PHYSICS

BOOKS - DC PANDEY ENGLISH

CALORIMETRY AND HEAT TRANSFER

Examples

1. When 400 J of heat are added to a 0.1 kg sample of metal, its temperature increase by $20(^{\circ})$C. What isthe specific heat of the metal?

A. 200J/Kg C

B. 300 J/Kg c

C. 400J/Kg c

D. 100J/Kg c

Answer: A

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2. A 10 kW drilling machine is used to drill a bore in a small aluminium block of mass 8.0 kg. How much is the rise in temperature of the block in 2.5 minutes, assuming 50% of power is used up in heating the machine itself or lost to the surroundings. Specific heat of aluminium $= 0.91 Jg^{-1} K^{-1}$.

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3. A geyser heats water flowing at the rate of 30 litre per minute from $27^{\circ} C$ to $77^{\circ} C$ If the geyser operates on a gas bomer, what is

the rate of consumption of the fuel if its heat of combustion is $4.0 \times 10^4 \times J/g$?

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4. 0.64 g of oxygen is kept ini a rigid container and is heated. Find the amount of heat required to raise the temperature from 20° to 30° C. The molar heat capacity of oxygen at constant volume is $20JK^{-1}mol^{-1}$

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5. A certain substance has a mass of 50/gmol. When 300 J of heat is added to 25 g of sample of this material, its tempertuare rises from 25 to 45°C. Calcualte (i) thermal capacity.. (ii) Specific heat and (iii) molar heat capacity of the sample.

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6. 10 g of water at $70^\circ C$ is mixed with 5 g of water at $30^\circ C$. Find the temperature of the mixture in equilibrium. Specific heat of water is $1cal/g.^\circ C$.

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7. Two liquids A and B are at $30^\circ C$ and $20^\circ C$, respectively When they are mixied in equal masses, the temperature of the mixture is found to be $26^\circ C$. The ratio of their specific heat is

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8. The temperature of equal masses of three different liquids A, B and C are $12^\circ C, 19^\circ C$ and $28^\circ C$ respectively. The temperature when A and B are mixed is $16^\circ C$ and when B and C are mixed is $23^\circ C$. The temperature when A and C are mixed is

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9. A piece of iron of mass $100g$ is kept inside a furnace for a long time put in a calorimeter of water equivalent $10g$ containing $240g$ of water at $20^\circ C$ The mixture attains an equilibrium temperature of $60^\circ C$ Find the temperature of the furnace specific heat capacity of iron $= 470Jkg^{-1}C^{-1}$

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10. At 1 atmospheric pressure, 1.000 g of water having a volume of $1.000cm^3$ becomes 1671 cm^3 of steam when boiled. The heat of vaporization of water at 1 atmosphere is $539cal/g$. What is the change in internal energy during the process ?

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11. Find the quantity of heat required to convert 40 g of ice at -20° C into water at 20° C. Given $L_{ice} = 0.336 \times 10^6 \frac{J}{k} g$. Specific heat of ice = 2100 J/kg-K

Specific heat of water = 4200 J/kg-K

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12. In a container of negligible mass 30g of steam at $100^\circ C$ is added to 200g of water that has a temperature of $40^\circ C$ If no heat is lost to the surroundings, what is the final temperature of the system? Also find masses of water and steam in equilibrium. Take $L_v = 539 cal/g$ and $c_{water} = 1 cal/g.^\circ C$.

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13. 19 g water at $30^\circ C$ and 5 g of ice at $-20^\circ C$ are mixed together in a calorimeter. What is the final temperature of the mixture ? Given

specific heat of ice =$0.5calg^{-1^{\circ}}C^{-1}$ and latent heat of fusion of ice = $80calg^{-1}$

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14. $5g$ ice at $0^{\circ}C$ is mixed with $5g$ of steam at $100^{\circ}C$. What is the final temperature?

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15. A lead bullet penetrates into a solid object and melts Assuming that $50\,\%$ of its K.E. was used to heat it , calculate the initial speed of the bullet , The initial temp , of bullet is $27^{\circ}c$ and its melting point is $327^{\circ}C$ Latent heat of fasion of lead $=2.5\times10^{4}Jkg^{-1}$ and sp heat capacity of lead $=125Jkg^{-1}K^{-1}$

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16. suppose you want to cool 0.25 kg of cola (mostly water), at $25^\circ C$ by adding ice initially at $-20^\circ C$. How much ice should you add so that the final temperature will be $0^\circ C$ with all the ice melt? Neglect the heat capacity of the container. specific heat of ice is $2000 Jkg^{-1}K^{-1}$. [take specific heat of cola $4160 Jkg^{-1}K^{-1}$.]

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17. An ice cube of mass 0.1 kg at $0^\circ C$ is placed in an isolated container which is at $227^\circ C$. The specific heat s of the container varies with temperature T according to the empirical relation $s = A + BT$, where $A = 100 cal/kg.K$ and $B = 2 \times 10^{-2} cal/kg.K^2$. If the final temperature of the container is $27^\circ C$, determine the mass of the container.

(Latent heat of fusion for water = $8 \times 10^4 cal/kg$, specific heat of water $= 10^3 cal/kg.K$).

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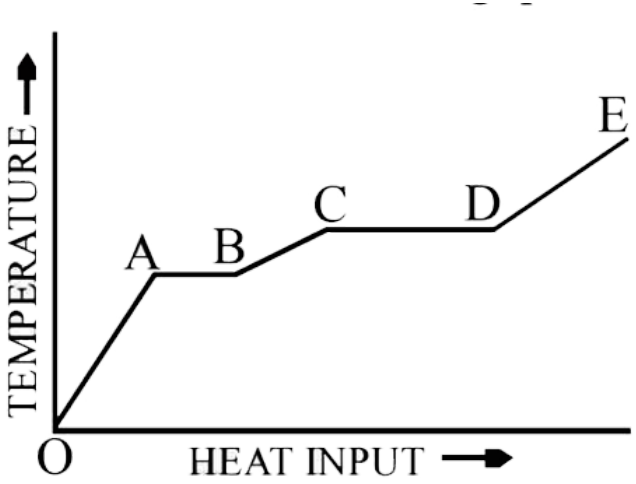
18. A solid material is supplied with heat at a constant rate. The temperature of the material is changing with the heat input as shown in the graph in figure. Study the graph carefully and answer the following questions:



(i) What do the horizontal regions AB and CD represent?

(ii) If CD is equal to 2AB, what do you infer?

(iii) What does the slope of DE represents?

(iv) The slope of $OA > the$ slope of BC. What does this indicate?

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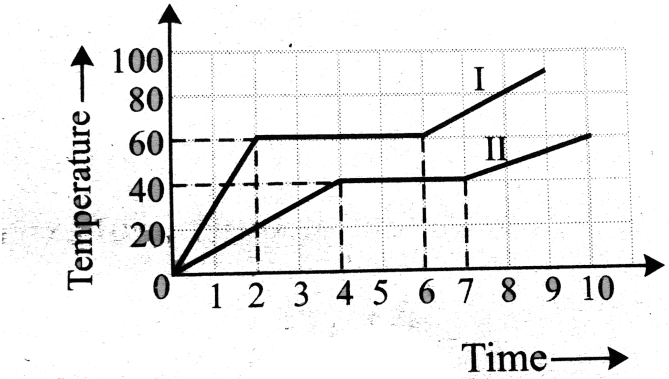

19.

Two bodies of equal masses are heated at a uniform rate under identical conditions. The change in temperature in the two cases in shown graphically. What are their melting points?

Find the ratio of their specific heats and latent heats.

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20. How much heat is required to convert 8.0 g of ice at $-15^{\circ}C$ to steam at $100^{\circ}C$? (Given,

$c_{ice} = 0.53 cal/g.^\circ C$, $L_f = 80 cal/g$ and $L_v = 539 cal/g$,

and $c_{water} = 1 cal/g.^\circ C$) .

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21. 100 g ice at $0^\circ C$ is mixed with 10 g steam at $100^\circ C$. Find the final temperature.

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22. Answer the following questions based on the p-T phase diagram of carbon dioxide as shown in the figure .

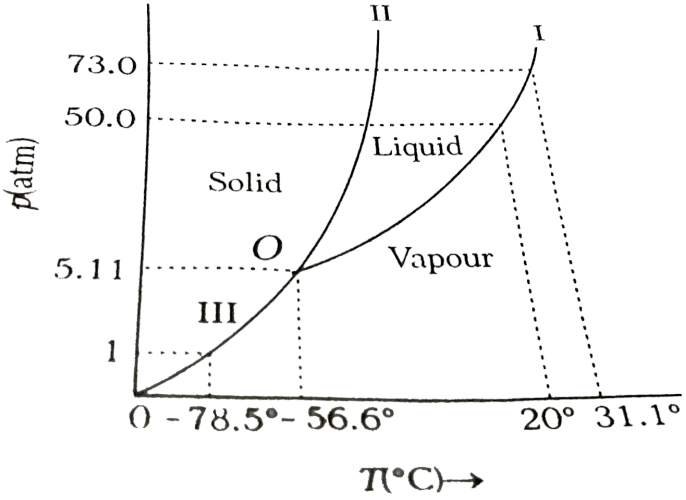
(i) At what temperature and pressure can the solid , liquid and vapour phases of $C0_2$ co-exist in equilibrium?

(ii) What is the effect of decrease of pressure on the fusion and boiling point of $C0_2$?

(iii) What are the critical temperature and pressure for $C0_2$? what is

their significance ?

(iv) Is $C0_2$ solid , liquid, or gas at (a) $-70^\circ C$under 1 atm (b) $-60^\circ C$ under 10 atm (c) $15^\circ C$ under 56 atm ?



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23. Thickness of ice on a lake is 5 cm and the temperature of air is $-20^\circ C$. If the rate of cooling of water inside the lake be 20000 cal $\min^{-1}$ through each square metre surface , find K for ice .

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24. One end of a copper rod of length 1 m and area of cross - section $400 \times 10^{-4} m^2$ is maintained at $100^\circ C$. At the other end of the rod ice is kept at $0^\circ C$. Neglecting the loss of heat from the surrounding, find the mass of ice melted in 1h. Given, $K_{Cu} = 401 W/m.K$ and $L_f = 3.35 \times 10^5 J/kg$.

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25. An iron boiler is 1 cm thick and has a heating area $2.5 m^2$. The two surface of the boiler are at $230^\circ C$ and $100^\circ C$ respectively. If the latent heat of the steam is $540 kcal kg^{-1}$ and thermal conductivity of iron is $1.6 \times 10^{-2} Kcals^{-1} m^{-1} K^{-1}$, then how much water will be evaporated into steam per minute ?

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26. A copper rod 2 m long has a circular cross-section of radius 1 cm. One end is kept at $100^\circ C$ and the other at $0^\circ C$. The surface is insulated so that negligible heat is lost through the surface. In steady state, find

(a) the thermal resistance of the bar

(b) the thermal current H

(c) the temperature gradient $\frac{dT}{dx}$ and

(d) the temperature at a distance 25 cm from the hot end.

Thermal conductivity of copper is 401 $W/m.K$.

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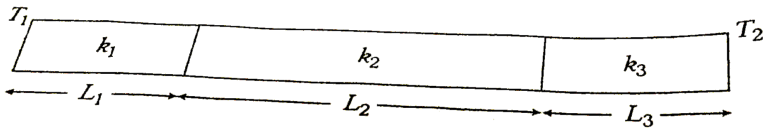
27. Three rods of same cross-section but different length and conductivity are joined in series . If the temperature of the two extreme ends are T_1 and $T_2(T_1 > T_2)$ find the rate of heat transfer

H.



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28. A composite slab is prepared by pasting two plates of thickness L_1 and L_2 and thermal conductivities K_1 and K_2 . The slab have equal cross-sectional area. Find the equivalent conductivity of the composite slab.

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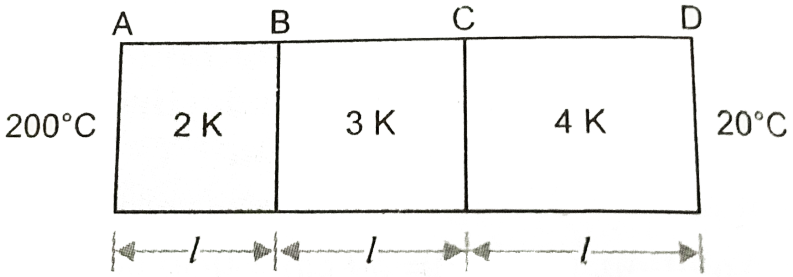
29. Three bars of equal lengths and equal area of cross-section are connected in series fig. their thermal conducitives are in the ratio $2:3:4$. If at the steady state the open ends of the first and the last bars are at temperature $200^\circ C$ and $20^\circ C$ respectively, find the

temperature of both the junctions.



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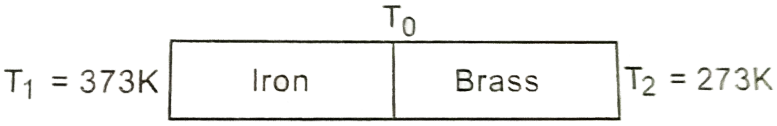
30. An iron bar $(L_1 = 0.1m, A_1 = 0.02m^2, K_1 = 79Wm^{-1}K^{-1})$ and a brass bar $(L_2 = 0.1m, A_2 = 0.02m^2, K_2 = 109Wm^{-1}K^{-1})$ are soldered end to end as shown in fig. the free ends of iron bar and brass bar are maintained at 373 K and 273 K respectively. Obtain expressions for and hence compute (i) the temperature of the junction of the two bars, (ii) the equivalent thermal conductivity of the compound bar and (iii) the heat current through the compound

bar.



