Exercise-1

✍ **Marked Questions can be used as Revision Questions.**

OBJECTIVE QUESTIONS

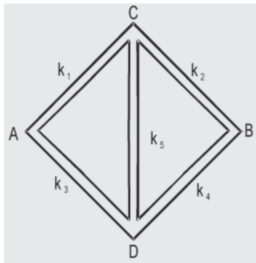
Section (A) : Thermal conduction in linear conductors at steady state

A-1. Which of 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

A-2.✍ 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 sq. cm. The thermal conductivity of copper is 400 W/mC. The two ends of this rod must be kept at a temperature difference of
(1) 1ºC (2) 10ºC (3) 100ºC (4) 1000ºC

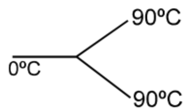
A-3. The lengths and radii of two rods made of same material are in the ratios 1 : 2 and 2 : 3 respectively; If the temperature difference between the ends for the two rods be the same, then in the steady state, the amount of heat flowing per second through them will be in the ratio:
(1) 1 : 3 (2) 4 : 3 (3) 8 : 9 (4) 3 : 2

A-4. Five rods of same dimensions are arranged as shown in the fig. They have thermal conductivities, k_1, k_2, k_5, k_4 and k_3 when points A and B are maintained at different temperatures. No heat flows through the central rod if



(1) $k_1k_4 = k_2k_3$ (2) $k_1 = k_4$ and $k_2 = k_3$
(3) $\frac{k_1}{k_4} = \frac{k_2}{k_3}$ (4) $k_1k_2 = k_3k_4$

A-5. 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 : **[JEE(Scr.)-2001, 1/35]**

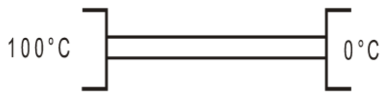


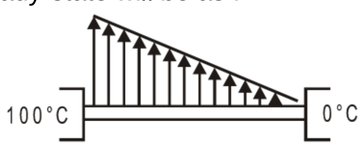
(1) 45°C (2) 60°C (3) 30°C (4) 20°C

A-6. The coefficients of thermal conductivity of a metal depends on
(1) temperature difference between the two sides (2) thickness of the metal plate
(3) area of the plate (4) none of the above

Section (B) : Thermal conduction in nonlinear conductors at steady state

B-1.✍ A conducting cylindrical rod of uniform cross-sectional area is kept between two large chambers which are at temperatures 100°C and 0°C respectively. The conductivity of the rod increases with x, where x is distance from 100°C end. The temperature profile of the rod in steady-state will be as :



(1) 

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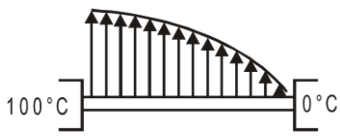
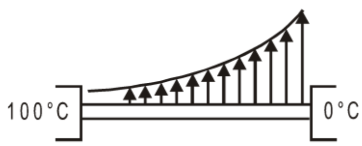
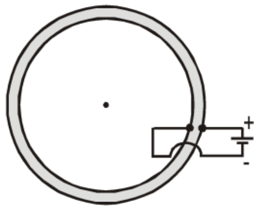
(3) 

(4) 

B-2. A shell, made of material of electrical conductivity $\frac{10^9}{\pi}$ $(\Omega\text{-m})^{-1}$, has thickness t = 2 mm and radius R = 10 cm. In an arrangement, its inside surface is kept at a lower potential than its outside surface. The resistance offered by the shell is equal to



(1) $5\pi \times 10^{-12}\ \Omega$ (2) $2.5 \times 10^{-11}\ \Omega$ (3) $5 \times 10^{-12}\ \Omega$ (4) $5 \times 10^{-11}\ \Omega$

Section (C) : Radiation, stefen's law and wein's law

C-1. 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

C-2. 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

C-3. 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

C-4. At T = 200K a black body emits maximum energy at wavelength of 14 μm. Then at T = 1000K the body will emit maximum energy at wavelength of-
(1) 70 mm (2) 70 μm (3) 2.8 μm (4) 2.8 mm

C-5. Water is usually heated by
(1) Conduction (2) Convection (3) Radiation (4) All the above processes

