PHYSICS

BOOKS - NAVNEET SCIENCE (HINGLISH)

HEAT

Can You Recall

1. What is the difference between heat and temperature ?

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2. What are the different ways of heat transfer ?

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Fill In The Blanks And Rewrite The Sentences

1. The amount of water vapour in air is determined in terms of its . . ..

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2. If objects of equal masses are given equal heat, their final temperature will be different .This is due to difference in their . . ..

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3. When a liquid is getting converted into solid, the latent heat is . . ..

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Rewrite The Following Statements By Selecting The Correct Options

1. . . . . . is used to study the anomalous behaviour of water

A. Calorimeter

B. Joule's apparatus

C. Hope's apparatus

D. Thermos flask

Answer: Hope's apparatus

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2. When water boils and is converted into steam,then . . ..

A. heat is taken in and temperature remains constant

B. heat is taken in and temperature rises

C. heat is given out and temperature lowers

D. heat is given out and temperature remains constant.

Answer:

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3. When steam condenses to form water . . ..

A. heat is absorbed and temperature increases

B. heat is absorbed and temperature remains the same.

C. heat is given out and temperature decreases

D. heat is given out and temperature the same.

Answer:

4. The temperature of ice can be decreased below $0^{\circ} C$ by mixing . . .. in it.

A. saw dust

B. sand

C. salt

D. coal

Answer: salt

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5. Which of the following is true for ice / water?

A. expands on melting and contracts on freezing

B. contracts on melting and does not undergo change in volume on freezing.

C. contracts on melting and expands on freezing.

D. does not undergo any change in volume on melting or freezing

Answer:

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6. Heat abosorbed when 1 g of ice melts at $0^{\circ}C$ to form 1g of water at the same temperature is

A. 80

B. 800

C. 540

D. 54

Answer: 80

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7. The latent heat of vaporization of water is . . . . . .

A. $540 cal / g$

B. $800cal / g$

C. $80cal / g$

D. 54 cal//g `

Answer: $540cal / g$

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8. The latent heat of fusion of ice is . . ..

A. $540cal / g$

B. $80cal / g$

C. $800cal / g$

D. $4cal / g$

Answer: $80cal / g$

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9. If the temperature of water is decreased from $4^{\circ} C$ from $10^{\circ} C$,then its . . ..

A. volume decreases and density increases

B. volume increases and density decreases

C. volume decreases and density decreases

D. volume increases and density increases.

Answer: volume increases and density decreases.

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10. At $0^{\circ}C$, the density of water is . . ..

A. $10g/cm^3$

B. $4g/cm^3$

C. $4 \times 10^3 kg/m^3$

D. $1 \times 10^3 kg/m^3$

Answer: $1 \times 10^3 kg/m^3$

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11. The density of water is maximum at

. . ..

A. $0^\circ C$

B. $-4^\circ C$

C. $100^\circ C$

D. $4^\circ C$

Answer: $4^\circ C$

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12. . . .. heat is needed to raise the temperature of 1 kg of water from $14.5^\circ C$ to $15.5^\circ C$.

A. 4180J

B. 10^3J

C. 1 cal

D. 4180 cal

Answer: 4180 J

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13. . . . . . heat is needed to convert 1g of water at $0^\circ C$ and at a pressure of one

atmosphere into 1g of steam under the same conditions.

A. 80 cal

B. 540 cal

C. 89 J

D. 540 J

Answer: 540 cal

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14. Water expands on reducing its temperature below . . .. $^{\circ} C$.

A. 0

B. 4

C. 8

D. 12

Answer: 4

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State Whether The Following Statements Are True Or False If A Statement Is False Correct It And Rewrite It

1. Specific latent heat of fusion is expressed in $g/cal.$

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2. If the temperatureof water is raised from $0^\circ C$ to $10^\circ C$, its volume goes on increasing.

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3. At dew point relative humidity is $100\ \%$.

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4. 1kcal =4.18 joules.

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5. Specific heat capacity is expressed in cal $/g.^{\circ}\ C$

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6. Latent heat of fusion, $Q = mL$.

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7. If the relative humidity is more than $60\,\%$, we feel that the air is humid.

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8. If the relative humicity is less than $60\ \%$,we feel that the air is dry.

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9. State true or false and give reasons for your ans

Relative humidity has no unit.

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10. Absolute humidity is expressed in kg/m^3.

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Identify The Odd One And Give The Reason

1. Temperature ,conduction ,convection, radiation.

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2. The joule,The erg,The calorie,The newton.

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3. $cal/g, cal/g.^\circ C, kcal/kg.^\circ C$, erg /g $.^\circ C$.

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Match The Columns

1. Match the following Column - A and Column - B:

Column A	Column B
(1) Latent heat	(a) $Q = mc\Delta T$
(2) Specific heat capacity	(b) $Q = mL$
(3) Heat absorbed or given out by a body when its temperature changes	(c) kcal
	(d) cal/g·°C

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Answer The Following Questions In One Sentence Each

1. State units of temperature.

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2. State units of energy.

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3. State the relation between the joule and the colorie.

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4. State the relation between the erg and the joule.

Watch Video Solution

5. State the relation between the erg and the kilocalorie

Watch Video Solution

6. State the relation between the joule and the kilocalorie.

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7. When heat energy is absorbed by an object , ΔT represents the rise in temperature. What would ΔTrepresent if the object loses heat energy ?

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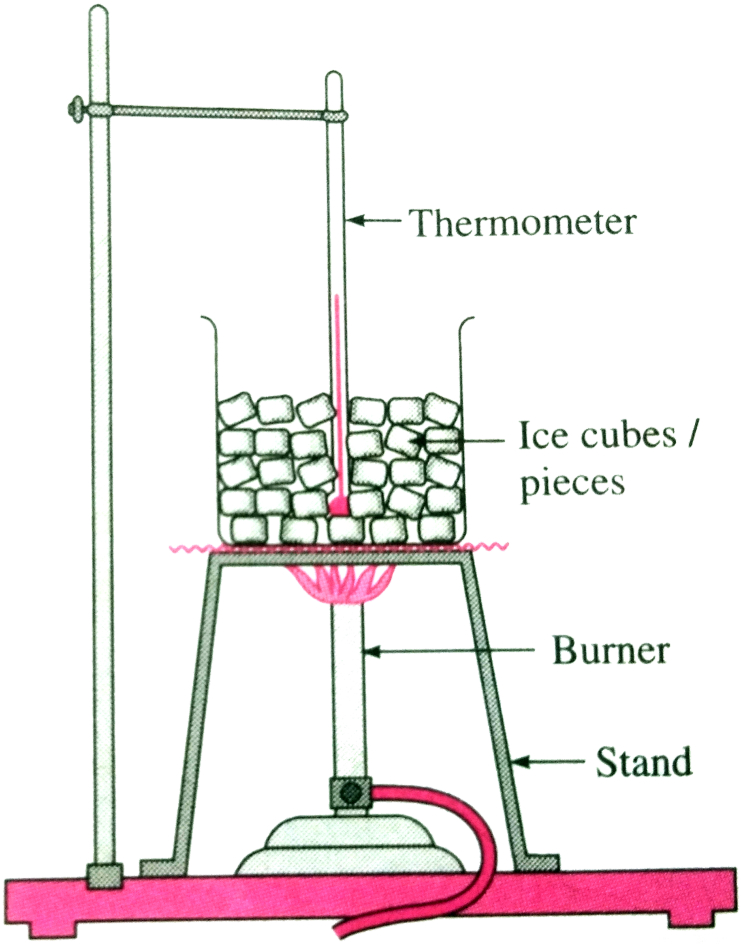
Answer The Following Questions

1.



(1) Take a few pieces of ice in a glass beaker as

shown in figure.

(2) Insert the bulb of a thermometer in ice and measure its temperature.