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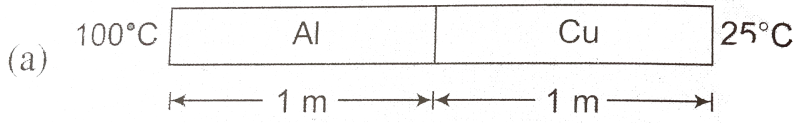
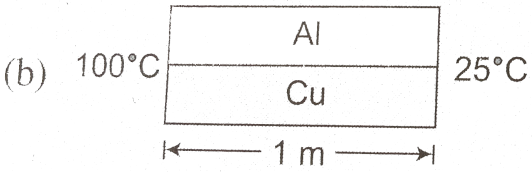
31. An aluminium rod and copper rod of equal length $1m$ and cross-sectional area $1cm^2$ are welded as shown. $K_{A1} = 200W/m^\circ C, K_{Cu} = 400W/m^\circ C$. Find heat current





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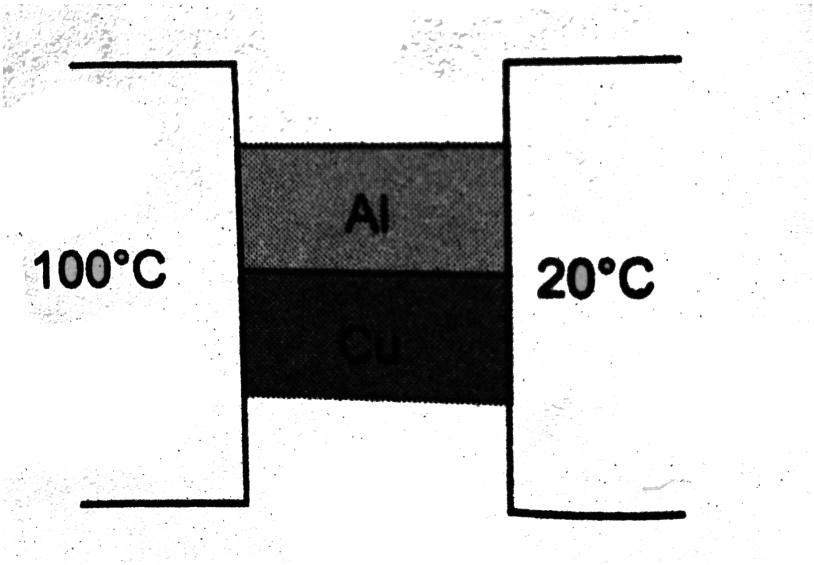
32. Two metal cubes with 3 cm- edges of copper and aluminium are arranged as shown in figure. Find

(a)the total thermal current from one reservoir to the other

(b) the ratio of the thermal current carried by the copper cube to that carried by the aluminium cube. Thermal conductivity of copper is 401 $W/m.K$ and that of aluminium id 237 $W/m.K$.



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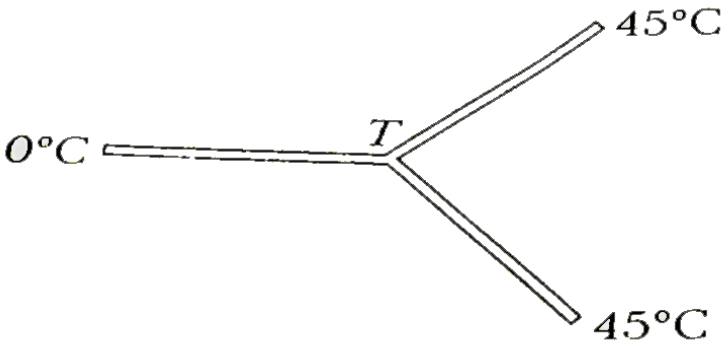
33. Three identical rods have been joined at a junction to make it a Y shape structure. If two free ends are maintained at $45^\circ C$ and the end is at $0^\circ C$, then what is the junction temperature T?



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34. A steel bar 10.0 cm long is welded end to end to a copper bar 20.0 cm long. Both bars are insulated perfectly on their sides . Each bar has a separate cross-section, 2.00 cm on a side . The free end of the steel bar is maintained at $100^\circ C$ by placing it in contact with steam and free end of the copper bar is maintained at $0^\circ C$ by placing it in contact with ice . find the temperature at the junction of

the two bars and the total rate of heat flow . thermal conductivity of steel $= 50.2 Wm^{-1}K^{-1}$.thermal conductivity of copper $= 385 Wm^{-1}K^{-1}$.

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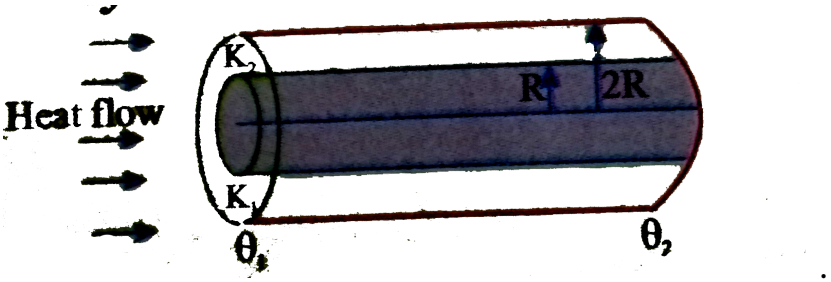
35. A cylinder of radius R made of a material of thermal conductivity K_1 is surrounded by cylindrical shell of inner radius R and outer radius $2R$ made of a material of thermal con-ductivity K_2 The two ends of the combined system are maintained at two differnet tem-peratures There is no loss of heat across the cylindrical surface and system is in steady state What is the effective thermal conductivity of the system



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36. 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

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37. A cubical block of mass $1.0kg$ and edge $5.0cm$ is heated to $227^\circ C$. It is kept in an evacuated chamber maintained at $27^\circ C$. Assming that the block emits radiation like a blackbody, find the rate at which the temperature of the block will decreases. Specific heat capacity of the material of the block is $400Jkg^{-1}K^{-1}$.

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38. One end of a rod of length $20cm$ is inserted in a furnace at $800K$ The sides of the rod are covered with an insulating material and the

other end emits radiation like a black body. The temperature of this end is $750K$ in the steady state The temperature of the surrounding air is $300K$ Assuming radiation to be the only important mode of energy transfer between the surrounding and the open end of the rod, find the thermal conductivity of the rod Stefan's constant $\sigma = 6.0 \times 10^{-8} Wm^{-2} K^{-4}$.

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39. A body cools in 10 min from 60° C to 40° C and to 42.5° C in 7.5 min. Find the temperature of the surroundings.

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40. A body cools down from 52.5° C to $47.5^\circ C$ in 5 min and to 42.5° C in 7.5 min. Find the temperature of the surroundings.

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41. The spectral energy distribution of the sun has maxima at 4753 $\mathring{A}$. Find the temperature of a star for which spectral distribution has maxima at 10350 $\mathring{A}$. [Temperature of sun is 6000 K]

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42. Two bodies A and B have thermal emissivities of 0.01 and 0.81 respectively. The outer surface areas of the two bodies are same. The two bodies emit total radiant power at the same rate. The wavelength λ_B corresponding to maximum spectral radiancy from B is shifted from the wavelength corresponding to maximum spectral radiancy in the radiation from A by 1.0 μm. If the temperature of A is 5802 K, calculate (a) the temperature of B, (b) wavelength λ_B.

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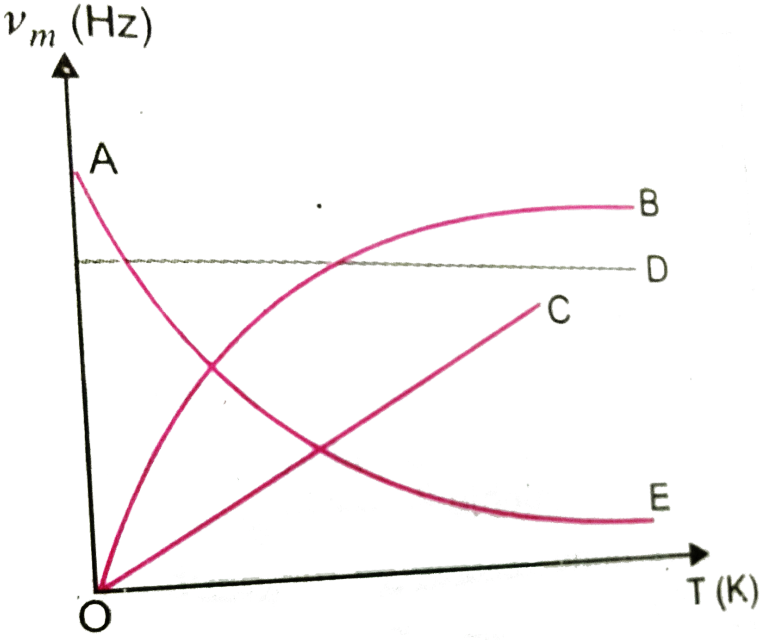
43. Which one of the following is $v_m - T$ graph for perfectly black body ? v_m is the frequency of radition with maximum intensity. T is the absolute temperature



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Check Point 16 1

1. Water is used in car radiators as coolant because

A. of its lower density

B. it is easily available

C. it is cheap

D. it has high specific heat

Answer: D

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2. If specific heat of a substance is infinite, it means

A. heat is given out

B. heat is taken in

C. no change in temperature takes place whether heat is taken in a or given out

D. All the above

Answer: C

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3. How much heat energy is gained when 5 kg of water at $20^{\circ}C$ is brought to its boiling point (Specific heat of water $= 4.2$ kj kg c)

A. 1680 kJ

B. 1700 kJ

C. 1720 kJ

D. 1740 kJ

Answer: A

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4. A metal brick is made from a mixture of 2.4 kg of aluminum 1.6 kg of brass and 0.8 kg of copper. The amount of heat required to raise the temperature of this block from $20^{\circ}C$ to $80^{\circ}C$ is (specific heats of aluminum brass and copper are $0.216, 0.0917, 0.0923 calkg^{-1}$ ^ $(\circ)C^{-1}$ respectively)

A. 96.2 cal

B. 44.4 cal

C. 86.2 cal

D. 62.8 cal

Answer: B

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5. 50 g of copper is heated to increase its temperature by $10^{\circ}C$. If the same quantity of heat is given to $10g$ of water, the rise in its temperature is (specific heat of copper $= 420J/kg^{\circ}/C$)

A. $5^{\circ}C$

B. $6^{\circ}C$

C. $7^{\circ}C$

D. $8^{\circ}C$

Answer: A

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6. A bubble of 8 mole of helium is submerged at a certain depth in water. The temperature of water increases by $30^{\circ}C$. How much heat is added approximately to helium during expansion

A. 4000 J

B. 3000 J

C. 3500 J

D. 5000 J

Answer: D

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7. A beaker contains 200 g of water. The heat capacity of the beaker is equal to that of 20 g of water. The initial temperature of water in the beaker is $20^\circ C$ .If 440 g of hot water at $92^\circ C$ is poured in it, the final temperature (neglecting radiation loss) will be nearest to

A. $58^\circ C$

B. $68^\circ C$

C. $73^\circ C$

D. $78^\circ C$

Answer: B

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8. $100g$ ice at $0^\circ C$ is mixed with $100g$ water at $100^\circ C$. The resultant temperature of the mixture is

A. $10^\circ C$

B. $20^\circ C$

C. $30^\circ C$

D. $0^\circ C$

Answer: A

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9. A liquid of mass m and specific heat c is heated to a temperature 2T. Another liquid of mass m/2 and specific heat 2 c is heated to a temperature T. If these two liquids are mixed, the resulting temperature of the mixture is

A. (2/3) T

B. (8/5)T

C. (3/5)T

D. $\left(\frac{3}{2}\right)$T

Answer: D

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10. $0.1m^3$ of water at $80^\circ C$ is mixed with $0.3m^3$ of water at $60^\circ C$. The finial temparature of the mixture is

A. $70^\circ C$

B. $65^\circ C$

C. $60^\circ C$

D. $75^\circ C$

Answer: B

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Check Point 16 2

1. A substance of mass M kg requires a power input of P wants to remain in the molten state at its melting point. When the power source is turned off, the sample completely solidifies in time t seconds. The latent heat of fusion of the substance is .....

A. Pm/t

B. Pt/m

C. m/Pt

D. t/mc

Answer: B

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2. 50 gram of ice at 0°C is mixed with 50 gram of water at $60^\circ C$, final temperature of mixture will be :-

A. $0^\circ C$

B. $40^\circ C$

C. $10^\circ C$

D. $15^\circ C$

Answer: A

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3. 80 g of water at $30^\circ C$ is mixed with 50 g of water at $60^\circ C$, final temperature of mixture will be

A. 30 g

B. 80 g

C. 1600 g

D. 150 g

Answer: A

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4. An iron ball of mass 0.2 kg is heated to $10^\circ C$ and put into a block of ice at $0^\circ C$. 25 g of ice melts. If the latent heat of fusion of ice is $80 cal g^{-1}$, then the specific heat of iron in $cal g^{-1^\circ} C$ is

A. 1

B. 0.1

C. 0.8

D. 0.008

Answer: B

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5. A steam at $100^\circ C$ is passed into $1kg$ of water contained in a calorimeter of water equivalent $0.2kg$ at $9^\circ C$ till the temperature of the calorimeter and water in it is increased to $90^\circ C$. Find the mass of steam condensed in $kg(S_w = 1cal/g^\circ C, \& L_{\text{steam}} = 540cal/g)$.

