PHYSICS

BOOKS - MBD

THERMAL PROPERTIES OF MATTER

Example

1. What is heat?

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2. Whta is temperature?

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3. When a object is heated, what physical changes are observed?

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4. What is the name of temperature measuring device?

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5. What is the principle of a Thermometer?

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6. Can a substance contract on heating?

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7. Are coefficients of thermal expansion constant for a given solid?

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8. If the temperature of a body rises through $1^{\circ} C$, what will be change on kelvin scale?

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9. What is lowest possible temperature?

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10. How many joules are there in 1 calories?

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11. What is the highest value of density of water?

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12. Do water and ice have the same specific heats?

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13. What should be the properties of a thermometric substance?

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14. At what temperature, the density of water is maximum?

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15. What is S.I. unit of specific heat?

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16. What is the value of specific heat of water in S.I. units?

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17. What is the principle of calorimetery?

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18. The temperature of a gas is incrased by $12^{\circ} C$. What is the corresponding change on kelvin scale?

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19. Of metal and alloy, which has greater value of temperature coefficient?

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20. What is the realtion between α, β and γ?

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21. What is thermal conductivity of a perfect heat conductor and perfect heat insulator?

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22. Which metal is a good conductor of electricity and heat ?

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23. Which is the only way of heat transfer through a solid?

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24. In which method of heat transfer, gravity does not play any role?

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25. There is a hole in a metal disc . What happens to the size of the hole if metal disc is heated?

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26. At what temperature will wood and iron appears equally hot or equally cold?

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27. How does the heat energy from the sun reaches earth?

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28. Why thick glass tumbler cracks when boiling liquid is put in it?

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29. Why a gas is cooled when expanded?

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30. Why people in desert wear heavy clothes?

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31. Which mode of transfer of heat is quickest?

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32. What is the basic condition for Newton's law of cooling to be obeyed?

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33. Stainless steel cooking pans are preferred with extra copper bottom. Why?

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34. What is the difference between rate of cooling and rate of loss of heat?

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35. Why after some time shining metal articles become dull?

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36. The triple points of neon and carbon dioxide are $24.57k$ and $216.55K$ respectivley. Express these temperatures on the Celsius and Fahrenheit scales.

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37. Two absolute scals A and B have triple points of water defined to be 200 A and 350 B. What is the relation between T_A and T_B?

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38. The electrical resistance in ohms of any specimen of material varies with temperature according to the approximate law.

$R - R_0\left[1 + 5 \times 10^{-3}(T - T_0)\right]$ The resistance is 101.6Ω at triple point of water and 165.5 at normal meting point of head

(600.5K). What is the temperature when the resistance is 123.4Ω?

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39. Answer the following

The triple-point of water is a standard fixed point in modern thermometry, why? What is wrong in taking the melting point of ice and the boiling point of water as standard point 1 as was originally done in the celsius scale?

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40. Answer the following

There were two fixed points in the original celsius scale as mentioned above which were assigned the number $0^{\circ}C$ and $100^{\circ}C$ respectively. On the absolute scale, one of the fixed points is the triple point of water which on the kelvin absolute scale is assigned the number 273.16 K. What is the other fixed point on this (kelvin) scale?

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41. Answer the following

The absolute temperature (kelvin scale) T is related to the temperature T_C on the celsius scale by $T_C = T - 273.15$. Why do we have 273.15 in this relation and not 273.16?

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42. Answer the following

What is the temperature of the triple point of water on an absolute scalw whose unit

interval size is equal to that of the Fahrenheit scale?

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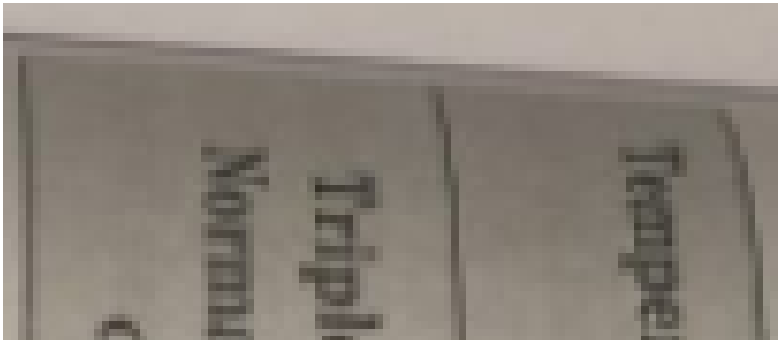
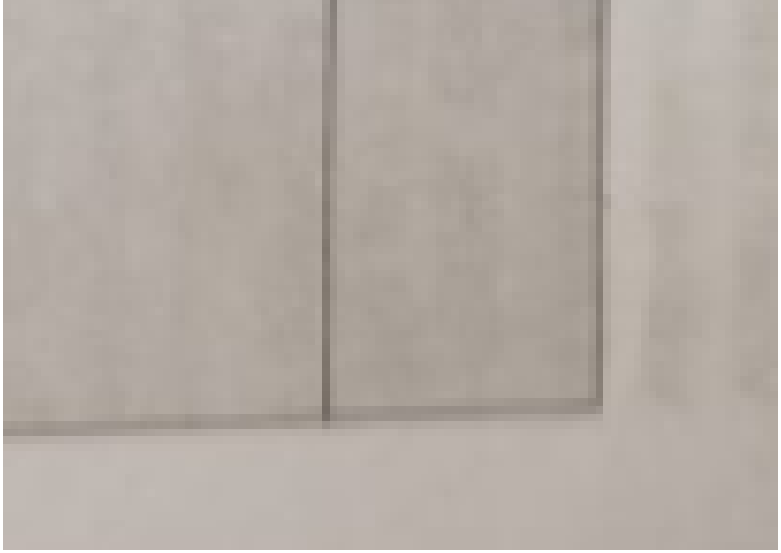
43. Two ideal gas thermometers A and B use oxygen and hydrogen respectively. The following observation are made. What is the absolute temperature of normal melting point of sulphur as read by thermometers A and B?:



rature	Press Ther
e point of water al melting-point of sulphur	1·250 1·757

observations are made :

sure mometer A	Pressure Thermometer B
$\times 10^5$ Pa $\times 10^5$ Pa	0-200 $\times 10^5$ Pa 0-287 $\times 10^5$ Pa.



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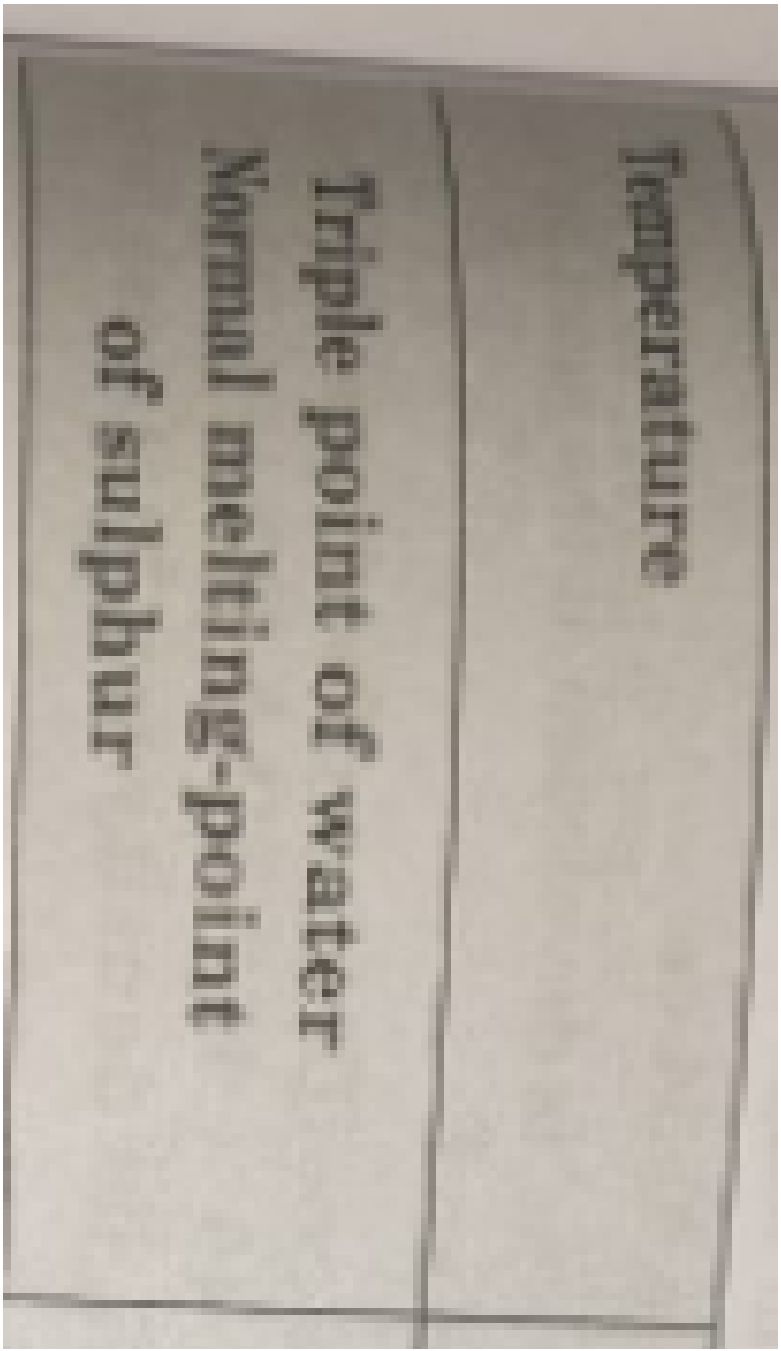
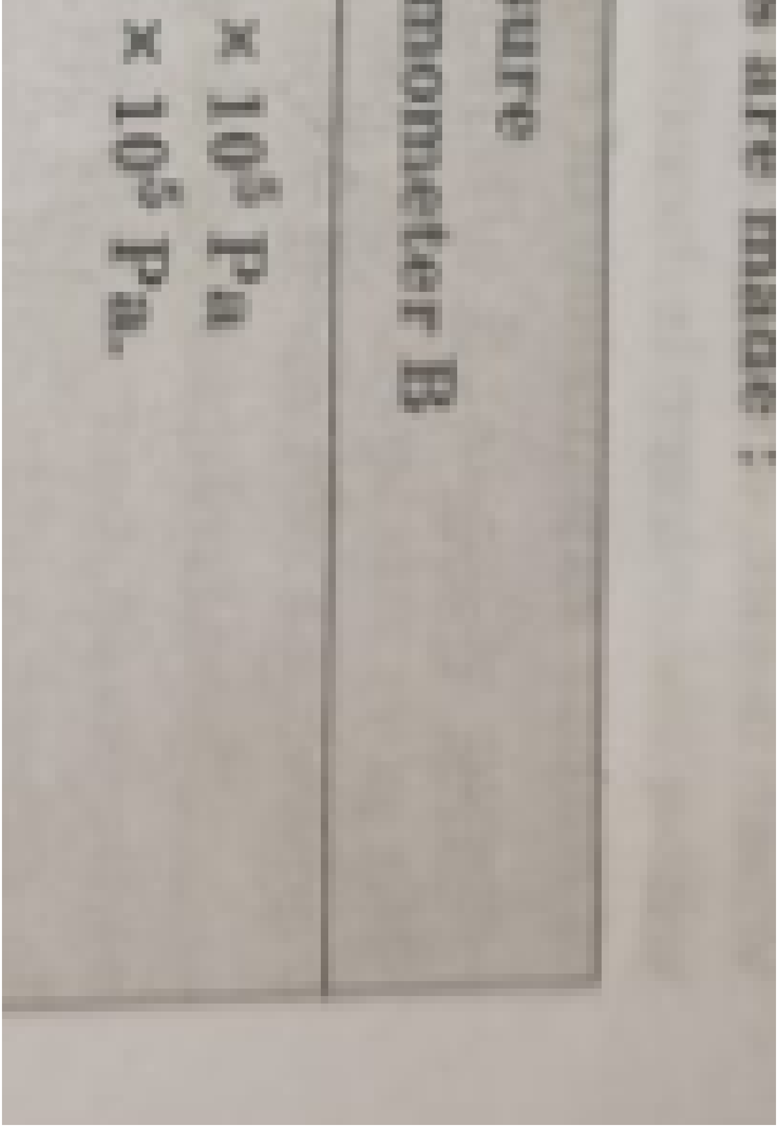
44. Two ideal gas thermometers A and B use oxygen and hydrogen respectively. The following observation are made: What do you think to the reason for slightly different

