



PHYSICS

BOOKS - NAVNEET PUBLICATION

HEAT

Solved

1. Distinguish between:

What is the difference between heat and temperature?



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2. What are the different modes of transfer of heat ?



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Exercise

1. Fill in the blanks and rewrite the sentences :

The amount of water vapour in air is

determined in terms of its



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2. Fill in the blanks and rewrite the sentences :

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. Fill in the blanks and rewrite the sentences :

When a liquid is getting converted in to solid ,
the latent heat is



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4. Choose the correct alternative and write it
along with its allotted alphabet:

..... 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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5. Choose the correct alternative and write it along with its allotted alphabet:

When water boils and is converted into , 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: A::C::D



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6. Choose the correct alternative and write it along with its allotted alphabet:

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 decrease

D. heat is given out and temperature remains the same

Answer: A::D



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7. Choose the correct alternative and write it along with its allotted alphabet:

..... Is an example of anomalous behaviour of water.

A. dew point

B. Solidification

C. Cracking of rocks

D. Evaporation

Answer: A::C



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8. Choose the correct alternative and write it along with its allotted alphabet:

Ice/water is a substance that

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: A::C::D



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

A. 80

B. 800

C. 540

D. 54

Answer:



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10. Choose the correct alternative and write it along with its allotted alphabet:

The latent heat of vaporization of water is

A. 540 cal/g

B. 800 cal/g

C. 80 cal/g

D. 54 cal/g

Answer: A::C::D



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11. Choose the correct alternative and write it along with its allotted alphabet:

The latent heat of fusion of ice is

A. 540 cal/g

B. 80 cal/g

C. 800 cal/g

D. 4 cal/g

Answer: A::C



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12. Choose the correct alternative and write it along with its allotted alphabet:

If the temperature of water is increased from 4°C to 10°C , then its

A. volume decrease and density increase

B. volume increase and density decrease

C. volume and density, both decrease

D. volume and density , both increase

Answer: A::C::D



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13. Choose the correct alternative and write it along with its allotted alphabet:

At 4°C, then density of water is

A. 10 g/cm³

B. 4 g/cm³

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

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

Answer: A:C



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14. Choose the correct alternative and write it along with its allotted alphabet:

The density of water is maximum at

A. 0°C

B. 4°C

C. 100°C

D. 4°C

Answer: C::D



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15. Choose the correct alternative and write it along with its allotted alphabet:

..... heat is needed to raise the temperature of 1kg of water from 14.5°C to 15.5°C .

A. 4180 j

B. 10^3 j

C. 1 cal

D. 4180 cal

Answer: A::D



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16. Choose the correct alternative and write it along with its allotted alphabet:

..... heat is needed to convert 1 g of water at

0° C and at a pressure of one atmosphere into
1 g of steam under the same conditions .

A. 80 j

B. 540 cal

C. 89 j

D. 540 j

Answer: A::C::D



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17. Choose the correct alternative and write it along with its allotted alphabet:

Water expands on reducing its temperature below °C .

A. 0

B. 4

C. 5

D. 12

Answer: D



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18. Choose the correct alternative and write it along with its allotted alphabet:

The vapour content in the air is measured using a physical quantity called

A. absolute humidity

B. relative humidity

C. dew point

D. humidity

Answer: A::B::D



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19. State whether the following statements are true or false. (If a statement is false , correct it and rewrite it):

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



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20. State whether the following statements are true or false. (If a statement is false , correct it and rewrite it):

If the temperature of water is raised from 0°C to 10°C , its volume goes on increasing.



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21. State whether the following statements are true or false. (If a statement is false , correct it

and rewrite it):

At dew point relative humidity is 100%.



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22. State whether the following statements are true or false. (If a statement is false , correct it and rewrite it):

1 Kcal = 4.18 joules.



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23. State whether the following statements are true or false. (If a statement is false , correct it and rewrite it):

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



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24. State whether the following statements are true or false. (If a statement is false , correct it and rewrite it):

Latent heat of fusion , $Q = m L$.





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25. State whether the following statements are true or false. (If a statement is false , correct it and rewrite it):

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



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26. State whether the following statements are true or false. (If a statement is false ,

correct it and rewrite it):

If the relative humidity is less than 60 % , we feel that the air is dry .



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27. State whether the following statements are true or false. (If a statement is false , correct it and rewrite it):

Relative humidity has no unit.



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28. State whether the following statements are true or false. (If a statement is false , correct it and rewrite it):

Absolute humidity is expressed in Kg/m^3 .



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29. Identify the odd one and give the reason :

Temperature, conduction , convection, radiation .



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30. Find the odd one out and give the reason:

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



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31. Identify the odd one and give the reason :

cal/g , cal/g^{°C} , Kcal/kg^{° C} , erg/g^{°C} .