A. 1

B. 0.18

C. 0.81

D. 0.135

Answer: A

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6. A lead bullet of $10g$ travelling at $300m/s$ strikes against a block of wood and comes to rest. Assuming 50% heat is absorbed by the bullet, the increase in its temperature is (sp-heat of lead is $150J/Kg-K$)

A. $100^\circ C$

B. $125^\circ C$

C. $150^\circ C$

D. $200^\circ C$

Answer: C

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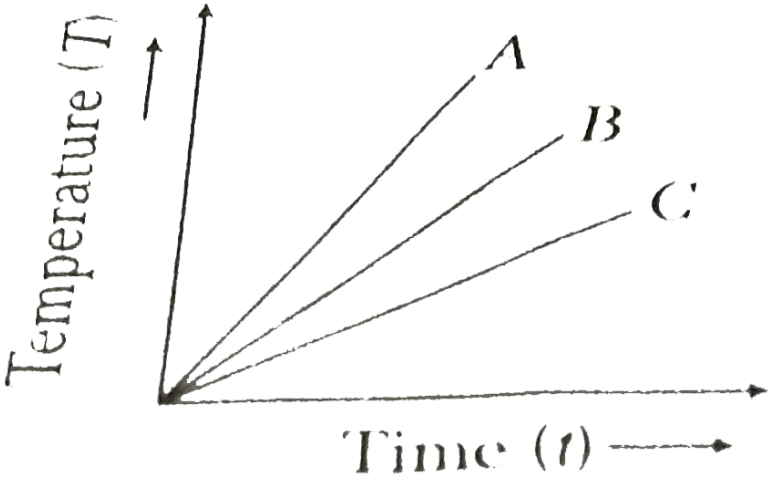
7. The temperatures versus time graph is shown in figure. Which of the substance A,B and C has the lowest heat capacity if heat is supplied to all of them at equal rates.



A. A

B. B

C. C

D. All the above

Answer: A

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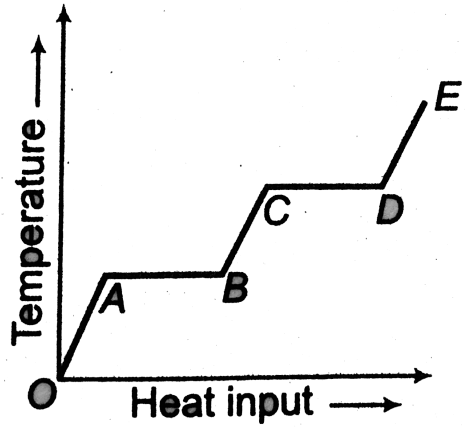
8. A solid material is supplied heat at a constant rate. The temperature of material is changing with heat input as shown in the figure. What does the slope of DE represent ?



A. latent heat of liquid

B. latent heat of vapour

C. heat capacity of vapour

D. inverse of heat capacity of vapour

Answer: D

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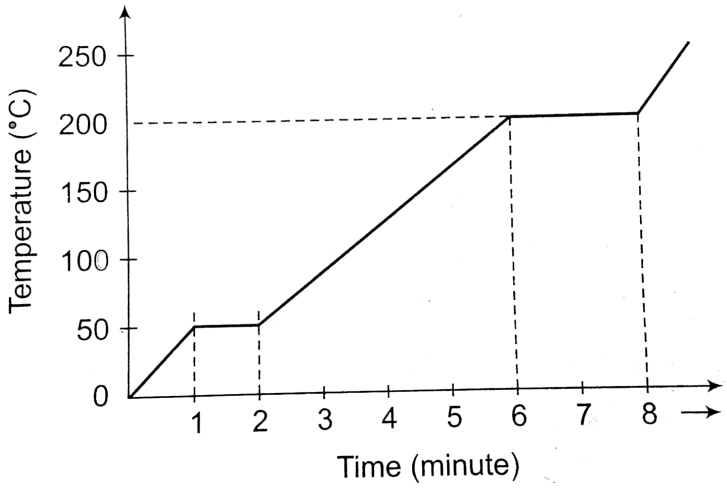

9.

A student takes 50 g wax (specific heat $= 0.6kcal/kg^\circ C$) and heats it till it boils. The graph between temperature and time is as follows. Heat supplied to the wax per minute and boiling point are respectively.

A. 500 cal,$50^\circ C$

B. 1000 cal, $100^\circ C$

C. 1500 cal, $200^\circ C$

D. 1000 cal, $200^\circ C$

Answer: C

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10. 4 kg of ice at $-15^\circ C$ are added to 5 kg of water at $15^\circ C$. The temperature of the mixture equals

A. $-15^\circ C$

B. $0^\circ C$

C. $5^\circ C$

D. $15^\circ C$

Answer: B

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Check Points 16 3

1. The layers of atmosphere are heated through

A. Convection

B. Conduction

C. Radiation

D. Both (a) and (c)

Answer: D

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2. Mud houses are cooler in summer and warmer in winter because

A. Mud is superconductor of heat

B. Mud is good conductor of heat

C. Mud is bad conductor of heat

D. None of the above

Answer: C

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3. Snow is more heat insulating than ice, because

A. Air is filled in pores of snow

B. Ice is more bad conductor than snow

C. Air is filled in pores of ice

D. Density of ice is more

Answer: A

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4. On heating one end of a rod the temperature of the whole rod will be uniform when .

A. K = 1

B. K = 0

C. K = 100

D. `K = oo

Answer: D

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5. If the temperature difference on the two sides of a wall increases from $100^\circ C$ to $200^\circ C$, its thermal conductivity

A. remains unchanged

B. is doubled

C. is halved

D. become four times

Answer: A

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6. The thermal conductivity of a rod depends on

A. length

B. mass

C. area of x-section

D. material of the rod

Answer: D

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7. The unit of thermal conductivity is :

A. $Js^{-1}K$

B. $Js^{-1}m^2k$

C. $Jm^{-1}K$

D. $Js^{-1}m^{-1}K^{-1}$

Answer: D

Watch Video Solution

8. Wires A and B have have identical lengths and have circular cross-sections. The radius of A is twice the radius of B i.e. $R_A = 2R_B$. 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. $K_A = 4K_B$

B. $K_A = 2K_B$

C. $K_A = \frac{K_B}{2}$

D. $K_A = \frac{K_B}{4}$

Answer: D

Watch Video Solution

9. The end of two rods of different materials with their thermal conductivities, area of cross-section and lengths all in the ratio 1:2 are maintained at the same temperature difference. If the rate of flow of heat in the first rod is $4cal/s$. Then, in the second rod rate of heat flow in cal/s will be

A. 1

B. 2

C. 8

D. 16

Answer: A

Watch Video Solution

10. The length of the two rods made up of the same metal and having the same area of cross-section are 0.6 m and 0.8 m respectively. The temperature between the ends of first rod is 90° C and 60° C and that for the other rod is 150 and 110° C. For which rod the rate of conduction will be greater

A. First

B. Second

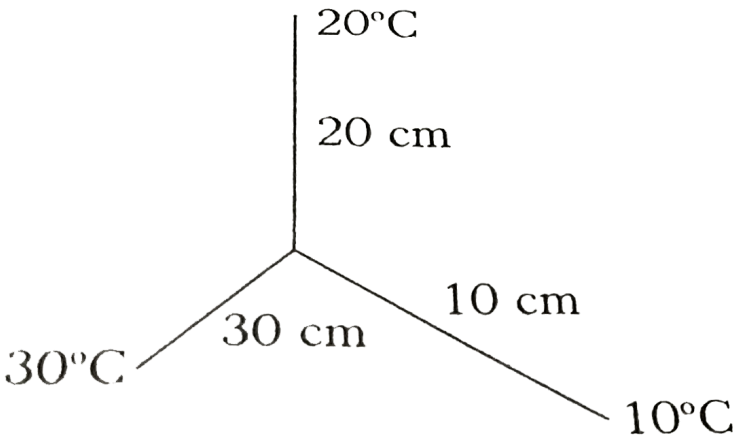
C. Same for both

D. None of the above

Answer: C

Watch Video Solution

11. Three rods made of the same material and having same cross-section area but different length 10 cm, 20 cm and 30 cm are joined as shown. The temperature of the junction is



A. $10.8^\circ C$

B. $14.6^\circ C$

C. $16.4^\circ C$

D. $18.2^\circ C$

Answer: C

Watch Video Solution

12. Two rods A and B are of equal lengths. Their ends of kept between the same temperature and their area of cross-section are A_1 and A_2 and thermal conductivities K_1 and K_2. The rate of heat transmission in the two rods will be equal, if

A. $K_1 A_2 = K_2 A_1$

B. $K_1 A_1 = K_2 A_2$

C. $K_1 A_1^2 = K_2 A_2^2$

D. $K_1^2 A_1$

Answer: B

Watch Video Solution

13. Consider a compound slab consisting of two different material having equal thickness and thermal conductivities K and $2K$ respectively. The equivalent thermal conductivity of the slab is

A. 2/3K

B. (b) $\sqrt{2}$K

C. 3K

D. (4/3)K

Answer: D

Watch Video Solution

14. In a steady state of thermal conduction, temperature of the ends A and B of a 20 cm long rod are $100^\circ C$ and $0^\circ C$ respectively. What will be the temperature of the rod at a point at a distance of 9 cm from the end A of the rod

A. $45^\circ C$

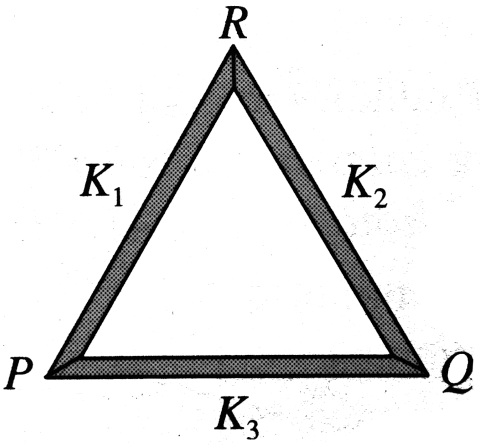
B. $55^\circ C$

C. $5^\circ C$

D. $65^\circ C$

Answer: B

Watch Video Solution



15.

Three rods of same dimensions are arranged as shown in Fig. They have thermal conductivities K_1,K_2 and K_3. The points P and Q are maintained at different temeperature for the heat to flow at the same rate along PRQ and PQ. Whi of the following options correct?

A. $K_3 = \frac{1}{2}(K_1 + K_2$

B. $K_3 = K_1 + K_2$

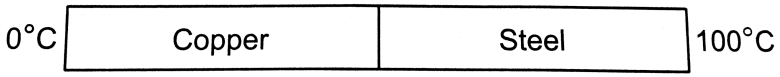
C. $K_3 = \frac{K_1 K_2}{K_1 + K_2}$

D. $K_3 = 2(K_1 + K_2)$

Answer: C

Watch Video Solution

16. Figure shows a copper rod joined to a steel rod. The rods have equal length and and the equal cross sectional area. The free end of the copper rod is kept at $0^\circ C$ and that of the steel rod is kept at $100^\circ C$. Find the temperature at the junction of the rods. conductivity of copper $= 390WM^{-1}.^\circ C^{-1}$ and that of steel $= 46Wm^{-1}.^\circ C^{-1}$.