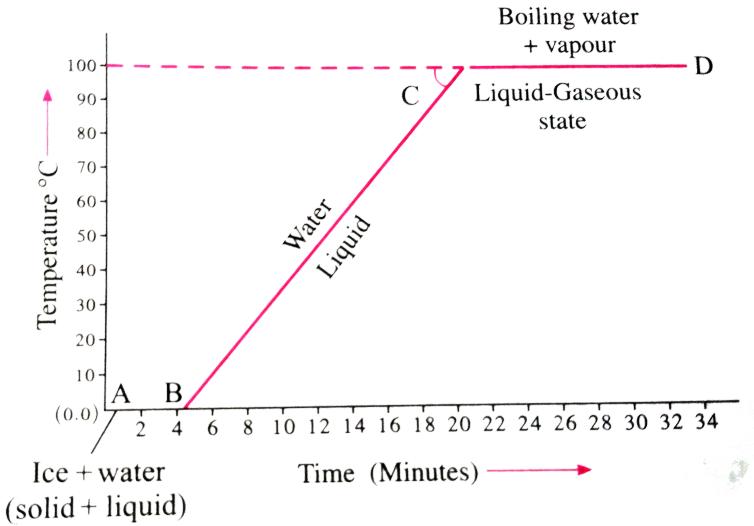
(3) Put the beaker on a stand and heat the ice usinga burner.

(4) Record the temperature using the thermometer after every minute.

(5) As the ice is heated,it starts melting. Stir the mixture of ice and water.

(6) Continue the heating even after ice starts melting.

(7) Draw a graph of temperature versus time.



Explain the following temperature vs time graph.

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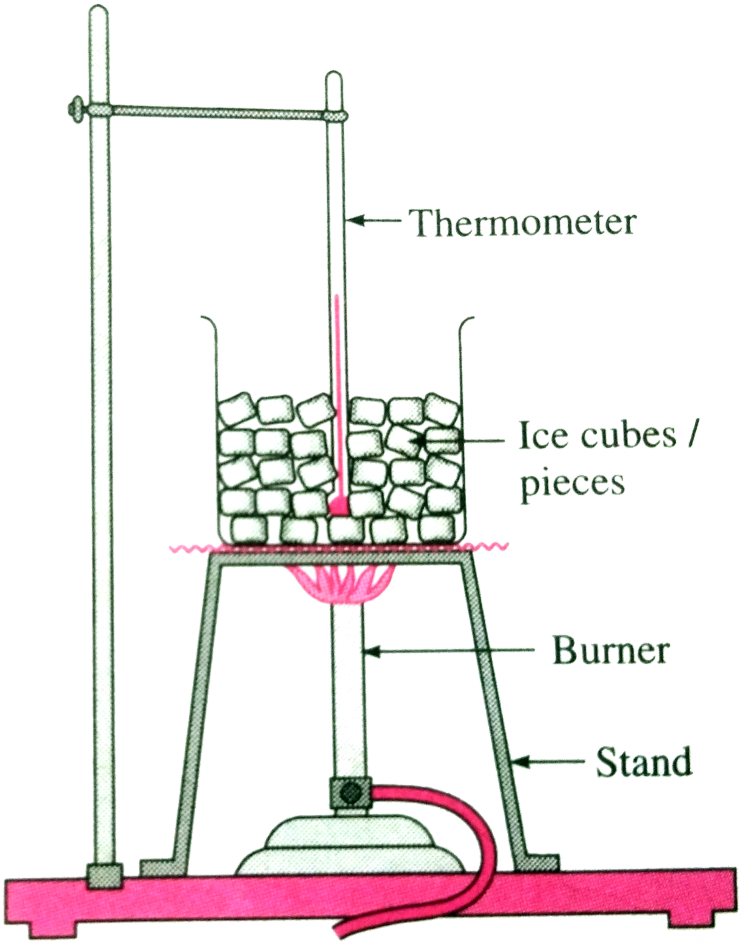
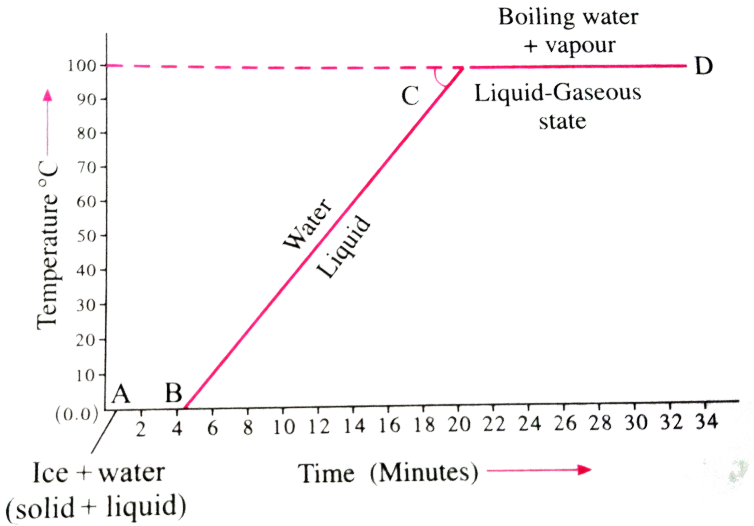
Explain the role of latent heat in the change of

state of a substance.





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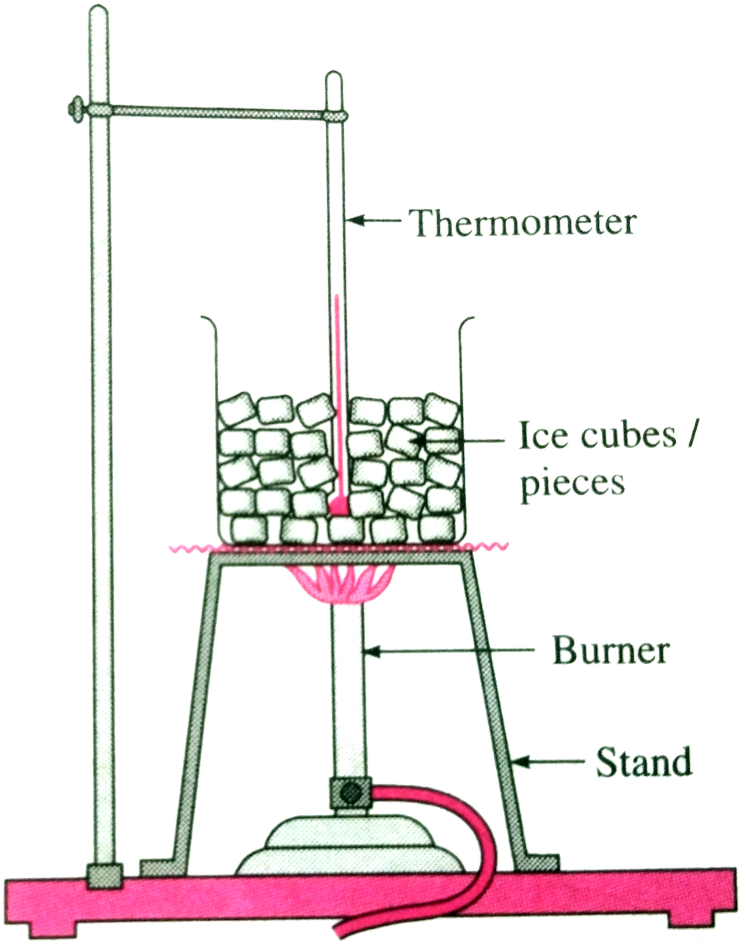
3. (1) Take a few pieces of ice in a glass beaker as shown in figure.



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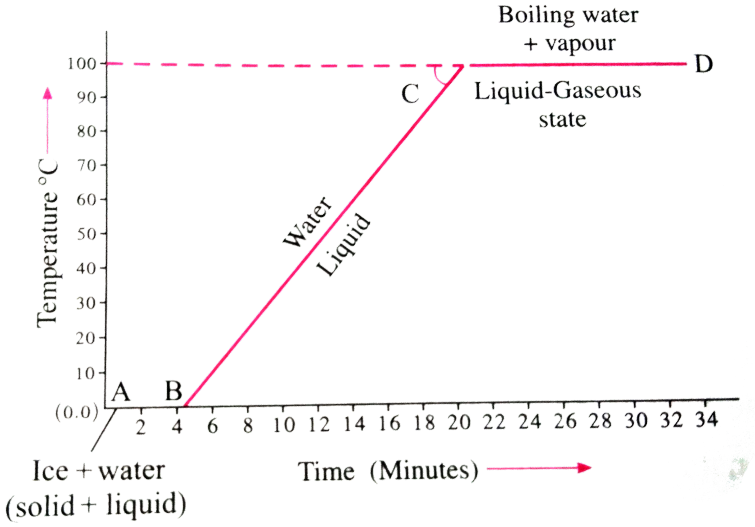

What is meant by latent heat ?How will the

state of matter transform if latent heat is given off ?