C-6. 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

C-7. 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 rediated upwards
(2) Air conducts heat upwards
(3) convection takes more heat upwards
(4) Conduction, convection and radiation all contribute significantly in transferring heat upwards

C-8. Mode of transmission of heat in which heat is carried by moving particles is:
(1) wave motion (2) convection (3) conduction (4) radiation

C-9. Which of the following surfaces will absorb maximum radiant energy-
(1) Black (2) Rough (3) Smooth white (4) Rough black

C-10. What represents the colour of star-
(1) Density (2) Distance (3) Energy (4) Temperature

C-11. 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-
(1) Newton's law of cooling (2) Vien's law
(3) Kirchoff's law (4) Stefan's

C-12. If the temperature of a lamp is about 600K, then the wavelength at which maximum emission takes place will be- (wien's constant $b = 3 \times 10^{-3}$ m-K)
(1) 500 Å (2) 5000 Å (3) 50000 Å (4) 500000 Å

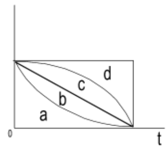
C-13. The spectral emissive power of a black body at a temperature of 6000K is maximum at λ_m = 5000 A°. If the temperature is increased by 10%, then the decrease in λ_m will be-
(1) 2.5% (2) 5.0% (3) 7.5% (4) 10%

C-14. Blackened metal foil receives heat from a heated sphere placed at a distance r from it. It is found that foil receives power P. If the temperature and the distance of the sphere are doubled, then the power received by the foil will be-
(1) P (2) 2P (3) 8P (4) 4P

Section (D) : Newton's Law of cooling

D-1. 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

D-2. A hot liquid is kept in a big room. Its temperature is plotted as a funcation of time. Which of the following curves may represent the plot ?
(1) a (2) c
(3) d (4) b



D-3. 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

D-4. 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_λ, a_λ, e_λ = const.

Exercise-2

✍ Marked Questions can be used as Revision Questions.

PART - I : OBJECTIVE QUESTIONS

1.✍ Two rods having thermal conductivities in the ratio of 5 : 3 and having equal length and equal cross-section are joined by face to face. If the temperature of free end of first rod is 100ºC and the free end of second rod is 20ºC, then temperature of the junction, is–
(1) 50ºC (2) 70ºC (3) 85ºC (4) 90ºC

2. Two cylindrical conductors A and B of same metallic material have their diameters in the raito 1 : 2 and lengths in the ratio 2 : 1. If the temperature difference between their ends is same, the ratio of heats conducted respectively by A and B per second is,
(1) 1 : 2 (3) 1 : 4 (3) 1 : 16 (4) 1 : 8

3. One end of a metal rod of length 1.0m and area of cross-section 100 cm^2 is maintained at 100ºC. If the other end of the rod is maintained at 0ºC, the quantity of heat transmitted through the rod per minute will be (coefficient of thermal conductivity of materal of rod = 100W/Kg/K)
(1) 3 x 10^3 J (2) 6 x 10^3 J (3) 9 x 10^3 J (4) 12 x 10^3 J

4. 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

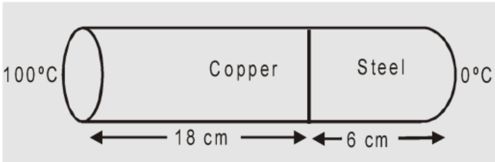
5. A heat flux of 4000 J/s is to be passed through a copper rod of length 10 cm and area of cross-section 100 sq. cm. The thermal conductivity of copper is 400 W/mC. The two ends of this rod must be kept at a temperature difference of

(1) 1ºC (2) 10ºC (3) 100ºC (4) 1000ºC

6. 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

7. 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 (area is same for both)?



(1) 75ºC (2) 67ºC
(3) 33ºC (4) 25ºC

8. A body takes 4 minutes to cool from 100°C to 70°C. To cool from 70°C to 40°C it will take-(room temperature is 15°C)

(1) 7 minutes (2) 6 minutes (3) 5 minutes (4) 4 minutes

9. A solid body is heated upto very high temperatures. As we go on heating, its brightness increases and it appears white at the end. The sequenc of the colour observed as the temperature of the body increases will be-

(1) Yellow, green, red, white. (2) Green, yellow, red, white.
(3) Red, green, yellow, white. (4) Red, yellow, green, white.