A. will be nore than 50° C

B. will be less than 50° C

C. will b 50° C

D. may be nore or less than 50 c depending upon the size of rods

Answer: A

Watch Video Solution

17. A wall has two layers A and B, each made of different material. Both the layers have the same thickness. The thermal conductivity of the material of A is twice that of B . Under thermal equilibrium, the temperature difference across the wall is $36^\circ C$. The temperature difference across the layer A is

A. 6° C

B. 12° C

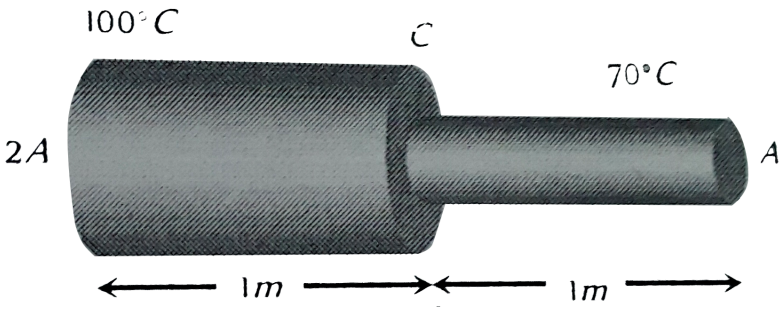
C. 24° C

D. 18° C

Answer: B

Watch Video Solution

18. A metal rod of length 2 m has cross sectional areas 2 A and A as shown in figure. The ends are maintained at temperatures 100° C and 70° C . The temperature at middle point C is



A. 80° C

B. 85° C

C. 90° C

D. 95° C

Answer: C

Watch Video Solution

19. A slab consists of two layers of different materials of the same thickness and having thermal conductivities K_1 and K_2. The equivalent thermal conductivity of the slab is

A. K1 + K2

B. K1 + K2/2

C. 2K1 + K2 /K1 + k2

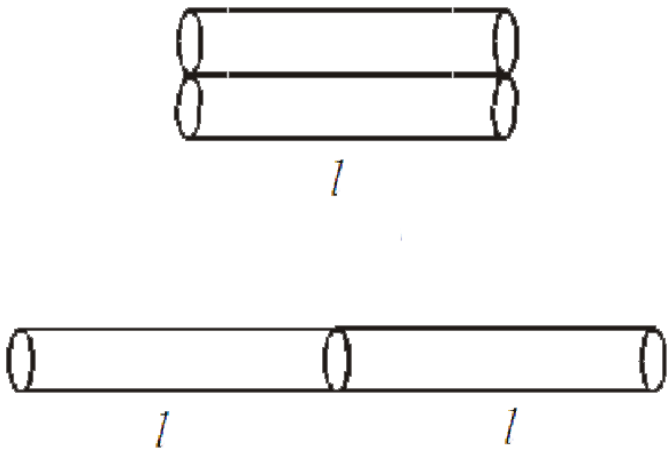
D. K1 + K2/2KK2

Answer: B

Watch Video Solution

20. Two rods of same length and transfer a given amount of heat 12 second, when they are joined as shown in figure (i). But when they are joined as shwon in figure (ii), then they will transfer same heat in

same conditions in



A. 24 s

B. 3 s

C. 1.5 s

D. 48 s

Answer: D

Watch Video Solution

Check Points 16 4

1. In a room containing air, heat can go from one place to another

A. conduction

B. convection

C. radiation

D. All the three

Answer: B

Watch Video Solution

2. Ice formed over lakes has

A. has vey high thermal conductivity and helpsinfurther ice formation

B. has very low conductivity and retards further formation of ice

C. permits quick convection and retards further formation of ice

D. is very good radiator

Answer: B

Watch Video Solution

3. 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 thermo flask

B. due to more pressure of air, the flask can crack

C. by convection,heat can flow through air

D. None of the above

Answer: C

Watch Video Solution

4. Why are two thin blankets are warmer than a single blanket of double the thickness?

A. their surface area increases

B. a layer of air is formed between these two blankets which is bad conductor

C. these have more wool

D. they absorb more heat from outside

Answer: B

Watch Video Solution

5. One likes to sit under sunshine in winter seasons, because

A. we get heat by radiation from Sun

B. we get heat by conduction by Sun

C. we get heat by conduction from Sun.

D. we get heat by conduction from Sun.

Answer: B

Watch Video Solution

6. 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. Temperature

Answer: A

Watch Video Solution

7. A body, which emits radiations of all possible wavelengths, is known as

A. Good conductor

B. Partial radiator

C. Planks's law

D. Perfectly Black Body

Answer: D

Watch Video Solution

8. Distribution of energy in the spectrum of a black body can be correctly represented by .

A. Stefan's law

B. Kirchoff's law

C. Planks's law

D. Wien's law

Answer: C

Watch Video Solution

9. Which of the following law states that "good absorbers of heat are good emitters"

A. Stefan's law

B. Kirchoff's law

C. Planks's law

D. Wien's law

Answer: B

Watch Video Solution

10. The ratio of the Emissive power to the absorption power of all substances for a particular wavelength is the same at given temperature. The ratio is known as

A. the emissive power of a perfectly black body

B. the emissive power of any type of body

C. the Stefan's constant

D. the Wien's law

Answer: A

Watch Video Solution

11. If between wavelength λ and$\lambda + d\lambda$, e_λ and a_λ be the emissive and absorptive powers of a body and E_λ be the emissive power of a perfectly black body, then according to Kirchoff's law, which is true

A. $e_\lambda = a_\lambda = E_\lambda$

B. $e_\lambda E_\lambda = a_\lambda$

C. $e_\lambda = a_\lambda E_\lambda$

D. $e_\lambda a_\lambda E_\lambda$=constant

Answer: C

Watch Video Solution

12. 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

A. Newton's law of cooling

B. Wein's law

C. Kirchoff's law

D. Stefan's law

Answer: C

Watch Video Solution

13. In MKS system, Stefan's constant is denoted by σ. In CGS system multiplying factor of σ will be

A. 1

B. 10^3

C. 10^5

D. 10^2

Answer: B

Watch Video Solution

14. A black body radiates 20 W at temperature $227^\circ C$. If temperature of the black body is changed to $727^\circ C$ then its radiating power wil be

A. $10cals^{-1}$

B. $80cals^{-1}$

C. $160cals^{-1}$

D. None of these

Answer: C

Watch Video Solution

15. Two spherical black bodies of radii R_1 and R_2 and with surface temperature T_1 and T_2 respectively radiate the same power. R_1 / R_2 must be equal to

A. $\left(\frac{T_1}{T_2}\right)^2$

B. $\left(\frac{T_2}{T_1}\right)^2$

C. $\left(\frac{T_1}{T_2}\right)^4$

D. $\left(\frac{T_2}{T_1}\right)^4$

Answer: B

Watch Video Solution

16. A sphere has a surface area of $1.0m^2$ and a temperature of 400 K and the power radiated from it is 150 W. Assuming the sphere is black body radiator. The power in kilowatt radiated when the area expands to $2.0m^2$ and the temperature changes to 800 K

A. 6.2

B. 9.6

C. 4.8

D. 16

Answer: C

Watch Video Solution

17. Two spheres of the same material have radii 1m and 4m and temperatures 4000K and 2000K respectively. The ratio of the energy radiated per second by the first sphere to that by the second is

A. 4 : 1

B. 1 : 1

C. 0.042361111111111

D. 0.044444444444444

Answer: C

Watch Video Solution

18. The area of a hole of heat furnace is $10^{-4}m^2$. It radiates 1.58×10^5 calories of heat per hour. If the emissivity of the furnace is 0.80, then its temperature is

A. 1500 K

B. 2000 K

C. 2500 K

D. 3000 K

Answer: C

Watch Video Solution

19. If a body cools down from $80^\circ C$to $60^\circ C$ in 10 min when the temperature of the surrounding of the is $30^\circ C$. Then, the temperature of the body after next 10 min will be

A. $50^\circ C$

B. $48^\circ C$

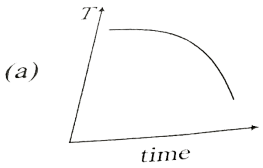
C. $30^\circ C$

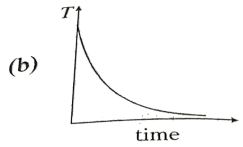
D. None of the above

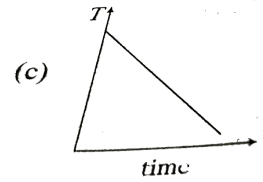
Answer: D

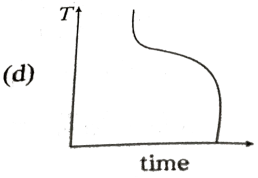
Watch Video Solution

20. A block of metal is heated to a temperature much higher than the room temperature and allowed to cool in a room free from air currents. Which of the following curves correctly represents the rate of cooling

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

21. If wavelengths of maximum intensity of radiations emitted by the sun and the moon are $0.5 \times 10^{-6} m$ and 10^{-4}m respectively, the

ratio of their temperature is .....

A. 2000

B. 1000

C. 100

D. 200

Answer: D

Watch Video Solution

22. The maximum wavelength of radiation emitted at 200 K is 4 μm. What will be the maximum wavelength of radiation emitted at 2400 K ?

A. $3\mu m$

B. $0.3\mu m$

C. $2\mu m$

D. None of these

Answer: A

Watch Video Solution

23. The maximum energy in thermal radiation from a source occurs at the wavelength 4000Å. The effective temperature of the source

A. 7000 K

B. 80000 K

C. 10^4 K

D. 10^6 K

Answer: A

Watch Video Solution

24. The intensity of radiation emitted by the sun has its maximum value at a wavelength of 510 nm and that emitted by the North star has the maximum value at 350 nm. If these stars behave like black bodies, then the ratio of the surface temperatures of the sun and the north star is

A. 1.46

B. 0.69

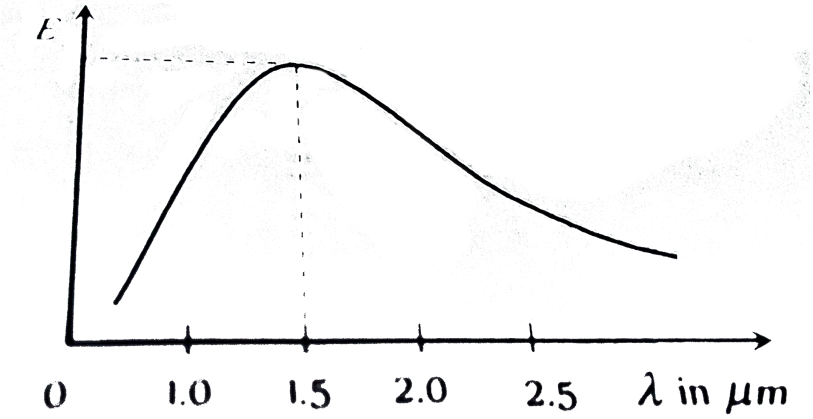
C. 1.21

D. 0.83

Answer: B

Watch Video Solution

25. In the figure, the distribution of energy density of the radiation emitted by a black body at a given temperature is shown. The possible temperature of the black body is



A. 1500K

B. 2000K

C. 2500K

D. 3000K

Answer: B

Watch Video Solution

26. The temperature of a body in increased from $27^\circ C$ to $127^\circ C$. By what factor would the radiation emitted by it increase?

A. 2000

B. 1000

C. 100

D. 3.16

Answer: D

Watch Video Solution

27. The calories of heat developed in 200 W heater in 7 min is estimated

A. 15000

B. 100

C. 1000

D. 20000

Answer: A

Watch Video Solution

28. The thickness of a metallic plate is 0.4 cm. The temperature between its two surfaces is $20^\circ C$. The quantity of heat flowing per second is 50 calories from $5cm^2$ area. In CGS system, the coefficient of thermal conductivity will be

A. 0.4

B. 0.6

C. 0.2

D. 0.5

Answer: C

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29. A spherical black body with radius 12 cm radiates 450 w power at 500 K. If the radius is halved and the temperature doubled, the power radiated in watts would be

A. 225

B. 450

C. 1000

D. 1800

Answer: D

Watch Video Solution

Taking It Together

1. If wavelengths of maximum intensity of radiations emitted by the sun and the moon are $0.5 \times 10^{-6} m$ and 10^{-4}m respectively, the ratio of their temperature is .....

A. 2000

B. $\frac{15}{9}$

C. $\frac{4}{5}$

D. $\frac{12}{27}$

Answer: A

Watch Video Solution

2. The maximum wavelength of radiation emitted at 200 K is 4 μm. What will be the maximum wavelength of radiation emitted at 2400

K ?

A. 15000

B. 100

C. 1000

D. 20000

Answer: D

3. The maximum energy in thermal radiation from a source occurs at the wavelength 4000Å. The effective temperature of the source

A. 0.4

B. 0.6

C. 0.2

D. 0.5

Answer: C

Watch Video Solution

4. The intensity of radiation emitted by the sun has its maximum value at a wavelength of 510 nm and that emitted by the North star has the maximum value at 350 nm. If these stars behave like black bodies, then the ratio of the surface temperatures of the sun and the north star is

A. 5120 W

B. 640 W

C. 2560 w

D. 1280 W

Answer: C

Watch Video Solution

5. The temperature of a body in increased from $27^\circ C$ to $127^\circ C$. By what factor would the radiation emitted by it increase?

A. 2000

B. $\frac{15}{9}$

C. $\frac{4}{5}$

D. 3.16

Answer: A

Watch Video Solution

6. The calories of heat developed in 200 W heater in 7 min is estimated

A. 15000

B. 100

C. 1000

D. 20000

Answer: D

Watch Video Solution

7. The thickness of a metallic plate is 0.4 cm. The temperature between its two surfaces is $20^\circ C$. The quantity of heat flowing per second is 50 calories from $5cm^2$ area. In CGS system, the coefficient of thermal conductivity will be

A. 0.4

B. 0.6

C. 0.2

D. 0.5

Answer: C

Watch Video Solution

8. A spherical black body with radius 12 cm radiates 450 w power at 500 K. If the radius is halved and the temperature doubled, the power radiated in watts would be

A. 225

B. 450

C. 1000

D. 1800

Answer: D

Watch Video Solution

9. Rate of heat flow through a cylindrical rod is H_1. Temperatures of ends of rod are T_1 and T_2. If all the dimensions of rod become double and temperature difference remains same and rate of heat flow becomes H_2. Then $\frac{H_1}{H_2}$ is $0.\ x$. Find value of x.