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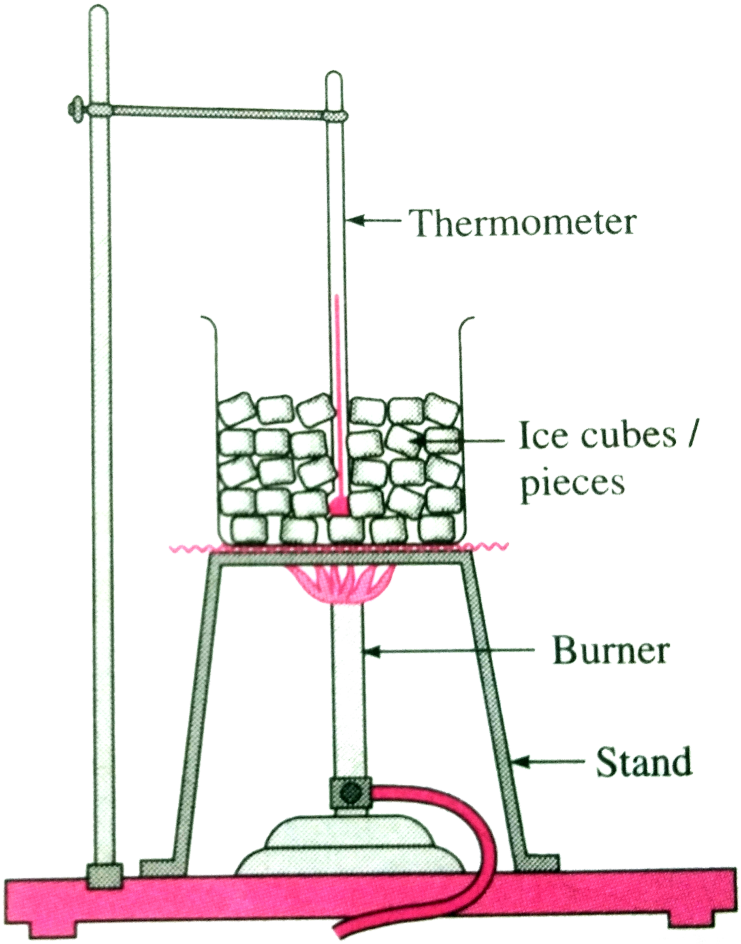
4. (1) Take a few pieces of ice in a glass beaker as shown in figure.



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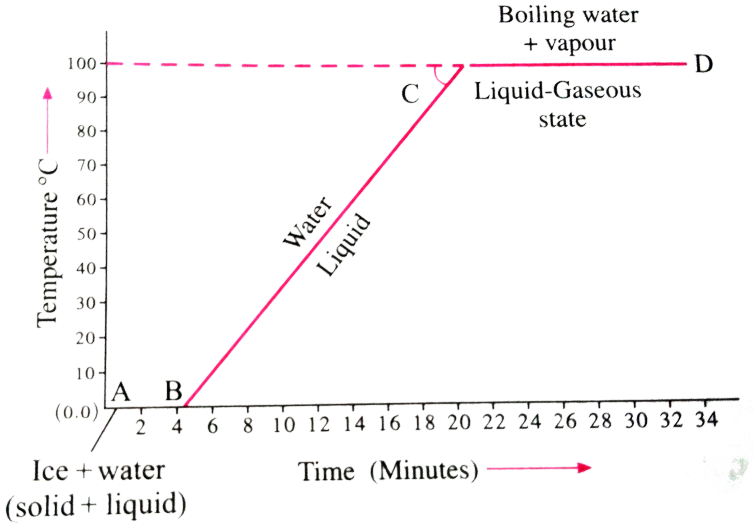

Define latent heat of fusion

OR

What is latent heat of fusion ? State its units.

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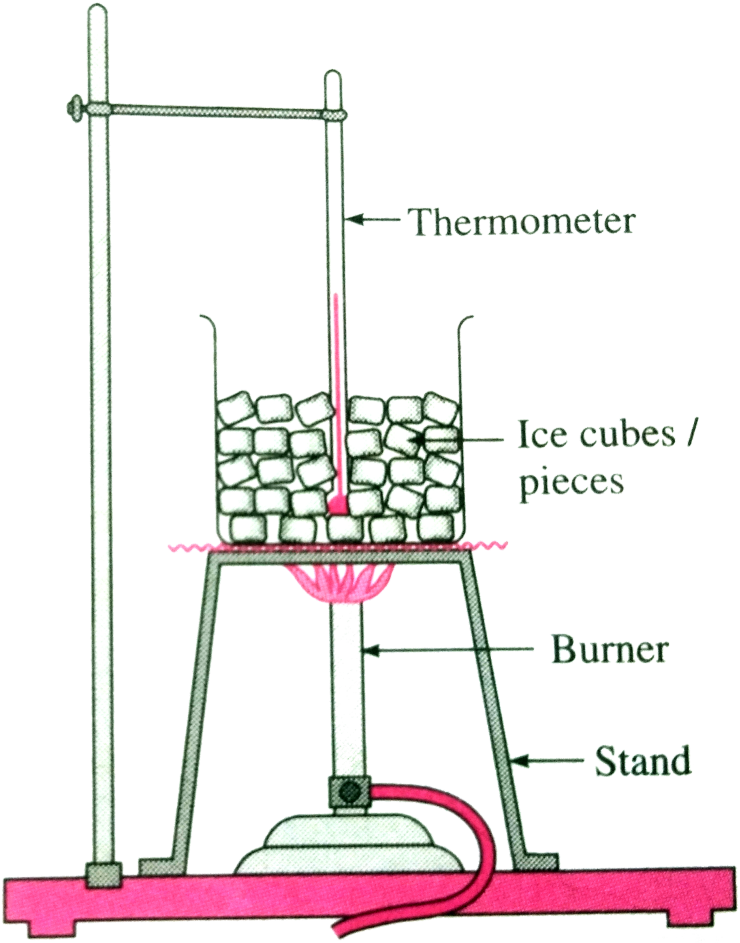

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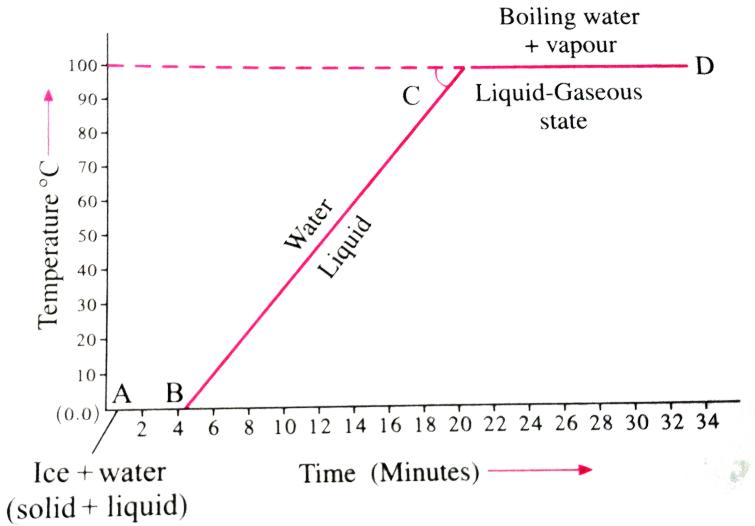

Define specific latent heat of fursion. OR

What is specific latent heat of fusion? State its units.