answers from A to B? (The thermometers are not faulty).



Pressure Thermometer A	Press Therm
$1{\cdot}250 \times 10^5$ Pa	0·200
$1{\cdot}757 \times 10^5$ Pa	0·287


sure
nometer B
× 10^5 Pa
× 10^5 Pa.

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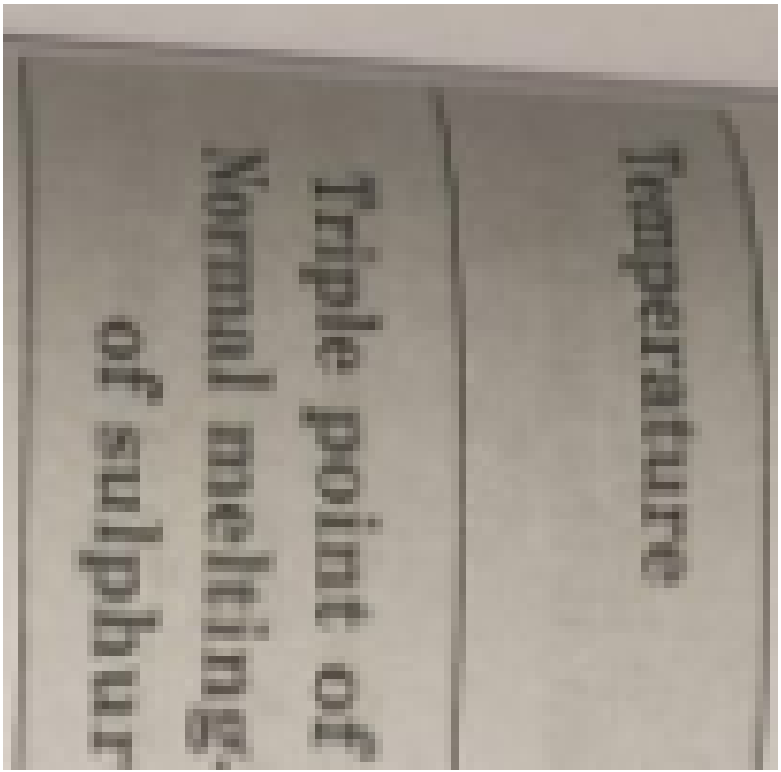
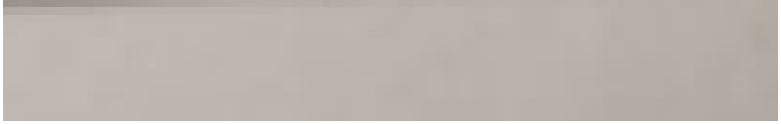
45. Two ideal gas thermometers A and B use oxygen and hydrogen respectively. The following observation are made: What further procedure is needed in the experiment to reduce the discrepancy between the two readings?



	Pressure Thermometer A
water -point	$1{\cdot}250 \times 10^5$ Pa $1{\cdot}757 \times 10^5$ Pa

...s observations are made :

	Pressure Thermometer B
	0-200 × 10^5 Pa 0-287 × 10^5 Pa.



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46. A steel tape 1 metre long is correctly calibrated for temperature of $27.0^{\circ}C$. The length of a steel rod measured by this tape is found to be 63.0 cm on a h ot day when the temperature is $45^{\circ}C$. What is the actual length of the steel rod on that day? What is the length of the same steel rod on a day when the temperature is $27.0^{\circ}C$? Coefficient

of linear expansion of steel $= 1.20 \times 10^{-5} C^{-1}$.