A. $H_2 = 2H_1$

B. $H_2 = H_1$

C. $H_2 = \frac{H_1}{4}$

D. $H_2 = 4H_1$

Answer: A

Watch Video Solution

10. A sphere, a cube and a thin circular plate are heated to the same temperature. All are made of the same material and have the equal masses. If t_1, t_2 and t_3 are the respective time taken by the sphere,

cube and the circular plate in cooling down to common temperature, then

A. $t_1 > t_2 > t_3$

B. $t_1 < t_2 < t_3$

C. $t_2 > t_1 > t_3$

D. $t_1 = t_2 = t_3$

Answer: A

Watch Video Solution

11. Certain amount of heat is given to 100 g of copper to increase its temperature by $21^\circ C$. If same amount of heat is given to 50 g of water, then the rise in its temperature is (specific heat capacity of copper $= 400 Jkg^{-1}K^{-1}$ and that for water $= 4200 Jkg^{-1}K^{-1}$)

A. $4^\circ C$

B. $5.25^\circ c$

C. $8^\circ C$

D. $6^\circ C$

Answer: A

Watch Video Solution

12. 2gm of steam condenses when passed through 40 gm of water initially at $25^\circ C$. The condensation of steam raises the temperature of water to $54.3^\circ C$. What is the latent heat of steam

A. 540 cal/g

B. 536 cal/g

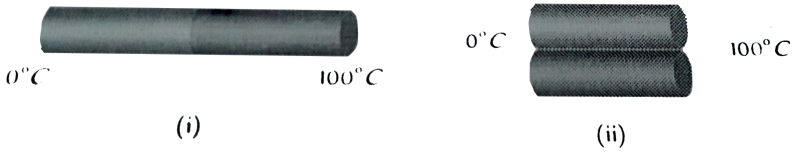
C. 270 cal/g

D. 480 cal/g

Answer: A

Watch Video Solution

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



A. 1 min

B. 2 min

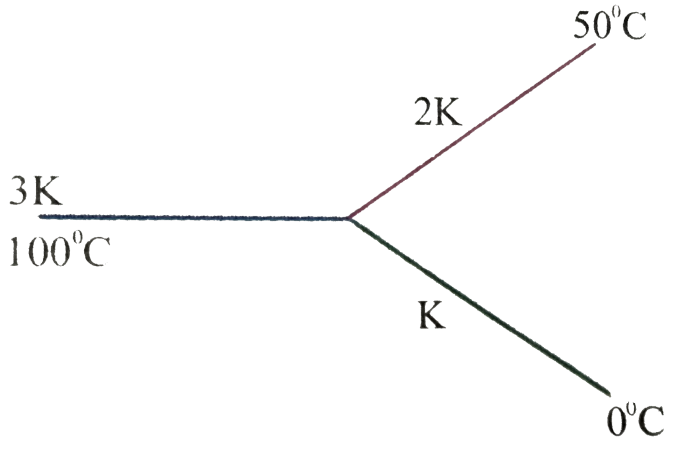
C. 4 min

D. 16 min

Answer: A

Watch Video Solution

14. Three rods of same dimensions have thermal conductivity $3K$, $2K$ and K They are arranged as shown in Then the temperature of the junction in steady state is



A. $75^\circ C$

B. $\frac{200}{3} \circ C$

C. $40^\circ c$

D. $\frac{100}{3} \circ c$

Answer: B

Watch Video Solution

15. A wall has two layers A and B each made of different materials. The layer A is 10cm thick and B is 20 cm thick. The thermal conductivity of A is thrice that of B. Under thermal equilibrium temperature difference across the wall is $35^\circ C$. The difference of temperature across the layer A is

A. $20^\circ C$

B. $10^\circ C$

C. $15^\circ C$

D. $5^\circ C$

Answer: D

Watch Video Solution

16. A body cools from $50^\circ C$ to $40^\circ C$ in 5 min. The surroundings temperature is $20^\circ C$. In what further times (in minutes) will it cool to $30^\circ C$?

A. 5

B. $\frac{15}{2}$

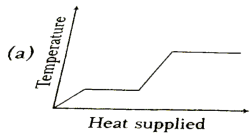
C. $\frac{25}{3}$

D. 10

Answer: C

Watch Video Solution

17. A block of ice at $-8^\circ C$ is slowly heated and converted to steam at $100^\circ C$. Which of the following curves represents the phenomena qualitatively?

A. 

B. 

C. 

D. 

Answer: A

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18. If one kilogram water at $100^{\circ}C$ is vapourised in open atmosphere. The correct statement is

A. increase in internal energy is equal to L (L is latent heat of vaporisation for 1 Kg)

B. increase in internal energy is zero

C. increase in internal energy is less than L

D. none of the above

Answer: C

Watch Video Solution

19. A liquid cools from $50^\circ C$ to $45^\circ C$ in 5 minutes and from $45^\circ C$ to $41.5^\circ C$ in the next 5 minutes. The temperature of the surrounding is

A. $27^\circ C$

B. $40.3^\circ C$

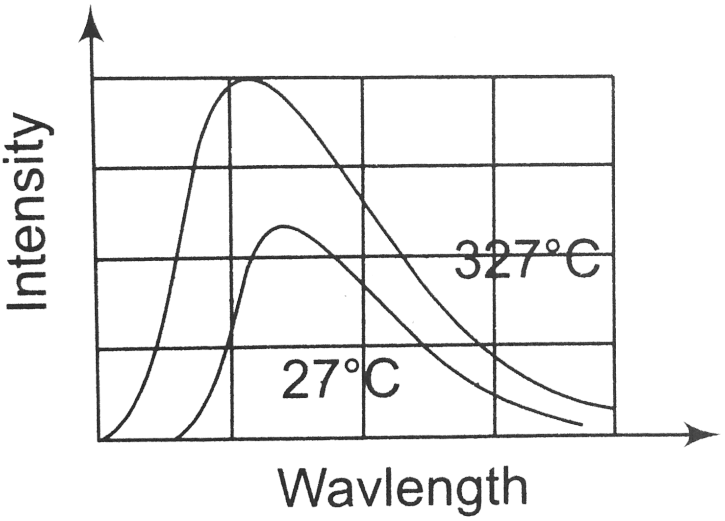
C. $23.3^\circ C$

D. $33.3^\circ C$

Answer: D

Watch Video Solution

20. The spectrum of a black body at two temperatures $27^\circ C$ and $327^\circ C$ is shown in the figure. Let A_1 and A_2 be the areas under the two curves respectively. Find the value of $\frac{A_2}{A_1}$



A. $1:16$

B. $4:1$

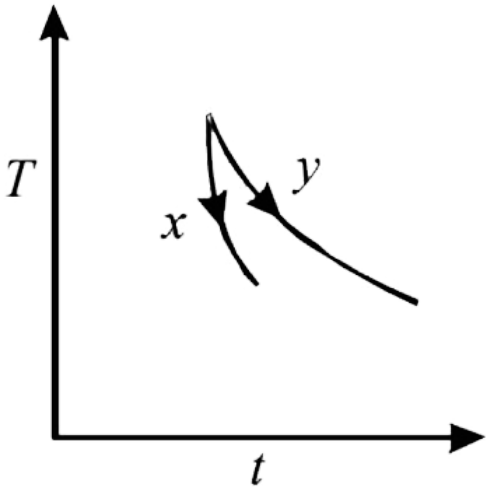
C. $2:1$

D. $16:1$

Answer: D

Watch Video Solution

21. The graph, shown in the adjacent diagram, represents the variation of temperature (T) of two 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



A. $e_x > e_y$ and $a_x < a_y$

B. $e_x < e_y$ and $a_x > a_y$

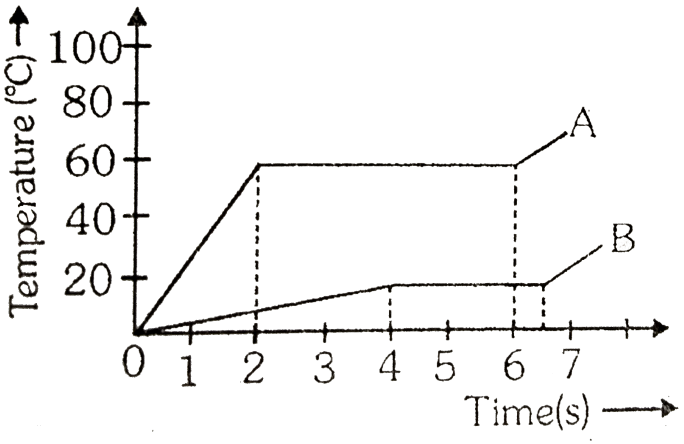
C. $e_x > e_y$ and $a_x > a_y$

D. $e_x < e_y$ and $a_x < a_y$

Answer: C

Watch Video Solution

22. Two substances A and B of equal mass m are heated by uniform rate of $6\text{cal}s^{-1}$ under similar conditions. A graph between temperature and time is shown in figure. Ratio of heat absorbed H_A / H_B by them during complete fusion :-



A. $\frac{9}{4}$

B. $\frac{4}{9}$

C. $\frac{24}{5}$

D. $\frac{5}{8}$

Answer: C

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23. Sunrays are allowed to fall on a lens of diameter 20 cm. They are then brought to focus on a calorimeter containing 20 g of ice. If the absorption by the lens is neglible, the time required to melt all the ice is

(solar constant =$1.9 cal \min^{-1} cm^{-2}$ and $L = 80 cal g^{-1}$)

A. 6.4 min

B. 3.2 min

C. 7.2 min

D. 2.7 min

Answer: D

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24. Two reactions (i) $A \rightarrow$ products (ii) $B \rightarrow$ products, follows first order kinetics. The rate of the reaction (i) is doubled when the temperature is raised from 300 K to 310 K. The half- life for this reaction at 310 K is 30 min. At the same temperature B decomposes twice as fast as A. If the energy of activation for the reaction (ii) is half that of reaction (i), calculate the rate constant of the reaction (ii) at 300 K.

A. $\frac{16}{3} r_0$

B. $\frac{8}{16} r_0$

C. $16 r_0$

D. $4r_0$

Answer: A

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25. The power radiated by a black body is P and it radiates maximum energy at wavelengthλ_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

A. $\frac{256}{81}P$

B. $\frac{27}{64}P$

C. $\frac{64}{27}P$

D. 81/256 P`

Answer: A

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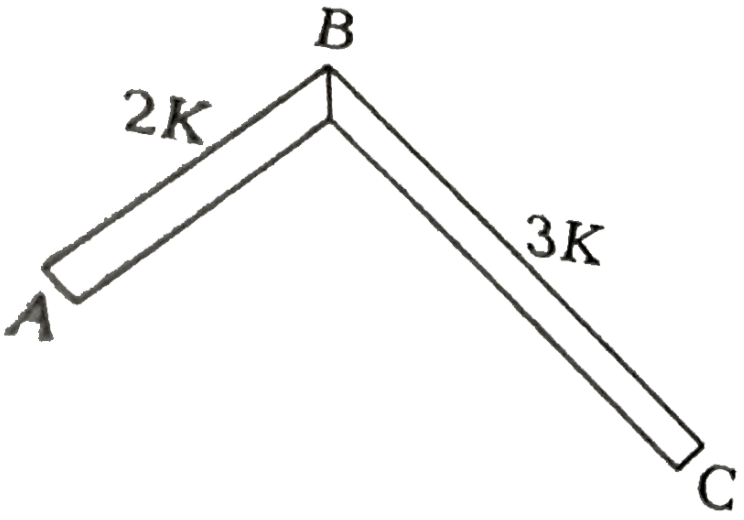
26. In the figure ABC is a conducting rod whose lateral surfaces are insulated. The length of the section AB is one-half of that of BC, and the respective thermal conductivities of the two sections are as given in the figure. If the ends A and C are maintained at $0^\circ C$ and $70^\circ C$ respectively, the temperature of junction B in the steady state is



A. $30^\circ C$

B. $40^\circ C$

C. $50^\circ C$

D. $60^\circ C$

Answer: A

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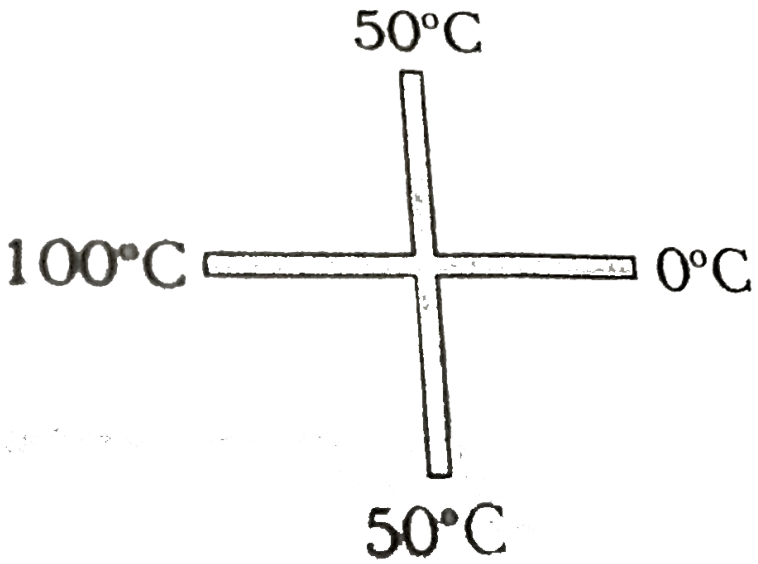
27. Two similar rods are joined as shown in figure. Then temperature of junction is (assume no heat loss through lateral surface of rod

and temperatures at the ends are shown in steady state)



