB and CD respectively. Ends A, B, C and D are maintained at 0°C , 100°C , 30°C and 60°C respectively. The direction of heat flow in PQ is
 (1) from P to Q (2) from Q to P
 (3) heat does not flow in PQ (4) data not sufficient

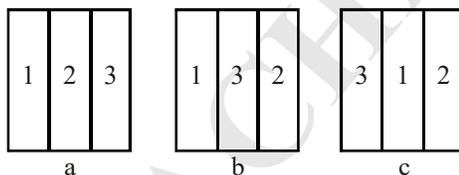


- Q.80 A composite rod made of three rods of equal length and cross-section as shown in the fig. The thermal conductivities of the materials of the rods are $K/2$, $5K$ and K respectively. The end A and end B are at constant temperatures. All heat entering the face A goes out of the end B there being no loss of heat from the sides of the bar. The effective thermal conductivity of the bar is



- (1) $15K/16$ (2) $6K/13$ (3) $5K/16$ (4) $2K/13$.

- Q.81 Figure shows three different arrangements of materials 1, 2 and 3 to form a wall. Thermal conductivities are $k_1 > k_2 > k_3$. The left side of the wall is 20°C higher than the right side. Temperature difference ΔT across the material 1 has following relation in three cases :



- (1) $\Delta T_a > \Delta T_b > \Delta T_c$ (2) $\Delta T_a = \Delta T_b = \Delta T_c$
 (3) $\Delta T_a = \Delta T_b > \Delta T_c$ (4) $\Delta T_a = \Delta T_b < \Delta T_c$

- Q.82 A 2cm thick slab of commercial thermocole, 100 cm^2 in cross-section and having thermal conductivity $2 \times 10^{-4}\text{ cal sec}^{-1}\text{ cm}^{-1}\text{ (}^{\circ}\text{C)}^{-1}$ has insulating regions differing by 100°C . The quantity of heat flowing through it in a day will be –
 (1) 20.4 kcal (2) 43.2 kcal (3) 86.4 kcal (4) 63.6 kcal

- Q.83 The coefficient of thermal conductivity of copper is nine time that of steel. In the composite cylindrical bar shown in Fig. What will be the temp. at the junction of copper and steel?

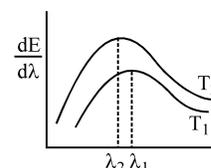


- (1) 75°C (2) 67°C (3) 33°C (4) 25°C

- Q.84 Two rods of length ℓ and 2ℓ , thermal conductivities $2K$ and K are connected end to end. If cross-sectional areas of to rods are equal, then equivalent thermal conductivity of the system is
 (1) $(5/6)K$ (2) $1.5K$ (3) $1.2 K$ (4) $(8/9)K$

- Q.85 The spectral emissive power E_{λ} for a body at temperature T_1 is plotted against the wavelength and area under the curve is found to be A . At a different temperature T_2 the area is found to be $9A$. Then $\lambda_1/\lambda_2 =$

- (1) 3 (2) $1/3$ (3) $1/\sqrt{3}$ (4) $\sqrt{3}$



- Q.86 A black metal container is heated by radiation emitted by a small sphere at temperature T and placed at a distance r . It is found that the power received by metal container is P . If the temperature and the distance are reduced to half their initial values, then the power received by metal container will be –
- (1) $\frac{P}{16}$ (2) $\frac{P}{4}$ (3) $\frac{P}{2}$ (4) P
- Q.87 The intensity of heat radiation by a point source measured by a thermopile placed at a distance d is I , If the distance of thermopile is doubled then the intensity of radiation will be –
- (1) I (2) $2I$ (3) $I/4$ (4) $I/2$
- Q.88 If the experiment of Newton's law of cooling, the graph drawn between logarithm of temperature difference with surrounding the time is obtained as –
- (1) A straight line passing through origin of positive gradient.
 (2) A straight line of positive gradient, not passing through origin.
 (3) A straight line of negative gradient not passing through origin.
 (4) None of the above.
- Q.89 The rate of emission of radiation of a black body at 273°C is E , then the rate of emission of radiation of this body at 0°C will be
- (1) $\frac{E}{16}$ (2) $\frac{E}{4}$ (3) $\frac{E}{8}$ (4) 0
- Q.90 Star S_1 emits maximum radiation of wavelength 420 nm and the star S_2 emits maximum radiation of wavelength 560 nm , what is the ratio of the temperature of S_1 and S_2 :
- (1) $4/3$ (2) $(4/3)^{1/4}$ (3) $3/4$ (4) $(3/4)^{1/2}$
- Q.91 From Kirchoff's law the ratio of emissive power and absorption power of all bodies –
- (1) Are different.
 (2) Is equal to emissive power of black body at same temperature.
 (3) Is equal to emissive power of white body.
 (4) Is equal to emissive power of black body at any temperature.

