PHYSICS

RESONANCE ENGLISH

CALORIMETRY

Solved Examples

1. What is the change in potential energy (in calories) of a $10kg$ mass after $10m$ fall?

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Example

1. Heat required to increases the temperature of $1kg$ water by $20^\circ C$

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2. Find the amount of heat released if $1kg$ steam at $200^\circ C$ is convered into $-20^\circ C$ ice.

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3. An iron block of mass $2kg$, fall form a height $10m$. After colliding with the ground it loses $25\,\%$ enegry to surroundings. Then find the temperature rise of block. (Take sp. Heat of iron $470J/kg^\circ C$)

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4. The temperature of equal masses of three different liquids $A, B,$ and C are $10^\circ C 15^\circ C$ and $20^\circ C$ respectively. The temperature when A and B are mixed is $13^\circ C$ and when B and C are mixed. It is $16^\circ C$. What will be the temperature when A and c are mixed?

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5. If three different liquid of different masses specific heats and temperature are mixed with each other and then what is the temperature mixture at thermal equilibrium.

$m_1, s_1, T_1 \rightarrow$ specification for liquid

$m_2, s_2, T_2 \rightarrow$ specification for liquid.

$m_3, s_3, T_3 \rightarrow$ specification for liquid.

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6. In following equiation calculate value of H: 1kg ice at $-20^{\circ}C = H + 1$kg water at $100^{\circ}C$, here H means heat required to change the state of substance.

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7. $1kg$ ice at $-20^{\circ}C$ is mixed with $1kg$ steam at $200^{\circ}C$. The equilibrium temperature and mixture content is

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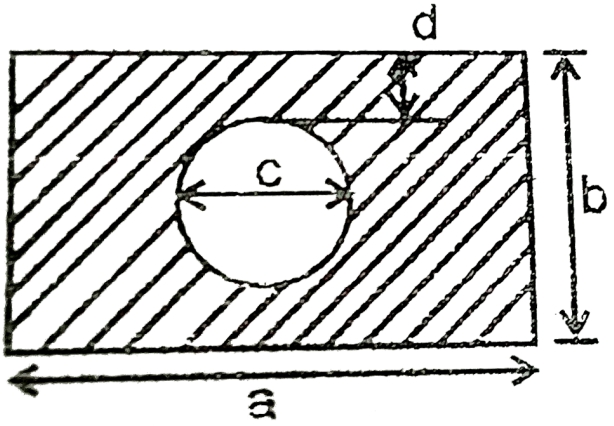
8. A rectangular plate has a circular cavity as shown in the figure. If we increases its temperature then which dimension

will increases in following figure.



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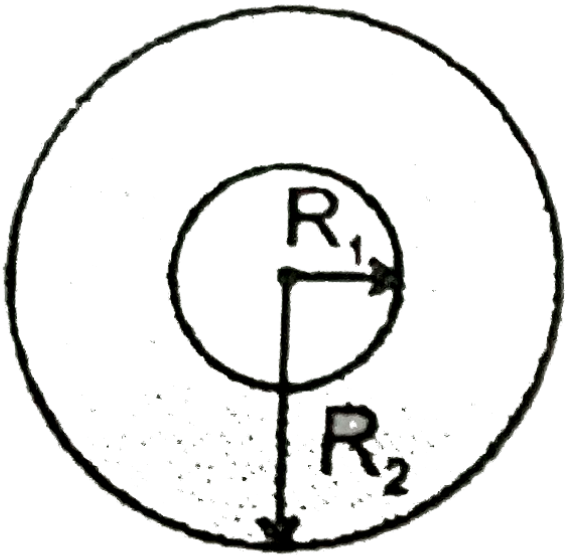
9. In the given figure, when temperature is increased then which of the following increases



(A) R_1 (B) R_1 (C)$R_2 - R_1$

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10. What is the percentage change in length of $1m$ iron rod it its temperature changes by $100^\circ C$. α for iron is $2 \times 10^{-5} / ^\circ C$.

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11.

In the given figure, a rod is free at one end and other end is fixed. When we change the temperature of rod by $\Delta\theta$, then strain produced in the rod will be

A. $\alpha\Delta\theta$

B. $\frac{1}{2}\alpha\Delta\theta$

C. zero

D. information incomplete

Answer:

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12. An iron ring measuring 15.00 cm in diameter is a be shrunk on a pulley which is 15.05 cm in diamer. All measurements refer to the room temperature 20^0C. To What minimum temperature should the ring be heated to make the job possible? Calculate the strain developed in the ring when in comes to the room temperature. Coefficient of linear expansion of iron $= 12 \times 10^{-6}$ ^ $0C^{-1}$.

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13. A steel rod of length 1 m rests on a smooth horizontal base. If it is heats from $0^{\circ}C$ to $100^{\circ}C$, what is the longitudional strain developed?

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14. A steel rod is clamped at its two ends and rests on a fixes horizontal base. The rod is unstrained at $20^{\circ}C$. Find the longitudinal strain developed in the rod if the temperature rises to $50^{\circ}C$. Coefficient of linear expansion of steel $= 1.2 \times 10^{-5\circ}C^{-1}$.

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15. A steel wire of cross-sectional area $0.5mm^2$ is held between two fixed supports. If the wire is just taut at $20^\circ C$, determine the tension when the temperature falls to $0^\circ C$. Coefficient of linear expansion of steel is $1.2 \times 10^{-5^\circ} C(-1)$ and its Young's modulus is $2.0 \times 10^{11} Nm^{-2}$.

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16. A pendulum clock consists of an iron rod connected to a small, heavy bob. If it is designed to keep correct time at $20^0 C$, how fast or slow will it go in 24 hours at $40^0 C$? Coefficient of linear expansion of iron $= 1.2 \times 10^{-5} C^{-1}$.

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17. A bar measured with a vernier caliper is found to be 180 mm long. The temperature during the measurement is $10^{\circ}C$. The measurement error will be if the scale of the vernier caliper has been graduated at a temeprature of $20^{\circ}C$. ($\alpha = 1.1 \times 10^{-5}.^{\circ} C^{-1}$. Assume that the length of the bar does not change.)

A. $1.98 \times 10^{-1} mm$

B. $1.98 \times 10^{-2} mm$

C. $1.98 \times 10^{-3} mm$

D. $1.98 \times 10^{-4} mm$

Answer:

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18. A plane lamina has area $2m^2$ at $10^\circ C$ then what is its area at $110^\circ C$ it's superficial expansion is $2 \times 10^{-5}/C$

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19. The volume of a glass vessel is 1000 cc at $20^\circ C$. What volume of mercury could be poured into it at this temperature so that the volume of the remaining space does not change with temperature? Coefficients of cubical expansion of mercury and glass are $1.8 \times 10^{-4\circ} C^{-1}$ and $9 \times 10^{-6\circ} C^{-1}$ respectively.

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20. If percentage change in length is 1% with change in temperature of a cuboid object $(l \times 2l \times 3l)$ then what is precentage change in its area and volume.

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21. The densities of wood and benzene at $0^\circ C$ are $880kg/m^3$ and $900kg/m^3$ respectively. The coefficients of volume expansion are $1.2 \times 10^{-3}/{}^\circ C$ for wood and $1.5 \times 10^{-3}/{}^\circ C$ for benzene. At what temperature will a piece of wood just sink in benzene?

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22. A glass vessel of volume $100cm^3$ is filled with mercury and is heated from $25^\circ C \rightarrow 75^\circ C$. What volume of mercury will overflow? Coefficient of linear expansion of glass $= 1.8 \times 10^{-6} / {}^\circ C$ and coefficeient of volume expansion of mercury is $1.8 \times 10^{-4} / {}^\circ C$.

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23. A body is float inside liquid. If we increase temperature then what changes occur in buyancy force? (Assume body is always in floating condition)

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24. In previous question discuss the case when body move downward, upwards and remains at same position when we increases temperature.

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25. The readings of a thermometer at $0^\circ C$ and $100^\circ C$ are $50cm$ and $75cm$ of mercury column respectively. Find the temperature at which its reading is $80cm$ of mercury column ?

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Solved Miscellaneous Problems

1. A bullte of mass $10gm$ in moving with speed $400m/s$. Find its kinetic energy in calories?

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Problem

1. Calculate amount of heat required to convert $1kg$ steam form $100^\circ C \rightarrow 200^\circ C$ steam

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2. Heat required to raise the temperature of one gram of water through $1^\circ C$ is

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3. $420J$ of energy supplied to $10g$ of water will rises its temperature by

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4. The ratio of the densities of the two bodies is $3:4$ and the ratio of specific heats is $4:3$ Find the ratio of their thermal capacities for unit volume?

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5. Heat released by $1kg$ steam at $150^\circ C$ if it convert into $1kg$ water at $50^\circ C$.

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6. $200gm$ water is filled in a calorimetry of negligible heat capacity. It is heated till its temperature is increase by $20^\circ C$. Find the heat supplied to the water.

