



PARISHRAM PUBLICATIONS
PUNE

NAME of Student : _____

Subject : Physics

Class : XI

Max. Marks :- 180

Chapter Test
14

Topic : Modes of Heat Transfer

NEET CHAPTER TEST

Marking Scheme:

- (i) Each question is allotted 4 (four) marks for each correct response.
(ii) $\frac{1}{4}$ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

- Q.1** The temperature of a furnace is 2324°C and the intensity is maximum in its radiation spectrum nearly at 12000\AA . If the intensity in the spectrum of a star is maximum nearly at 4800\AA , then the surface temperature of star is
(1) 8400°C (2) 7200°C
(3) 6219.5°C (4) 5900°C
- Q.2** 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
(1) 1 : 3 (2) 4 : 3
(3) 8 : 9 (4) 3 : 2
- Q.3** A slab consists of two parallel layers of copper and brass of the same thickness and having thermal conductivities in the ratio 1 : 4. If the free face of brass is at 100°C and that of copper at 0°C , the temperature of interface is -
(1) 80°C (2) 20°C
(3) 60°C (4) 40°C
- Q.4** Two metal rods, 1 & 2 of same length have same temp difference between their ends, their thermal conductivities are K_1 & K_2 and cross sectional areas A_1 & A_2 respectively. What is required condition for same rate of heat conduction in them.
(1) $K_1 = K_2$ (2) $K_1 A_1 = K_2 A_2$
(3) (4)
- Q.5** According to Newton's law of cooling the rate of cooling of a body is proportional to :-
(1) Temperature of the body
(2) Temperature of the surrounding
(3) Fourth power of the temperature of body
(4) Difference of the temp. of the body and the surrounding.

- Q.6** The original temperature of a black body is 727°C . Calculate temperature at which this black body total radiant energy, become double :
(1) 971 K (2) 1190 K
(3) 2001 K (4) 1458 K
- Q.7** Calculate the energy radiated per minute from the filament of an incandescent lamp at 2000K if the surface area is $5 \times 10^{-5} \text{m}^2$ and its relative emittance is 0.85, $\sigma = 5.7 \times 10^{-8} \text{MKS units}$:
(1) 1230 J (2) 2215 J
(3) 2115 J (4) 2313 J
- Q.8** Three discs A , B and C having radii 2m, 4m and 6m respectively are coated with carbon black on their outer surfaces . The wavelengths corresponding to maximum intensity are 300nm, 400 nm and 500 nm respectively. The power radiated by them are Q_A , Q_B and Q_C respectively.
(1) Q_A is maximum (2) Q_B is maximum
(3) Q_C is maximum (4) $Q_A = Q_B = Q_C$
- Q.9** The energy emitted per second by a black body at 27°C is 10 J. If the temperature of the black body is increased to 327°C , the energy emitted per second will be :-
(1) 20 J (2) 40 J
(3) 80 J (4) 160 J
- Q.10** For a black body at temperature 727°C , its radiating power is 60 watt and temperature of surrounding is 227°C . If temperature of black body is changed to 1227°C then its radiating power will be :-
(1) 304 W (2) 320 W
(3) 240 W (4) 120 W
- Q.11** Out of the metal balls of same diameter one is solid and other is hollow. Both are heated to the same temperature at 300°C and then allowed to cool in the same surroundings then rate of loss of heat will be:
(1) More for hollow sphere
(2) More for solid sphere
(3) Same for both
(4) None of the above
- Q.12** A body cools from 60°C to 50°C in 10 minutes. If the room temperature is 25°C and assuming Newton's cooling law holds good, the temperature of the body at the end of next 10 minutes is :
(1) 45°C (2) 42.85°C
(3) 40°C (4) 38.5°C

Q.13 The temperature of hot and cold end of a 20 cm long rod in thermal steady state are at 100°C and 20°C respectively. Temperature at the centre of the rod is

- (1) 50°C (2) 60°C
 (3) 40°C (4) 30°C

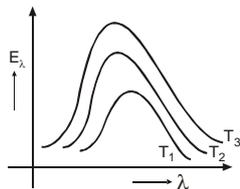
Q.14 Consider a compound slab consisting of two different materials having equal thicknesses and thermal conductivities K and $2K$, respectively. The equivalent thermal conductivity of the slab is

- (1) $3K$ (2) $(4/3)K$
 (3) $(2/3)K$ (4)

Q.15 The radii of two spheres made of same metal are r and $2r$. These are heated to the same temperature and placed in the same surrounding. The ratio of rates of decrease of their temperature will be

- (1) $1 : 1$ (2) $4 : 1$
 (3) $1 : 4$ (4) $2 : 1$

Q.16 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 ?