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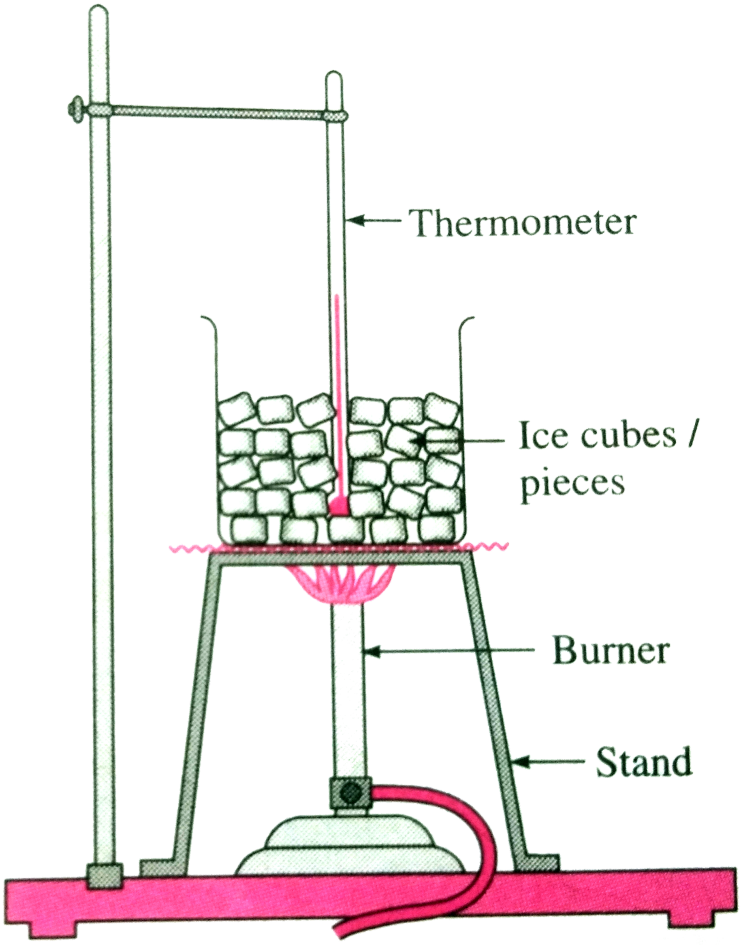
6. (1) Take a few pieces of ice in a glass beaker as shown in figure.



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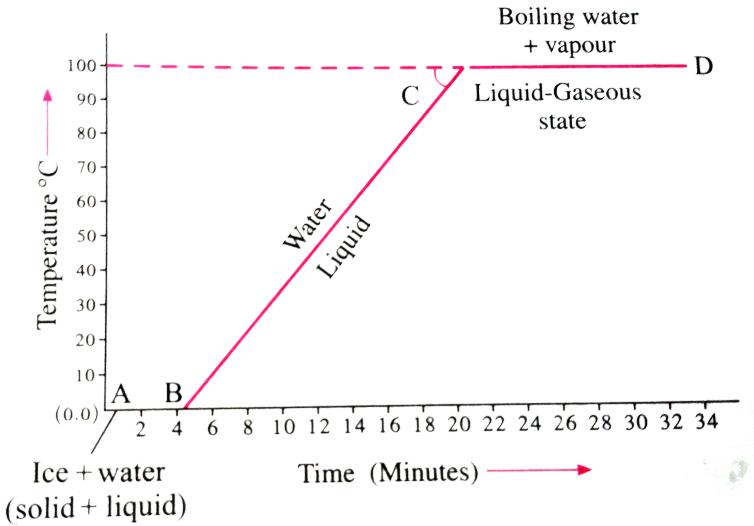

Explain the term latent heat of vaporization.

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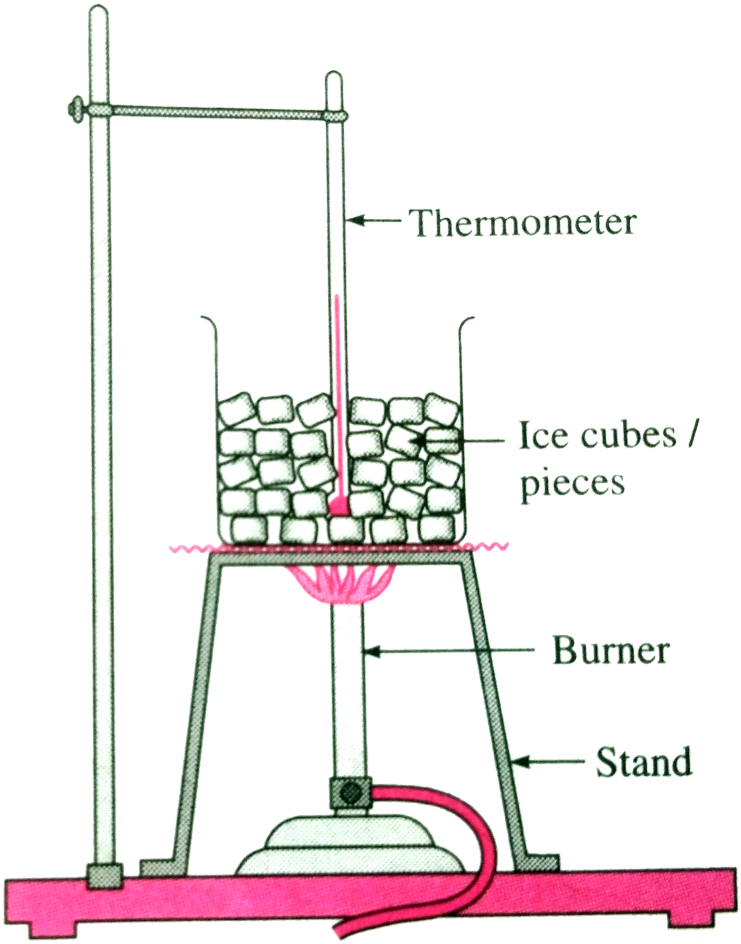
7. (1) Take a few pieces of ice in a glass beaker as shown in figure.



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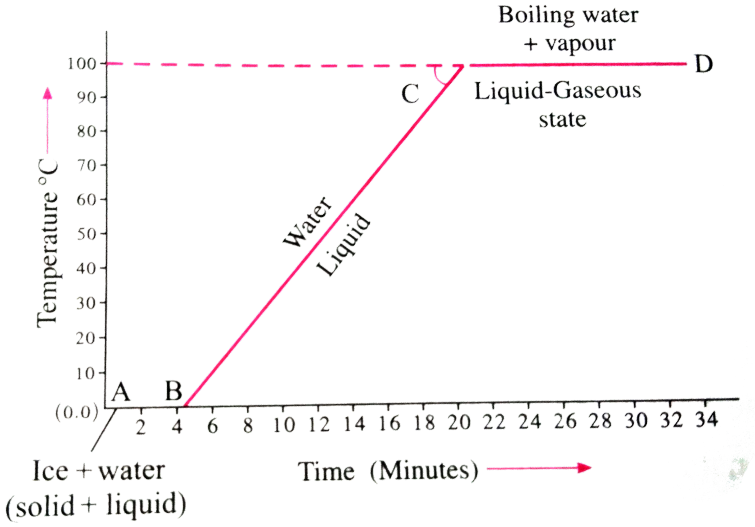

Define boiling point of a liquid. OR What is boiling point of a liquid ?