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7. A bullet of mass $5gm$ is moving with speed $400m/s$. Strike a targent and energy. Then calculate rise of temperature of bullet. Assuming all the lose in kinetic energy is converted into heat energy of bullet if is specific heat is $500J/kg^\circ C$.

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8. $1kg$ ice at $-10^\circ C$ is mixed with $1kg$ water at $100^\circ C$. Then final equilirium temperature and mixture content.

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9. $1kg$ ice at -10° is mixed with $1kg$ water at $50^\circ C$. The final equilibrium temperature and mixture content.

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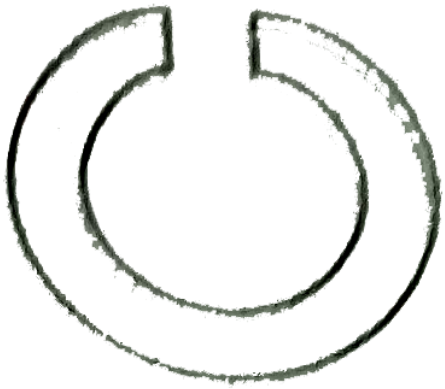
10. A small ring having small gap is shown in figure on heating what will happen to size of gap.



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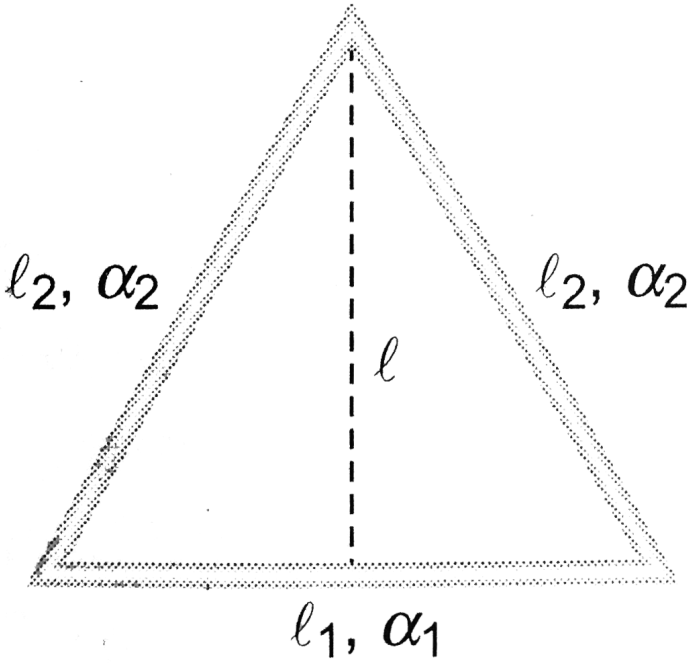
11. An isosceles triangles is formed with a thin rod of length l_1 and coefficient of linear expansion α_1, as the base and two thin rods each of length l_2 and coefficient of linear expansion α_2 as the two sides. The distance between the apex and the midpoint of the base remain unchanged as the temperature

is varied. the ratio of lengths $\frac{l_1}{l_2}$ is



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12. A concrete slab has a length of 10 m on a winter night when the temperature is $0^\circ C$. Find the length of the slab on a summer day when the temperature is $35^\circ C$. The coefficient of linear expansion of concrete is $1.0 \times 10^{-5\circ} C^{-1}$.

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13. A steel rod is clamped at its two ends and rests on a fixes horizontal base. The rod is unstrained at $20^{\circ}C$. Find the longitudinal strain developed in the rod if the temperature rises to $50^{\circ}C$. Coefficient of linear expansion of steel $= 1.2 \times 10^{-5\circ}C^{-1}$.

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14. If rod is initially compressed by Δl length then what is the strain on the rod when the temperature

(a) is increased by $\Delta\theta$ (b) is decreased by $\Delta\theta$

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15. A pendulum clock having copper rod keeos correct time at 20^0C. It gains 15 seconds per day if cooled to $0^\circ C$. Calculate the coefficient of linear expansion of copper.

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16. A meter scale made of steel is calibrated at $20^\circ C$ to give correct reading. Find the distance between 50 cm mark and 51 cm mark if the scale is used at $10^\circ C$. Coefficient of linear expansion of steel is $1.1 \times 10^{-5\circ} C^{-1}$

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17. A uniform solid brass sphere is rotating with angular speed ω_0 about a diameter. If its temperature is now

increased by $100^\circ C$, what will be its new angular speed. (given$\alpha_B = 2.0 \times 10^{-5} per^\circ C$)

A. $\frac{\omega_0}{1 - 0.002}$

B. $\frac{\omega_0}{1 + 0.002}$

C. $\frac{\omega_0}{1 + 0.004}$

D. $\frac{\omega_0}{1 - 0.004}$

Answer:

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18. The volume occupied by a thin- wall brass vessel and the volume of a solid brass sphere are the same and equal to $1,000 cm^3 at 0^\circ C$. How much will the volume of the vessel and

that of the sphere change upon heating to $20^{\circ}C$? The coefficieny of linear expansion of brass is $\alpha = 1.9 \times 10^{-5}$.

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19. When a thin rod of length $'l'$ is heated from $t_1^0 C$ to $t_2^0 C$ length increases by $1\ \%$. If plate of length $2l$ and breadth $'l'$ made of same material is heated form $t_1^0 C$ to $t_2^0 C$, percentage increase in area is

A. $1\ \%$

B. $3\ \%$

C. $4\ \%$

D. $2\ \%$

Answer:

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20. The density of wathr at $0^\circ C$ is $0.998 gcm^{-3}$ at $4^\circ C$ is $1.00 gcm^{-3}$. Calculate the average coefficient of volume expansion of water in the temperature range 0 to 4^C.

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21. A glass vessel measures exactly $10cm \times 10cm \times 10cm$ at $0^\circ C$. It is filled completely with mercury at this temperature. When the temperature is raised 10 10^C, $1.6cm^3$ of mercury overflows. Calculate the coefficient of volume expansion of mercury. Coefficient of linear expansion of glass $= 6.5 \times 10^{-6\circ} C^{-1}$.

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22. A metal ball immersed in alcohol weights W_1 at $0^\circ C$ and W_2 at $50^\circ C$. The coefficient of expansion of cubical the metal is less than that of the alcohol. Assuming that the density of the metal is large compared to that of alcohol, it can be shown that

A. W1>W2

B. W2>W1

C. W1=W2

D. None of these

Answer:

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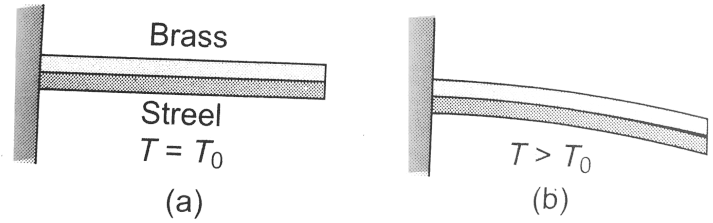
23. In figure which strip brass or steel have higher coefficient of linear expansion.



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24. The upper and lower fixed points of a fualty thermometer are $5^\circ C$ and $105^\circ C$. If the thermometer reads $25^\circ C$, what is the actual temperature?

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25. At what temperature is the Fahrenheit scale reading equal to

(a) twice (b) half of Celsius ?

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26. If the temperature of a patient is $40^{\circ} C$, his temperature on the Fahrenheit scale will be

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Board Level Exercise

1. What is the principle of calorimetry.

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2. Define one calorie

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3. Define specific heat of body.

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4. Which one of the following graphs represents variation of specific heat capacity of water with temperature?

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5. What is the value of specific heat of water in SI unit? Does it very with temperature?

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6. Define water equivalent

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7. Define latent heat. What are the $S.\ I.$ Units of latent heat?

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8. When hot water is poured on a glass plate, it breaks because of

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9. Iron rims are heated red hot before planting on car wheels. Why?

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10. Explain, what is meant by the coefficients of linear (α), superficial (β) and cubical expansion (γ) of a solid. Given their units. Find the relationship between them.

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11. Define temperature.

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12. Write the $S.\ I.$ unit of temperature.

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13. Is it possible to liquefy a gas at any temperature?

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14. At what temperature do the Celsius and Fahrenheit readings have the same numerical value ?

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15. At what temperature do the Kelvin and Celsius scales coincide?

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16. Can water be boiled without heating?

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17. Name the principle used in the mercury thermometer.

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18. Differentiate between evaporation and boiling.

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19. How the fishes can survive in the extreme winter, when ponds and lakes are frozen?