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32. Match the columns :

| Column A | Column B |
|----------------------------|--------------|
| (1) Specific latent heat | (a) J/K |
| (2) Specific heat capacity | (b) J/kg |
| | (c) kcal |
| | (d) cal/g·°C |

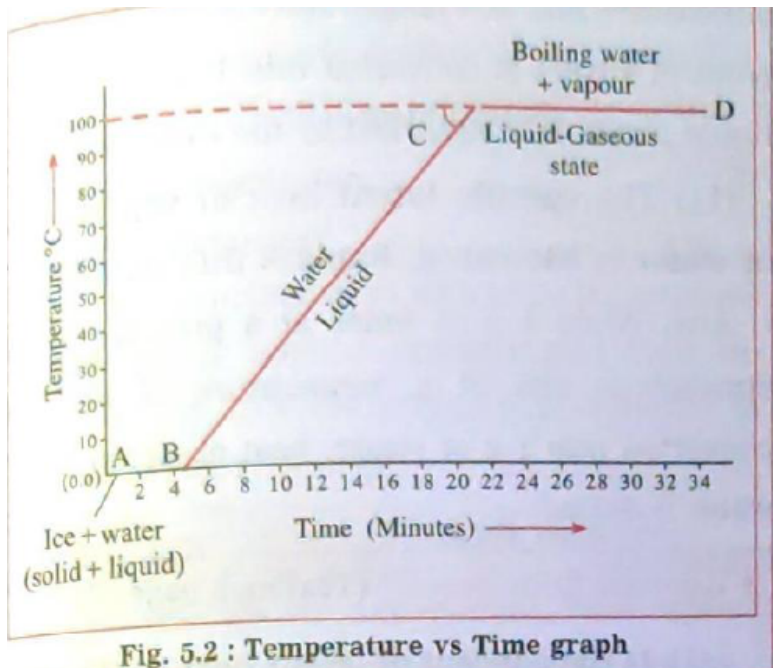


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33. Answer the following questions :

Explain the following temperature vs time

graph



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34. Explain the Role of Latent heat in the change of state of a substance



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35. Answer the following questions :

What is meant by latent heat ? How will the state of matter transform if latent heat is given off ?



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36. Answer the following questions :

Define latent heat of fusion ?



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37. Answer the following questions :

What is latent heat of fusion ? State its unit .



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38. Answer the following questions :

Define specific latent heat of fusion ?



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39. Answer the following questions :

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



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40. Answer the following questions :

Explain the term latent heat of vaporization .



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41. Answer the following questions :

Define boiling point of a liquid.



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42. What is Boiling point of liquid?



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43. Answer the following questions :

Define specific latent heat of vaporization .



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44. Answer the following questions :

Define specific latent heat of vaporization .



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45. Answer the following questions :

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



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46. Answer the following questions :

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



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47. Answer the following questions :

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



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48. Answer the following questions :

Define regelation.



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49. Answer the following questions :

What is regelation ?



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50. Answer the following questions :

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



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51. Answer the following questions :

Observe figure and answer the following questions

At what temperature does this process take

place .

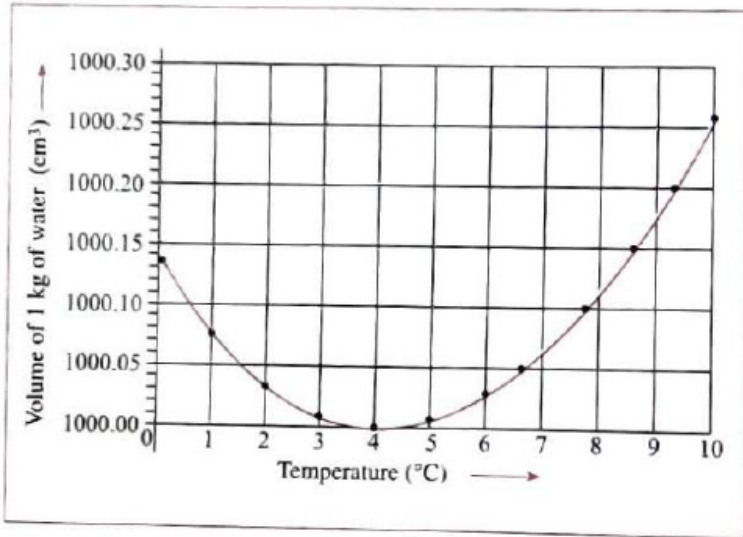


Fig. 5.5



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52. Answer the following questions :

Draw a neat labelled diagram of Hope's apparatus. Explain how is apparatus can be

used to demonstrate anomalous behaviour of water. Draw a graph of temperature of water against time.