- (1) Sun - T_1 , tungsten filament - T_2 , welding arc - T_3
 (2) Sun - T_2 , tungsten filament - T_1 , welding arc - T_3
 (3) Sun - T_3 , tungsten filament - T_2 , welding arc - T_1
 (4) Sun - T_1 , tungsten filament T_3 , welding arc - T_2

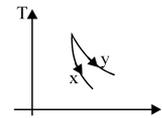
Q.17 A liquid takes 5 min. to cool from 80°C to 50°C . How much time it take to cool from 60°C to 30°C ? Temperature of surroundings is 20°C

- (1) 10 min. (2) 20 min.
 (3) 100 min. (4) 9 min.

Q.18 Energy is being emitted from the surface of black body at 127°C the rate of $1.0 \times 10^6 \text{ J/sm}^2$. The temperature of black body at which the rate of energy is $16.0 \times 10^6 \text{ J/sm}^2$ will be :

- (1) 754°C (2) 527°C
 (3) 254°C (4) 508°C

Q.19 The graph, shown in the diagram, represents the variation of temperature (T) of the 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.



- (1) $E_x > E_y$ and $a_x < a_y$
 (2) $E_x < E_y$ and $a_x > a_y$
 (3) $E_x > E_y$ and $a_x > a_y$
 (4) $E_x < E_y$ and $a_x < a_y$

Q.20 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°C and 20°C respectively. Thermal conductivity of glass in MKS system is 0.2. The heat flowing in the room per second will be -

- (1) 3×10^4 joules (2) 2×10^4 joules
 (3) 30 joules (4) 45 joules

Q.21 If the coefficient of conductivity of aluminium is $0.5 \text{ cal/cm-sec-}^{\circ}\text{C}$, then in order to conduct 10 cal/sec-cm^2 in the steady state, the temperature gradient in aluminium must be

- (1) 5°C/cm (2) 10°C/cm
 (3) 20°C/cm (4) 10.5°C/cm

Q.22 Two spheres P and Q, of same colour having radii 8cm and 2 cm are maintained at temperatures 127°C and 527°C respectively. The ratio of energy radiated by P and Q is -

- (1) 0.054 (2) 0.0034
 (3) 1 (4) 2

Q.23 Two spheres of radii in the ratio $1 : 2$ and densities in the ratio $2 : 1$ and of same specific heat, are heated to same temperature and left in the same surrounding. Their rate of falling temperature will be in the ratio :

- (1) $2 : 1$ (2) $1 : 1$
 (3) $1 : 2$ (4) $1 : 4$

Q.24 A body takes T minutes to cool from 62°C to 61°C when the surrounding temperature is 30°C . The time taken by the body to cool from 46°C to 45.5°C is :

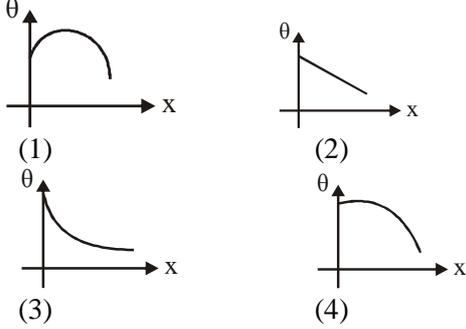
- (1) Greater than T minutes
 (2) Equal to T minutes
 (3) Less than T minutes
 (4) Equal to $T/2$ minutes

Q.25 The material used in the manufacture of cooker must have(K -coefficient of thermal conductivity, S : specific heat of material used) :

- (1) high K and low S
 (2) low K and low S
 (3) high K and high S
 (4) low K and high S

Q.26 A black body radiates energy at the rate of $E \text{ watt/m}^2$ at a high temperature $T \text{ K}$. When the temperature is reduced to K , the radiant energy will be