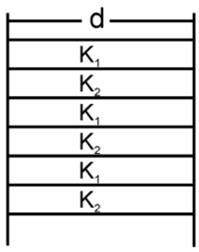
10. A sphere, a cube and a thin circular plate made up of same material and having the same mass are initially heated to a temperature of 200ºC. Which of these objects will cool slowest, when left in air at room temperature

(1) Sphere (2) Cube
(3) Circular plate (4) All will cool at the same rate

11. A black body is at a temperature of 2800 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 Wien constant $b = 2.88 \times 10^6$ nm K. Then

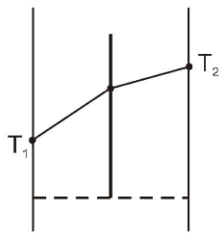
(1) $U_1 = 0$ (2) $U_3 = 0$ (3) $U_1 > U_2$ (4) $U_2 > U_1$

12. 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) $\frac{2 K_1 K_2}{K_1+K_2}$

13. The wall of a house is made of two different materials of same thickness. The temperature of the outer wall is T_2 and that of inner wall is $T_1 < T_2$. The temperature variation inside the wall as shown in the figure. Then :



(1) thermal conductivity of inner wall is greater than that of outer.
(2) thermal conductivity of outer wall is greater than that of inner
(3) thermal conductivities of the two are equal
(4) no conclusion can be drawn about thermal conductivities

PART - II : MISCELLANEOUS QUESTIONS

Section (A) : Assertion/Reasoning

A-1. **STATEMENT-1 :** Two solid cylindrical rods of identical size and different thermal conductivity K_1 and K_2 are connected in series. Then the equivalent thermal conductivity of two rod system is less than the value of thermal conductivity of either rod.

STATEMENT-2 : For two cylindrical rods of identical size and different thermal conductivities K_1 and K_2 respectively connected in series, the equivalent thermal conductivity K is given by

$$\frac{2}{K} = \frac{1}{K_1} + \frac{1}{K_2}$$

(1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1
(2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1
(3) Statement-1 is True, Statement-2 is False
(4) Statement-1 is False, Statement-2 is True.

A-2. **STATEMENT-1 :** As the temperature of the blackbody increases, the wavelength at which the spectral intensity (E_λ) is maximum, decreases.
STATEMENT-2 : The wavelength at which the spectral intensity will be maximum for a black body is proportional to the fourth power of its absolute temperature.
(1) Statement-1 is True, Statement-2 is True; Statement-2 **is** a correct explanation for Statement-1
(2) Statement-1 is True, Statement-2 is True; Statement-2 **is NOT** a correct explanation for Statement-1
(3) Statement-1 is True, Statement-2 is False
(4) Statement-1 is False, Statement-2 is True.

Section (B) : Match The Column

B-1. Match the statements in column-I with the statements in column-II.

Column-I	Column-II
(1) For a perfect black body	(p) Absorption of radiation occurs
(2) For a perfectly polished white body	(q) Emission of radiation occurs
(3) When radiation from air is incident on a perfectly transparent medium of greater refractive index	(r) Reflection of radiation will alway occur
(4) When radiation moves from a perfectly transparent medium of greater refractive index to air	(s) Transmission (refraction) of radiation will always occur

(All conditions are for temperature T > 0 K.)

Section (C) : One Or More Than One Options Correct

C-1. Assume transmitivity $t \rightarrow 0$ for all the cases :
(1) bad absorber is bad emitter
(2) bad absorber is good reflector
(3) bad reflector is good emitter
(4) bad emitter is good absorber

C-2. A hollow and a solid sphere of same material and having identical outer surface are heated under identical condition to the same temperature at the same time (both have same e, a) :
(1) in the beginning both will emit equal amount of radiation per unit time
(2) in the beginning both will absorb equal amount of radiation per unit time
(3) both spheres will have same rate of fall of temperature (dT/dt)
(4) both spheres will have equal temperatures at any moment

C-3. Two bodies A and B have thermal emissivities of 0.01 and 0.81 respectively. The surface areas of the two bodies are the same. The two bodies emit total radiant power at the same rate. The wavelength λ_B corresponding to maximum spectral radiancy in the radiation from B is shifted from the wavelength corresponding to maximum spectral radiancy in the radiation from A by 1.00 μm. If the temperature of A is 5802 K,

(1) the temperature of B is 1934 K (2) $\lambda_B = 1.5\ \mu m$
(3) the temperature of B is 11604 K (4) the temperature of B is 2901 K

C-4. The solar constant is the amount of heat energy received per second per unit area of a perfectly black surface placed at a mean distance of the Earth from the Sun, in the absence of Earth's atmosphere, the surface being held perpendicular to the direction of Sun's rays. Its value is 1388 W/m^2 .