Direction for following questions :

- A. Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.**
B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
C. Assertion is true but Reason is false.
D. Assertion and Reason both are false.

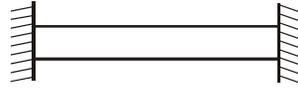
- Q.92 **Assertion:** The transfer of energy from a hot body to a cold body is a non-mechanical process.
Reason : When two bodies, one hot and other cold are kept in thermal contact, then internal energy of hot body decreases while that of cold body increases.
- (1) A (2) B (3) C (4) D

- Q.93 **Assertion :** In summers length of metallic scale will increase.

Reason : In summers a metallic scale will read more than the actual.

- (1) A (2) B (3) C (4) D

- Q.94 **Assertion :** A metallic rod is fixed from two ends as shown in figure. When the temperature is increased compressive stresses are developed in the rod.



Reason : At higher temperature, natural length of the rod will be more.

- (1) A (2) B (3) C (4) D

- Q.95 **Assertion :** All black coloured objects are considered black bodies.

Reason : Black colour is a good reflector of heat.

- (1) A (2) B (3) C (4) D

- Q.96 **Assertion :** Good conductors of electricity are also good conductors of heat.

Reason : In good conductors of electricity there are large numbers of free electrons.

- (1) A (2) B (3) C (4) D

- Q.97 **Assertion :** The molecules at 0°C ice and 0°C water will have same potential energy.

Reason : Potential energy depends only on temperature of the system.

- (1) A (2) B (3) C (4) D

- Q.98 **Assertion :** Two bodies at different temperatures, if brought in thermal contact do not necessary settle to the mean temperature.

Reason : The two bodies may have different thermal capacities.

- (1) A (2) B (3) C (4) D

- Q.99 **Assertion :** If temperature of any IBB is increased by 100% then there will be 400% increase in quantity of radiation emitted from its surface.

Reason : Equation $\frac{\Delta E}{E} = 4 \frac{\Delta T}{T}$ also true for large percentage increase ($E = \sigma T^4$)

- (1) A (2) B (3) C (4) D

- Q.100 **Assertion :** Wein's distribution law fails at short wavelengths.

Reason : Intensity of radiations of very short wavelength is small.

- (1) A (2) B (3) C (4) D

- Q.101 **Assertion :** Green body appears green as it reflects/transmits green and absorbs all rest of colours.

Reason : Green is a primary colour.

- (1) A (2) B (3) C (4) D

- Q.102 **Assertion :** Most of heat transfer that is taking place on earth is by convection.

Reason : Solar constant is the solar radiation incident normally on one square metre area at the mean distance of the earth from the sun in free space.

- (1) A (2) B (3) C (4) D

ANSWER KEY

Q.1	1	Q.2	3	Q.3	4	Q.4	3	Q.5	2
Q.6	2	Q.7	1	Q.8	1	Q.9	3	Q.10	1
Q.11	2	Q.12	1	Q.13	4	Q.14	2	Q.15	1
Q.16	1	Q.17	4	Q.18	(i) 1 (ii) 4	Q.19	2	Q.20	1
Q.21	1	Q.22	3	Q.23	1	Q.24	4	Q.25	2
Q.26	2	Q.27	3	Q.28	3	Q.29	3	Q.30	2
Q.31	4	Q.32	2	Q.33	3	Q.34	4	Q.35	4
Q.36	2	Q.37	4	Q.38	3	Q.39	4	Q.40	2
Q.41	1	Q.42	1	Q.43	3	Q.44	2	Q.45	2
Q.46	1	Q.47	4	Q.48	2	Q.49	3	Q.50	3
Q.51	2	Q.52	1	Q.53	3	Q.54	1	Q.55	1
Q.56	2	Q.57	2	Q.58	4	Q.59	3	Q.60	1
Q.61	2	Q.62	1	Q.63	4	Q.64	4	Q.65	4
Q.66	4	Q.67	3	Q.68	2	Q.69	3	Q.70	3
Q.71	3	Q.72	1	Q.73	3	Q.74	3	Q.75	3
Q.76	4	Q.77	4	Q.78	4	Q.79	1	Q.80	1
Q.81	2	Q.82	3	Q.83	1	Q.84	3	Q.85	4
Q.86	2	Q.87	3	Q.88	3	Q.89	1	Q.90	1
Q.91	2	Q.92	2	Q.93	3	Q.94	1	Q.95	4
Q.96	1	Q.97	4	Q.98	1	Q.99	4	Q.100	4
Q.101	2	Q.102	3						