- (1) $E / 16$ (2) $E / 4$
 (3) $4 E$ (4) $16 E$

- Q.27** A black body emits radiations of maximum intensity at 5000\AA when its temperature is 1227°C . If its temperature is increased by 1000°C then the maximum intensity of emitted radiation will be at:
 (1) 2754.8\AA (2) 3000\AA
 (3) 3500\AA (4) 4000\AA
- Q.28** If the temperature of the sun were to increase from 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—
 (1) 4 (2) 16
 (3) 32 (4) 64
- Q.29** A black body, at a temperature of 227°C , radiates heat at a rate of $7\text{ cal cm}^{-2}\text{ s}^{-1}$. At a temperature of 727°C , the rate of heat radiated in the same units will be :
 (1) 80 (2) 60
 (3) 50 (4) 112
- Q.30** A cylindrical metallic rod in thermal contact with two reservoirs of heat at its two ends conducts an amount of heat Q in time t . The metallic rod is melted and the material is formed into a rod of half the radius of the original rod. What is the amount of heat conducted by the new rod, when placed in thermal contact with the two reservoirs in time t ?
 (1) $Q/2$ (2) $Q/4$
 (3) $Q/16$ (4) $2Q$
- Q.31** If the radius of a star is r and it acts as a black body, what would be the temperature of the star, in which the rate of energy production is Q ?
 (1) $(4\pi R^2 Q/\sigma)^{1/4}$ (2) $(Q/4\pi R^2 \sigma)^{1/4}$
 (3) $Q/4\pi R^2 \sigma$ (4) $(Q/4\pi R^2 \sigma)^{-1/2}$
 (σ stands for Stefan's constant.)
- Q.32** A slab of stone of area 0.36 m^2 and thickness 0.1 m is exposed on the lower surface to steam at 100°C . A block of ice at 0°C rests on the upper surface of the slab. In one hour 4.8 kg of ice is melted. The thermal conductivity of slab is : (Given latent heat of fusion of ice $3.36 \times 10^5\text{ J kg}^{-1}$) :
 (1) $2.05\text{ J/m/s}^\circ\text{C}$ (2) $1.02\text{ J/m/s}^\circ\text{C}$
 (3) $1.33\text{ J/m/s}^\circ\text{C}$ (4) $2.29\text{ J/m/s}^\circ\text{C}$
- Q.33** 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 cal/min cm^2 (2) 25 cal/min cm^2
 (3) 0.32 cal/min cm^2 (4) 2 cal/min cm^2
- Q.34** Temperature of black body is 3000K when black body cools. Then change in wavelength $\Delta\lambda = 9$ micron corresponding to maximum energy density. Now temperature of black body is -
 (1) 293 K (2) 2700 K
 (3) 270 K (4) 1800 K
- Q.35** The ratio of coefficient of thermal conductivity of two different materials is $5:3$. If the thermal resistance of rods of same thickness of these material is same, then what is ratio of length of these rods -
 (1) $3:5$ (2) $5:3$
 (3) $25:9$ (4) $9:25$
- Q.36** A long metallic bar is carrying heat from one of its ends of the other end under steady-state. The variation of temperature θ along the length x of the bar from its hot end is best described by which of the following figures?

- Q.37** If a liquid takes 30 sec. in cooling of 95°C to 90°C and 70 sec. in cooling of 55°C to 50°C then temp. of room is -
 (1) 16.5°C (2) 22.5°C
 (3) 28.5°C (4) 32.5°C
- Q.38** The thermal capacities of two bodies are in the ratio of $1:4$. If the rates of loss of heat are equal for the two bodies under identical conditions of surroundings, then the ratio of rates of fall of temp. of the two bodies is -
 (1) $1:4$ (2) $4:1$
 (3) $1:8$ (4) $8:1$
- Q.39** Two stars appear to be red and blue, what is true about them -
 (1) The red star is nearer
 (2) The blue star is nearer
 (3) The temperature of red star is more
 (4) The temperature of blue star is more
- Q.40** A cylinder of radius R made of material of thermal conductivity K_1 is surrounded by a cylindrical shell of inner radius R and outer radius $2R$ made of a material of thermal conductivity K_2 . The two ends of combined system are maintained at two different temperature there is no loss of heat across cylindrical surface and system is in steady state calculate effective thermal conductivity of system.
 (1) $\frac{K_1 + 3K_2}{4}$ (2) $K_1 + K_2$
 (3) $\frac{K_1 + 8K_2}{9}$ (4) $\frac{8K_1 + K_2}{9}$
- Q.41** A wall is made up of two layers A and B. The thickness of the two layers is the same, but materials are different. The thermal conductivity of A is double

than that of B. In thermal equilibrium the temperature difference between the two ends is 36°C . Then the difference of temperature at the two surfaces of A will be

- (1) 6°C (2) 12°C
 (3) 18°C (4) 24°C

Q.42 Cooling rate of a sphere of 600 K at external environment (200 K) is R when the temperature of sphere is reduced to 400 K than cooling rate of the sphere is

- (1) $(3/16) R$ (2) $(16/3) R$
 (3) $(9/27) R$ (4) None

Q.43 Rate of heat flow through a cylindrical rod is Q_1 . Temperatures of ends of rod are T_1 and T_2 . If all the linear dimensions of the rod become double and temperature difference remains same it's rate of heat flow is Q_2 , then :-

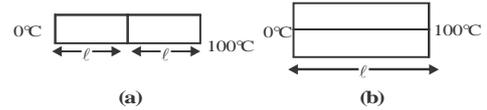
- (1) $Q_1 = 2Q_2$ (2) $Q_2 = 2Q_1$

- (3) $Q_2 = 4Q_1$ (4) $Q_1 = 4Q_2$

Q.44 Temperature of a body is 400°C assuming the surrounding temperature to be negligible at what temperature will be the body emit double energy radiation ?

- (1) 200°C (2) 200 K
 (3) 800°C (4) 800 K

Q.45 Two identical square rods of metal are welded end to end as shown in figure (a) 20 calories of heat flows through it in 4 minutes. If the rods are welded as shown in figure (b), the same amount of heat will flow through the rods in -



- (1) 1 minute (2) 2 minutes
 (3) 4 minutes (4) 16 minutes