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Exercise 1

1. In the following equation calculate the value of H.

$1kg$ syeam at $200^\circ C = H + 1kg$ water at $100^\circ C \left(S_{\text{system}} = \text{Constant} = 0.5cal/gm^\circ C\right)$

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Exercise 2

1. A metal ball of specific gravity 4.5 and specific heat $0.1cal/gm-^{\circ}C$ is placed on a large slab of ice at $0^{\circ}C$. Half of the ball sinks in the ice. The initial temperature of the ball is:- (Latent heat capacity of ice $=80cal/g$, specific gravity of ice $=0.9$)

A. $100^{\circ}C$

B. $90^{\circ}C$

C. $80^{\circ}C$

D. $70^{\circ}C$

Answer: C

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Exercie 3

1. A cube of coefficient of linear expansion α is floating in a bath containing a liquid of coefficient of volume expansion γ_l . When the temperature is raised by ΔT, the depth upto which the cube is submerged in the liquid remains the same. Find relation between α and γ_l

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Exercie

1. 2 litres water at $27^\circ C$ is heated by a $1kW$ heater in an open container. On an average heat is lost to surroundings at the rate $160J/s$. The time required for the temperature to reach $77^\circ C$ is

A. $8\ \text{min}\ 20\,\text{sec}$

B. $10\ \text{min}$

C. $7\ \text{min}$

D. $14\ \text{min}$

Answer: A

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2. In a insulated vessel, 0.05 kg steam at 373 K and 0.45 kg of ice at 253 K are mixed. Find the final temperature of the mixture (in kelvin.)

Given, $L_{fusion} = 80cal/g = 336J/g$

$L_{\text{vaporization}} = 540cal/g = 2268J/g$

$s_{ice} = 2100J/kg.K = 0.5cal/g.K$

and $s_{\text{water}} = 4200J/kg.K = 1cal/g.K$.

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3. A piece of ice (heat capacity $= 2100Jkg^{-1}.^{\circ}C^{-1}$ and latent heat $= 3.36 \times 10^5 Jkg^{-1}$) of mass m grams is at $-5.^{\circ}C$ at atmospheric pressure. It is given 420 J of heat so that the ice starts melting. Finally when the ice . Water mixture is in equilibrium, it is found that 1 gm of ice has

melted. Assuming there is no other heat exchange in the process, the value of m in gram is

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4. Steel wire of length 'L' at $40^\circ C$ is suspended from the ceiling and then a mass 'm' is hung from its free end. The wire is cooled down from $40^\circ C \rightarrow 30^\circ C$ to regain its original length 'L'. The coefficient of linear thermal expansion of the steel is $10^{-5}/^\circ C$, Young's modulus of steel is $10^{11} N/m^2$ and radius of the wire is 1mm. Assume that $L >>$ diameter of the wire. Then the value of 'm' in kg is nearly

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5. Time taken by a 836 W heater to heat one litre of water from $10^{\circ}C \rightarrow 40^{\circ}C$ is

A. $50s$

B. $100s$

C. $150s$

D. $200s$

Answer: C

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6. The specific heat capacity of a metal at low temperature (T) is given as

$$C_p\left(kJK^{-1}kg^{-1}\right) = 32\left(\frac{T}{400}\right)^3$$

A 100 gram vessel of this metal is to be cooled from $20^\circ K$ to $4^\circ K$ by a special refrigerator operating at room temperaturte $(27^\circ C)$. The amount of work required to cool the vessel is

A. greater than $0.148kJ$

B. between $0.148kJ$ and $0.028kJ$

C. less than $0.028kJ$

D. equal to $0.002kJ$

Answer: B

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7. A metal rod of Young's modulas Y and coefficient of thermal expansion α is held at its two ends such that its

length remains invariant. If its temperature is raised by $t^{\circ}c$, then the linear stress developed in it is

A. $\frac{Y}{\alpha t}$

B. $Y\alpha t$

C. $\frac{1}{(Y\alpha t)}$

D. $\frac{\alpha t}{Y}$

Answer: B

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8. An aluminium sphere of $20cm$ diameter is heated from $0^{\circ}C$ to $100^{\circ}C$. Its volume changes by (given that the coefficient of linear expanison for aluminium $\left(\alpha_{Al} = 23 \times 10^{-6/0}C\right)$

A. $2.89cc$

B. $9.28cc$

C. $49.8cc$

D. $28.9cc$

Answer: D

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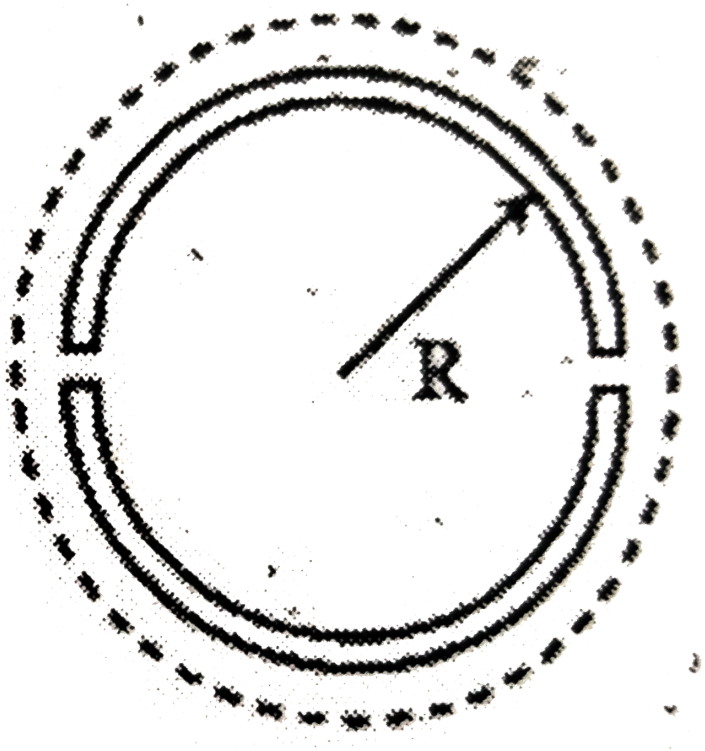
9. A wooden wheel of radius R is made of two semicircular parts (see figure), The two parts are held together by a ring made of a metal strip of cross sectional area S and length L. L is slightly less than $2\pi R$. To fit the ring on the whell, it is heated so that its temperature rises by ΔT and it just steps over the wheel. As it cools down to surrounding temperature,

it presses the semicirular parts together. If te doefficient of linear expansion of the metal is α, and its Youngs' modulus is dY, the force that on part of the wheel applies on the other part is :



A. $2\pi SY\alpha\Delta T$

B. $Sy\alpha\Delta T$

C. $\pi SY\alpha\Delta T$

D. $2SY\alpha\Delta T$

Answer: D

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Advanced Level Problems

1. A thermally insulated, closed copper vessel contains water at $15^\circ C$. When the vessel is shaken vigorously for 15 minuts, the temperature rises to $17^\circ C$. The mass of the vessel is 100 g and that of the water is 200 g. The specific heat capacities of copper and water are $420\frac{J}{kg-K}$ and $4200\frac{J}{kg-K}$ resprectively. Neglect any thermal expansion.

(a) How much heat is transferred to the liquid vessel system?

(b) How much work has been doen on this system?

(c) How much is the increase in internal energy of the system?

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2. The time represented by the clock hands of a pendulum clock depends on the number of oscillations performed by pendulum. Every time it reaches to its exterme position the second hand of the clock advances by one second that means second hand moves by two second when one oscillation is completed.

(a) How many number of oscillations completed by pendulum of clock in 15 minutes at calibrated temperature $20^{\circ} C$

(b) How many number of oscillations are completed by a

pendulum of clock in 15 minutes at temperature of $40^{\circ}C$ if $\alpha = 2 \times 10^{-5}/^{\circ}C$

(c) What time is represented by the pendulum clock at $40^{\circ}C$ after 15 minutes if the initial time shown by the clock is $12:00$ pm?

(d) If the clock gains two seconds in 15 minutes in correct clock then find-(i) Number of extra oscillations (ii) New time period (iii) change in temperature.

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3. Consider a cylindrical container of cross-section area A length h and having coefficient of linear expansion α_c. The container is filled by liquid of real expansion coefficient γ_L up to height h_1. When temperature of the system is increased by $\Delta\theta$ then

(a). Find out the height, area and volume of cylindrical container and new volume of liquid.

(b). Find the height of liquid level when expansion of container is neglected.

(c). Find the relation between γ_L and α_c for which volume of container above the liquid level

(i) increases

(ii). decreases

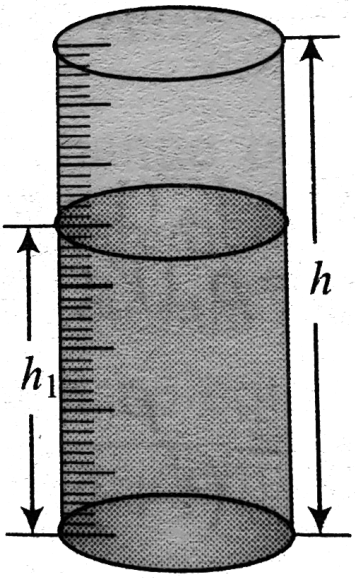
(iii). remains constant.

