1.

One kilogram of ice at $0^{\circ}C$ is mixed with one kilogram of water at $80^{\circ}C$. The final temperature of the mixture is (Take: Specific heat of water = 4200 J $kg^{-1}k^{-1}$, Latent heat of ice = 336 kJ kg^{-1})

(1) $0^{\circ}C$ (2) $50^{\circ}C$

(3) $40^{\circ}C$ (4) $60^{\circ}C$

2.

Hot water cools from $60^{\circ}C$ to $50^{\circ}C$ in first 10 minutes and from $50^{\circ}C$ to $42^{\circ}C$ in next 10 minutes. The temperature of surrounding is :

1. 5° C
2. 10° C
3. 15° C
4. $20^{\circ}C$

3.

Two identical bodies are made of a material for which the heat capacity increases with temperature.One of these is at 100° C,while the other one is at 0° C. If the two bodies are brought into contact, then assuming no heat loss,the final common temperature is -

(a) 50° C

(b) more than 50°C

(c) less than 50°C but greater than 0°C

(d) $0\ {}_0C$

4.

Steam at 100°C is passed into 20 g of water at 10°C. When water acquires a temperature of 80°C, the mass of water present will be (Take specific heat of water=1 cal g^{-1} °C^{-1} and latent heat of steam = 540 cal g^{-1})

(a) 24 g

(b) 31.5g

(c) 42.5 g

(d) 22.5 g

5.

Certain quantity of water cools from 70°C to 60°C in the first 5 min and to 54°C in the next 5 min. The temperature of the surroundings is

(a) 45°C

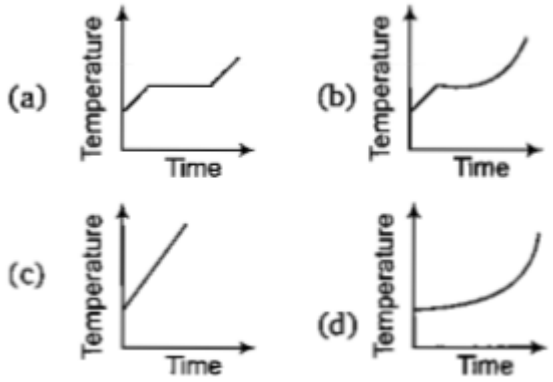
(b) 20°C

(c) 42°C

(d) 10°C

6.

Liquid oxygen at 50K is heated to 300K at constant pressure of 1 atm. The rate of heating is constant.Which one of the following graphs represents the variation of temperature with time?



7.

A black body at $227^{\circ}C$ radiates heat at the rate of 7 cal $cm^{-2}s^{-1}$. At a temperature of $727^{\circ}C$, the rate of heat radiated in the same units will be

(a) 60 (b) 50

(c) 112 (d) 80

8.

On a new scale of temperature (which is linear) and called the W scale, the freezing and boiling points of water are $39^{\circ}W$ and $239^{\circ}W$ respectively. What will be the temperature on the new scale, corresponding to a temperature of $39^{\circ}C$ on the Celsius scale?

(a) $78^{\circ}W$ (b) $117^{\circ}W$

(c) $200^{\circ}W$ (d) $139^{\circ}W$

9.

A metal bar of length *L* and area of cross-section *A* is clamped between two rigid supports. For the material of the rod, its Young's modulus is *Y* and coefficient of linear expansion is α. If the temperature of the rod is increased by $\Delta t^{\circ}C$, the force exerted by the rod on the supports is

(a) $Y\ AL\ \Delta t$ (b) $Y\ A\ \alpha\ \Delta t$

(c) $\frac{YL\,\alpha\Delta t}{A}$ (d) $Y\,\alpha\,AL\;\Delta\,t$

10.

The coefficient of linear expansion of brass and steel are α_1 and α_2. If we take a brass rod of length l_1 and steel rod of length l_2 at 0°*C*, their difference in length $(l_2 - l_1)$ will remain the same at a temperature if

(a) $\alpha_1 l_2 = \alpha_2 l_1$ (b) $\alpha_1 l_2^2 = \alpha_2 l_1^2$

(c) $\alpha_1^2 l_1 = \alpha_2^2 l_2$ (d) $\alpha_1 l_1 = \alpha_2 l_2$

11.

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

12.

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

(a) 80°C (b) 20°C
(c) 60°C (d) 40°C

13.

Wires A and B have identical lengths and have circular cross-sections. The radius of A is twice the radius of B i.e. $\mathrm{r_A} = 2\mathrm{r_B}$. 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) $\mathrm{K_A} = 4\mathrm{K_B}$ (b) $\mathrm{K_A} = 2\mathrm{K_B}$
(c) $\mathrm{K_A} = \mathrm{K_B}/2$ (d) $\mathrm{K_A} = \mathrm{K_B}/4$

14.