If the solar constant for the earth is 's'. The surface temperature of the sun is TK, D is the diameter of the Sun, R is the mean distance of the Earth from the Sun . The sun subtends a small angle 'θ' at the earth. Then correct options is/are :–

(1) $s = \sigma T^4 \left(\frac{D}{R}\right)^2$ (2) $s = \frac{\sigma T^4}{4}\left(\frac{D}{R}\right)^2$ (3) $s = \frac{\sigma T^4}{4}\theta^2$ (4) $s = \frac{\sigma T^4}{4}\left(\frac{R}{D}\right)^2$

Exercise-3

✍ Marked Questions can be used as Revision Questions.

*** Marked Questions may have more than one correct option.**

PART - I : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

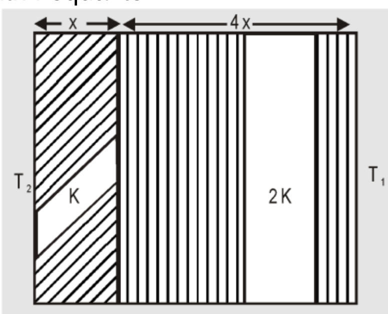
1. Infrared radiations are detected by **(AIEEE-2002, 4/300)**
(1) spectrometer (2) pyrometer (3) nanometer (4) photometer

2. Which of the following is more close to a black body ? **(AIEEE-2002, 4/300)**
(1) Black board paint (2) Green leaves (3) Black holes (4) Red roses

3. Which of the following radiations has the least wavelength ? **(AIEEE-2003, 4/300)**
(1) γ-rays (2) β-rays (3) α-rays (4) X-rays

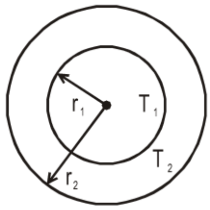
4. If the termpreature of the sun were to increase from T to 2T and its radius from R to 2R, then the ratio of the radiant energy received on earth to what it was previously will be- **(AIEEE-2004, 4/300)**
(1) 4 (2) 16 (3) 32 (4) 64

5. The temperature of the two outer surfaces of a composite slab, consisting of two materials K and 2K and thickness x and 4x, respectively, are T_2 and T_1($T_2 > T_1$). The rate of heat transfer through the slab, in a steady state is $\left(\frac{A(T_2 - T_1)K}{x}\right)f$ with f equal to– **(AIEEE-2004, 4/300)**



(1) 1 (2) 1/2 (3) 2/3 (4) 1/3

6. The figure shows a system of two concentric spheres of radii r_1 and r_2 and 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 :



[AIEEE-2005, 4/300]

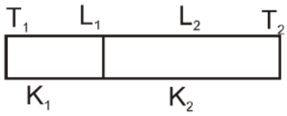
(1) $\frac{(r_2 - r_1)}{(r_1 r_2)}$ (2) $\ln\frac{(r_2)}{(r_1)}$

(3) $\frac{r_1 r_2}{(r_2 - r_1)}$ (4) $(r_2 - r_1)$

7. Assuming the sun to be a spherical body of radius R at a temperature of T K, evaluate the total radiant power, incident on Earth, at a distance r from the Sun. (earth radius = r_0) **(AIEEE-2006; 3/180)**

(1) $\frac{R^2\sigma T^4}{r^2}$ (2) $\frac{4\pi r_0^2 R^2\sigma T^4}{r^2}$ (3) $\frac{\pi r_0^2 R^2\sigma T^4}{r^2}$ (4) $\frac{r_0^2 R^2\sigma T^4}{4\pi r^2}$