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53. Answer the following questions :

Explain the role of anomalous behaviour of water in preserving aquatic life in regions of cold climate.



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54. Answer the following questions :

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



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55. Answer the following questions :

A mountaineer climbing on the everest, experienced the following facts. Explain each fact with the scientific reasons :

He found fishes alive below the ice



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56. Answer the following questions :

A mountaineer climbing on the everest, experienced the following facts. Explain each fact with the scientific reasons :

Time required for cooking was more as he went higher.



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57. Answer the following questions :

A mountaineer climbing on the everest, experienced the following facts. Explain each fact with the scientific reasons :

He saw many times cliffs falling suddenly.



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58. Answer the following questions :

A mountaineer climbing on the everest, experienced the following facts. Explain each

fact with the scientific reasons :

He saw tubes carrying water broken



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59. Answer the following questions :

What is humidity?



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60. Answer the following questions :

When is air said to be saturated with water

vapour ?



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61. Answer the following questions :

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



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62. Answer the following questions :

When air is said to be unsaturated with water

vapour?



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63. Answer the following questions :

What is dew point temperature ?



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64. Answer the following questions :

Define dew point temperature ?



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65. Answer the following questions :

Name the physical quantity used to express the amount of water vapour present in air .



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66. Answer the following questions :

Define absolute humidity.



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67. Answer the following questions :

What is absolute humidity ? State its unit.



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68. Answer the following questions :

Define relative humidity.



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69. Answer the following questions :

What is relative humidity ? Write the formula for % relative humidity.



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



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71. Answer the following questions :

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



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72. Answer the following questions :

The mass of water vapour in air enclosed in a certain space is 60 g and the mass of water vapour needed to saturate the same air with water vapour under the same conditions is

100g. What is the corresponding % relative humidity?



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73. Answer the following questions :

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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74. Answer the following questions :

State two effects of humidity present in atmosphere .



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75. Answer the following questions :

Explain how dew and fog are formed .



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76. Answer the following questions :

Write a short note on formation of dew and fog .



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77. How can you relate the formation of water droplets on the outer surface of a bottle taken out of refrigerator with formation of dew



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78. Answer the following questions :

State the units of heat.



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79. Answer the following questions :

Define the kilocalorie.



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80. Answer the following questions :

Define the calorie.



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81. Answer the following questions :

State the relation between the kilocalorie and the calorie.



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82. While deciding the unit for heat, which temperatures interval is chosen? why?



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83. Answer the following questions :

What is meant by specific heat capacity?



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84. Define Specific Heat Capacity.



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85. What is meant by specific heat capacity?

How will you prove experimentally that different substances have different specific heat capacities?



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86. Answer the following questions :

Study the following procedure and answer the

questions below:

(i) Take 3 spheres of iron, copper and lead of equal mass.

(ii) Put all the 3 spheres in boiling water in a beaker for some time.

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

(iv) Note the depth that each sphere goes into the wax.

Which property of a substance can be studied with this procedure?



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87. Answer the following questions :

Study the following procedure and answer the questions below:

(i) Take 3 spheres of iron , copper and lead of equal mass.

(ii) Put all the 3 spheres in boiling water in a beaker for some time .

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

(iv) Note the depth that each sphere goes into the wax.

Describe that property in minimum words.



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88. Answer the following questions :

Study the following procedure and answer the questions below:

(i) Take 3 spheres of iron , copper and lead of equal mass.

(ii) Put all the 3 spheres in boiling water in a beaker for some time .

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

(iv) Note the depth that each sphere goes into

the wax.

Explain the rule of heat exchange with this property.



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89. Answer the following questions :

Write the symbol for specific heat capacity .

State the units of specific heat capacity.



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90. Answer the following questions :

State the SI unit of specific heat capacity.



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



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92. Answer the following questions :

Explain the principle of heat exchange.



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93. Answer the following questions :

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



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94. Answer the following questions :

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



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95. Give scientific reasons:

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



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96. Give scientific reasons:

Burns from steam are worse than those from boiling water at the same temperature.



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97. Give scientific reasons:

In winter, the pipelines carrying water burst in cold countries.



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98. Give scientific reasons:

In crushed ice is pressed and then the pressure is released, a lump of ice is formed.



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99. Give scientific reasons:

In cold countries , in winter, even when the water lakes freezes, aquatic animals and plants can survive.



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100. Give scientific reasons:

Water droplets are seen on the outer surface of a cold drink bottle .



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101. Give scientific reasons:

During cold nights, sometimes dew is formed .



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102. Give scientific reasons:

When you enter a warm room after being outside on a frosty early morning ,your spectacles ' steam up'.



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103. Give scientific reasons:

A plastic bottle , completely filled with water, when kept in a freezer, is likely to break.