(d). On the surface of a cylindrical container a scale is attached for the measurement of level of liquid of liquid filled inside it. If we increase the temperature of the temperature of the system by $\Delta\theta$, then

(i). Find height of liquid level as shown by the scale on the vessel. Neglect expansion of liquid.

(ii). Find the height of liquid level as shown by the scale on

the vessel. Neglect expansion of container.



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4. One gram of water $\left(1cm^3\right)$ becomes $1671cm^3$ of steam when boiled at a constant pressure of 1 atm $\left(1.013 \times 10^5 Pa\right)$. The heat of vaporization at this pressure is $L_v = 2.256 \times 10^6 J/kg$. Compute (a) the work done by the

water when it vaporizes and (b) its increase in internal energy.

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5. A metal piece weighing $15g$ is heated to $100^\circ C$ and then immersed in a mixture of ice and water at the thermal equilibrium. The volume of the mixture is found to be reduced by $0.15cm^3$ with the temperature of mixture remaining constant. Find the specific heat of the metal. Given specific gravity of ice $= 0.92$, specific gravity of water at $0^\circ C = 1.0$, latent heat of fusion of ice $= 80cal - g^{-1}$.

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6. (a) The brass scale of a barometer gives correct reading at $0^\circ C$. Coefficient of linear expansion of brass is $2.0 \times 10^{-5} / ^\circ C$. The barometer reads $75cm$ at $27^\circ C$. What is the atmospheric pressure at $27^\circ C$?

(b) A barometer reads $75.0cm$ on a steel scale. The room temperature is $30^\circ C$. The scale is correctly graduated for $0^\circ C$. The coefficient of linear expansion of steel is $\alpha = 1.2 \times 10^{-5} / ^\circ C$ and the coefficient of volume expansion of mercury is $\gamma = 1.8 \times 10^{-4} / ^\circ C$. Find the correct atmospheric pressure.

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7. A clock with an iron pendulum keeps correct time at $20^\circ C$. How much time will it lose or gain in a day if the temperature

changes to $40^\circ C$. Thermal coefficient of liner expansion $\alpha = 0.000012 per^\circ C$.

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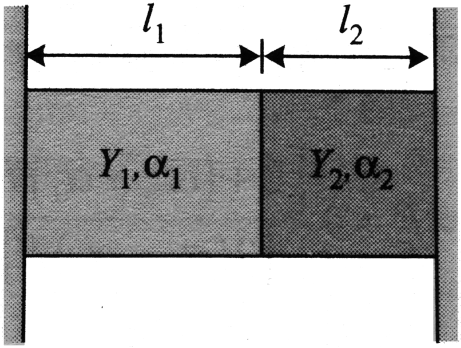
8. Two rods of different metals having the same area of cross section A are placed between the two massive walls as shown is Fig. The first rod has a length l_1, coefficient of linear expansion α_1 and Young's modulus Y_1. The correcsponding quantities for second rod are l_2, α_2 and Y_2. The temperature of both the rods is now raised by $t^\circ C$.

i. Find the force with which the rods act on each other (at higher temperature) in terms of given quantities.

ii. Also find the length of the rods at higher temperature.



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9. A composite rod is made by joining a copper rod, end to end, with a second rod of different material but of the same area of cross section. At $25^\circ C$, the composite rod is $1m$ long and the copper rod is $30cm$ long. At $125^\circ C$ the length of the composite rod increases by $1.91mm$. When the composite rod is prevented from expanding by holding it between two

rigid walls, it is found that the constituent rods have remained unchanged in length inspite of rise of temperature. Find young's modulus and the coefficient of linear expansion of the second rod (Y of copper $= 1.3 \times 10^{10} N/m^2$ and a of copper $= 17 \times 10^{-6}/K$).

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10. A piece of metal weighs 46 g in air and 30 g in liquid of density $1.24 \times 10^3 kgm^{-3}$ kept at $27^0 C$. When the temperature of the liquid is raised to $42^0 C$, the metal piece weights 30.5 g . The density of the liquid at $42^0 C$ is $1.20 \times 10^3 kgm^{-3}$. Calculate the coefficient of linear expansion of the metal.

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11. Two steel rods and an aluminium rod of equal length l_0 and equal cross- section are joined rigidly at their ends as shown in the figure below. All the rods are in a state of zero tension at $0^\circ C$. Find the length of the system when the temperature is raised to θ. Coefficient of linear expansion of aluminium and steel are α_a and α_s respectively. Young's modulus of aluminium is Y_a and of steel is Y_s.

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12. Consider a metal scale of length $30cm$ and an object. The scale is calibrated for temp $20^\circ C$.

(a) What is the actual length of division which is shown as $1cm$ by scale at $40^\circ C$. Given $\alpha_s = 2 \times 10^{-5}/^\circ C$.

(b) What will be the reading of scale at $40^\circ C$ if the actual

length of objects is $10cm$.

(c) What will be the actual length of object at $40^{\circ}C$ if is measured length is $10cm$.

(d) What is $\%$ error in measurement for part (b) and (c).

(e) If the linear expansion coefficient of object is $\alpha_0 = 4 \times 10^{-5}$ and neglecting the expansion of scale, then answers of (b) and (c) parts.

(f) If $\alpha_0 = 4 \times 10^{-5}$ and $\alpha_s = 2 \times 10^{-5}$ then find answers of (b) and (c) part.

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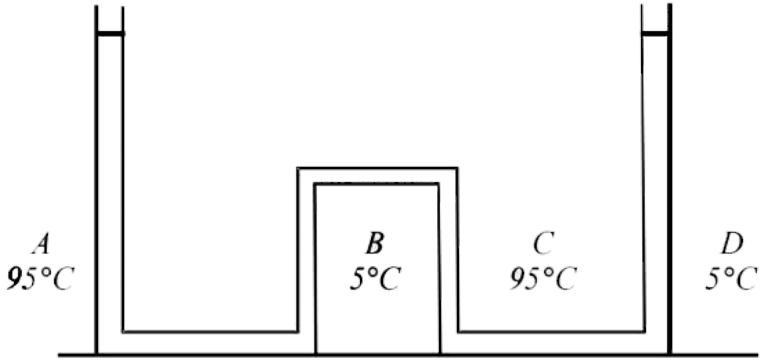
13. The apparatus shown in the figure consists of four glass columns connected by horizontal section. The height of two central column B and C are 49 cm each. The two outer columns A and D are open to the temperature. A and C are

maintained at a temperature of $95^\circ C$ while the columns B and D are maintained at $5^\circ C$. The height of the liquid in A and D measured from the base the are 52.8 cm and 51cm respectively. Determine the coefficient of thermal expansion of the liquid



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Exercise

1. 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 $g = 10N/kg$]

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2. A copper cube of mass $200g$ slides down an a rough inclined plane of inclination 37° at a constant speed. Assume that any loss in mechanical energy goes into the copper block as thermal energy .Find the increase in the temperature of the block as it slides down through $60cm$. Specific heat capacity of copper $= 420Jkg^{-1}K^{-1}$

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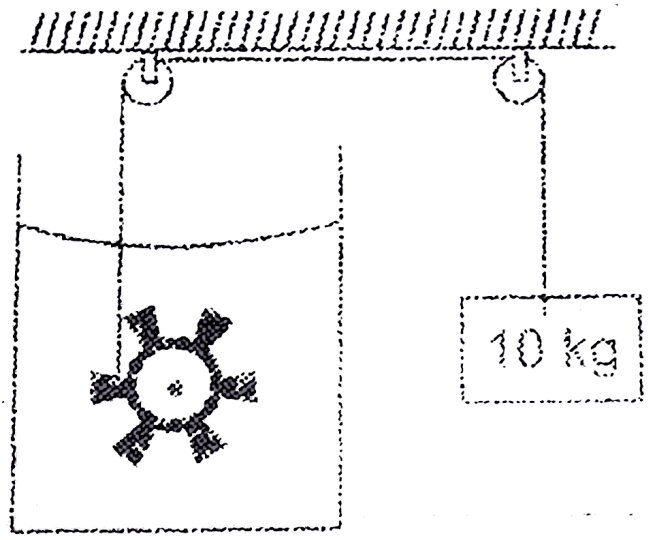
3. A paddle wheel is connected with a block of mass $10kg$ as shown in figure. The wheel is completely immersed in liquid of heat capacity $400J/K$. The container is adiabatic. For the time interval in which block goes down $1m$ slowly calculate

(a) Work done on the liquid

(b) Heat supplied to the liquid

(c) Rise in the temperature of the liquid Neglect the heat capacity of the container and the paddle. $\left(g = 10m/s^2\right)$



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4. 300 grams of water at $25^\circ C$ is added to 100 grams of ice at $0^\circ C$. The final temperature of the mixture is ____ $\hat{}$ $\circ C$

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5. The temperature of a metal ball is raised. Arrange the percentage change in volume, surface area and raidus in ascending order.

