PHYSICS

BOOKS - BITSAT GUIDE PHYSICS (HINGLISH)

TRANSMISSION

Others

1. One end of a metal rod is kept in a furnace. In steady state, the temperature of the rod

A. may be variable

B. must be constant

C. must be variable

D. none of the above

Answer:

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2. Calculate the daily loss of energy by the earth, if the temperature gradient in the earth's crust is $32^{\circ} C$ per km and mean conductivity of the rock

is 0.008 of CGS unit. (Given radius of earth $= 6400km$)

A. $10^{40}cal$

B. $10^{30}cal$

C. $10^{18}cal$

D. $10^{10}cal$

Answer:

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3. Cylinder rod of copper of length $2m$ and cross-sectional area $2cm^2$ is insulated at its curved surface. The one end of rod is maintained in steam chamgber and other is maintained in ice at $0^\circ C$ (The thermal coductivity of copper is $386J/m-s.^\circ C$). Find the temperature at a point which is at a distance of $120cm$ from the colder end.

A. $80^\circ C$

B. $60^\circ C$

C. $50^\circ C$

D. none of the above

Answer:

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4. Cylinder copper rod of length $1m$ and a cylinder steel rod of length $1.5m$ are joined together end to end. The cross sectional area of eac rod is $3.14cm$. The free ends of steel rod and copper rods are maintained at $0^\circ C$ and $100^\circ C$ respectively. The surfaces of rods are thermally insulated. Find the temperature of copper steel

junction. (Given thermal conductivity of steel $= 46J/m - s.^\circ C$ and the thermal conductivity of copper $= 386J/m - s.^\circ C$)

A. 40°

B. 60°

C. 93°

D. $80.64^\circ C$

Answer:

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5. A block of ice at $0^\circ C$ rest on the upper surface of the slab of stone of area $3600cm^2$ and thickness of $10cm$. The slab is exposed on the lower surface to steam at $100^\circ C$. If $4800g$ of ice is melted in one hour, then calculate the thermal conductivity of stone.

(Given the latent heat of fusion of ice $= 80cal/g$)

A. $K = 2.96 \times 10^{-3} cal/cms.^\circ C$

B. $K = 1.96 \times 10^{3} cal/cms.^\circ C$

C. $K = 0.96 \times 10^{3} cal/cms.^\circ C$

D. none of the above

Answer:

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6. The ice is filled in a hollow glass sphere of thickness $2mm$ and external radius $10cm$. This hollow glass sphere with ice now placed in a bath containing boiling water at $100^{\circ}C$. Calculate the rate at which ice melts. Neglect volume change in ice.

(Given, thermal conductivity of glas $1.1W/m/K$,

latent heat of ice $= 336 \times 10^3 J/kg$)

A. $\frac{m}{t} = 0.01kg/s$

B. $\frac{m}{t} = 0.002kg/s$

C. $\frac{m}{t} = 0.02kg/s$

D. $\frac{m}{t} = 0.001kg/s$

Answer:

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7. $5cm$ thick walls of a box like cooler is made of plastic toam. Its total surface area is $1.5m^2$. If outside temperature is $30^\circ C$, then how much ice melts each hour inside the cooler to old its temperature at $0^\circ C$.

(Given K for plastic $= 0.04W/mK$, $L_0 = 80cal/g$ and $1kcal = 4.184kJ/kcal$)

A. $4kg$

B. $0.39kg$

C. $3.9kg$

D. $0.2kg$

Answer:

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8. If in two identical containers, equal quantities of ice melts completely in 30 and 20 minutes respectively, then find the ratio of the thermal conductivities of the material of two containers.

A. $1:1$

B. $1:2$

C. $3:2$

D. $2:3$

Answer:

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9. A compound rod is formed of a steel core of diameter $1cm$ and outer casing is of copper, whose outer diameter is $2cm$. The length of this compound rod is $2m$ and one end is maintained as $100^\circ C$ and the end is at $0^\circ C$. If the outer surface of the rod is thermally insulated, then

heat current in the rod will be (Given thermal conductivity of steel $j = 12cal/m/k/s$, thermal conductivity of copper $= 92cal/m/k/s$

A. $2cal/s$

B. $1.13cal/s$

C. $1.42cal/s$

D. $2.68cal/s$

Answer:

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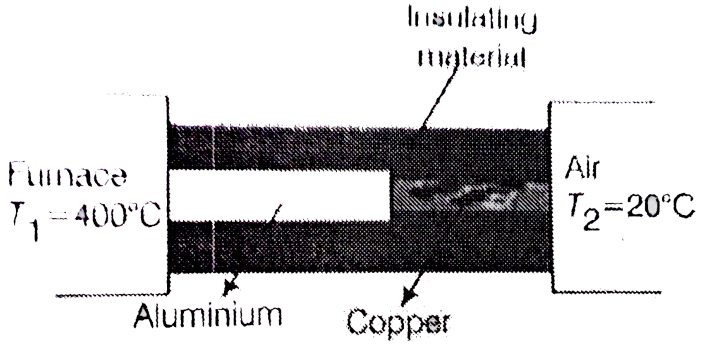
10. An aluminium rod of length L and cross-sectional area $2A$ is joined with a copper rod of length $2L$ and area of cross-section is A as shown in figure. Find the temperature of aluminium-copper junction in the steady state of the system.