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47. A large steel wheel is to be fitted on a shaft of the same material . At $27^{\circ} C$, the outer diameter of the shaft is 8.70 cm and the diameter of the central hole in the wheel is 8.69 cm. The shaft is cooled using 'dry ice'. At what temperature of the shaft does the wheel slip on the shaft? Assume coefficient of linear

expansion of the steel is to be constant over the required temperature range : $\alpha_{steel} = 1.20 \times 10^{-5} K$.

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48. A hole is drilled in a copper sheet. The diameter of the hole is 4.24 cm at $27^{\circ} C$. What is the change in the diameter of the hole when the sheet is heated to $227^{\circ} C$? Coefficient of linear expansion of copper $= 1.70 \times 10^{5}$ ^ $\circ C^{-1}$.

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49. A brass wire 1.8 m long at $27^\circ C$ is held when taut with little tension between two rigid supports. If the wire is cooled to a temperature - $39^\circ C$, what is the tension developed in the wire, if tis diameter is 2.0 mm? Coefficient of linar expansion of brass $= 2.0 \times 10^5$ ^ $\circ C^{-1}$, Young's modulus of brass $= 0.91 \times 10^{11} Pa$.

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50. A brass rod of length 50 cm and diameter 3.00 mm is joined to a steel rod of the same length and diameter. What is the change in length of the combined rod at $250^{\circ}C$, if the original lengths are at $40.0^{\circ}C$? Is there a 'thermal stress' developed at the junction? The ends of the rod are free to expand coefficent of linear expansion of brass $= 2.0 \times 10^{-5}$ ^ $\circ C^{-1}$, steel $= 1.2 \times 10^{-5}$ ^ $\circ C^{-1}$).

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51. The coefficient of volume expansion of glycerine is 49×10^{-5} ^ $\circ C^{-1}$. What is the fractional change in its density for $30^{\circ} C$ rise in temperature?

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52. 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 $= 0.91 Jg^{-1} \hat{} \circ C^{-1}$

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53. A coper block of mass 2.5 kg is heated in a furnace to a temperature of $500^{\circ} C$ and then placed on a large ice block. What is the maximum amount of ice that can melt? (specific heat of copper $= 0.39 Jg^{-1} C^{-1}$, heat of fusion of watter =$335 Jg^{-1}$).

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54. In a experiment on the specific heat of a metal, a 0.20 kg block of the metal at $150^{\circ} C$ is dropped in a copper calorimeter (of water equivalent 0.025 kg) containing 150 cc of water at $27^{\circ} C$. The final temperature is $40^{\circ} C$. Compute the specific heat of the metal. If heat losses to the surroundings are not negligible, is your answer greater or smaller than the actual value for specific heat of the metal?

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55. Answer the following questions based on the P-T phase diagram of carbon dioxide:

At what temperature and pressure can the solid, liquid and vapour phases of CO_2 co-exist in equilibrium?

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56. Answer the following questions based on the P-T phase diagram of carbon dioxide:

What is the efect of decrease of pressure on the fusion and boiling point of CO_2?

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57. Answer the following questions based on the P-T phase diagram of carbon dioxide:

What are the critical temperature and pressure for $CO_{\circ}$? What is their significance?

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58. Answer the following questions based on the P-T phase diagram of CO_2

CO_2 at 1 atm pressure and temperature $60^\circ C$ is compressed isothermally. Does it go through a liquid phase?

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59. Answer the following questions based on the P-T phase diagram of CO_2

What happens when CO_2 at 4 atm pressure is

cooled from room temperature at constnat pressure?

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60. Answer the following questions based on the P-T phase diagram of CO_2

Describe qualitatively the changes in a given mass of solid CO_2 at 10 atm pressure and temperature $-65^\circ C$ as it is heated upto room temperature at constant pressure.

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61. Answer the following questions based on the P-T phase diagram of CO_2

CO_2 at 1 atm pressure and temperature $60^\circ C$ is compressed isothermally. Does it go through a liquid phase?

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62. A child running a temperature of $101^\circ F$ is given an antipyrin (i.e. a medicine that lowers fever) which causes an increase in the rate of

evaporation of sweat from his body. If the fever is brought down to $98^{\circ}F$ in 20 min., What is the average rate of extra evaporation caused by the drug ? Assume the evaporation mechanism to be the only way by which heat is lost. The mass of the child is 30 kg. The specifric heat of human body is approximately the same as that of water, and latent heat of evaporation of water at that temperature is aout $580 cal g^{-1}$.

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63. A thermocole box is a cheap and effieicnet method for storing small quantity of cooked food in summer in particular. A cubical box of side 30 cm has a thickness of 5 cm. If 4 kg of ice are put in a box. Estimate the amount of ice remaining after 6 h. The outside temperature $45^{\circ}C$, and coefficient $K = 0.01Js^{-1}m^{-1}k^{-1}$ [Heat of fusion of water $= 335 \times 10^{3}Jkg^{-1}$].

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64. A brass boiler has a base area of $0.15m^2$ and thickness 1.0 cm. It boils water at the rate of 6.0 kg/min. When placed on a gas stove. Estimate the temperature of the part of the flame in contact with boiler. Thermal conductivity of brass $= 109js^{-1}m^{-1}\hat{}\circ C^{-1}$.

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65. Explain why:

A body with large reflecting is a poor emitter.

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66. Explain why:

A brass tumbler feels much colder than a wooden tray on a chilly day.