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6. A brass disc fits snugly in a hole in a steel plate. Should you heat or cool this system to losen the disc from the hole ?

given that $\alpha_b > \alpha_F e$.

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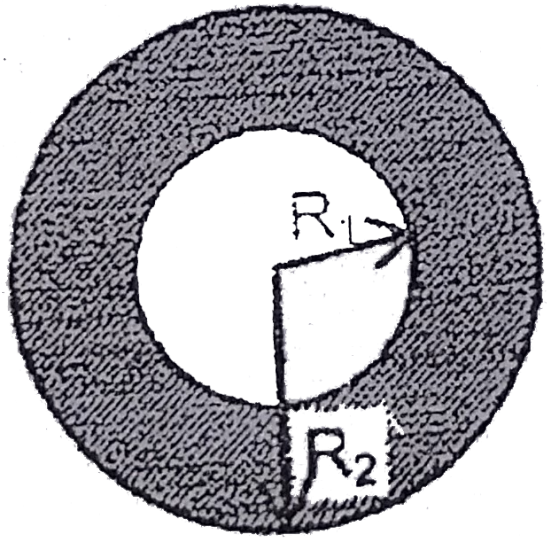
7. Temperature of plate is increased by $\Delta\theta$ then find new



A. inner radius

B. outer radius

C. the difference in outer and inner radius and show that it is positive

D. area of plate meterial (assume coefficient of expansion is α)

Answer: A::B::C::D

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8. We have a hollow sphere and a solid sphere equal radii and of the same material. They are heated to raise their temperature be equal amounts. How will the cange in their volumes, due to volume expansions, be related? Consider two cases (i) hollow sphere is filled with air, (ii) there is vaccum inside the hollow sphere.

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9. What should be the sum of lengths of an aluminium and steel rod at $0^\circ C$ is, so that all the temperature their difference in length is $0.25m$. (Take coefficient of linear expansion for aluminium and steel at $0^\circ C$ as $22 \times 10^{-6}/.^\circ C$ and $11 \times 10^{-5}/.^\circ C$ respectively.)

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10. A steel tape is correctly calibrated at $20^\circ C$ and is used to measure the length of a table at $30^\circ C$. Find the percentage error in the measurement of length. $\left[\alpha_{steel} = 11 \times 10^{-5}/.^\circ C\right]$

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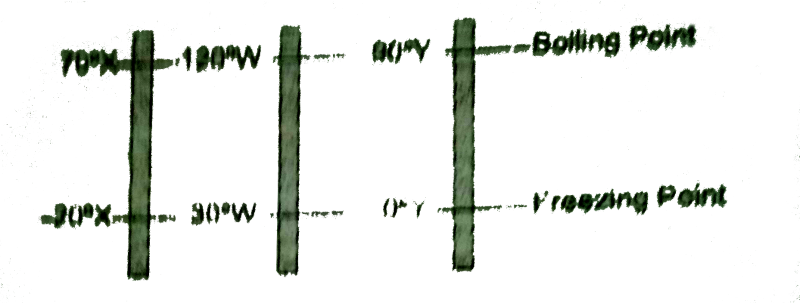
11. The figure shows three temperature scales with the freezing and boiling points of water indicated.



(a) Rank the size of a degree on these scales, greatest first.

(b) Rank the following temperatures, highest first : $50^{\circ} X$, $50^{\circ} W$ and $50^{\circ} Y$.

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12. At what temperature the Fahrenheit and Celsius scales of temperature give the same reading ?.

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13. A small quantity mass m, of water at a temperature $\theta(\text{in } {}^{\circ}C)$ is poured on to a larger mass M of ice which is at its melting point. If c is the specific heat capacity of water and L the specific heat capacity of water and L the specific latent heat of fusion of ice, then the mass of ice melted is give by

A. $\frac{ML}{mc\theta}$

B. $\frac{mc\theta}{ML}$

C. $\frac{Mc\theta}{L}$

D. $\frac{mc\theta}{L}$

Answer: D

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14. A thermally isolated vessel contains 100g of water at $0^\circ C$ when air above the water is pumped out, some of the water freezes and some evaporates at $0^\circ C$ itself. Calculate the mass at $0^\circ C = 2.10 \times 10^6 j/kg$ and latent heat of fusion of ice $= 3.36 \times 10^5 j/kg$.

A. $86.2g$

B. $13.8g$

C. $76.2g$

D. $65.6g$

Answer: A

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15. $20gm$ ice at $-10^\circ C$ is mixed with mgm steam at $100^\circ C$. The minimum value of m so that finally all ice and steam converts into water is:

(Use $s_{\text{ice}} = 0.5\text{cal gm}^\circ C$, $S_{\text{water}} = 1cal/gm^\circ C$, L (melting) $= 80cal/gm$ and $L(\text{vaporization}) = 540cal/gm$)

A. $\frac{85}{32}gm$

B. $\frac{85}{64}gm$

C. $\frac{32}{85}gm$

D. $\frac{64}{85}gm$

Answer: A

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16. $2kg$ ice at $-20^\circ C$ is mixed with $5kg$ water at $20^\circ C$. Then final amount of water in the mixture will be: [specific heat of ice $= 0.5cal/gm^\circ C$, Specific heat of water $= 1cal/gm^\circ C$, Latent heat of fusion of ice $= 80cal/gm$]

A. $6kg$

B. $7kg$

C. $3.5kg$

D. $5kg$

Answer: A

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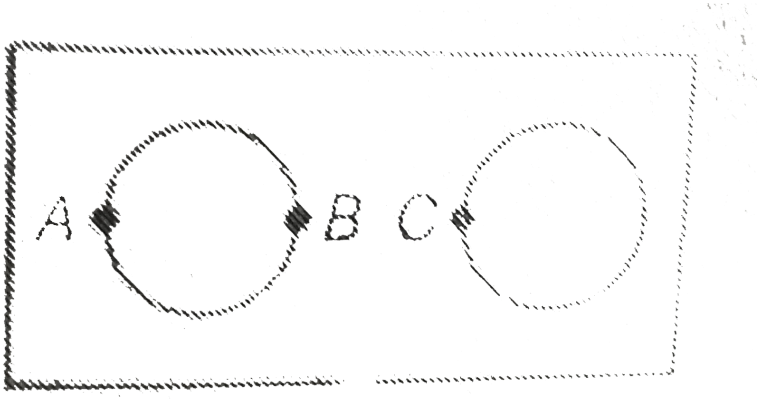
17. Two large holes are cur in a metal sheet. If this is heated, distance AB and BC, (as shown)



A. both will increase

B. both will decreases

C. AB increases, BC decreases

D. AB decreases, BC increases

Answer: A

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18. A steel scale is to be prepared such that the millimeter intervals are to be accurate within $6 \times 10^{-5} mm$. The maximum temperature variation form the temperature of calibration during the reading of the millimeter marks is $(\alpha = 12 \times 10^{-6} / {}^{\circ} C)$

A. $4.0^{\circ} C$

B. $4.5^{\circ} C$

C. $5.0^{\circ} C$

D. $5.5^{\circ} C$

Answer: C

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19. Expansion during heating

A. occurs only in a solid

B. increases the density of the material

C. decreases the density of the material

D. occurs at the same rate for all liquids and solids.

Answer: C

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20. If a bimetallic strip is heated it will

A. bend towards the metal with thermal expansion coefficient.

B. bend towards the metal with higher thermal expansion coefficient.

C. twist itself into helix.

D. have no bending.

Answer: A

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21. Two rods, one of aluminium and other made of steel, having initial lengths l_1 and l_2 are connected together to form a single rod of length $(l_1 + l_2)$. The coefficient of linear expansions for aluminium and steel are α_a and α_s respectively. If length of each rod increases by same amount

when their tempertures are raised by $t^{\circ}C$, then find the ratio $l_1(l_1 + l_2)$.