Given thermal conductivity $K_{Al} = 240 J/m/s/.^\circ C, K_{Cu} = 400 J/m/s/.^\circ C$

A. $300^\circ C$

B. $400^\circ C$

C. $288.24^\circ C$

D. $275.4^\circ C$

Answer:

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11. A uniform metal ring with centre C have two points A and B such that angle ACB is θ. A and B are maintained at two different constant

temperature.

If the angle between A and B i.e. $\theta = 180^\circ$ the rate of heat flow from A and B is $1.2W$, then what will be the rate, when $\theta = 90^\circ$?

A. $0.6W$

B. $0.9W$

C. $1.6W$

D. $1.8W$

Answer:

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12. What amount of ice at $-14^{\circ}C$ required to cool $200gg$ of water from $25^{\circ}C$ to 10CC? (Given $C_{\text{ice}} = 0.5ca\frac{l}{g}.^{\circ}C$, L_f for ice $= 80cal/g$)

A. $31g$

B. $41g$

C. $51g$

D. $21g$

Answer:

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13. A metallic sphere having inner and outer radii a and b respectively has thermal conductivity $K = \frac{K_0}{r}(a \leq r \leq b)$

Find the thermal resistance between inner surface and outer surface.

A. $\frac{(b-a)}{4\pi K_0}$

B. $\frac{\left(b^2-a^2\right)}{4\pi K_a ab}$

C. $\frac{4\pi K_0}{(b-a)}$

D. none of these

Answer:

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14. 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. $42.85^\circ C$

B. $45^\circ C$

C. $40.46^\circ C$

D. $44.23^\circ C$

Answer:

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15. Find the time in which a layer of ice thickness h will grow on the surface of the pond of surface area A, when the surrounding temperature falls to $-T^{\circ}C$.

(Assume $K =$ thermal conductivity of ice, $\rho -$ densityy of water $L =$ latent heat of fusion)

A. $t = \frac{\rho L}{2KT}h^2$

B. $t - \frac{\rho L}{KT}h^2$

C. $t = \frac{\rho L h^2}{3KT}$

D. $t = \frac{\rho L h^2}{4KT}$

Answer:

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16. A black body maintained at a certain temperature radiates heat energy at the rate Q watt. If its surface is smoothened so as to lower its emissivitiy by 10%, what will be the increase in its rate of radiation at double the initial temperature?

A. $\left(0.9 \times 102^4 - 1\right)Q$ watt

B. $0.9 \times 2^4 Q$ watt

C. $(0.9 \times 2)^4 Q$ watt

D. $(0.9)^4 \times 2Q$ watt

Answer:

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17. The thermal radiation emitted by a body per second per unit area is $\frac{\Delta H}{A\Delta t} = kT^4$. If σ is Stefan's constant, then body

A. may be polished

B. may be black body

C. must be black body

D. must not be black body

Answer:

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18. If temperature of black body increases from $300K$ to $900K$, then the rate of energy radiation increases by

A. 81

B. 3

C. 9

D. 2

Answer:

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19. Three objects coloured black, gray and white can withstand hostile conditions upto $2800^\circ C$. These objects are thrown into a furance where

each of them attains a temperature of $2000^{\circ}C$.

Which object will glow brightest?

A. The white object

B. The black object

C. All glow with equal brightness

D. Grey object

Answer:

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20. The power P is received by a surface at temperature T_0K from a small sphere at temperature

A. $T(T > > T_0)$ and at a distance $'d'$. If both $'T'$ and $'d'$ are doubled, then power received by surface will become

B. P

C. $2P$

D. $4P$

Answer: A

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21. 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

A. $4Q_1$

B. $2Q_1$

C. $\frac{Q_1}{4}$

D. $\frac{Q_1}{2}$

Answer:

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22. Assuming the Sun to be a spherical body of radius R at a temperature of TK, evaluate the total radiant powered incident of Earth at a distance r from the sun

where r_0 is the radius of the Earth and σ is Stefan's constant.

A. $4\pi r_0^2 R^2 \sigma T^4 / r^2$

B. $\pi r_0^2 R(2) \sigma T^4 / r^2$

C. $r_0^2 R^2 \sigma T^4 / 4\pi r^2$

D. $R^2 \sigma T^4 / r^2$

Answer:

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23. What will be the increment in heat energy radiated when the temperature of hot body is raised by 5%?