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67. Explain why:

An optical pyrometer (for measuring high temperature) calibrated for an ideal black body radiation gives too low value for the temperature of a red hot iron piece in the open, but gives a correct value for the temperature when the same piece is in the furnace.

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68. Explain why:

The earth without its atmosphere would be in hospitably cold.

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69. Explain why:

Heating systems based on circulation of steam are more efficient in warming a building than those based on circulation of hot water.

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70. A body cools from $80^\circ C$ to $50^\circ C$ in 5 minuts. Calculate the time it takes to cool from $60^\circ C$ to $30^\circ C$. The temperature of surrounding is $20^\circ C$.

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71. A bimetallic strip is made of aluminium and steel $(\alpha_A > \alpha_{steel})$. On heating, the strip will

A. remain straight,

B. get twisted

C. will bend with aluminium on concave side

D. will bend with steel on concave side.

Answer:

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72. A uniform metallic rod rotates about its perpendicular bisector with constant angular

speed. If it is heated uniformly to raise its temperature slightly

A. its speed of rotation increases

B. its speed of rotation decreases

C. its speed of rotation remains same

D. its speed increases because it moment of inertia increases.

Answer:

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73. An aluminium sphere is dipped into water. Which of the following is true?

A. Buoyancy will be less in water at $0^\circ C$ than that in water at $4^\circ C$.

B. Buoyancy will be more in water at $0^\circ C$ than that in water at $4^\circ C$.

C. Buoyancy in water at $0^\circ C$ will be same as that in water at $4^\circ C$.

D. Buoyancy may be more or less in water at $4^\circ C$ depending on the radius of the

sphere.

Answer:

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74. As the temperature is increased, the time period of a pendulum

A. increased as its efective length increases eventhoguh its centre of mass still remains at the centre of the bob.

B. decreases as its effective length increases even though its centre of mass still remains at the centre of the bob

C. increases as its effective length increases due to shifting of centre of mass below the centre of the bob.

D. decreases as its effective length remains same but the centre of mass shifts above the centre of the bob.

Answer:

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75. Heat is associated with

A. kinetic energy of random motion of molecules.

B. kinetic energy of orderly motionof molecules.

C. total kinetic energy of random and orderly motion of molecule

D. kinetic energy of random motion in some cases and kinetic energy of orderly motion in other.

Answer:

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76. The radius of a metal sphere at room temperature T is R, and the coefficient of linear expansion of the meta is α. The sphere is heated a little by a temperature ΔT so that

its new temperature is $T + \Delta T$. The icnrease in the volume of the sphere is approximately

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

B. $\pi R^2\alpha\Delta T$

C. $4\pi R^3\alpha\Delta T/3$

D. $4\pi R^3\alpha\Delta T$

Answer:

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77. A sphere, a cube and a thin circular plate, all of same material and same mass are initially heated to same hgih temperature.

A. Plate will cool faxstest and cube the slowest

B. sphere will cool fastest and cube the slowest.

C. Plate will cool fastest and sphere the slowest

D. Cube will cool fastest and plate the slowest

Answer:

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78. Mark the correct options

A. A system X is in the thermal equilibrium with Y but not with Z. System Y and Z

may be in thermal equilibrium with each other

B. A system X is in thermal equilibrium with Y but not with Z. Systems Y and Z are not in thermal equilibrium with eachother.

C. A system X is neither in thermal equilibriumn with Y nor with Z. The system Y and Z must be in thermla equilibrium with each other

D. A system X is neither in thermal equilibrium with Y nor with Z. The system Y and Z may be in thermal equilibrium with each other.

Answer:

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79. Gulab Jamuns' (assumed to be spherical) are to be heated in an oven. They are available intwo sizes, one twice bigger (in radius) than

the other. Pizzas (assumed to be discs) are also to be heated in oven. They are also in two sizes, one twice bgi (in radius) than the other. All four are put together to be heated to oven temperature. Choose the correct option from the following

A. Both size gulab jamuns will get heated in the same time

B. Smaller gulab jamuns are heated before the bigger one

C. Smaller pizzas are hated before bigger ones.

D. Bigger pizzas are heated before smaller one.

Answer:

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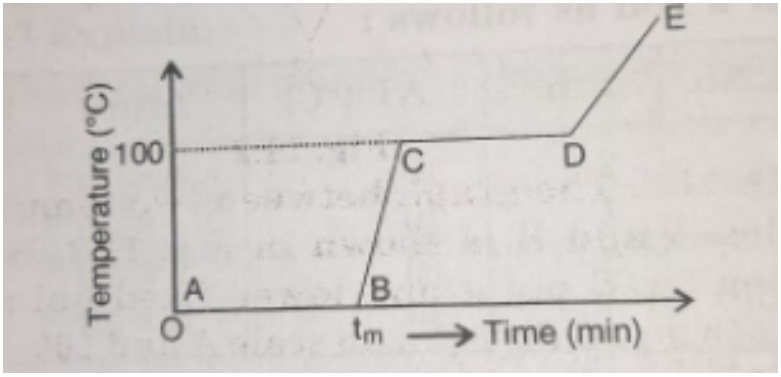
80. Refer to the plot of temperature versus time (shown in the figure) showing the changes in the state of ice on heating (not to

scale).



Which of the following is correct?

A. The region AB represents ice and water in thermal equilibrium

B. At B water starts boiling

C. At C all the water gets converted into steam.

D. C to D represents water and steam in equilibrium at boiling point.

Answer:

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81. A glass full of hot milk is pured on the table. It begins to cool gradually. Which of the following is incorrect?