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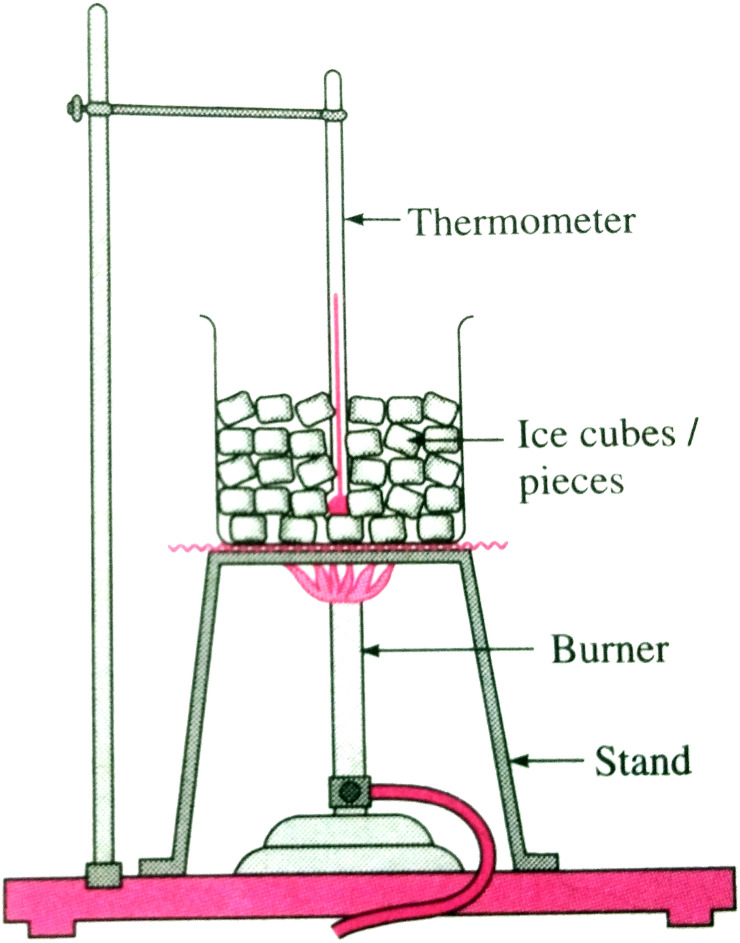
8.



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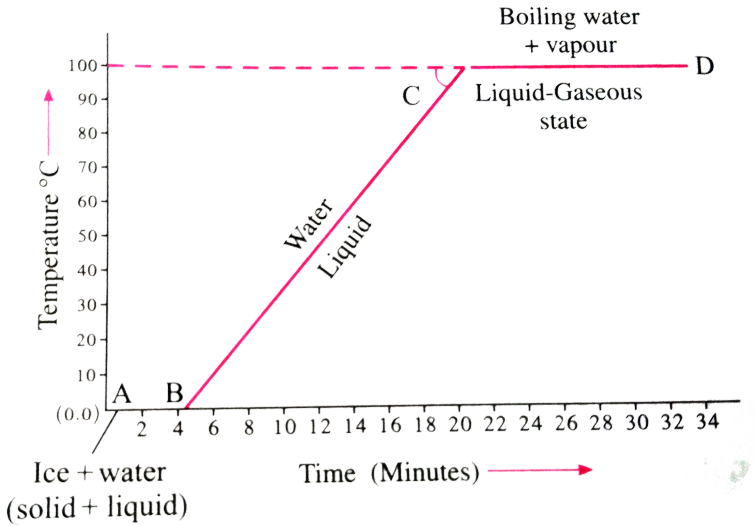

Define specific latent heat of vaporization.

OR

What is specific latent heat of vaporization?

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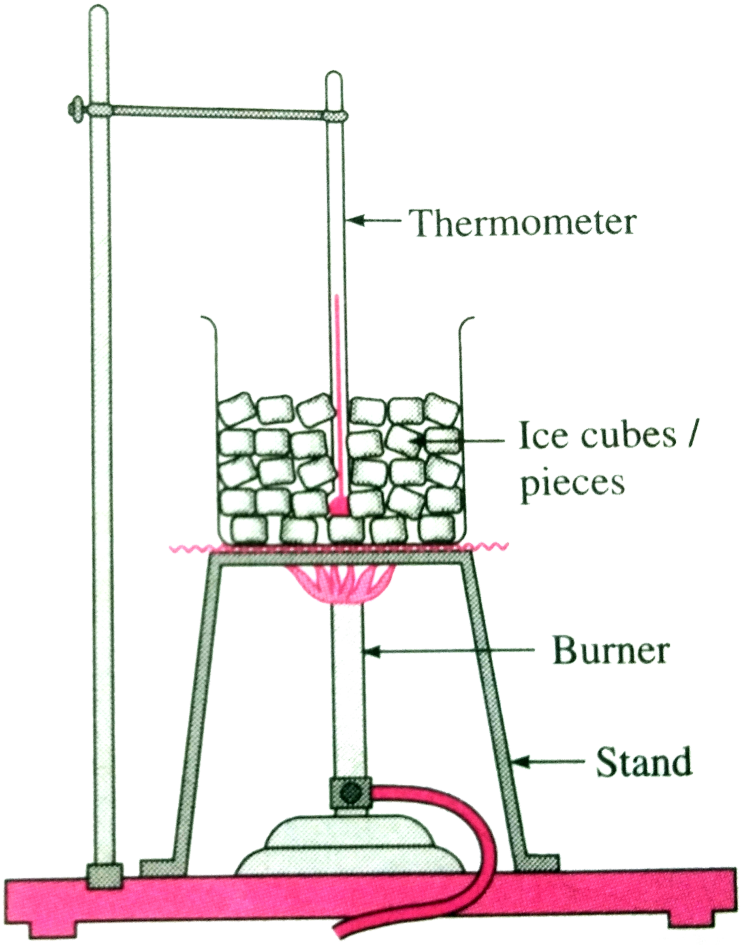
9. (1) Take a few pieces of ice in a glass beaker as shown in figure.



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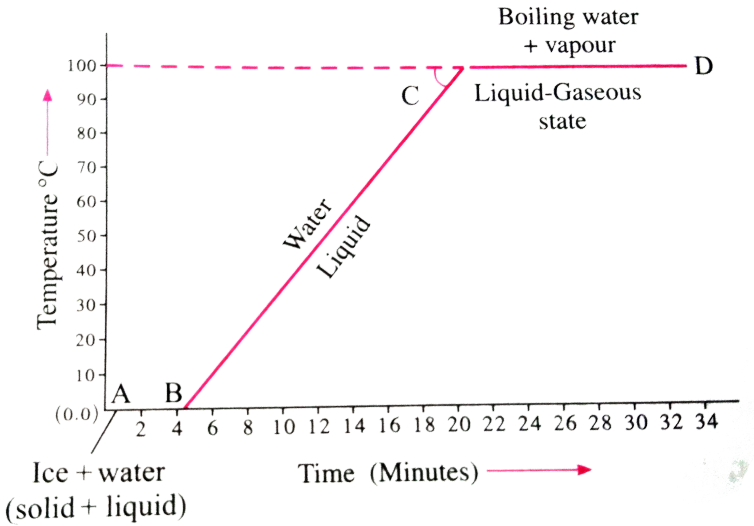

The specific latent heat of fusion of ice is $80cal/g$ .Explain this statement .

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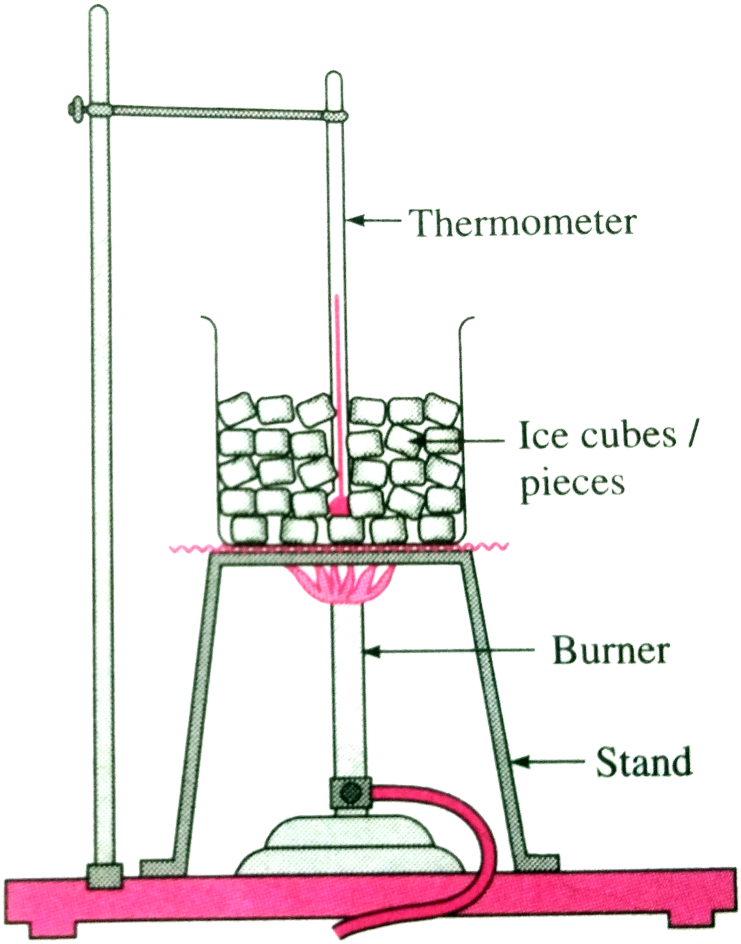
10. (1) Take a few pieces of ice in a glass beaker as shown in figure.