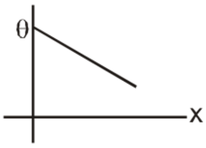
8. One end of a thermally insulated rod is kept at a temperature T_1 and the other at T_2. The rod is composed of two sections of lengths L_1 and L_2 and thermal conductivities k_1 and k_2 respectively. The temperature at the interface of the sections is **(AIEEE-2007; 3/120)**



(1) $\frac{(K_2 L_2 T_1 + K_1 L_1 T_2)}{(K_1 L_1 + K_2 L_2)}$ (2) $\frac{(K_2 L_1 T_1 + K_1 L_2 T_2)}{(K_2 L_1 + K_1 L_2)}$

(3) $\frac{(K_1 L_2 T_1 + K_2 L_1 T_2)}{(K_1 L_2 + K_2 L_1)}$ (4) $\frac{(K_1 L_1 T_1 + K_2 L_2 T_2)}{(K_1 L_1 + K_2 L_2)}$

9. A long metallic bar is carrying heat from one of its ends to 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. **[AIEEE-2009, 4/144]**

(1) 

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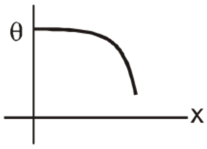
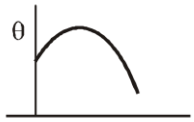
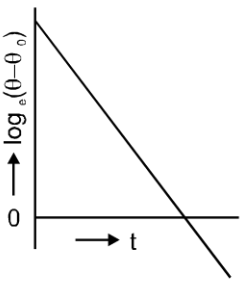
(3) 

(4) 

10. A liquid in a beaker has temperature θ(t) at time t and θ_0 is temperature of surroundings, then according to Newton's law of cooling the correct graph between $\log_e(\theta - \theta_0)$ and t is

[AIEEE-2012, 4/120, –1]



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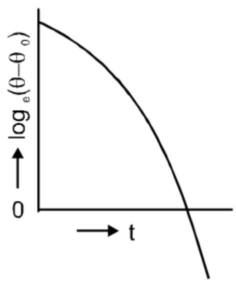

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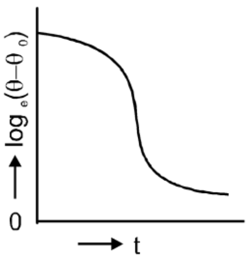

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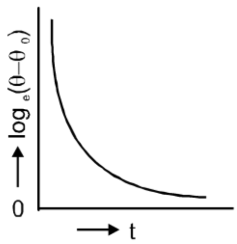
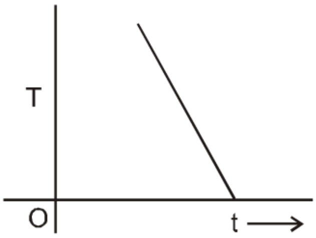
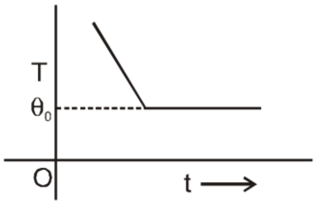


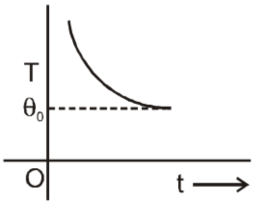
(4)

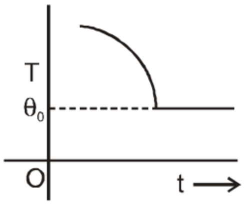
11. If a piece of metal is heated to temperature θ and then allowed to cool ina room which is at temperature θ_0, the graph between the temperature T of the metal and time t will be closest to :

[JEE(Main)-2013, 4/120, –1]

(1) 

(2) 

(3) 

(4) 

12. Three rods of Copper, brass and steel are welded together to form a Y-shaped structure. Area of cross-section of each rod = 4 cm^2. End of copper rod is maintained at 100°C where as ends of brass and steel are kept at 0°C. Lengths of the copper, brass and steel rods are 46, 13 and 12 cms respectively. The rods are thermally insulated from surroundings except at ends. Thermal conductivities of copper, brass and steel are 0.92, 0.26 and 0.12 CGS units respectively. Rate of heat flow through copper rod is : **[JEE(Main)-2014 ; 4, –1]**