A. $\frac{\alpha_s}{\alpha_a}$

B. $(\alpha_a).(\alpha_s)$

C. $\frac{\alpha_s}{(\alpha_a + \alpha_s)}$

D. $\frac{\alpha_a}{(\alpha_a + \alpha_s)}$

Answer: C

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22. A liquid with coefficient of volume expansion γ is filled in a container of a material having coefficient of linear expansion α. If the liquid overflows on heating, then

A. $\gamma > 3\alpha$

B. $\gamma < 3\alpha$

C. $\gamma = 3\alpha$

D. none of these

Answer: A

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23. if two temperatures differ by 25 degree on celsius scale, the difference of temperature on Fahrenheit scale is

A. $45^\circ F$

B. $72^\circ F$

C. $32^\circ F$

D. $25^\circ F$

Answer: A

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24. 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. $2Pt/M$

B. $Pt/2M$

C. Pt/M

D. PM/t

Answer: C

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25. Steam at $100^\circ C$ is passed into 1.1 kg of water contained in a calorimeter of water equivalent 0.02 kg at $15^\circ C$till the temperature of the calorimeter and its contents rises to $80^\circ C$. The mass of the steam condensed in kilogram is

A. 0.130

B. 0.065

C. 0.260

D. 0.135

Answer: A

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26. If I is the moment of inertia of a solid body having α-coefficient of linear expansion then the change in I corresponding to a small change in temperature ΔT is

A. $\alpha I \Delta T$

B. $\frac{1}{2}\alpha I \Delta T$

C. $2\alpha I \Delta T$

D. $3\alpha I \Delta T$

Answer: C

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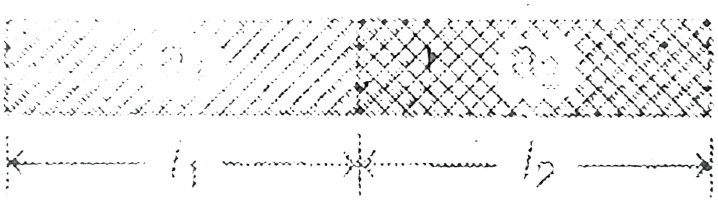
27. Two rods having lengths l_1 and l_2, made of material with linear expansion coefficients α_1 and α_2 were soldered together. The equivalent coefficeints linear expansion for the composite rod is



A. $\frac{l_1\alpha_2 + l_2\alpha_1}{l_1 + l_2}$

B. $\frac{l_1\alpha_1 + l_2\alpha_2}{\alpha_1 + \alpha_2}$

C. $\frac{l_1\alpha_1 + l_2\alpha_2}{l_1 + l_2}$

D. $\frac{l_2\alpha_1 + l_1\alpha_2}{\alpha_1 + \alpha_2}$

Answer: C

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28. Show that the volume thermal expansion coefficient for an ideal gas at constant pressure is $\frac{1}{T}$.

A. T

B. T^2

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

D. $\frac{1}{T^2}$

Answer: C

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29. A metal ball immersed in water weighs w_1 at $5^\circ C$ and $w_2 at 50^\circ C$. The coefficient of cubical expansion of metal is

less than that of water. Then

A. $w_1 > w_2$

B. $w_1 < w_2$

C. $w_1 = w_2$

D. data is insufficient

Answer: B

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30. A piece of metal floats on mercury. The coefficient of volume expansion of metal and mercury are γ_1 and γ_2, respectively. if the temperature of both mercury and metal are increased by an amount ΔT, by what factor does the

fraction of the volume of the metal submerged in mercury changes ?

A. $\frac{1+\gamma_2\Delta T}{1+\gamma_1\Delta T}$

B. $\frac{1+\gamma_1\Delta T}{1+\gamma_2\Delta T}$

C. $1+(\gamma_1+\gamma_2)\Delta T$

D. None of these

Answer: A

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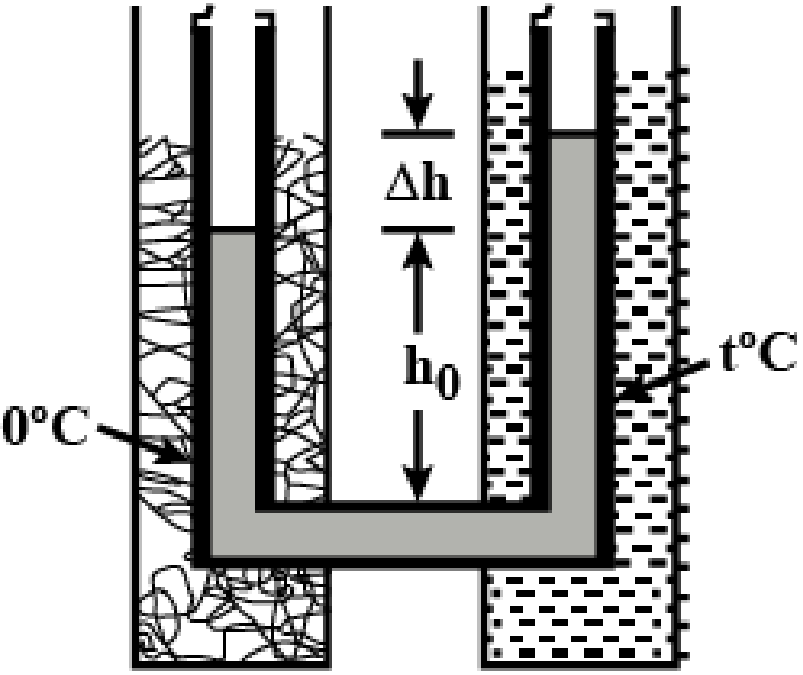
31. Two vertical glass tibes filled with a liquid are connected at their lower ends by a horizontal capillary tube. One tube is surrounded by a bath containing ice and water at $0^\circ C$ and the other by hot water a $t^\circ C$. The difference in the height of

the liquid in the two columns is Δh, and the height of the colume at $0^\circ C$ is h_0. coefficient of volume expansion of the liquid is.



A. $a.\ \dfrac{\Delta h}{h_0 t}$

B. $b.\ \dfrac{2\Delta h}{h_0 t}$

C. $c.\ \dfrac{2h_0}{\Delta h t}$

D. $d.\ \dfrac{h_0}{\Delta h t}$

Answer: A

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32. The gas thermometers are more sensitive than liquid thermometers because gases

A. Statement-1 is True, Statement-2 is True, Statement-2 is correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is Flase, Statement-2 is True.

Answer: A

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33. STATEMENT-1: When water is heated by a burner in metallic container its level first decreases then increases.

STATEMENT-2: Thermal conductivity of metal is very compared to water.

A. Statement-1 is Ture, Statement-2 is Ture, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is Ture, Statement-2 is Ture, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is False, Statement-2 is Ture.

D. Statement-1 is True, Statement-2 is False

Answer: A

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34. A pitcher contains $200kg$ of water $0.5gm$ of water comes out on the surface of the pitcher every second through the pores and gets evaporated taking energy form the remaining water. Calculate the approximate time (in min) in which temperature of the water decreases by $5^{\circ}C$. Neglect backward heat transfer form the atmosphere to th water. (Write the answer to the nearest interger)

Specific heat capacity of water $= 4200J/Kg^{\circ}C$

Latent heat of vaporization of water $2.27 \times 10^6 J / Kg$

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35. How long does a $59kw$ water heater take to raise the temperature of $150L$ of water from $21^\circ C$ to $38^\circ C$ (in min)

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36. The specific heat of a substance varies with temperature according to $c = 0.2 + 0.16T + 0.024T^2$ with T in $^\circ c$ and c is cal/gk. Find the energy (in cal) required to raise the temp of $2g$ substance from $0^\circ \rightarrow 5^\circ C$

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37. $50g$ of ice at $0^\circ C$ is mixed with $200g$ of water at $0^\circ C$.6 kcal heat is given to system [Ice +water]. Find the temperature (in $.^\circ C$) of the system.

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38. Earth receives $1400W/m^2$ of solar power. If all the solar energy falling on a lens of area $0.2m^2$ is focused on to a

block of ice of mass 280 grams, the time taken to melt the ice will be..... Minutes. ($Latentheatoffusionofice$= $3.3 \times 10^5 J/kg.$)

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39. A 50gram lead bullet, specific heat 0.02 is initially at 30° C. It is fired vertically upwards with a speed of $840m/s$. On returning to the starting level, it strikes a cake of ice at $0^\circ C$. How much ice is melted ? Assume that all energy is spent in melting ice only. Take latent heat of ice $= 80cal.$ / gram.

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40. The temperature of 100g of water is to be raised from $24^\circ C$ to $90^\circ C$ by adding steam to it. Calculate the mass of

the steam required for this purpose.

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41. An electrically heated coil is immersed in a calorimeter containing 360 g of water at $10^\circ C$. The coil consumes energy at the rate of 90 W. The water equivalent of calorimeter and coil is 40 g. The temperature of water after 10 min is

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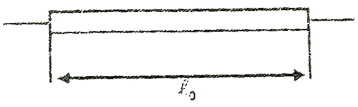
42.



As a result of temp rise of $32^\circ C$, a bar with a crack at its centre buckless upward. If the fixed distance l_0 is $4m$, and

coefficeient of linear expansion of bar in $25 \times 10^{-5/\circ} C^{-1}$.

Find the rise x (in cm) of the centre.