A. $50^\circ C$

B. $75^\circ C$

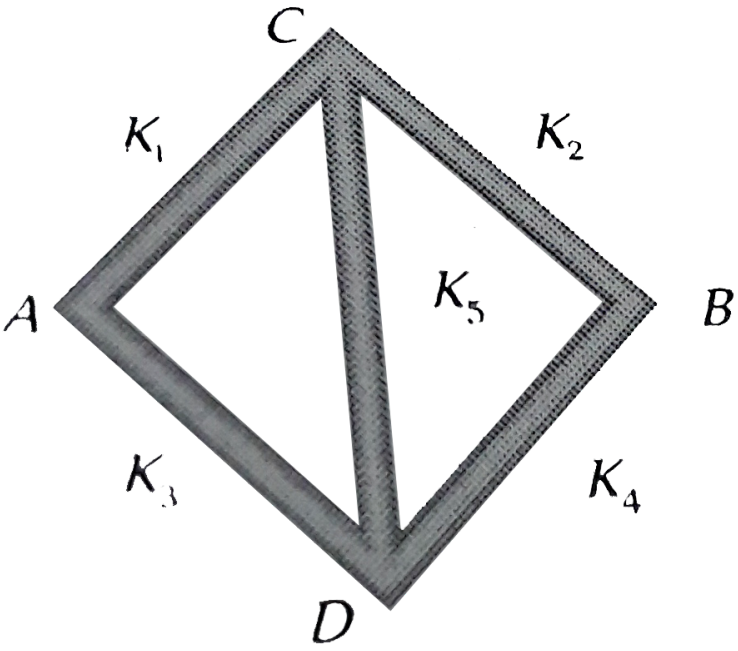
C. $66.6^\circ C$

D. $33.3^\circ C$

Answer: A

Watch Video Solution

28. Five rods of same dimensions are arranged as shown in the figure. 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



A. $K_1 = K_4$ and $K_2 = K_3$

B. $K_1K_4 = K_2K_3$

C. $K_1K_2 = K_3K_4$

D. None of the above

Answer: B

Watch Video Solution

29. Three identical metal rods A, B and C are placed end to end and a temperature difference is maintained between the free ends of A and C. If the thermal conductivity of $B(K_B)$ is thrice that of $C(K_C)$ and half that of $A(K_A)$, $(K_A = 49w/mK)$ calculate the effective thermal conductivity of the system ?

A. $\frac{1}{3}K_A$

B. $3K_A$

C. $2K_A$

D. $\frac{2}{3}K_A$

Answer: A

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30. $0.3Kg$ of hot coffee, which is at $70^\circ C$, is poured into a cup of mass 0.12 kg . Find the final equilibrium temperature. Take room temperature at $20^\circ C$.

$(s_{coffee} = 4080\frac{J}{k}g - K \text{ and } s_{\cup} = 1020\frac{J}{k}g - K.)$

A. $45.5^\circ C$

B. $55.5^\circ C$

C. $65.5^\circ C$

D. $40.5^\circ C$

Answer: C

Watch Video Solution

31. A calorimeter contains 10 g of water at $20^\circ C$. The temperature falls to $15^\circ C$ in 10 min. When calorimeter contains 20 g of water at $20^\circ C$, it takes 15 min for the temperature to becomes $15^\circ C$. The water equivalent of the calorimeter is

A. 5 g

B. 10 g

C. 25 g

D. 50 g

Answer: B

Watch Video Solution

32. 19 g of water at $30^\circ C$ and 5 g of ice at $-20^\circ C$ are mixed together in a calorimeter. What is the final temperature of the

mixture? Given specific heat of ice $= 0.5 cal g^{-1} (.^{\circ} C)^{-1}$ and latent heat of fusion of ice $= 80 cal g^{-1}$

A. $0^{\circ} C$

B. $-5^{\circ} C$

C. $5^{\circ} C$

D. $10^{\circ} C$

Answer: C

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33. Work done in converting 1 g of ice at $-10^{\circ} C$ into steam at $100^{\circ} C$ is

A. 3045 J

B. 6056 J

C. 721 J

D. 616 J

Answer: A

Watch Video Solution

34. Two rigid boxes containing different ideal gases are placed on a table. Box A contains one mole of nitrogen at temperature T_0, while Box contains one mole of helium at temperature $\left(\frac{7}{3}\right)T_0$. The boxes are then put into thermal contact with each other, and heat flows between them until the gasses reach a common final temperature (ignore the heat capacity of boxes). Then, the final temperature of the gasses, T_f in terms of T_0 is

A. $T_f = \frac{7}{3}T_0$

B. $T_f = \frac{3}{2}T_0$

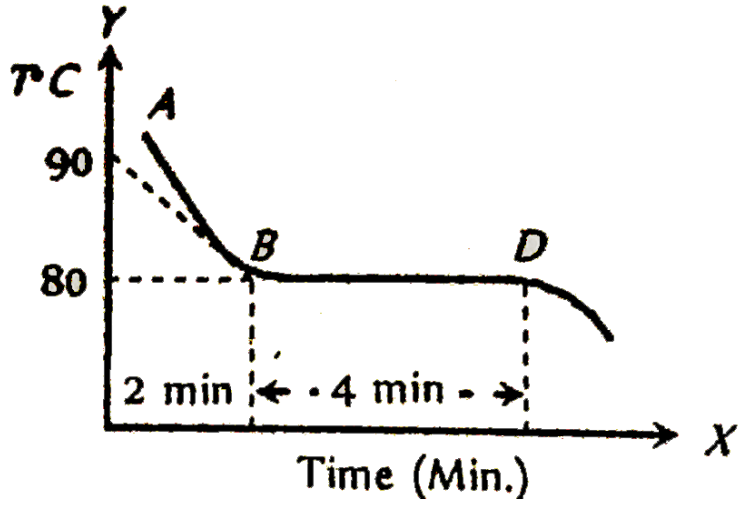
C. $T_f = \frac{5}{2}T_0$

D. $T_f = \frac{3}{7}T_0$

Answer: B

Watch Video Solution

35. The figure given below shows the cooling curve of pure wax material after heating. It cools from A to B and solidifies along BD . If L and C are respective values of latent heat and the specific heat of the liquid wax, the ratio L / C is



A. 40

B. 80

C. 100

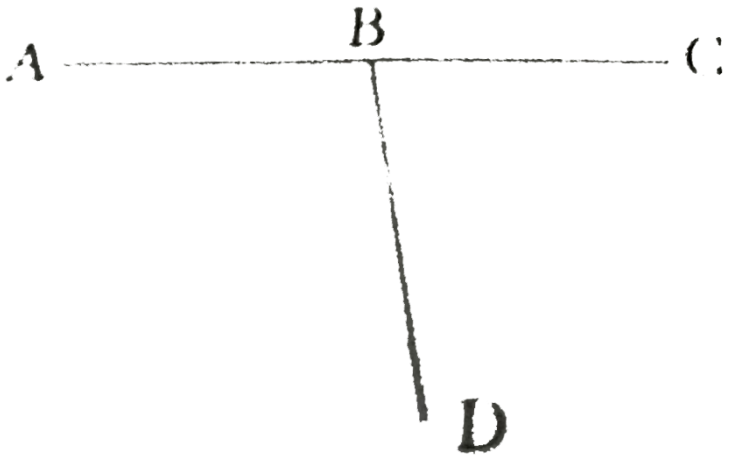
D. 20

Answer: D

Watch Video Solution

36. Three conducting rods of same material and cross-section are shown in figure. Temperatures of A,D and C are maintained at $20^\circ C, 90^\circ C$ and $0^\circ C$. The ratio of lengths BD and BC if there is no

heat flow in AB is



A. $\frac{2}{7}$

B. $\frac{7}{2}$

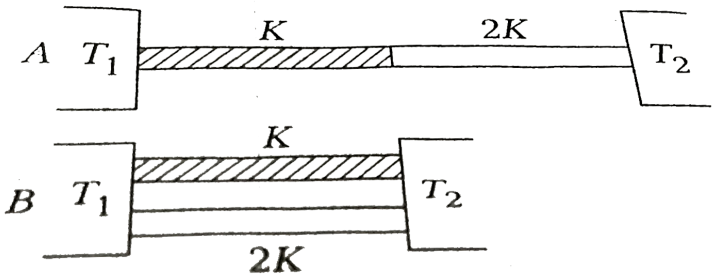
C. $\frac{9}{2}$

D. $\frac{2}{9}$

Answer: B

Watch Video Solution

37. Two rods with the same dimensions have thermal conductivities in the ratio 1 : 2. they are arranged between heat reservoirs with the same temperature difference, in two different configurations, A and B. The rates of heat flow in A and B are I_A and I_B respectively. The ratio $\frac{I_A}{I_B}$ is equal to



A. $1:2$

B. $1:3$

C. $2:5$

D. $2:9$

Answer: D

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38. Two identical conducting rods are first connected independently to two vessels, one containing water at $100^{\circ}C$ and the other containing ice at $0^{\circ}C$. In the second case, the rods are joined end to end and connected to the same vessels. Let q_1 and q_2 gram per second be the rate of melting of ice in the two cases respectively. The ratio $\frac{q_1}{q_2}$ is

(a) $\frac{1}{2}$ (b) $\frac{2}{1}$ (c) $\frac{4}{1}$ (d) $\frac{1}{4}$

A. $\frac{1}{2}$

B. $\frac{2}{1}$

C. $\frac{4}{1}$

D. $\frac{1}{4}$

Answer: C

Watch Video Solution

39. Three rods of identical area of cross-section and made from the same metal from the sides of an isosceles triangle. ABC, right angled at B. The points A and B are maintained at temperatures T and $\sqrt{2}T$ RESPECTIVELY. In the steady state the temperature of the point C is T_C.

Assuming that only heat conduction takes place , $\frac{T_C}{T}$ is equal to

A. $\frac{1}{\sqrt{2}+1}$

B. $\frac{3}{\sqrt{2}+1}$

C. $\frac{1}{2\left(2\sqrt{2}-1\right)}$

D. $\frac{1}{\sqrt{3}\left(\sqrt{2}-1\right)}$

Answer: B

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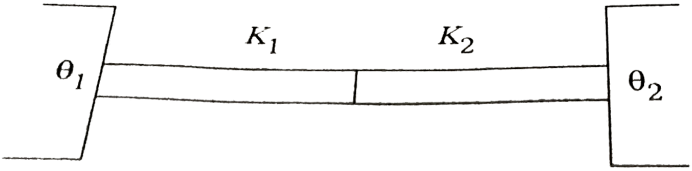
40. Two identical rods are made of different materials whose thermal conductivities are K_1 and K_2. They are placed end to end between two heat reservoirs at temperatures θ_1 and θ_2. The temperature of the junction of the rod is



A. $\frac{\theta_1 + \theta_2}{2}$

B. $\frac{K_1\theta_1 + K_2\theta_2}{K_1 + K_2}$

C. $\frac{K_1\theta_2 + K_2\theta_1}{K_1 + K_2}$

D. $\frac{K_1\theta_1 + K_2\theta_2}{[K_1 - K_2]}$

Answer: B

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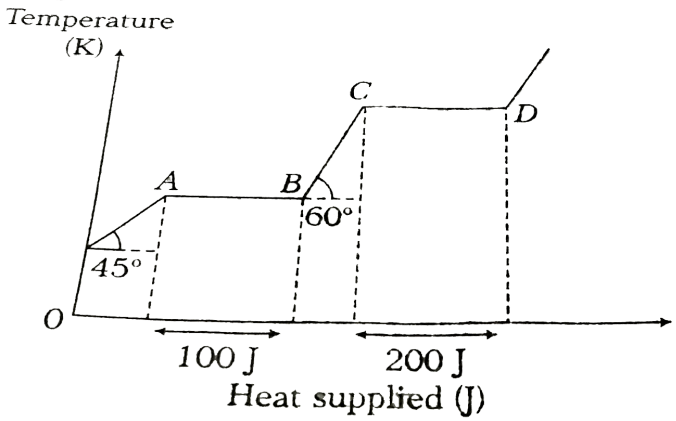
41. The temperature change versus heat supplied curve is given for 1 kg of a solid block. Then, which of the following statement is/are correct ?



A. Specific heat capacity of the solid is $2Jkg^{-1}K^{-1}$

B. Specific heat capacity of liquid phase is $\sqrt{3}Jkg^{-1}K^{-1}$

C. Latent heat of vaporisation is $100Jkg^{-1}$

D. Latent heat of vaporisation is $200Jkg^{-1}$

Answer: D

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42. 2kg of ice at $-20^{\circ}C$ is mixed with 5kg of water at $20^{\circ}C$ in an insulating vessel having a negligible heat capacity. Calculate the final mass of water remaining in the container. It is given that the specific heats of water & ice are $1kcal/kg/^{\circ}C$ and 0.5 $kcal/kg/^{\circ}C$ while the latent heat of fusion of ice is $80kcal/kg$

A. 7 kg

B. 6 kg

C. 4 kg

D. 2 kg

Answer: B

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43. 10 gm of ice cubes at $0^{\circ}\mathrm{C}$ are released in a tumbler (water equivalent 55 g) at $40^{\circ}\mathrm{C}$. Assuming that negligible heat is taken

from the surroundings, the temperature of water in the tumbler becomes nearly$(\mathrm{L} = 80\ \mathrm{cal/g})$

A. $31^\circ C$

B. $22^\circ C$

C. $19^\circ C$

D. $15^\circ C$

Answer: B

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44. A cylindrical metallic rod in thermal contact with two reservation 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 reservation in time t?