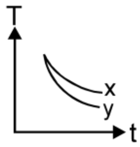
(1) 1.2 cal/s (2) 2.4 cal/s (3) 4.8 cal/s (4) 6.0 cal/s

13. An ideal gas undergoes a quasi static, reversible process in which its molar heat capacity C remains constant. If during this process the relation of pressure P and volume V is given by PV^n = constant, then n is given by (Here C_p and C_V are molar specific heat at constant pressure and constant volume, respectively) : **[JEE(Main)-2016 ; 4, –1]**

(1) $n = \frac{C - C_P}{C - C_V}$ (2) $n = \frac{C_P - C}{C - C_V}$ (3) $n = \frac{C - C_V}{C - C_P}$ (4) $n = \frac{C_P}{C_V}$

PART - II : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

1. The temperature of bodies X and Y vary with time as shown in the figure. If emissivity of bodies X and Y are e_X & e_Y and absorptive powers are A_X and A_Y, (assume other conditions are identical for both):then **[JEE (Scr.) 2003, 3/84, –1]**



(A) $e_Y > e_X$, $A_Y > A_X$ (B) $e_Y < e_X$, $A_Y < A_X$

(C) $e_Y > e_X$, $A_Y < A_X$ (D) $e_Y < e_X$, $A_Y > A_X$

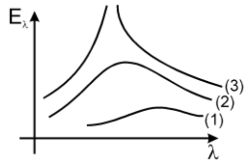
2. Two containers, one is having ice at 0°C and other containing boiling water at 100°C are connected by two identical rods. When rods are in parallel the rate of heat transfer is Q_1 and when rods are in series, the rate of heat transfer is Q_2. Then Q_2/Q_1 will be : **[JEE(Scr.) 2004' 3/84, –1]**

(A) 2 : 1 (B) 1 : 2 (C) 4 : 1 (D) 1 : 4

3. Three discs of same material A, B, C of radii 2 cm, 4 cm and 6 cm respectively are coated with carbon black. Their wavelengths corresponding to maximum spectral radiancy are 300, 400 and 500 nm respectively then maximum power will be emitted by **[JEE(Scr.) 2004' 3/84, –1]**

(A) A (B) B (C) C (D) same for all

4. Three graphs marked as 1, 2, 3 representing the variation of maximum emissive power and wavelength of radiation of the sun, a welding arc and a tungsten filament. Which of the following combination is correct **[JEE(Scr.)-2005, 3/84, –1]**

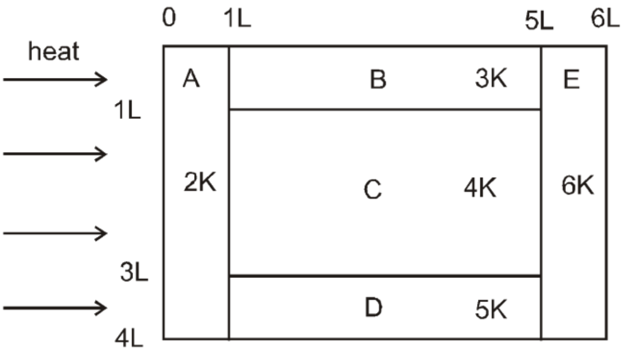


(A) 1- bulb, 2 → welding arc, 3 → sun (B) 2- bulb, 3 → welding arc, 1 → sun

(C) 3- bulb, 1 → welding arc, 2 → sun (D) 2- bulb, 1 → welding arc, 3 → sun

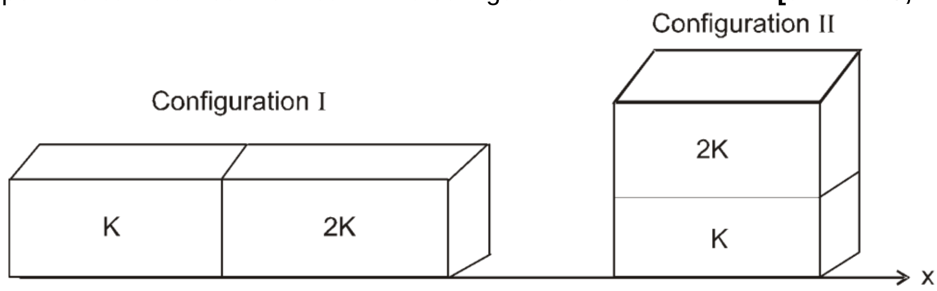
5. In which of the following phenomenon heat convection does not take place **[JEE (Scr.) 2005, 3/84 , –1]**
(A) land and sea breeze
(B) boiling of water
(C) heating of glass surface due to filament of the bulb
(D) air around the furnace