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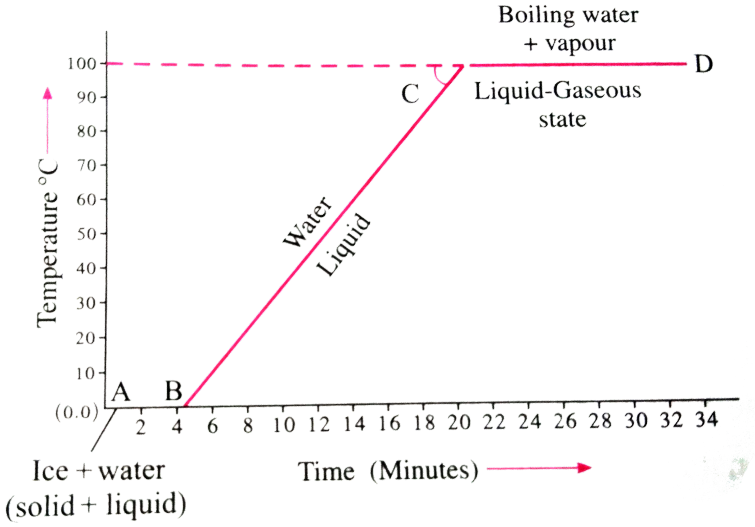

The specific latent heat of fusion of silver is $88.2kJ/kg$. Explain this statement.

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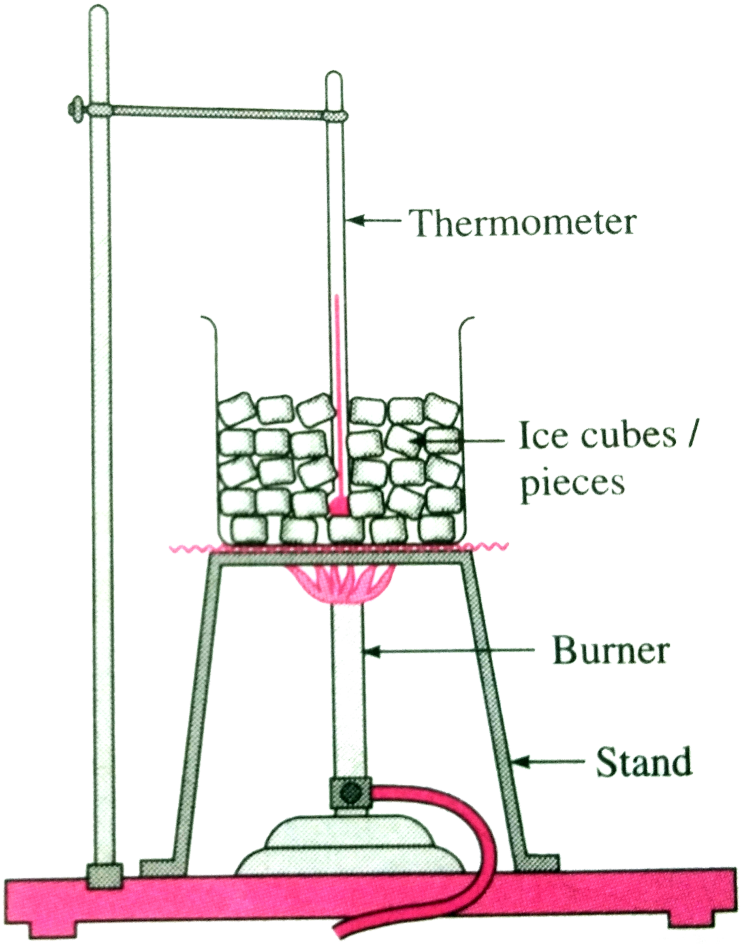
11. (1) Take a few pieces of ice in a glass beaker as shown in figure.



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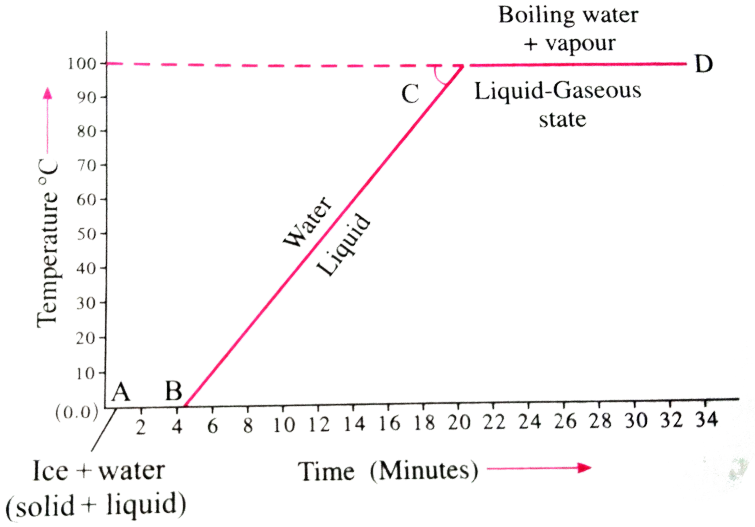

The specific latent heat of vaporization of water is $540 cal / g$. Explain this statement.

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Textbook Page 632

1. Is the concept of latent heat applicable during transformation of gaseous phase to liquid phase and from liquid phase to solid phase ? If yes then explain how?

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2. Where does the latent heat go during these transformation?

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Textbook Page 63

1. Take a small slab of ice, a thin wire, two identical weights. Activity :

(1) Put a slab of ice on a stand as shown in

figure.

(2) Hang two equal weights to the two ends of a metal wire and put the wire on the slab as shown in the figure.

What do you observe ?

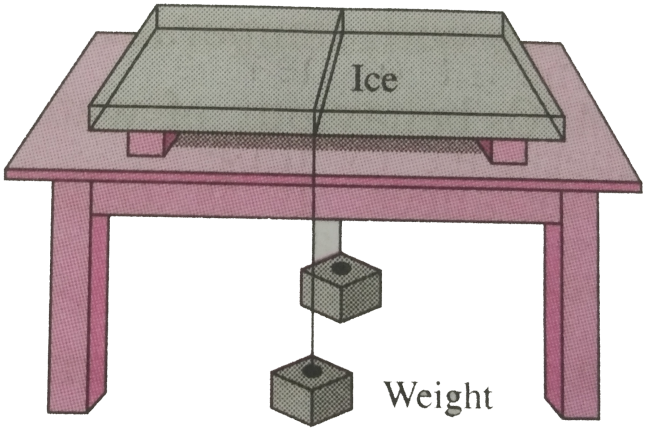

Fig. 5.3 : Regelation

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2. Take a small slab of ice, a thin wire, two identical weights. Activity :

(1) Put a slab of ice on a stand as shown in figure.

(2) Hang two equal weights to the two ends of a metal wire and put the wire on the slab as shown in the figure.

Define regelation.

OR

What is regelation ?