A. The rate of cooling is constant till milk attains the temperature of the surrounding.

B. The temperature of milk falls off exponetially with time

C. While cooling, there is a flow of heat from milk to the surrounding as well as from surrounding to the milk but the net flow of heat is from milk to the surrounding and that is why it cools.

D. All three phenomenon, conduction, convectoin and radiation are responsible for the loss of heat from milk to the surroundings.

Answer:

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82. Is the bulb of a thermometer made of diathermic or adiabatic wall?

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83. A student records the initial length l, change in temperature ΔT and change in length Δl of a rod as follows: If the first observation is correct, what can you say about observations 2, 3 and 4?

S.No.	l(m)	ΔT (°C)	Δl(m)
1.	2	10	4×10^{-4}
2.	1	10	4×10^{-4}
3.	2	20	2×10^{-4}
4.	3	10	6×10^{-4}

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84. Why does a metal bar appear hotter than a wooden bar at the same temperature? Equivalently it also appears cooler than wooden bar if they are both colder than room temeperature.

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85. Calculate the temperature which has same numerical value on Celsius and Fahrenheit scale.

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86. These days people use steel utensils with copper bottom. This is supposed to be good for uniform heating of food. Explain this effect using the fact that copper is the better conductor.

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87. Find out the increase in moment of inertia I of a uniform rod coefficient of linear

expansion α about its perpendicular bisector when its temperature is slightly increased by ΔT.

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88. During summers in India, one of the common practice to keep cool is to make ice balls of crushed ice, dip it in flavored sugars syrup and sip it. For this a stick is inserted into cursched ice and its squeezed in the palm to make it into the ball. Equivalently in winter, in

those areas where it snows, people make snow balls and throw around. Explain the formation of ball out of crushed ice or snow in light of P-T diagram of water.

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89. 100 g of water is supercooled to $-10^{\circ}C$. At this point, due to some disturbance mechanised or otherwise some of its suddenly freeazes to ice What will be the temperature of the resultant mixture and how much mass

would freeze?

$(S_W = 1cal/g/^\circ C$ and $L_{Wfusion}$ = 80 cal/g].

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90. One day in the morning, Ramesh filled up $\frac{1}{3}$ bucket of hot water from geyser, to take bath. Remaining 2.3 was to be filled by cold water (at room temperature) to bring mixture to a comfortable temperature. Suddenly Ramesh had to attend to something which would take some time say 5 - 10 minutes

before he could take bath. Now the he had two options:

(i) fill the remaining bucket completely by cold water and then attend to the work, (ii) first attend to the work and fill the remaining bucket just before taking bath. Which option do you think would have kept water warmer ? Explain.

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bucket just before taking bath. Which option do you think would have kept water warmer ? Explain.

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92. We would like to prepare a scale whose length does not change with temperature. It is proposed to prepare a unit scale of this type whose length remains, say 10 cm. We can use a bimetallic strip made of brass and iron each of different length whose length (both

components) would change in such a way that difference between their lengths remains constant. Ifalpa_(iron = 1.2 xx 10^-5 //K and alpha_(brass = 1.8 xx 10^-5//K`, what should we take as length of each strip?

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93. We would like to make a vessel whose volume does not change with temperature. We can use brass and iron $\left(\beta_{brass} = 6 \times 10^{-5} / k\right.$ and

$\beta_{iron} = 3.55 \times 10^{-5}/k)$ to create a volume of 100 cc. How do you think you can achieve this.

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94. Calculate the stress developed inside a tooth cavity filled with copper when hot tea at tempreature of $57^{\circ}C$ is drunk. You can take bdy (tooth) temperature ot be $37^{\circ}C$ and $\alpha = 1.7zz10^{-5}/^{\circ}C$, bulk modulus for copper $= 140 \times 10^{9} N/m^{2}$.

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95. A thin rod having length L_0 at $0^\circ C$ and coefficient of lineare expansion α has its two ends maintained at temperatures θ_1 and θ_2, respectivley. Find its new length.

Watch Video Solution

96. According to Stefan's law of radiation, a black body radiates energy σT^4 from its unit surface area every second where T is the

surface temperature of the black body and $\sigma = 5.67 \times 10^{-8} W / m^2 K^4$ is known as Stefan's constant. A nuclear weapon may be thought of as a ball of radius 0.5 m. When detonated, it reaches temperature of $10^6 K$ and can be treated as a black body.

Estimate the power it radiates

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Estimate the power it radiates

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99. Which of the following has the highest specific heat?

A. Copper

B. Water

C. Hydrogen

D. Silver

Answer:

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100. Boiling water is changing into steam . The specific heat of boiling water is

A. Zero

B. One

C. Infinity

D. Less than one.

Answer:

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101. One gram of ice at $0^\circ C$ is aded to 5 gram of water at $10^\circ C$. Final temperature of the mixture is

A. $-5^\circ C$

B. $5^\circ C$

C. $0^\circ C$

D. None of these

Answer:

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102. An iron ball is heated. The percentage increase will be largest in

A. Diameter

B. Volume

C. Surface area

D. Density

Answer:

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103. Coefficient of cubical expansion of water

A. $0^\circ C$

B. $4^\circ C$

C. $15.5^\circ C$

D. $100^\circ C$

Answer:

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104. 540 g of ice at $0^\circ C$ is mixed with 540 g of water at $80^\circ C$. The final tempreature of the mixture in $\circ^C$ will be