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104. Give scientific reasons:

The outer surface of a beaker containing ice cubes becomes wet in a short while.



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105. 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 resistance 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.

Heat transferred from where to where?



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106. 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 resistance 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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107. 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 resistance 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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108. 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 resistance 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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109. Solve the following examples / numerical problems:

Calculate the amount of heat required to convert 5g of ice of 0°C into water at 0°C .

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



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110. Solve the following examples / numerical problems:

Find the amount of heat required to convert 10 g of water at 100°C into steam. (Specific latent heat of vaporization of water =540 cal/g)



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111. Solve the following examples / numerical problems:

Calculate the amount of heat required to convert 15 g of water at 100°C into steam. (Specific latent heat of vaporization of water = 540 cal/g)



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112. Solve the following examples / numerical problems:

How many calories of heat will be absorbed when 3 kg of ice at 0°C melts ?



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113. Solve the following examples / numerical problems:

Calculate the amount of heat required to convert 10 g of water at 30°C into steam at 100°C . (Specific latent heat of vaporization of water = 540 cal/g)



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114. Solve the following examples / numerical problems:

If water of mass 80 g and temperature 45°C is mixed with water of mass 20 g and temperature 30°C . What will be the maximum temperature of the mixture ?



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115. Solve the following examples / numerical problems:

When water of mass 70 g and temperature 50°C is added to water of mass 30g , the maximum temperature of the mixture is found

to be 41°C . Find the temperature of water of mass 30g before hot water was added to it.



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116. Solve the following examples / numerical problems:

Find the heat needed to raise the temperature of a silver container of mass 100 g by 10°C .

($c=0.056 \text{ cal/g}^{\circ}\text{C}$)



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117. Solve the following examples / numerical problems:

How much heat energy is necessary to raise the temperature of 5 kg of water from 20°C to 100°C ?



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118. Liquid ammonia is used in ice factory for making ice from water. If water at 20°C is to be converted into 2 kg ice at 0°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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119. A Thermally Insulated Pot Has 150 G Ice at Temperature 0°C . How Much Steam of 100°C Has to Be Mixed to It, So that Water of Temperature 50°C Will Be Obtained? Given :
specific heat capacity of water, $c = 1 \text{ cal/g } ^{\circ}\text{C}$
Latent heat of vaporization of water = 540 cal/g
Latent heat of melting of ice = 80 cal/g



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120. Equal heat is given to two objects A and B of mass 1 g. temperature of A increases by $3^{\circ}C$ and B by $5^{\circ}C$ which object has more specific heat ? And by what factor?



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121. A calorimeter has mass 100 g and specific heat $0.1 \text{ kcal}/\text{kg}^{\circ}C$. It contains 250 gm of liquid at $30^{\circ}C$ having specific heat of 0.4

$kcal / kg^{\circ} C$. If we drop a Piece of ice mass 10 g at $0^{\circ} C$, what will be the temperature of the mixture?



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122. A copper sphere of 100 g mass is heated to raise its temperature to $100^{\circ} C$ and is released in water of mass 195 g and temperature $20^{\circ} C$ in a copper calorimeter. If the mass of calorimeter is 50g, what will the maximum temperature of water?



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123. Solve the following examples / numerical problems:

If steam of mass 100 g and temperature 100°C is released on an ice slab of temperature 0°C , how much ice will melt?



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124. Calculate the amount of heat required to convert 80 g of ice at 0°C into water at the

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



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125. Find the heat required to convert 20 g of ice at 0°C into water at the same temperature . (Specific latent heat of fusion of ice = 80 cal/g)



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126. Calculate the quantity of heat released during the conversion of 10g of ice cold water (temperature 0°C) into ice at the same temperature. (Specific latent heat of fusion of ice = 80 cal/g)



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127. How many calories of heat will be absorbed when 2kg of ice at 0°C melts ? (Specific latent heat of fusion of ice = 80 cal/g)





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128. How much heat will be required to convert 20g of water at 100°C into steam at 100°C ?
(Specific latent heat of vaporization of water = 540 cal/g)



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129. Find the heat absorbed by 25g of water at 100°C when converted into steam at the same

temperature ? (Specific latent heat of vaporization of water = 540 cal/g)



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130. If water of mass 60g and temperature 50°C is mixed with water of mass 40g and temperature 30°C , what will be the maximum temperature of the mixture ?



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131. If water of mass 60g and temperature 60°C is mixed with water of mass 60g and temperature 40°C , what will be the maximum temperature of the mixture ?



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132. Find the heat needed to raise the temperature of a piece of iron of mass 500g by 20°C .($c=0.110\text{ cal/g}^{\circ}\text{C}$)



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



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



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135. If the mass of steam is 50g , how much ice will melt ?



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