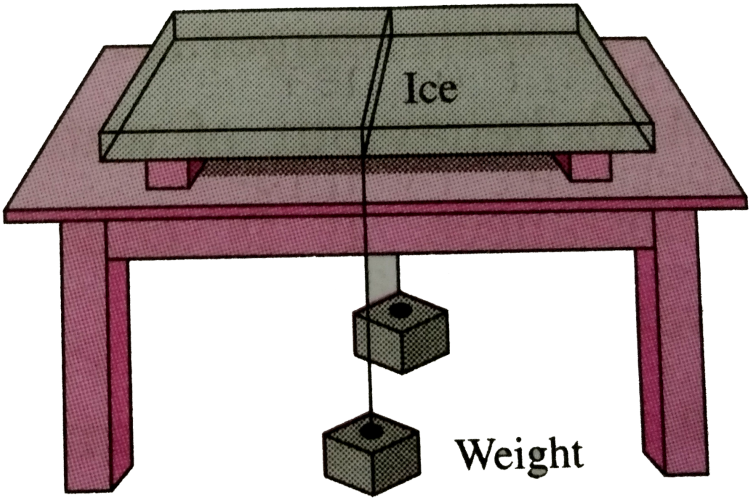

Fig. 5.3 : Regelation

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Textbook Page 64

1. Take a small slab of ice, a thin wire, two identical weights.

In the above experiment, the wire moves through the ice slab. However, the ice slab does not break. Why ?

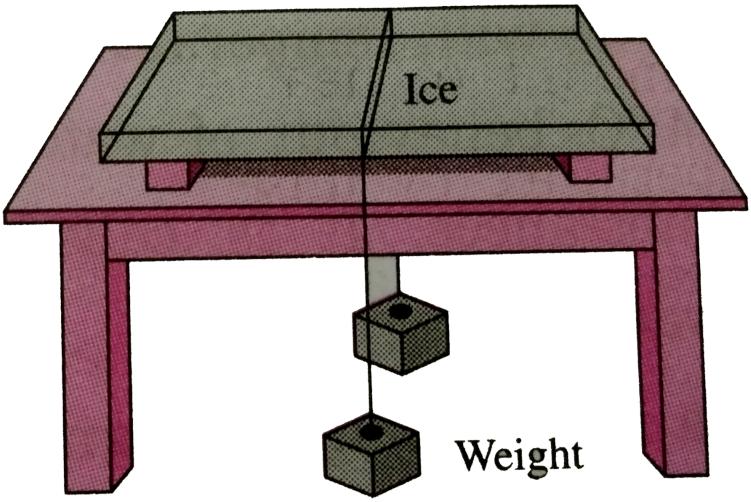

Fig. 5.3 : Regelation

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2. Is there any relationship of latent heat with regelation ?

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3. You know that as we go higher than the sea level, the boiling point of water decreases. What would be the effect on the melting point of solid?

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Textbook Page 65

1. We feel that some objects are cold, and some are hot. Is this feeling related in some way to our body temperature ? Give reasons. Also explain this with reference to the zeroth law of thermodynamics.

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2. The terms hot and cold are used in relative context. Explain.

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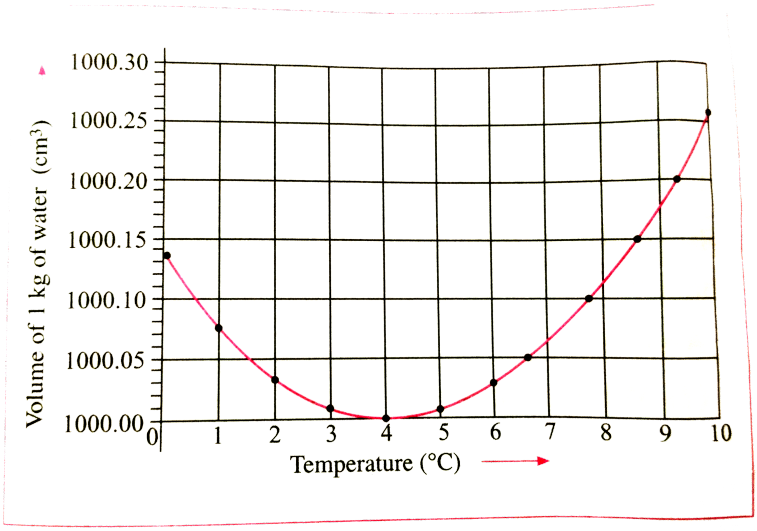
3. Observe the following graph. Considering the change in volume of water as its temperature is raised from $0^{\circ}C$, discuss the difference in the behaviour of water and other substances. What is this behaviour of water

called ?



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4. Draw a neat labelled diagram of Hope's apparatus. Explain how this apparatus can be used to demonstrate anomalous behaviour of

water.Drawa graph of temperature of water against time.

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5. Explain in detail the role of anomalous behaviour of water in preserving aquatic life in regions of cold climates such as polar regions..

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6. What is anamolous behavious of water?

Also explain the following : In cold regions in winter, the rocks crack due to anomalous expansion of water.

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Textbook Page 66

1. How will you explain the following statements with the help of the anamolous

behaviour of water ?

(1) In regions with cold climate,the aquatic plants and animals can survive even when the atomospheric temperature goes below $0^{\circ} C$.

(2) In cold regions in winter the pipe for water supply break and even rocks crack.

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2. A mountainer climbing on the Everst, experienced the following facts. Explain each fact with the scientific reason : (1) He found

fishes alive below the ice (2) Time required for cooking was more as he went higher (3) He saw many cliffs falling suddenly (4) He saw tubes carrying water broken.

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3. What is humidity ?

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4. When in air said to be saturated with water vapour ?

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5. What does the amount of water vapour needed to saturate air depend on ?

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6. When is air said to be unsaturated with water vapour ?

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7. What is dew point temperature ?

OR

Define dew point temperature ?

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8. Name the physical quantity used to express the amount of water vapour presentin air.

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9. Define absolute humidity. OR

Whatis absolute humidity ?State its unit.

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10. Define relative humidity . OR

What is relative humidity ?

Write the formula for % relative humidity .

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11. On what basis and how will you determne whether air is saturated with vapour or not ?

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12. What is the value of relative humidity at the dew point temperature ?

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13. The mass of water vapour in air enclosed in a certain space 60g and the mass of water vapour needed to saturate the same air with water vapour under the same condition is 100g.What is the corresponding % relative humidity ?

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14. During winter, sometimes we see a white trail at the back of a flying aeroplane in a clear sky. Explain why.

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15. State two effects of humidity present in atmosphere.

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16. Explain how dew and fog are formed. OR Write a short note on formation of dew and fog.

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17. How can you relate the formation of water droplets on the outer surface of a bottle taken out of a refrigerator with formation of dew ? Also explain what is dew point?

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18. State the units of heat .

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19. Define the kilocalorie.

Watch Video Solution

20. Define the calorie.

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21. State the relation between the kilocalorie and the calorie.

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22. While deciding the unit for heat, which temperature interval is chosen ? Why ?

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23. What is mean by specific heat capacity ? [OR Define specific heat capacity.] How will you prove experimentally that different substances have different specific heat capacities ?

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24. Study the following procedure and answer the question below :

1. Take 3 spheres of iron , copper and lead of equal mass.

2. Put all the 3 spheres in boiling water in a beaker for some time.

3. Take 3 spheres out of the water. Put them immediately on a thick slab of wax.

4. Note the dept that each sphere goes into the wax.

(i) Which property of a substance can be studied with this procedure ? ltbr. (ii) Describe that property in minimum words.

(iii) Explain the rule of heat exchange with this property.

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25. Write the symbol for specific heat capacity .

State the units of specific heat capacity.

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26. Which principle is used to measure the specific heat capacity of a substance?

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27. Principle of heat exchange:

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28. The specific heat capacity of silver is $0.056 kcal/kg.^\circ C$. Explain this statement.

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29. Explain how the specific heat capacity of a solid can be determined (measured) by the method of mixture.

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Give Scientific Reasons

1. Even though heat is supplied to boiling water, there is no increase in its temperature.

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2. Burns from steam are worse those from boiling water at the same temperature. Is it true? If so, why?

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3. In wingter, the pipelines carrying water burst in cold countries.