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

15.

The temperature of hot and cold end of a 20 cm long rod in thermal steady state are at 100 $^\circ$Cand 20°C respectively. Temperature at the centre of the rod is
(a) 50°C (b) 60°C
(c) 40°C (d) 30°C

16.

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

17.

A cylindrical rod having temperature $\mathrm{T_1}$ and $\mathrm{T_2}$ at its ends. The rate of flow of heat is $\mathrm{Q_1}$ cal/sec. If all the linear dimensions are doubled keeping temperature constant then rate of flow of heat $\mathrm{Q_2}$ will be
(a) $4\mathrm{Q_1}$ (b) $2\mathrm{Q_1}$
(c) $\frac{\mathrm{Q_1}}{4}$ (d) $\frac{\mathrm{Q_1}}{2}$

18.

A body of length 1m having cross sectional area 0.75 $\mathrm{m^2}$ has heat flow through it at the rate of 6000 Joule/sec. Then find the temperature difference if K = 200 $\mathrm{Jm^{-1}\,K^{-1}}$

(a) 20°C (b) 40°C
(c) 80°C (d) 100°C

19.

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

20.

In heat transfer, which method is based on gravitation ?

(a) Natural convection (b) Conduction
(c) Radiation (d) Stirring of liquids

21.

Certain substance emits only the wavelengths λ_1, λ_2, λ_3 and λ_4 when it is at a high temperature. When this substance is at a colder 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

22.

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.

23.

A black body at 200 K is found to exit maximum energy at a wavelength of 14 μm. When its temperature is raised to 1000K, the wavelength at which maximum energy is emitted is
(a) 14 μm (b) 70 μF
(c) 2. 8 μm (d) 2. 8 nm

24.

A black body has maximum wavelength λ_m at temperature 2000 K. Its corresponding wavelength at temperature 3000 K will be
(a) $\frac{3}{2}\lambda_m$ (b) $\frac{2}{3}\lambda_m$
(c) $\frac{4}{9}\lambda_m$ (d) $\frac{9}{4}\lambda_m$

25.

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

(a) $\frac{E}{16}$ (b) $\frac{E}{4}$
(c) 4E (d) 16 E

26.

An object is at a temperature of 400°C. At what temperature would it radiate energy twice as fast? The temperature of the surroundings may be assumed to be negligible .
(a) 200°C (b) 200 K
(c) 800°C (d) 800 K

27.

A black body at a temperature of 227°C radiates heat energy at the rate of 5 cal / cm^2 − sec. At a temperature of 727°C, the rate of heat radiated per unit area in cal / cm^2 will be
(a) 80 (b) 160
(c) 250 (d) 500

28.

A body radiates energy 5W at a temperature of 127°C. If the temperature is increased to 927°C, then it radiates energy at the rate of
(a) 410 W (b) 81 W
(c) 405 W (d) 200 W

29.

The temperatures of two bodies A and B are respectively 727°C and 327°C. The ratio of the rates of heat radiated by them is

(a)727:327 (b) 5 : 3
(c) 25 : 9 (d) 625 : 81

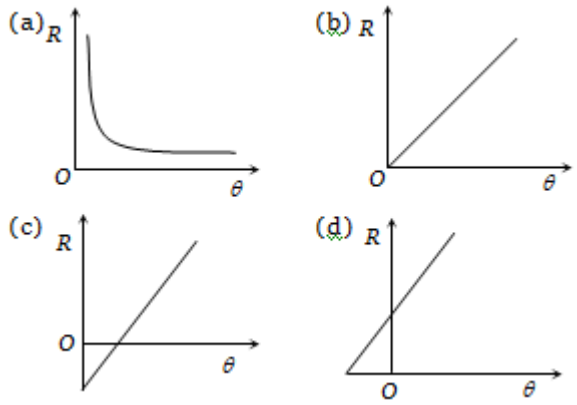
30.

The radiant energy from the sun incident normally at the surface of earth is 20 kcal /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) 160 kcal /m^2 min (b) 40 kcal /m^2 min
(c) 320 kcal /m^2 min (d) 80 kcal /m^2 min

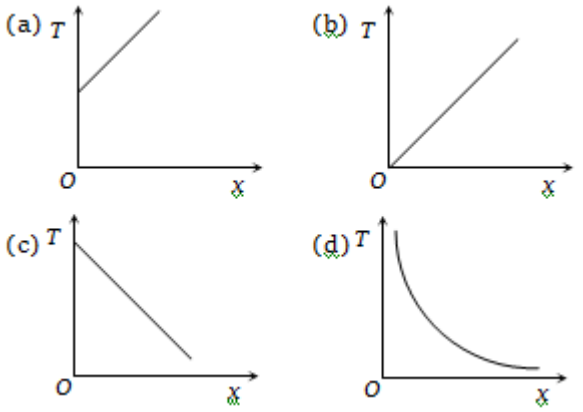
31.