A. $\frac{Q}{4}$

B. $\frac{Q}{16}$

C. $2Q$

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

Answer: B

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45. if 1 g of steam is mixed with 1 g of ice, then the resultant temperature of the mixture is

A. $270^\circ C$

B. $230^\circ C$

C. $100^\circ C$

D. $50^\circ C$

Answer: C

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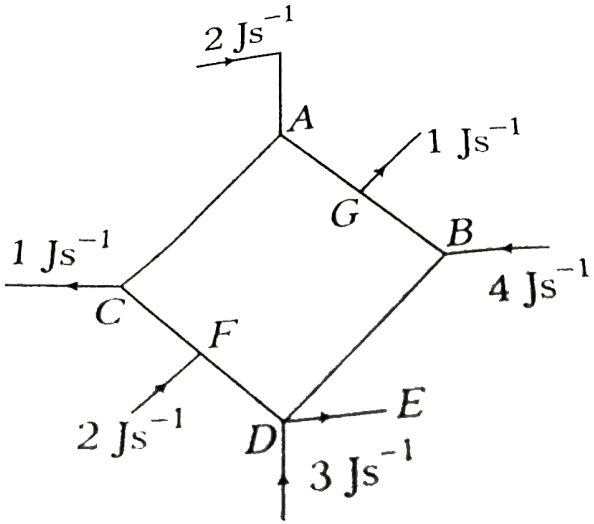
46. The rate of flow of heat through 12 identical conductors made of same material is shown in the figure. Then, which of the following is correct ?



A. The rate of flow of heat through rod DE is $8Js^{-1}$

B. Junctions C and F are at the same temperature

C. Junction A and G are at the same temperature

D. The rate of flow of heat through CF is $5Js^{-1}$

Answer: B

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47. Equal masses of three liquids A, B and C have temperature $10^{\circ}C$, $25^{\circ}C$ and $40^{\circ}c$ respectively. If A and B are mixed, the mixture has a temperature of $15^{\circ}C$. If B and C are mixed, the mixture has a temperature of $30^{\circ}C$, if A and C are mixed will have a temperature of

A. $16^{\circ}C$

B. $20^{\circ}C$

C. $25^{\circ}C$

D. $29^{\circ}C$

Answer: A

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48. In an industrial process 10 kg of water per hour is to be heated from $20^\circ C$ to $80^\circ C$. To do this steam at $150^\circ C$ is passed from a boiler into a copper coil immersed in water. The steam condenses in the coil and is returned to the boiler as water at $90^\circ C$. How many kilograms of steam is required per hour (specific heat of steam $= 1 cal/g^\circ C$, Latent heat of vapourization $= 540 cal/g$)?

A. 1 g

B. 1 kg

C. 10 g

D. 10 kg

Answer: B

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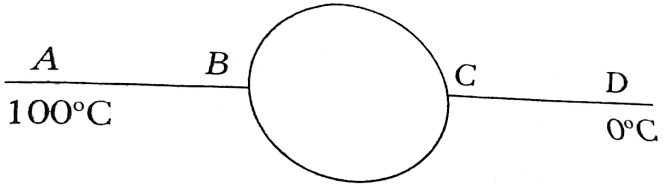
49. Two identical conducting rods AB and CD are connected to a circular conducting ring at two diametrically opposite points B and C, the radius of the ring is equal to the length of rods AB and CD. The area of cross-section, thermal conductivity of the rod and ring are equal. points A and D are maintained at temperatures of $100^\circ C$ and $0^\circ C$. temperature at poimt C will be



A. $62^\circ C$

B. $37^\circ C$

C. $28^\circ C$

D. $45^\circ C$

Answer: C

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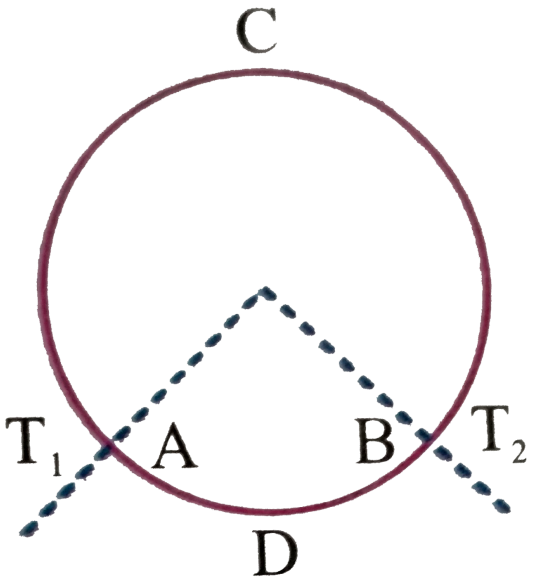
50. A ring consisting of two parts ADB and ACB of same conductivity k carries an amount of heat H The ADB part is now replaced with another metal keeping the temperature $T_1)$ and T_2 constant The heat carried increases to $2H$ What should be the conductivity of the new ADB Given $\frac{ACB}{ADB} = 3$



A. $\frac{7}{3}K$

B. $2k$

C. $\frac{5}{2}K$

D. $3K$

Answer: A

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51. Water is being boiled in a flat bottomed kettle placed on a stove The area of the bottom is $300cm^2$ and the thickness is $2mm$ If the amount pf steam produced is $1gm\ \min^{-1}$ then the difference of the temperature between the inner and the outer surface of the bottom is (thermal conductivity of the matrial of the kettle $0.5ca\,\mathrm{lcm}^{-1}C^{-1}$ latent heat of the steam is equal to $540calg^{-1}$) .

A. $12^\circ C$

B. $1.2^{\circ}C$

C. $0.2^{\circ}C$

D. $0.012^{\circ}C$

Answer: D

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Assertion And Reason

1. Assertion : A body that is a good radiator is also a good absorber of radiation at a given wavelength.

Reason : According to Kirchhoff's law the absorptivity of a body is equal to its emissivity at a given wavelength

A. If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: A

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2. Assertion : All black coloured objects are considered black bodies.

Reason : Black colour is a good absorber of heat

A. If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: D

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3. These question consists of two statements each printed as Assertion and Reason. While answering these question you are required to choose any one of the following four responses.

Assertion: Absorptive power of any substance is temperature independent. Buit emissive power depends on the temperature.

Reason: Emissive power αT^4

A. If both Assertion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: A

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4. Assertion : A normal body can radiate energy more than a perfectly black body.

Reason : A perfectly black body is always black in colour.

A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If both Assertion and Reason are false.

Answer:

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5. Assertion : For higher temperature, the peak emission wavelength of a black body shifts to lower wavelengths.

Reason : Peak emission wavelength of a black body is proportional to the fourth power of temperature.

A. If both Assertion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: B

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6. Assertion : Temperature near the sea-coast are moderate.

Reason : Water has a high thermal conductivity.

A. If both Assertion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: C

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7. Assertion : It is hotter over the top of a fire than at the same distacne of the side.

Reason : Air surrounding the fire conducts more heat upward

A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: C

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8. Assertion : Blue star is at high temperature than red star.

Reason : Wein's displacement law states that $T \propto (1/\lambda_m)$.

A. If both Assertion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: A

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9. Assertion : Snow is better insulator than ice.

Reason : Snow contain air packet and air is good insulator of heat.

A. If both Assertion and Reason are correct but Reason is the correct explanation of Assertion.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: A

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10. These question consists of two statements each printed as Assertion and Reason. While answering these question you are required to choose any one of the following four responses.

Assertion: Good conductors of electricity are also good conductors of heat

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

A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: A

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11. These question consists of two statements each printed as Assertion and Reason. While answering these question you are required to choose any one of the following five responses.

Assertion: If temperature of a body is increased, more number of photons of small wavelengths are radiated.

Reason: By increasing the temperature, total energy radiation will increase.

A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: B

12. These question consists of two statements each printed as Assertion and Reason. While answering these question you are required to choose any one of the following five responses.

Assertion: Emissive power of a perfectly black body is one.

Reason: Absorptive power of perfectly black body is one.

A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: D

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13. These question consists of two statements each printed as Assertion and Reason. While answering these question you are required to choose any one of the following five responses.

Assertion: If a body is good absorber of green light then it will be good reflector or red light.

Reason: At a given temperature, the ratio of emissive power to absorptive power is same for all substances.

A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: D

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14. These question consists of two statements each printed as Assertion and Reason. While answering these question you are required to choose any one of the following five responses.

Assertion: Water vapours at 100°C will burn you more than water at 100°C.

Reason: Heat required to convert total mass of any substances from one state to another state is called latent heat.

A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: C

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15. These question consists of two statements each printed as Assertion and Reason. While answering these question you are required to choose any one of the following five responses.

Assertion: Heat required to convert 1g ice at 0° C into vapour at 100° C is 720 cal.

Reason: Conversion of solid state directly into vapour state is called vaporisation.

A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: C

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16. These question consists of two statements each printed as Assertion and Reason. While answering these question you are required to choose any one of the following five responses.

Assertion: Gravity plays very important role in the process of natural convection.

Reason: Convection mainly takes place in liquids and gases.

A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: B

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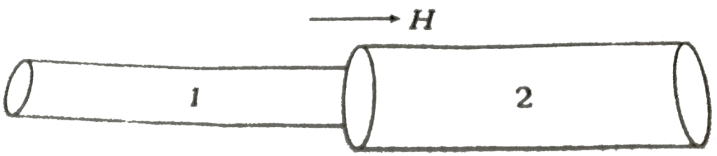
17. These question consists of two statements each printed as Assertion and Reason. While answering these question you are required to choose any one of the following five responses.

Assertion: Two conducting rods of material and same lengths are joined end to end as shown in figure. Heat current H is flowing through them as shown. Reason: Temperature differences across rod-1 is more than the temperature difference across of rod-2.



A. If both Assertion and Reason are correct and Reason is also a good absorber of radiation at a given wavelength.

B. If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true.

Answer: C

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Match The Columns

1. Match the following columns,

Column1	Coloumn2
a Specific heat	p [MLT^(-3)K^(-1)]
b Coefficient of thermal conductivity	q [MT^(-3)K^(-4)]
c Boltzmann constant	r [L^(2)T^(-2)K^(-1)]
d Stefan's constat	s [ML^(2)T^(-2)K^(-1)]

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2. Match the following columns,

Column1	Column2
a Thermal resitance	p [MT^(-3)K^(-4)]
b Stefan's constant	q [M^(-1)L^(-2)T^(3)K]
c Wien's constant	r [ML^(2)T^(-3)]
d Heat current	s [LK]

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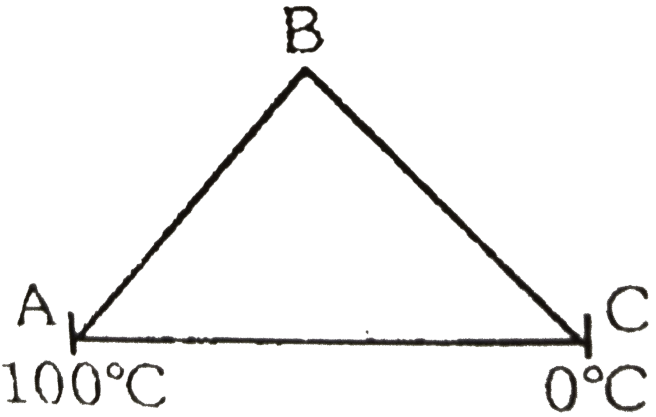
3. Three rods of equal length of same material are joined to form an equivalent triangle ABC as shown figure. Area of cross-section of rod AB is S of rod BC is $2S$ and that of AC is S, then



Column-I		Column-II	
(A)	Temperature of junction B	(p)	Greater than $50^\circ C$
(B)	Heat current in AB	(q)	Less than $50^\circ C$
(C)	Heat current in BC	(r)	Is equal to current in BC
		(s)	Is $\frac{2}{3}$ times heat current in AC
		(t)	None

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4. Three liquids A, B and C having same specific heat and mass , 2m and 3m have temperatures $20^\circ C, 40^\circ C$ and $60^\circ C$ respectively. Temperature of the mixture when

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Medical Entrance S Gallery

1. A black body is at a temperature of $5760K$. The energy of radiation emitted by the body at wavelength $250nm$ is U_1 at wavelength $500nm$ is U_2 and that at $1000nm$ is U_3. Wien's consant, $b = 2.88 \times 10^6 nmK$. Which of the following is correct?