6.*✍ A composite block is made of slabs A, B, C, D and E of different thermal conductivities (given in terms of a constant K) and sizes (given in terms of length, L) as shown in the figure. All slabs are of same width. Heat 'Q' flows only from left to right through the blocks. Then in steady state **[JEE, 2011, 4,/160]**



(A) heat flow through A and E slabs are same
(B) heat flow through slab E is maximum
(C) temperature difference across slab E is smallest
(D) heat flow through C = heat flow through B + heat flow through D.

7.✍ Two rectangular blocks, having indentical dimensions, can be arranged either in configuration I or in configuration II as shown in the figure, On of the blocks has thermal conductivity k and the other 2k. The temperature difference between the ends along the x-axis is the same in both the configurations. It takes 9s to transport a certain amount of heat from the hot end to the cold end in the configuration I. The time to transport the same amount of heat in the configuration II is : **[JEE-2013, 3/60,–1]**



(A) 2.0 s (B) 3.0 s (C) 4.5 s (D) 6.0 s

8. Two spherical stars A and B emit blackbody radiation. The radius of A is 400 times that of B and A emits 10^4 times the power emitted from B. The ratio $\left(\frac{\lambda_A}{\lambda_B}\right)$ fo their wavelengths λ_A and λ_B at which the peaks occur in their respective radiation curves is : **[JEE(Advanced)-2015 ; 4/88]**

9. A metal is heated in a furnace where a sensor is kept above the metal surface to read the power radiated (P) by the metal. the sensor has scale that displays $\log_2 (P / P_0)$, where P_0 is a constant. When the metal surface is at a temperature of 487 ºC, the sensor shows a value 1. Assume that the emissivity of the metallic surface remains constant. What is the value displayed by the sensor when the temperature of the metal surface is raised to 2767 ºC. **[JEE(Advanced)-2016 ; P-1, 3/62]**

Answers

EXERCISE # 1

Section (A) :

A-1.	(4)	**A-2.**	(3)	**A-3.**	(3)
A-4.	(1)	**A-5.**	(2)	**A-6.**	(4)

Section (B) :

B-1.	(2)	**B-2.**	(4)

Section (C) :

C-1	(4)	**C-2**	(2)	**C-3**	(3)
C-4	(3)	**C-5**	(2)	**C-6**	(3)
C-7	(3)	**C-8**	(2)	**C-9**	(4)
C-10	(4)	**C-11**	(3)	**C-12**	(3)
C-13	(4)	**C-14**	(4)		

Section (D) :

D-1	(3)	**D-2**	(1)	**D-3**	(2)
D-4	(2)				

EXERCISE # 2

PART- I

1.	(2)	**2.**	(4)	**3.**	(2)
4.	(4)	**5.**	(3)	**6.**	(3)
7.	(1)	**8.**	(1)	**9.**	(4)
10.	(1)	**11.**	(4)	**12.**	(2)
13.	(2)				

PART- II

Section (A) :

A-1.	(4)	**A-2.**	(3)

Section (B) :

B-1 (1 → p,q); (2 → r); (3 → s); (4 → s)

Section (C) :

C-1.	(1,2,3)	**C-2.**	(1,2)	**C-3.**	(1,2)
C-4.	(2,3)				

EXERCISE # 3

PART- I

1.	(2)	**2.**	(1)	**3.**	(1)
4.	(4)	**5.**	(4)	**6.**	(3)
7.	(3)	**8.**	(3)	**9.**	(1)
10.	(1)	**11.**	(3)	**12.**	(3)
13.	(1)				

PART- II

1.	(A)	**2.**	(D)	**3.**	(B)
4.	(A)	**5.**	(C)	**6.**	(ACD)
7.	(A)	**8.**	2	**9.**	9