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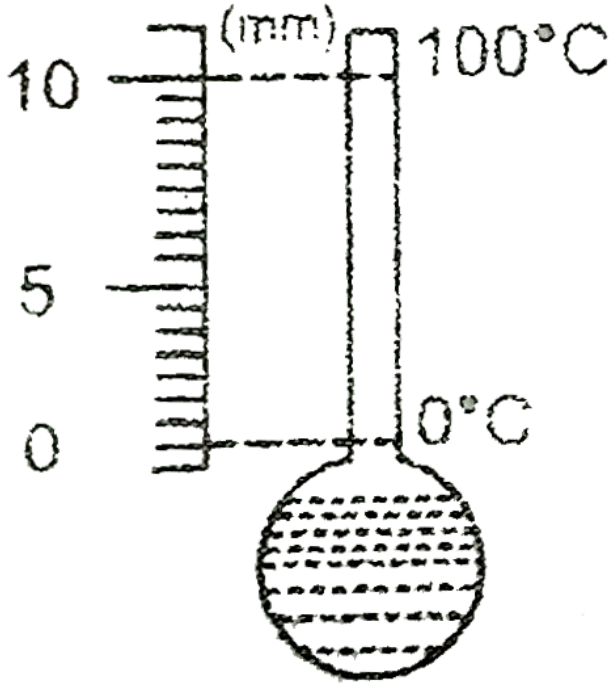

43.

Level of a certain liquid at $0^\circ C$ and $100^\circ C$ are 0 and $10mm$ on a given fixed scale (as shown in fig.) coefficient of volume

expansion this liquid varies with temperature as $\gamma = \gamma_0\left(1 + \frac{T}{100}\right)$ (where T in $.^\circ C$) Find the level (in mm) of liquid at $48^\circ C$

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44. A simple seconds pendulum is constructed out of a very thin string of thermal coefficient of linear expansion $\alpha = 20 \times 10^{-4}/^\circ C$ and a heavy particle attached to one end. The free end of the string is suspended from the ceiling of an elevator at rest. the pendulum keeps correct time at $0^\circ C$. when the temperature rises to $50^\circ C$, the elevator operator of mass $60kg$ being a student of Physics accelerates the elevator vertically, to have the pendulum correct time. the apparent weight of the operator when the pendulum keeps correct time at $50^\circ C$ is $(\text{Take } \ g = 10m/s^2)$

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45. A steel rod of length $25cm$ has a cross-sectional area of $0.8cm^2$. The force required to stretch this rod by the same amount as the expansion produced by heating it through $10^\circ C$ is $\left(\alpha_{steel} = 10^{-5}/^\circ C \text{ and } Y_{steel} = 2 \times 10^{10} N/m^2\right)$

Watch Video Solution

46. A 1-L flask contains some mercury. It is found that at different temperature, the volume of air inside the flask remains the same. What is the volume of mercury in the flask, given that the coefficient of linear expansion of glass $= 9 \times 10^{-6}/^\circ C$ and the coefficient of volume expansion of $Hg = 1.8 \times 10^{-4}/^\circ C$?

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47. When two non reactive samples at different temperatures are mixed in an isolated container of negligible heat capacity the final temperature of the mixture can be:

A. lesser than lower or greater than higher temperature is

B. equal to lower or higher temperature

C. greater than lower but lesser than higher temperature

D. average of lower and higher temperatures

Answer: B::C::D

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48. Two identical beakers with negligible thermal expansion are filled with water to the same level at $4^{\circ} C$. If one says A is heated while the other says B is colled, then:

A. water level in A must rise

B. water level in B must rise

C. water level in A must fall

D. water level in B must fall

Answer: A::B

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49. When m gm of water at $10^{\circ} C$ is mixed with m gm of ice at $0^{\circ} C$, which of the following statements are false?

A. The temperature of the system will be given by the equation

$$m \times 80 + m \times 1 \times (T - 0) = m \times 1 \times (10 - T)$$

B. Whole of ice will melt and temperature will be more than $0^\circ C$ but lesser than $10^\circ C$

C. Whole of ice will melt and temperature will be $0^\circ C$

D. Whole of ice will not melt and temperature will be $0^\circ C$

Answer: A::B::C

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50. A bimetallic strip is formed out of two identical strips one of copper and the other of brass. The coefficients of linear

expansion of the strip goes up by $\Delta T$and the strip bends to from an arc of radius of curvature R. Then R is.

A. Proportional to ΔT

B. inversely proportional to ΔT

C. proportional to $|\alpha_B - \alpha_C|$

D. inversely proportional to $|\alpha_B - \alpha_C|$

Answer: B::D

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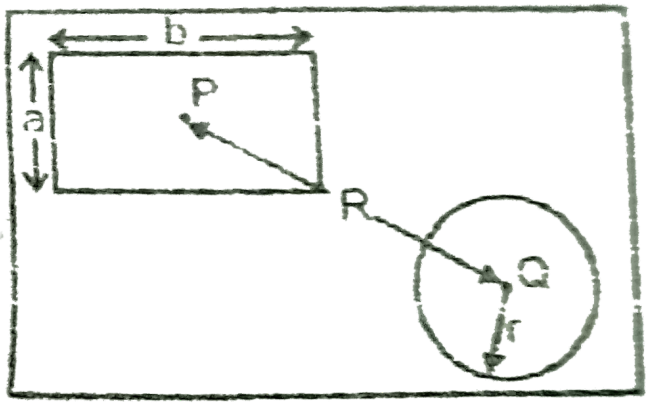
51. There is a rectangular metal plate in which two cavities in the shape of rectangle and circle are made, as shown with dimensions. P and Q are the centres of these cavities. On heating the plate, which of the following quantities

increases?



A. πr^2

B. ab

C. R

D. b

Answer: A::B::C::D

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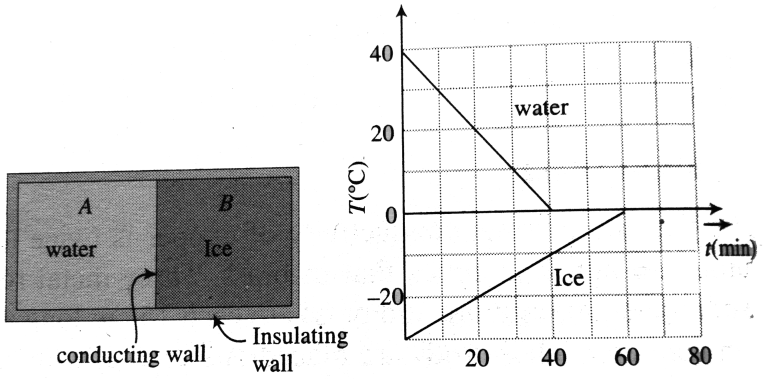

52.

A 0.60 kg sample of water and a sample of ice are placed in two compartmetnts A and B separated by a conducting wall, in a thermally insulated container. The rate of heat transfer from the water to the ice through the conducting wall is constant P, until thermal equilibrium is reached. The temperature T of the liquid water and the ice are given in graph as functions of time t. Temperature of the compartments remain homogeneous during whole heat transfer process. Given specific heat of ice $= 2100 J/kg - K$

, specific heat of water $= 4200 J/kg - K$, and latent heat of fusion of ice $= 3.3 \times 10^5 J/kg$.

A. $42.0W$

B. $36.0W$

C. $21.0W$

D. $18.0W$

Answer: A

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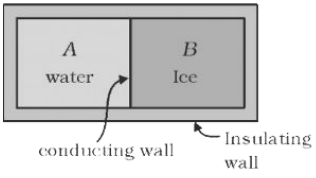
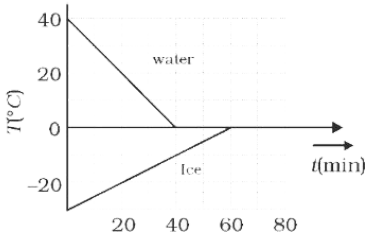
53. A 0.60 kg sample of water and a sample of ice are placed in two compartments A and B separated by a conducting wall, in a thermally insulated container. The rate of heat transfer from the water to the ice through the conducting

wall is constant P, until thermal equilibrium is reached. The temperature T of the liquid water and the ice are given in graph as functions of time t. Temperature of the compartments remain homogeneous during whole heat transfer process. Given specific heat of ice $= 2100 J/Kg - K$, specific heat of water $= 4200 J/kg - K$ and latent heat of fusion of ice $= 3.3 \times 10^5 J/kg.$





The initial mass of the ice in the container is equal to :

A. $0.36kg$

B. $1.2kg$

C. $2.4kg$

D. $3.6kg$

Answer: C

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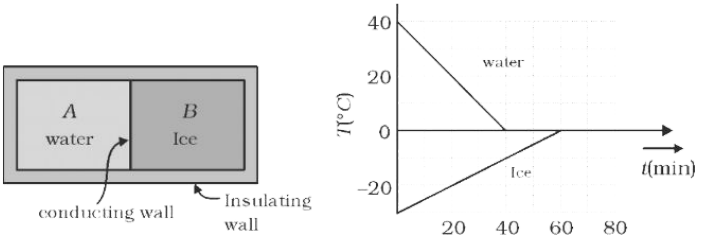
54. A 0.60 kg sample of water and a sample of ice are placed in two compartments A and B separated by a conducting wall, in a thermally insulated container. The rate of heat transfer from the water to the ice through the conducting wall is constant P, until thermal equilibrium is reached. The temperature T of the liquid water and the ice are given in graph as functions of time t. Temperature of the compartments remain homogeneous during whole heat transfer process. Given specific heat of ice $= 2100J/Kg - K$, specific heat of water

$= 4200 J/kg - K$ and latent heat of fusion of ice $= 3.3 \times 10^5 J/kg.$



The mass of the ice formed due to conversion from the water till thermal equilibrium is reached is equal to :

A. $0.12kg$

B. $0.15kg$

C. $0.25kg$

D. $0.40kg$

Answer: B

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55. In a container of negligible heat capacity, $200gm$ ice at $0^\circ C$ and $100gm$ steam at $100^\circ C$ are added to $200gm$ of water that has temperature $55^\circ C$. Assume no heat is lost to the surroundings and the pressure in the container is constant $1.0atm$. (Latent heat of fusion of ice $= 80cal/gm$, Latent heat of vaporization of water $= 540cal/gm$, Specific heat capacity of ice $= 0.5cal/gm - K$, Specific heat capacity of water $= 1cal/gm - K$)

What is the final temperature of the system ?