A. U_3 = 0

B. $U_1 > U_2$

C. $U_2 > U_1$

D. $U_1 = 0$

Answer: C

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2. A piece of ice falls from a height h so that it melts completely. Only one-quarter of the heat produced is absobed 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 $3.4 \times 10^5 J/kg$ and $g = 10N/kg$]

A. 544 km

B. 136km

C. 68 km

D. 34km

Answer: B

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3. The two ends of a metal rod are maintained at temperature $100^\circ C$ and $110^\circ C$. The rate of heat flow in the rod is found to be

$4.0 J/s$. If the ends are maintained at temperature s $200^\circ C$ and $210^\circ C$. The rate of heat flow will be

A. 44 Js^{-1}

B. 16.8 Js^{-1}

C. 8 Js^{-1}

D. 4 Js^{-1}

Answer: D

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4. The black body spectrum of an object O_1 is such that its radiant intensity (i.e. intensity per unit wavelength interval) is maximum at a wavelength of 200 nm. Another object O_2 has the maximum radiant intensity at 600 nm. The ratio of power emitted per unit area by source O_1 to that of source O_2 is

A. $1:81$

B. $1:9$

C. $9:1$

D. $81:1$

Answer: D

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5. Two plates of equal area are placed in contact with each other. The thickness of the plates are 2.0 cm and 3.0 cm respectively. The outer face of first plate is at $-25^\circ C$ and that of second plate is at $+25^\circ C$. The conductivities of the plates are in the ratio $2:3$. Calculate the temperature of the common surface of the plates.

A. 0° C

B. 2.5° C

C. $5^\circ C$

D. $6.5^\circ C$

Answer: C

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6. If the wavelength corresponding to maximum energy radiated from the moon is 14 micron, and wien's constant is $2.8 \times 10^{-3} mK$, then temperature of moon is

A. 207 K

B. 270 K

C. $207^\circ C$

D. $270^\circ C$

Answer: A

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7. A solid at temperature T_1 is kept in an evacuated chamber at temperature $T_2 > T_1$. The rate of increase of temperature of the body is proportional to

A. $t_2^4 - t_1^4$

B. $\left(t_4^2 + 273\right) - \left(t_1^4 + 273\right)$

C. $t_2 - t_1$

D. $t_2^2 - t_1^2$

Answer: C

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8. A black body with surface area 0.001 m^2 is heated upto a temperature 400 K and is suspended in a room temperature 300K.

The intitial rate of loss of heat from the body to room is

A. 10 W

B. 1W

C. 0.1W

D. 0.5 W

Answer: B

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9. Identify the incorrect statement.

A. temperature of the surface of a body

B. the heat of a body

C. the calorific value of fuel

D. the heat transferred to a body

Answer: B

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10. Water is being boiled in a flat bottomed kettle placed on a stove . The area of the bottom is $300cm^2$ and the thickness is 2 mm. If the amount of steam produced is 1 g $\overset{-1}{\min}$, then the difference of the temperature between the inner and outer surfaces of the bottom is (thermal conductivity of the material of the lettle = $0.5calcm^{-1}\hat{}(\circ)Cs^{-1}$ and latent heat of the steam is equal to to $540calg^{-1}$)

A. 0.12×10^{-5}K

B. 1.9×10^{-3}K

C. $1.3 \times 10^{-4^\circ}$C

D. 1.2×10^{-3}K

Answer: D

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11. A cylinder of radius R made of a 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 the combined system are maintained at two different temperatures. There is no loss of heat across the cylindrical surface and the system is in steady state. The effective thermal conductivity of the system is

(a) $K_1 + K_2$ (b) $K_1K_2/(K_1 + K_2)$

(c)$(K_1 + 3K_2)/4$

(d) $(3K_1 + K_2)/4$.

A. $K = K_1 + K_2$

B. $K = \frac{K_1K_2}{K_1 + K_2}$

C. $K = \frac{K_1 + 3K_2}{4}$

D. $K = \frac{3K_1 + K_2}{4}$

Answer: C

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12. on observing light form three different stars P, Q and R, it was found that intensity of violet colour is maximum in the spectrum of P, the intensity of green colour is maximum in the spectrum of R and the intensity of red colour is maximum in the spectrum of Q. If T_p, T_Q and T_R are the respective absolute temperatures of P, Q and R, then it can be concluded from the above observation that

A. $T_P > T_Q > T_R$

B. $T_P > T_R > T_Q$

C. $T_P < T_R < T_Q$

D. $T_P < T_Q < T_R$

Answer: B

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13. A piece of ice of mass $100g$ and at temperature $0^\circ C$ is put in $200g$ of water of $25^\circ C$. How much ice will melt as the temperature of the water reaches $0^\circ C$? (specific heat capacity of water $= 4200 Jkg^{-1}K^{-1}$ and latent heat of fusion of ice $= 3.4 \times 10^5 JKg^{-1}$).

A. 128 g

B. 185.4 g

C. 92.8g

D. 61.8g

Answer: D

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14. A pan filled with hot food cools from $94^\circ C$ to $86^\circ C$ in 2 minutes when the room temperature is at $20^\circ C$. How long will it take to cool from $71^\circ C$ to $69^\circ C$? Here cooling takes place according to Newton's law of cooling.

A. 50 s

B. 40 s

C. 38 s

D. 42 s

Answer: D

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15. 1 g of ice at $0^\circ C$ is mixed with 1 g of steam at $100^\circ C$. After thermal equilibrium is achieved, the temperature of the mixture is

A. 50° C

B. 0° C

C. 55° C

D. 100° C

Answer: D

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16. Stream at $100^\circ C$ is passed into 20 g of water at $10^\circ C$. When water acquires a temperature of $80^\circ C$, the mass of water present will be [Take specific heat of water $= 1 cal g^{-1}.^\circ C^{-1}$ and latent heat of steam $= 540 cal g^{-1}$]

A. 24 g

B. 31.5g

C. 42.5g

D. 22.5 g

Answer: D

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17. A 10 W electric heater is used to heat a container filled with 0.5 kg of water. It is found that the temperature of water and container rises by 3° K in 15 min. The container is then emptied, dired and filled with 2kg of oil. The same heater now raises the temperature of container oil system by 2K in 20 min. Assume there is no heat loss in the process and the specific heat of water is $4200 Jkg^{-1}K^{-1}$, the specific heat of oil in the same limit is equal to

A. 1.50×10^3

B. 2.55×10^3

C. 3.00×10^3

D. 2.10×10^3

Answer: B

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18. A block of ice of mass 50kg is sliding on a horizontal plane. It starts with speed $5ms^{-1}$ and stops after moving through some distance. The mass of ice that has melted due to friction between the block and the surface is (assuming that no energy is lost and the surface is (assuming that no energy is lost and latent heat of fusion of ice is 80 $calg^{-1}$)

A. 2.86 g

B. 3.86 g

C. 0.86 g

D. 1.86 g

Answer: D

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19. Same quantity of ice is filled in each of the two metal container P and Q having the same size, shape and will thickness but make of different materials. The containers are kept in identical surroundings, The ice in P melts completely in time t_1, whereas in Q takes a time t_2. The ratio of thermal conductivities of the materials of P and Q is:

A. $t_2 : t_1$

B. $t_1 : t_2$

C. $t_1^2 : t_2^2$

D. $t_2^2 : t_1^2$

Answer: A

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20. Two identical rods are connected between two containers. One of them is at $100^\circ C$ containing water and another is at $0^\circ C$ containing ice. If rods are connected in parallel then the rate of melting of ice is $q_1 g/s$. If they are connected in series then teh rate is $q_2 g/s$. The ratio q_2/q_1 is

A. 2

B. 4

C. $\frac{1}{2}$

D. $\frac{1}{4}$

Answer: D

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21. Two rods of length d_1 and d_2 and coefficients of thermal conductivites K_1 and K_2 are kept touching each other. Both have the same area of cross-section. The equivalent thermal conductivity.

A. $K_1 d_1 + K_2 d_2$

B. $K_1 + K_2$

C. $\frac{K_1 d_1 + K_2 d_2}{d_1 + d_2}$

D. $\frac{d_1 + d_2}{\left(\frac{d_1}{K_1}\right) + \left(\frac{d_2}{K_2}\right)}$

Answer: D

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22. Certain quantity of water cools from $70^\circ C$ to $60^\circ C$ in the first 5 min and to $54^\circ C$ in the next 5 min. The temperature of the surrounding is

A. 45° C

B. 20° C

C. 42°

D. 10° C

Answer: A

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23. A piece of iron is heated in a flame. It first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observation is possible by using.

A. Stefan's law

B. Wien's displacement law

C. Kirchoff's law

D. Newton's law of cooling

Answer: B

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24. In a steady state of thermal conduction, temperature of the ends A and B of a 20 cm long rod are $100^{\circ}C$ and $0^{\circ}C$ respectively. What will be the temperature of the rod at a point at a distance of 9 cm from the end A of the rod

A. 60° C

B. 80° C

C. 90° C

D. 10° C

Answer: D

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25. Two bulbs A and B of equal capacity are filled with He and SO_2, respectively, at the same temperature.

(a) If the pressures in the two bulbs are same, what will be the ratio of the velocities of the molecules of the two gases?

A. $3:4$

B. $81:256$

C. $4:3$

D. $256:81$

Answer: C

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26. Hot water kept in a beaker placed in a room cools from $70^\circ C$ to $60^\circ C$ in 4 minutes. The time taken by it to cool from $69^\circ C$ to $59^\circ C$ from

A. 4min

B. 5 min

C. 6 min

D. 8 min

Answer: B

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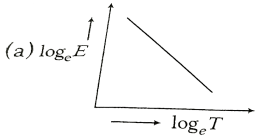
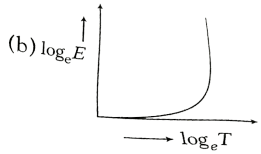
27. In a hydrogen atom, the radius of n^{th} bohr orbit is r_n. The graph between log (r_n/r_1) and logn will be

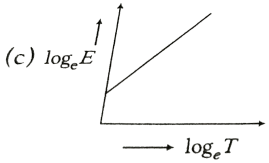
A.



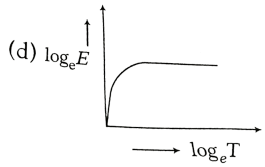
B.



C.



D.



Answer: C

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28. A sample of 100 g water is slowly heated from 27^oC to 87^oC. Calculate the change in the entropy of the water. specific heat capacity of water =4200 j/kg k .

A. 3.2×10^{-9}kg

B. 1.87×10^{-9}kg

C. 0.96×10^{-9}kg

D. 2.8×10^{-9} kg

Answer: B

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29. Water is used in car radiators as coolant because

A. having value of specific heat

B. high density

C. low surface tension

D. low density

Answer: A

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30. A body cools from 60° C to 50° C in 10 min. Find its temperature at the end of next 10 min if the room temperature is $25^\circ C$. Assume Newton's law of cooling holds.

A. 38.5° C

B. 40° C

C. 45° C

D. 42.85° C

Answer: D

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31. If the radius of a star is R and it acts as a black body, what would b the temperature of the star, in which the rate of energy production

is Q?

A. $\frac{Q}{4}\pi R^2\sigma$

B. $\left(\frac{Q}{4}\pi R^2\sigma\right)^{-\frac{1}{2}}$

C. $\left(4\pi R^2 Q/\sigma\right)^{\frac{1}{4}}$

D. $\left(Q/4\pi R^2\sigma\right)^{\frac{1}{4}}$

Answer: D

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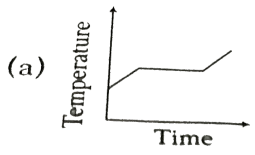
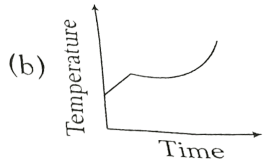
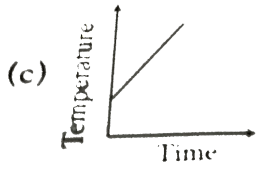
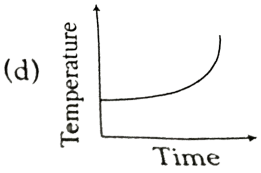
32. Liquid oxygen at $50K$ is heated to $300K$ at constant pressure of $1atm$. The rate of heating is constant. Which of the following graphs represents the variation of temperature with time?

A.



B. 

C. 

D. 

Answer: A

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33. The temperature at which a black body of unit area loses its energy at the rate of 1 joule/second is

A. 65° C

B. -65° C

C. 65 K

D. 72 K

Answer: C

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34. A rod AB is 1m long. The temperature of its one end A is maintained at 100° C and other end B at 10° C, the temperature at a distance of 60 cm from point B is

A. 64° C

B. 36° C

C. 46° C

D. 72° C

Answer: A

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35. Two slabs A and B of different materials but of the same thicknesss are joined end to end to form a composite slab. The thermal conductivities of A and B are K_1 and K_2 respectively. A steady temperature difference of 12°C is maintained across the composite slab. If $K_1 = \frac{K_2}{2}$, the temperature difference across slabs A is

A. 4°C

B. 6°C

C. 8°C

D. 10°C

Answer: C

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36. 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 looks brighter red and blue looks ordinary blue

C. blue shines like brigher red compared to the red piece

D. Both the pieces will look equally red

Answer: C

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37. The temperature gradient in a rod of $0.5m$ length is $80^\circ C/m$. It the temperature of hotter end of the rod is $30^\circ C$, then the temperature of the cooler end is

A. 0° C

B. -10° C

C. 10° C

D. 40° C

Answer: B

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38. The thickness of a metallic plate is 0.4 cm. The temperature between its two surfaces is $20^\circ C$. The quantity of heat flowing per second is 50 calories from $5cm^2$ area. In CGS system, the coefficient of thermal conductivity will be

A. 0.2

B. 0.3

C. 0.4

D. 0.5

Answer: A

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