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 -



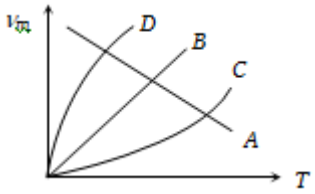
32.

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 ?



33.

Which of the following is the v_m v/s T graph for a perfectly black body (v_m =maximum frequency of radiation) ?



(a) A (b) B
(c) C (d) D

34.

If 1gm of steam is mixed with 1 g of ice, then the resultant temperature of the mixture is

1. $270^{\circ}C$
2. $230^{\circ}C$
3. $100^{\circ}C$
4. $50^{\circ}C$

35.

Which one of the following processes depends on gravity?

1. Conduction
2. Convection
3. Radiation
4. None of the above

36.

Consider two rods of the same length and different specific heats $(S_1,\ S_2)$, conductivities $(K_1,\ K_2)$ and area of cross-sections $(A_1,\ A_2)$ and both having temperature T_1 and T_2 at their ends. If the rate of loss of heat due to conduction is equal then

1. $K_1A_1 = K_2A_2$
2. $\frac{K_1A_1}{S_1} = \frac{K_2A_2}{S_2}$
3. $K_2A_1 = K_1A_2$
4. $\frac{K_2A_1}{S_2} = \frac{K_1A_2}{S_1}$

37.

If λ_m denotes the wavelength at which the radiation emission from a body at a temperature TK is maximum, then

1. λ_m is independent of T
2. $\lambda_m \propto T$
3. $\lambda_m \propto T^{-1}$
4. $\lambda_m \propto T^4$

38.

Assuming the sun to have a spherical outer surface of radius r, radiating like a black body at temperature $t^{\circ}C$ the power received by a unit surface, (normal to the incident rays) at a distance R from the centre of the sun is

1. $\frac{r^2\sigma(t+273)^4}{4\pi R^2}$
2. $\frac{16\pi^2r^2\sigma t^4}{R^2}$
3. $\frac{r^2\sigma(t+273)^4}{R^2}$
4. $\frac{4\pi r^2\sigma t^4}{R^2}$

39.

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 of 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. $\frac{Q}{2}$
2. $\frac{Q}{4}$
3. $\frac{Q}{16}$
4. $2Q$

40.

When 1 kg of ice at $0^{\circ}C$ melts to water at $0^{\circ}C$

, the resulting change in its entropy, taking latent heat of ice to be 80 cal $^{\circ}C^{-1}$ is

1. $293\ \text{cal}\ K^{-1}$
2. $273\ \text{cal}\ K^{-1}$
3. $8 \times 10^{4}\ \text{cal}\ K^{-1}$
4. $80\ \text{cal}\ K^{-1}$

41.

A piece of ice falls from a height h so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted into heat during its fall. The value of h is (latent heat of ice is $3.4 \times 10^{5}\ \text{J kg}^{-1}$ and $g = 10\ \text{N kg}^{-1}$).

1. 136 km
2. 68 km
3. 34 km
4. 544 km

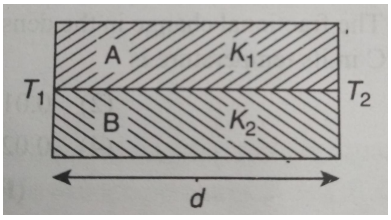
42.

A body cools from a temperature 3T to 2T in 10 min. The room temperature is t. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 min will be

1. $\frac{3}{2}T$
2. $\frac{4}{3}T$
3. T
4. $\frac{7}{4}T$

43.

Two rods A and B of different materials are welded together as shown in figure. Their thermal conductivities are K_1 and K_2. The thermal conductivity of the composite rod will be



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

44.

A spherical blackbody with a radius of 12 cm radiates 450 watt power at 500 K. If the radius were halved and the temperature is doubled, the power radiated (in watt) would be

1. 450
2. 1000
3. 1800
4. 225

45.

The power radiated by a black body is P and it radiates maximum energy at wavelength, λ_0. If the temperature of the black body is now changed so that it radiates maximum energy at wavelength $\frac{3}{4}\lambda_0$, the power radiated by it becomes nP. The value of n is

1. $\frac{256}{81}$
2. $\frac{4}{3}$
3. $\frac{3}{4}$
4. $\frac{81}{256}$

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