A. $48^\circ C$

B. $72^\circ C$

C. $94^\circ C$

D. $100^\circ C$

Answer: D

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56. In a container of negligible heat capacity 200 gm ice at 0° C and 100 gm steam at 100° C are added to 200 gm of water that has temperature 55° C. Assume no heat is lost to the surroundings and the pressure in the container is constant of

$1.0atm\left(L_f = 80cal/gm,\ L_v = 540cal/gm,\ s_w = 1cal/gm^\circ C\right)$

At the final temperature, mass of the total water present in the system, is

A. $472.6gm$

B. $483.3gm$

C. $483.6gm$

D. $500gm$

Answer: B

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57. In a container of negligible heat capacity, $200gm$ ice at $0^\circ C$ and $100gm$ steam at $100^\circ C$ are added to $200gm$ of water that has temperature $55^\circ C$. Assume no heat is lost to the surrpundings and the pressure in the container is constant $1.0atm$. (Latent heat of fusion of ice $= 80cal/gm$, Latent heat of vaporization of water $= 540cal/gm$, Specific heat capacity of ice $= 0.5cal/gm - K$, Specific heat capacity of water $= 1cal/gm - K$)

Amount of the steam left in the system, is equal to

A. $16.7gm$

B. $12.0gm$

C. $8.4gm$

D. $0gm$, as there is no steam left.

Answer: A

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58. The amount of heat required to change the state of 1 kg of substance at constant temperature is called

A. kilocal

B. calorie

C. specific heat

D. latent heat

Answer: D

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59. The water equivatent of a 400 g copper calorimeter (specific heat $= 0.1 \text{cal} / g^{\circ} C$)

A. 40 g

B. 4000 g

C. 200 g

D. 4g

Answer: A

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60. Heat required to convert 1 g of ice at $0^\circ C$ into steam at $100^\circ C$ is

A. 100 cal

B. $0.01 cal/^\circ C$

C. 720 cal

D. 1 kilocal

Answer: C

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61. Thermal capacity of 40 g of aluminium $(s = 0.2 cal/g - K)$ is

A. $40cal/^{\circ}C$

B. $160cal/^{\circ}C$

C. $200cal/^{\circ}C$

D. $8cal/^{\circ}C$

Answer: D

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62. Boiling water is changing into steam. Under this condition, the specific heat of water is

A. zero

B. one

C. infinite

D. less than one

Answer: C

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63. One kg of ice at $0^\circ C$ is mixed with 1 kg of water at $10^\circ C$.

The resulting temperature will be

A. between $0^\circ C$ and $10^\circ C$

B. $0^\circ C$

C. less than $0^\circ C$

D. greater than $0^\circ C$

Answer: B

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64. A metallic ball and highly stretched spring are made of the same material and have the same mass. They are heated so that they melt. The latent heat required

A. Are the same for the

B. is greater fore the ball

C. is greater for the spring

D. For the two may or may not be the same depending upon the metal

Answer: A

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65. If a bimetallic strip is heated, it will

A. bend towards the metal with lower themal expansion coefficient.

B. bend towards the metal with higher thermal expansion coefficient.

C. twist itself into helix.

D. have no bending.

Answer: A

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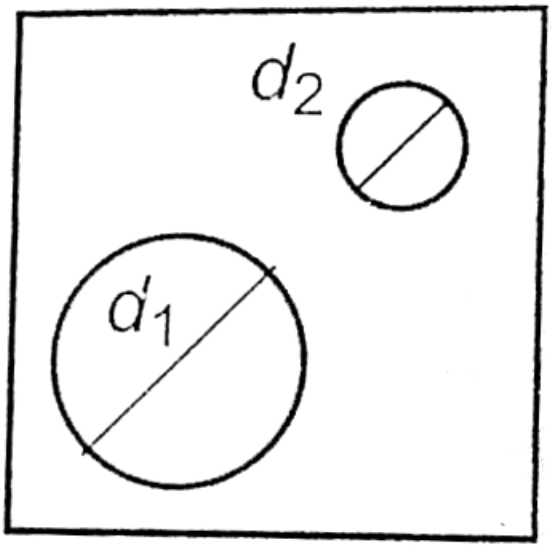
66. Two holes of unequal diameters d_1 and $d_2(d_1 > d_2)$ are cut in metal sheet is heated



A. Both d_1 and d_2 wil decreases

B. Both d_1 and d_2 will increases

C. d_1 will increase d_2 will increases

D. d_1 will decreases, d_2 will increases

Answer: B

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67. A metallic bar is heated from $0^{\circ}C$ to $100^{\circ}C$. The coefficient of linear expansion is $10^{-5}K^{-1}$. What will be the percentage increase in length

A. $0.01\,\%$

B. $0.1\,\%$

C. $1\,\%$

D. $10\,\%$

Answer: B

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68. A pendulum clock has an iron pendulum 1 m long $\left(\alpha_{\text{iron}} = 10^{-5}/^{\circ}C\right)$. If the temperature rises by $10^{\circ}C$, the clock

A. will lose 8 seconds per day

B. will lose 4.32 seconds per day

C. will gain 8 seconds per day

D. will gain 4.32 second per day

Answer: B

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69. If the length of a cylinder on heating increases by 2%, the area of its base will increase by

A. $0.5\ \%$

B. $2\ \%$

C. $1\ \%$

D. $4\ \%$

Answer: D

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70. The volume of a solid decreases by 0.6% when it is cooled through $50^\circ C$. Its coefficient of linear expansion is

A. $4 \times 10^{-6} K$

B. $5 \times 10^{-5} K$

C. $6 \times 10^{4} K$

D. $4 \times 10^{-5} K$

Answer: D

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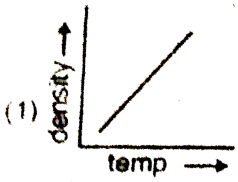
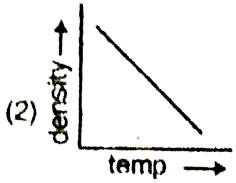
71. Which of the following curve represent variation of density of water with temperature best-

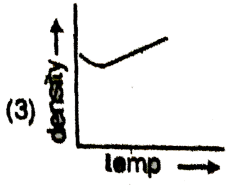
A.



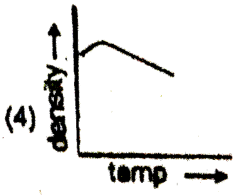
B.



C.



D.



Answer: D

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72. A rectangular block is heated from $0^{\circ}C$ to $100^{\circ}C$. The percentage increases in its length is 0.10 % what will be the percentage increases in it volume ?

A. $0.03\ \%$

B. $0.10\ \%$

C. $0.30\ \%$

D. none of these

Answer: C

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73. A thin copper wire of length l increases in length by 1% when heated from $0^\circ C$ to $100^\circ C$. If a then copper plate of area $2l \times l$ is heated from $0^\circ C$ to $100^\circ C$, the percentage increases in its area will be

A. 1%

B. 2%

C. 3%

D. 4%

Answer: B

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74. A liquid with coefficient of volume expansion γ is filled in a container of a material having coefficient of linear expansion α . If the liquid overflows on heating, then

A. $\gamma > 3\alpha$

B. $\gamma < 3\alpha$

C. $\gamma = 3\alpha$

D. none of these

Answer: A

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75. A different of temperature of $25^\circ C$ is equivalent to a difference of

A. $45^\circ F$

B. $72^\circ F$

C. $32^\circ F$

D. $25^\circ F$

Answer: A

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76. Statement-1: Gas thermometers are more sensitive than liquid thermometers.

Statement-2: Coefficient of thermal expansion of gases is more than liquid.

A. Statement-1 is true, Statement-2: is true, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is true, Statement-2: is true, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is true but statement-2 is false

D. Statement-1 is false, Statement-2 is true

Answer: A

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