A. $40^\circ C$

B. 79.9°

C. $0^\circ C$

D. $80^\circ C$

Answer:

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105. A body takes 10 minutes to cool from $60^\circ C$ to $50^\circ C$. If the temperature of surrounding s is $25^\circ C$, then temperature of body after next 10 minutes will be

A. $48^\circ C$

B. $46^\circ C$

C. $49^\circ C$

D. $43^\circ C$

Answer:

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106. Dimensional formula of specific heat capaicty is

A. $\left[ML^2T^{-2}k\right]$

B. $\left[ML^2T^{-2}K^{-1}\right]$

C. $\left[MLt^{-2}K^{-1}\right]$

D. $\left[M^0L^2T^{-2}K^{-1}\right]$

Answer:

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107. Boiling point of water

A. increases with the decrease in pressure

B. increases with the increase in pressure

C. decreases with te increase in pressure

D. remains the same with increase in pressure.

Answer:

Watch Video Solution

108. Two spheres are made of same metal had and have same mass. One is solid and the other is hollow. When heated to the same temperature, percentage increase in diameter will be

A. more for hollow sphere

B. less for hollow sphere

C. same for both

D. cannot say

Answer:

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109. The specific heat of an ideal gas varies with temperature T as

A. T^1

B. T^2

C. T^{-1}

D. T^0

Answer:

Watch Video Solution

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

A. Conduction

B. Convection

C. Radiation

D. All these

Answer:

Watch Video Solution

111. It is hotter at some distance over the fire than in front of it, because:

A. heat is radiated upwards only

B. convection of het occurs downwards only

C. air conducts heat upwards only

D. convection of heat occurs upwards only.

Answer:

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112. The dimensional formula of coefficient of thermal cnductivity is

A. $\left[M^1L^1T^{-3}K^{-1}\right]$

B. $\left[M^1L^2T^2K^{-1}\right]$

C. $\left[M^1L^1T^{-3}k^{-4}\right]$

D. $\left[M^1L^0T^{-2}K^{-1}\right]$

Answer:

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113. Steam at $100^{\circ}C$ is moe dangerous than the same mass of water at $100^{\circ}C$ because

A. steam contains more internal energy

B. steam moves faster than water

C. steam is less dense than water

D. steam has a higher specific heat capacity than water.

Answer:

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114. Which mode of transfer of heat is quickest?

A. Conduction

B. Convection

C. Radiation

D. (A) and (B)

Answer:

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115. Solids are heated by the mode of

A. Conduction

B. Convection

C. Radiation

D. None of these

Answer:

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116. If m is the mass, θ is temperature and c is spedific heat, then thermal capacity k is given by

A. $k = mc\theta$

B. $k = m\theta$

C. $k = m\frac{c}{\theta}$

D. $k = mc$

Answer:

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117. The presence of gravitational field is required for the heat transfer by

A. stiring off liquid

B. Conduction

C. Natural covection

D. Radiation

Answer:

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118. According to Neton's law of cooling, the rate of colling of a body is proportional to $(\Delta\theta)^n$, where $\Delta\theta$ is difference of temprature of the body and the surroundings, and n is equal to

A. 1

B. 2

C. 3

D. 4

Answer:

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119. Fill in the blanks:

The instrument used to measure tempreature is called _____.

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120. What is the realtion between α, β and γ?

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121. Fill in the blanks:

_____ expand most on heating.

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122. Fill in the blanks:

_____ have no definie shape but have definite volume.

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123. Fill in the blanks:

Water has ____density at $4^{\circ} C$

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124. Fill in the blanks:

Unit of latent heat is _____.

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125. Fill in the blanks:

When a solid or liquid is heated through a small range of temperature its volume _____ (more or less) constant.

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126. What is the name of temperature measuring device?

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127. Define specific heat.

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128. Can specific heat of a gas be negative?

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129. Define coefficient of linear expansion of a solid.

Watch Video Solution

130. Define absolute zero.

Watch Video Solution

131. Are coefficients of thermal expansion constant for a given solid?

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132. What is the principle of calorimetery?

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133. Is it possible that there is no increase in the temperature of a body despite being heated?

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134. Do all bodies expand on heating?

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135. What is thermal capacity? Give its SI unit.

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136. What is water equivalent?

Watch Video Solution

137. Define latent heat.

Watch Video Solution

138. What is the realtion between α, β and γ?

Watch Video Solution

139. What is the value of J?

Watch Video Solution

140. Which is greater : C_p or C_v?

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141. Heat flows from a body at ____ temperature to that at _____ temeprature.

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142. Heat is a form of _____.

Watch Video Solution

143. The degree of _____ of a body is called its temperature.

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144. Thrmal capacity of a body and its water equivalent are _____ equal.

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145. Hat can be transferred rom one place to another by ____ ways.

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146. In the steady state, the rate of flow of heat through any section of a metal bar is ____.

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147. Distinguish between heat and work, and justify the statement that heat and work are interrelated.

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148. Define the following terms:

Critical temperature

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149. Which metal is used in thermometer?

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150. Ditinguish clearly between temperature and heat.

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151. Why a gas has two principal specific heat capacities?

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152. Why a gas has two principal specific heat capacities?

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153. Of what significance is the difference between these two specific heat capacities ratios?

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154. Prove that there is only one triple point.

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155. There are two spheres of same material and same radius at same temperature but one being solid while the other hollow. Which sphere will expand more if they are heated to the same temperature .

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156. There are two spheres of same material and same radius at same temperature but one being solid while the other hollow. Which

sphere will expand more if they are heated to the same temperature .

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157. Why do we pack ice in gunny bags?

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158. Why do Eskimos make double walled houses?

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159. On a winter night, you feel warmer when clouds cover the sky than when the sky is clear. Explain.

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160. Why do we wear woolen clothes in winter?

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161. The lid of a tea pot is provided with a hole, why?

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162. Two rods X and Y are of equal lengths. Each rod has its ends at temperature T_1 and T_2. What is the condition that will ensure equal rate of flow of heat through the rods X and Y?

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163. Explain different scales of temperature

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164. What is the effect of temperature on solids? And also define coefficients of linear, superficial and cubical expansion and write relation between them.

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165. Explain thermal expansion in terms of vibratory motion of atoms.

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166. Define calorie.

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167. Define Joule's Mechanical equivalent of heat.

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168. Define specific heat.

Watch Video Solution

169. How does specific heat vary with temperature.

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170. Define calorimetry. What is its principle?

Watch Video Solution

171. What do you mean by phases of a substance?

Watch Video Solution

172. Define equilibrium state.

Watch Video Solution

173. What is Evaporation ?

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174. Define a black body and explain how it can be realised in practice.

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175. State Stefan Boltzmann law for the black body radiation.

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176. What is the basic condition for Newton's law of cooling to be obeyed?

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177. What space must be left between two rails 60 m long so as to allow for an expansion upto $40^{\circ}C$ assuming that the rails are laid down at $15^{\circ}C$, $\alpha = 0.000012$?

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178. An ironring which is 1 m in diameter is to be shrunk on a pulley which is 1.005 m in diameter. If the temprature of the ring is $10^{\circ} C$, find the temperature to which it must be raised so as that it will just slip on the circumferences on the pulley, α for iron = 0.00012`.

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179. A metal plates 5 millimetre thick and 10 centimetre square has a temperature difference of $35^{\circ} C$ between its urfaces. If 1820 calories of heat are transimitted every second, what is the co-efficient of thermal conductivity of the metal?

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180. The opposite faces of a cubical block of iron and cross-section 4 sq. cm are kept in

contact with steam of melting ice. Calculate the amount of ice melted at the end of 10 minutes if $K = 0.2 cal cm^{-1} s^{-1} C^{-1}$ for iron.

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181. The heat of combustion of ethane gas is 373 K Cal per mole. Assuming that 50% of heat is lost, how many litres of ethane measured at S.T.P. must be burnt to convert 50 kg of water at $10^{\circ} C$ to steam at $100^{\circ} C$? One mole of gas

occupies 22.4 litres at S.T.P. Latent heat (L) of steam $= 2.25 \times 10^6 Jk^{-1}$.

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182. Calculate the heat of combustion of coal when 10 g of coal on burning raises the temperature of 2 litres of water from $20^\circ C \rightarrow 55^\circ C$.

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183. The coefficient of cubical expansion of mercury is 0.00018 and that of brass 0.00006 per deg C. If a barometer having a brass-scale were to read 74.5 cm at $30^{\circ}C$, find the true barometric height at $0^{\circ}C$. The scale is supposed to be correct at $15^{\circ}C$.

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184. A brass wire 1.8 m long at $27^{\circ}C$ is held when taut with little tension between two

rigid supports. If the wire is cooled to a temperature - $39^{\circ}C$, what is the tension developed in the wire, if tis diameter is 2.0 mm? Coefficient of linar expansion of brass $= 2.0 \times 10^{5}$ ^ $\circ C^{-1}$, Young's modulus of brass $= 0.91 \times 10^{11} Pa$.

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185. A cylinder of diameter exactly 1 cm at $30^{\circ}C$ is to be slided into a hole in a steel plate. The hole has a diameter of 0.99970 cm

at $30^{\circ}C$. To what temperature must the plate be heated? For steel $\alpha = 1.1 \times 10^{-5}$ ^ $\circ C^{-1}$

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186. A metal rod A of 25 cm length expands by 0.050 cm when its temprature is raised frmo $0^{\circ}C$ to $100^{\circ}C$. Another rod B of a different metal of length 40 cm expands by 0.040 cm for the same rise in temperature. A third rod C of 50 cm length is made up of pieces of rods A

and B placed end to end expands by 0.03 cm on heating from $0^{\circ}C$ to $50^{\circ}C$. Find the lengths of each portion of the composite rod C.

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Exercise

1. What is the value of Rydberg constant?

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2. What is an ideal gas ?

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3. Of metal and alloy, which has greater value of temperature coefficient?

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4. What is SI unit of coefficient fo linear expansion?

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5. Why is J called as conversion factor?

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6. Do water and ice have the same specific heats?

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7. Distinguish between heat and temperature.

Watch Video Solution

8. What is meant by the statement that heat is an energy in transit?

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9. Why are two ends of a long bridge generally kept on trolley?

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10. Define specific heat.

Watch Video Solution

11. A brass and an iron rod are each of one metre long at $0^\circ C$. Find the difference in their lengths at $100^\circ C$. Coefficient of linear expansion of brass is 0.000019 and of iron = 0.000012.

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12. What is meant by coefficient of linear expansion, superficial expansion and cubical expansion? Derive the relation between them.

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13. How is molar specific heat different from specific heat?

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14. Define calorimetry. What is its principle?

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