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4. If crushed ice is pressed and then the pressure is released, a lump of ice is formed. Why does this happen? Explain with reference to regelation.

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5. In cold countries , in wingter, even when the water of lakes freezes, aquatic animals and plants can survive. How do you think it is possible? Explain in detail.

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6. Why are water droplets are seen on the outer surface of a cold drink bottle?

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7. During cold nights, sometimes dew is formed. State true/false

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8. Why do your spectacles steam up, when you enter a warm room after being outside on a frosty early morning ?

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9. When a plastic bottle completely filled with water is kept in a freezer, it breaks. Why does this happen?

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10. Why does the outer surface of a beaker containing ice cubes becomes wet in a short while?

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Distinguish Between

1. Absolute humidity and relative humidity.

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Read The Following Paragraph And Answer The Questions

1. Read the following paragraph and answer the questions.

If heat is exchanged between a hot and cold

object, the temperature of the cold object goes on increasing due to gain of energy and the temperature of the hot object goes on decreasing due to loss of energy.

The change in temperature continues till the temperatures of both the objects attain the same value. In this process, the cold object gains heat energy and the hot object loses heat energy. If the system of both the objects is isolated from the environment by keeping it inside a heat resistant box (meaning that the energy exchange takes place between the two objects only), then no energy can flow from

inside the box or come into the box.

i. Heat is transferred from where to where?

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2. Read the following paragraph and answer the questions.

If heat is exchanged between a hot and cold object, the temperature of the cold object goes on increasing due to gain of energy and the temperature of the hot object goes on decreasing due to loss of energy.

The change in temperature continues till the temperatures of both the objects attain the same value. In this process, the cold object gains heat energy and the hot object loses heat energy. If the system of both the objects is isolated from the environment by keeping it inside a heat resistant box (meaning that the energy exchange takes place between the two objects only), then no energy can flow from inside the box or come into the box.

Which principle do we learn about from this process?

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3. Read the following paragraph and answer the questions.

If heat is exchanged between a hot and cold object, the temperature of the cold object goes on increasing due to gain of energy and the temperature of the hot object goes on decreasing due to loss of energy.

The change in temperature continues till the temperatures of both the objects attain the same value. In this process, the cold object gains heat energy and the hot object loses

heat energy. If the system of both the objects is isolated from the environment by keeping it inside a heat resistant box (meaning that the energy exchange takes place between the two objects only), then no energy can flow from inside the box or come into the box.

How will you state the principle briefly?

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4. Read the following paragraph and answer the questions.

If heat is exchanged between a hot and cold object, the temperature of the cold object goes on increasing due to gain of energy and the temperature of the hot object goes on decreasing due to loss of energy.

The change in temperature continues till the temperatures of both the objects attain the same value. In this process, the cold object gains heat energy and the hot object loses heat energy. If the system of both the objects is isolated from the environment by keeping it inside a heat resistant box (meaning that the energy exchange takes place between the two

objects only), then no energy can flow from inside the box or come into the box.

Which property of the substance is measured using this principle?

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Solve The Following Examples Numerical Problems

1. Calculate the amount of heat required to convert5g of ice of $0^{\circ}C$ into water at $0^{\circ}C$.

(Specific latent heat of fusion of ice $80 cal / g$)

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2. Find the amount of heat required to convert 10g of water at $100^{\circ} C$ into steam. (Spefic latent heat of vaporization of water $= 540 cal / g$)

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3. Calculate the amount of heat required to convert 15g of ice of $100^{\circ} C$ into steam.

(Specific latent heat of vaporization ofwater= $540 cal / g$)

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4. How many calories of heat will be absorbed when 3 kg of ice at $0^{\circ} C$ melts ?

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5. Calculate the amount of heat required to convert 10g of water at $30^{\circ}C$ into steam at $100^{\circ}C$. (Specific latent heat of vaporization of water $= 540cal/g$)

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6. If water of mass 80g and temperature $45^{\circ}C$ is mixed with water of mass 20g and temperature $30^{\circ}C$, what will be maximum temperature of the mixture?

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7. When water of mass 70g and temperature $50^{\circ}C$ is added to water of mass 30g, the maximum temperature of the mixutre is found to be $41^{\circ}C$. Find the temperature of water of mass 30g before hot water was added to it.

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8. Find the heat needed to raise the temperature of a silver container of mass 100

g by $10^{\circ} C$. $(c = 0.056 cal/g.^{\circ} C)$

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9. Liquid ammonia is used in ice factory for making ice from water. If water at $20^{\circ} C$ is to be converted into 2 kg ice at $0^{\circ} C$, how many grams of ammonia are to be evaporated ?

(Given : The latent heat of vaporization of ammonia $= 341 cal/g$)

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10. A thermally insulated pot has 150 g ice at temperature $0^\circ C$. How much steam of $100^\circ C$ has to be mixed to it , so that water of temperature $50^\circ C$ will be obtained ? (Given : Latent heat of melting of ice = 80 cal/g, latent of vaporization of water = 540 cal/g, spcific heat of water = $1 cal/g.^\circ C$)

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11. Equal heat is given to two objects A and B of mass 1g. The temperature of A increases by

$3^\circ C$ and that of B by $5^\circ C$. Which object has more specific heat? And by what factor ?

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12. A calorimeter has mass 100 g and specific heat 0.1 kcal/$kg.^\circ C$. It contains 250 g of liquid at $30^\circ C$ having specific heat of 0.4 kcal/ $kg.^\circ$ C . If we drop a piece of ice of mass 10 g at $0^\circ c$ into it , what will be the temperature of the mixture ?

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13. If steam of mass 100g and temperature $100^{\circ}C$ is released on an ice slab of temperature $0^{\circ}C$, how much ice will melt ?

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Numerical Problems For Practice

1. Calculate the amount of heat required to convert 80g of ice at $0^{\circ}C$ into water at the

same temperature . (Specific latent heat of fusion of ice $= 80cal/g$)

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2. Find the heat required to convert 20 g of iceat $0^\circ C$ into water at the same temperature. (Specific latent heat of fusion of ice $= 80cal/g$)

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3. Calculate the quantity of heat released during the conversion of10g of ice cold water (temperature $0^{\circ}C$) into ice at the same temperature . (Specific latent heat of freezing of water $= 80cal/g$)

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4. How many calories of heat will be absorbed when 2kg of ice at $0^{\circ}C$melts ?

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

Watch Video Solution

5. Find the amount of heat required to convert 10g of water at $100^{\circ} C$ into steam. (Spefic latent heat of vaporization of water $= 540 cal / g$)

Watch Video Solution

6. Calculate the amount of heat required to convert 10g of water at $30^{\circ}C$ into steam at $100^{\circ}C$. (Specific latent heat of vaporization of water $= 540cal/g$)

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7. If water of mass 60 g and temperature $50^{\circ}C$ is mixed with water of mass 40g and temperature $30^{\circ}C$, what will be the maximum temperature of the mixture ?

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8. If water of mass 60 g and temperature $60^\circ C$ is mixed with water of mass 60 g and temperature $40^\circ C$, what will be the maximum temperature of the mixture ?

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9. Find the heat needed to raise the temperature of a piece of iron of mass 500 g by $40^\circ C. (c = 0.110 cal/g.^\circ C)$

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10. Water of mass 200 g and temperature $30^{\circ} C$ is taken in a copper calorimeter of mass 50g and temperature $30^{\circ} C$. A copper sphere of mass 100g and temperature $100^{\circ} C$ is released into it. What will be the maximum temperature of the mixture ? [c (water = $1 cal / g.^{\circ} C$, c (copper) = $0.1 cal / g.^{\circ} C$]

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11. A copper calorimeter of mass 100g and temperature $30^\circ C$ contains water of mass 200 g and temperature$30^\circ C$. If a pieceof ice of mass 40g and temperature $0^\circ C$ is added to it,what will be the maximum temperature of the mixture ? [c(copper) $= 0.1cal/g.^\circ C$, c (water) = $1cal/g.^\circ C, L = 80cal/g$]

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12. If the mass of steam is 50g, how much heat is released.

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