A. 0.05

B. 0.06

C. 0.1165

D. 0.2155

Answer:

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24. Two spheres of the same material having radii r and $4r$ and temperature $2T_0$ and T_0 respectively. The ratio of rate of radiation of energy by the sphere is

A. $1:1$

B. $1:2$

C. $2:1$

D. $3:1$

Answer:

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25. A sphere a cube and a thin circular plate all of same material having same mass are initially heated to $200^{\circ}C$. Which of these will cool fastest?

A. Circular plate

B. Sphere

C. Cube

D. All of these

Answer:

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26. A body at a temperature of $727^\circ C$ and having surface area $5cm^2$, radiations $300J$ of energy

each minute. The emissivity is(Given Boltzmann constant $= 5.67 \times 10^{-8} Wm^{-2} K^{-4}$

A. $e = 0.18$

B. $e = 0.05$

C. $e = 0.2$

D. $e = 0.15$

Answer:

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27. Choose the correct relation, when the temperature of an isolated black body falls from T_1 to T_2 in time $'t'$ and assume $'c'$ to be a constant.

A. $t = c\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$

B. $t = c\left(\frac{1}{T_2^2} - \frac{1}{T_1^2}\right)$

C. $T = C\left(\frac{1}{T_2^3 - \frac{1}{T_1^3}}\right)$

D. $t = c\left(\frac{1}{T_2^4} - \frac{1}{T_1^4}\right)$

Answer:

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28. The temperature and the surface area of the body are $227^{\circ}C$ and $0.15m$ respectively. If its transmitting power is negligible and reflecting power is 0.5, then calculate the thermal power of the body.

(Given $\sigma - 5.67 \times 10^{-4} J/m^2/s/K$)

A. $300W$

B. $265.78W$

C. $201W$

D. $320.89W$

Answer:

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29. The surface temperature of the sun is $'T'K$ and the solar constant for a plte is $'s'$. The sun subtends an angle θ at the planet. Then,

A. $s \propto T^4$

B. $s \propto T^2$

C. $s \propto \theta^2$

D. $s \propto \theta$

Answer:

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30. When a blackened platium wire is heated gradually, it apears

A. first blue, then red and finally white

B. first red, then blue and finally white

C. first white, then blue and finally red

D. first red, then white and finally blue

Answer:

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31. Surface temperature of the sun as estimate is $6032.25K$. Find the wavelength at which sun radiates maximum energy (Given, Wien's constant $= 0.2898cm - k$)

A. $\lambda_m = 5000\text{Å}$

B. $\lambda_m = 4804.2\text{Å}$

C. $\lambda_m = 3809.5\text{Å}$

D. $\lambda_m = 2891.6\text{Å}$

Answer:

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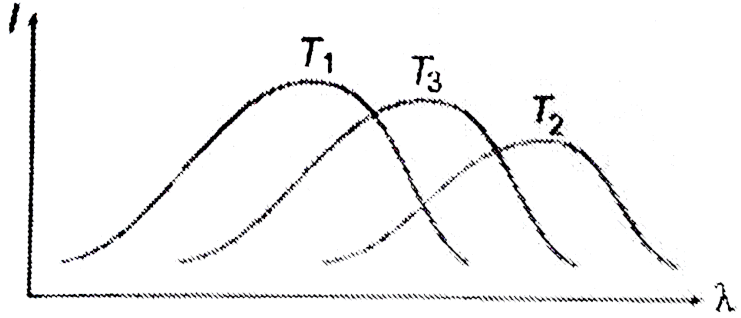
32. The plots of intensity of radiation versus wavelength of 3 black bodies of temperatures T_1, T_2 and T_3 as shown in the figure, then



A. $T_1 > T_2 > T_3$

B. $T_3 > T_2 > T_1$

C. $T_1 > T_3 > T_2$

D. $T_1 < T_3 < T_2$

Answer:

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33. 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. $50K$

B. $12.5K$

C. $25K$

D. $60K$

Answer:

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34. The rate at which a black body emits radiation at a temperature T is proportional to

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

B. T

C. T^3

D. T^4

Answer:

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35. 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. Temeprature remains unchanged

Answer:

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36. In a 10 m deep lake, the bottom is at a constant temperature of $4^{\circ}C$. The air temperature is constant at $-4^{\circ}C$. $K_{ice} = 3K_{\omega}$. Neglecting the expansion of water on freezing, the maximum thickness of ice will be

A. $7.5m$

B. $6m$

C. $6m$

D. $2.5m$

Answer:

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37. Two slabs A and B of equal surface area are placed one over the other such that their surfaces are completely in contact. The thickness of slab A is twice that of B. The coefficient of thermal conductivity of slab B is maintained at $25^\circ C$. The temperature at the contact of their surface is

A. $62.5^\circ C$

B. $45^\circ C$

C. $55^{\circ} C$

D. $85^{\circ} C$

Answer:

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

A. the nature of the surface

B. the area of the surface

C. the temperature of the surface

D. all of the factors

Answer: