PHYSICS

BOOKS - PEARSON IIT JEE FOUNDATION

HEAT

Example

1. Calculate the amount of heat required in joule, such that the amount of heat required to heat certain amount of water is 8750 cal?

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2. The heat capacity of 80 kg lead is found to be 11.2 kJ K^{-1}. Find its specific heat capacity

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3. Find the specific ehat capacity of ice if 12 kg of ice absorbs 50.4 kJ of heat to raise its temperature from $-20°C$ to $0°C$.

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4. Two bodies A and B of equal masses are supplied with equal amountt of heat energy. If rise in temperature of A is more than that in B, what is the relation between their specific heats?

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5. At what temperature on the Fahrenheit scale is the reading five times the reading on the Celsium scale?

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6. The lower and upper fixed points of a fauly thermomenter ar $-2°C$ and $102°C$, respectively. If the thermometer reads $50°C$ on this thermometer, find the correct temperature onn the celsium scale.

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7. Calcualte the mass of stea that should be passed though 60 g of water at $20°C$, such that the final temperature is $40°C$. (take specific latent heat of steam is 2250 J g^{-1}).

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8. Calculate the amount of ice, which is sufficient to cool 45g of water, contained at $30°C$, such that the final temperature of the mixture is $10°C$. (Take specific latent heat of fusion of ice is 336 J g^{-1})

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9. The heat capacity of 80 kg lead is found to be 11.2 kJ K^{-1}. Find its specific heat capacity

10. Find the specific heat capacity of ice if 1.2 kg of ice absorbs 50.4 kJ of heat to raise its temperature from $-20°C$ to $0°C$.

11. Two bodies A and B of equal masses are supplied with equal amountt of heat energy. If rise in temperature of A is more than that in B, what is the relation between their specific heats?

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Very Short Answer Type Question

1. What is heat?

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2. Why is a constriction provided in a clininal thermometer?

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3. Define 1 calorie and 1 kilocalorie. What is the use of calorimeter?

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4. The boiling point of pure water is _____. $^\circ C$, at normal atmospheric pressure.

5. Define heat capacity and specific heat capacity. Give their S.I. units.

6. In Galileo's thermomenter, the expansion of ___is used to measure the temperature.

7. Why boiling water is not used to sterilize a clinical thermomenter?

8. Define temperature.

9. What physical quality determines the flow of heat energy?

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10. State the use of Six's maximum and minimum thermometer.

▶ Watch Video Solution

11. What is a hypsometer?

▶ Watch Video Solution

12. Specific heat capacity of water is ____ J $kg^{-1}K^{-1}$.

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13. Define melting and boiling points.

▶ Watch Video Solution

14. What is the normal human body temperature?

▶ Watch Video Solution

15. Why is the handle of a pressure cooker made of ebonite?

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16. What relation is used to convert temperature in one scale to other scale?

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17. If the pressure is chagned, what happens to melting and boiling points of a substance?

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18. Express $102° F$ in celsius scale of temperature.

▶ Watch Video Solution

19. 8400J=_____calories.

▶ Watch Video Solution

20. The temperature of body increases by $1° C$. How much is the corresponding rise in Fahrenheit temperature?

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21. What is the use of safety valve in a pressure cooker?

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22. What is the principle of the thermometer?

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23. Upper fixed point of a themometer is marked using a

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24. For the same rise in temperature, which expands more, alcohol or mercury?

▶ **Watch Video Solution**

25. What is the principle of working of pressure cooker?

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1. What is a bimetallic strip? Where is it used?

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2. At what temperature will both the Celsius and Fahrenheit scales read the same value?

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4. Find the heat energy required to boil 5 kg of water iff its initial temperature is $30°C$ (specific heat of water is 4200 J kg^{-1} k^{-1} and boiling point is $100°C$)

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5. the thermal capacity of 11 kg of water is same as 120 kg of copper. If specific heat capacity of water is 4200. J kg^{-1} K^{-1}, find the specific heat capacity of copper.

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6. Distinguish between heat and temperature.

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7. At what temperature the reading on the Celsium scale, is half the reading on the Fahrenheit scale?

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8. Explain, how land and sea breezes occur?

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10. How are LFP and UFP marked in a Celsium scale? Explain.

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11. A faulty thermomenter who's LFP is $-5°C$ and UFP is $105°C$ measures a temperature as $80°C$. What is the correct temperature?

12. Describe, with a neat diagram, the working of a clinical thermometer.

13. If the temperature of a body increases by$10°C$, find the rise in temperature in Fahrenheit scale.

14. What is riveting? Explain

1. Describe andd experment to determine melting point of ice and boiling point of water.

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2. Explain why a constriction is provided in a clinical thermometer, consiering the fact that during expansion mercury level while increasing passes through the sae constriction.

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3. Describe an experiment to determine melting point of wax.

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4. Alcohol thermometers are preferred to a mercury thermomemter in cold countries.

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5. Describe, with a neat diagram, the working of Six's maximum and minimum thermometer.

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Level 1

1. In six' maximum and minimum thermometer, the thermometric liquid is mercury.

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2. Liquefaction is the process in which a solid changes into liquid on supply of heat.

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3. If the heat energy abosrobed by two identical bodies A and B is 1 calorie and 1 joule, repsectively, the rise in temperature of A is greater than the rise in temperature of B.

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Level 1 Fill In The Blanks

1. If the melting point of ice at a give place is $0°C$, the atmospheric pressure at the place is _____.

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2. A good conductor of heat will have ____ specific heat capacity.

3. Increase in pressure____ the melting point of ice.

4. In Six's maximum an minimum thermometer, the indices are brought down to the level of the mercury with the help of_____.

5. The iron rims are fitted to the wooden wheels of bullock carts and tongas by process of ____

6. The normal temperature of the human body is $98.4° F$.Calculcate this temperature on celsius scale and absolute scale.

7. The average kinetic energy of the molecules of substance_____during the process of melting.

Level 1 Match The Column

Column A			Column B
A. Absolute zero of temperature	( )	a	Decrease in melting point on increase in pressure.
B. Number of divisions of celsius scale	( )	b.	Average kinetic energy of molecules
C. LFP of a thermometer librated in Kelvin scale.	( )	c.	Sum of potential and kinetic energy of the molecules.

1.

Column A			Column B
D. Number of divisions on clinical thermometer calibrated in Fahrenheit.	( )	d.	15
E. Skating	( )	e.	High specific heat capacity of water
F. Bimetallic strip	( )	f.	100
G. Temperature of melting ice	( )	g.	273
H. Formation of sea and land breezes	( )	h.	Zero kelvin
I. Heat	( )	i.	Zero degree celsius
J. Temperature	( )	j.	Thermal expansion

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1. Which of the following represents the smallest temperature change?

A. $1°C$

B. $1°F$

C. $1K$

D. Both a and b

Answer: B

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2. If C, F and K are the temperature on Celsius, Fahrenheit and Kelvin scale, $\Delta C, \Delta F$ and ΔK are the change in temperature in celsium, Fahrenheit and Kelvin scale, respectively, the correct relation among the following is:-

A. $\dfrac{C}{5} = \dfrac{F}{9} = \dfrac{K - 273}{5}$

B. $\dfrac{\Delta C}{5} = \dfrac{\Delta F}{9} = \dfrac{\Delta K}{5}$

C. $\dfrac{\Delta C}{5} = \dfrac{\Delta F - 32}{9} = \dfrac{\Delta K - 273}{5}$

D. $\dfrac{C}{5} = \dfrac{F}{9} = \dfrac{K}{5}$

Answer: B

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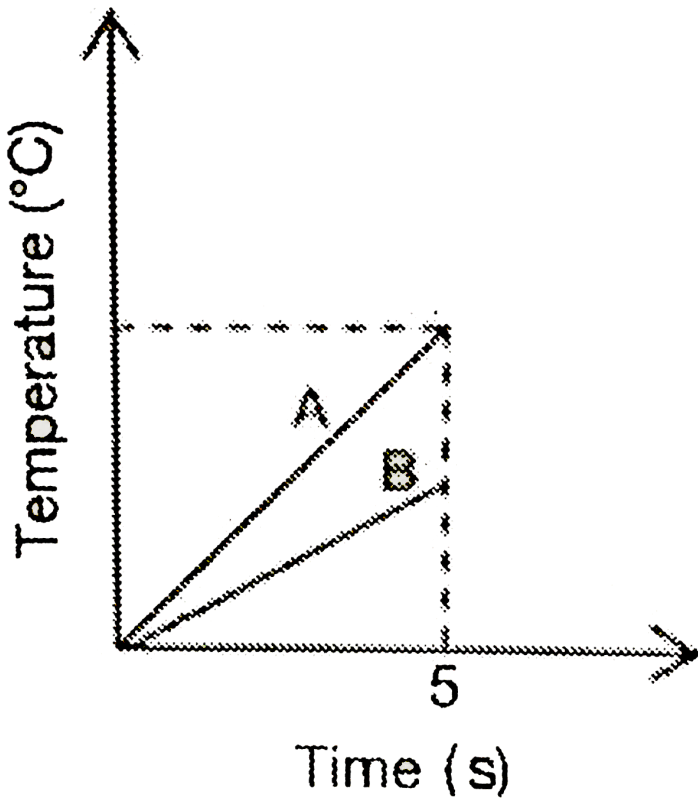3. The degree of hotness or coldness of a body is called its

A. Heat capacity

B. Temperature

C. Latent heat capacity

D. None of these

Answer: B

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4. When equal amount of heat is supplied to two different substnace 'A' and 'B', the riese in temperature with time is graphically represented as follows. Choose the correct statement.

A. If masses of 'A' and 'B' are equal, specifici heat of 'A' is equal to specific heat of 'B'

B. If mass of 'A' is greater than mass of 'B' the specific heat capacity of

'A' is greater than the specific heat capacity of 'B'.

C. Heat capacity of A is less heat capacity of B.

D. None of these

Answer: C

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5. For a certain engineering application, it is required to rise the temperature of a given mass of a body as quickly as possible. The material should have

A. High specific heat capacity

B. high density.

C. Low specific heat capacity

D. Heat capacity

Answer: C

6. Specific heat capacity of water is

A. 1 cal $g^{-1}.^\circ C^{-1}$

B. 4186 J $g^{-1}.^\circ C^{-1}$

C. 4186 kJ $kg^{-1} \quad K^{-1}$

D. All of the above

Answer: A

7. Under normal conditions, naphthalene changes its state from_____

A. Solid to liquid

B. liquid to gas

C. liquid to solid

D. solid to gas

Answer: D

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8. The distance betweent he LFP and UFP of a thermometer is 18 cm. the readint on the thermometer in Fahrenheit scale when the length of the mercury thread is 8 cm is____

A. $212° F$

B. $112° F$

C. $80° F$

D. $180° F$

Answer: B

9. A: At high altitude regions the cooking of food becomes difficult

B: Water boils at lower temperature when the presure is low.

A. Both A and B are wrong.

B. A and B are correct and B is not the correct explanation of A.

C. A and B are correct and B is the correct explanation of A.

D. A is correct but B is wrong.

Answer: C

10. The change in temperature of a body is $20°C$, then the change in temperature of Kelvin scale is :-

A. 293 K

B. 25 K

C. 20 K

D. 253 K

Answer: C

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11. In the process of boiling,

A. Kinietic and potential energy of water molecules increases

B. kinetic energy of molecules increases and potential energy of

molecules decreases.

C. potential energy of molecules increases and kinetic energy of

molecules remains same.

D. Kinetic energy of molecules increases and potential energy of

molecules remains the same.

Answer: C

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12. When the pressure increased,

A. melting point of ice decreases and boiling point of water increases.

B. Melting point of ice and boiling point of water decreases.

C. melting point of ice and boiling point of water increases.

D. melting point of ice increases and boiling point of water decreases.

Answer: A

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13. Food in the pressure cooker is cooked faster, as

A. the boiling point increases due to an increase in pressure.

B. the boiling decreases due to an increase in pressure.

C. More steam is available at $100°C$

D. more pressure is available at $100°C$

Answer: A

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14. Given that the ratio of specific heat capacity of alcohol to that of water is 13 : 25, which of the following statements is true?

A: When temperature is raised through $1°C$ the heat energy absorbed by 2 kg of alcohol is less than the heat energy absorbed by 1 kg of water.

B: Heat capacity of 2 kg alcohol is more than the heat capacity of 1 kg water.

A. A is true and B is false.

B. A and B are true

C. A is false and B is true.

D. A and B are false.

Answer: C

15. $-40°C$ is numerically equal to

A. $-40°F$

B. $233K$

C. $-32°R$

D. All the above

Answer: A

16. Which of the following properties are suitable for making cooking utensils?

A. High specific heat and high conductivity.

B. Low specific heat and low conductivity

C. High specific heat and low conductivity.

D. Low specific heat and high conductivity.

Answer: D

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17. The advantage of alcohol is thermometric liquid is due to its

A. low boiling point

B. low freezing point.

C. high vapour pressure.

D. All the above

Answer: B

18. The temperature at which molecular movement of matter ceases is called_____

    A. normal temperature

    B. zero kelvin

    C. abnormal temperature

    D. None of these

Answer: B

19. Gas thermometers are more sensitive as compared to liquid thermometers, as their

A. coefficient of expansion is very high

B. coefficient of expansion is very low.

C. density is very high

D. None of these

Answer: A

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20. Which among the following is the hottest substance?

A. Water at $100^\circ C$

B. Steam at $100^\circ C$

C. Mercury at $100^\circ C$

D. All the above are equally hot.

Answer: D

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21. Mercury is used as thermometer liquid. Which among the following properties of mercury is used in this?

    A. Low specific heat capacity

    B. High boiling point and low melting point

    C. Low vapour pressure

    D. All the above

Answer: D

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22. A difference of temperature of $25°C$ is equivalent to a difference of

    A. $25°C$

    B. $25K$

    C. $25°R$

D. None of these

Answer: D

23. Arrange the following steps in proper sequence for the construction and calibration of Celsius thermometer.

(A) Lower fixing point is marked by immersing the bulb of the thermometer in melting ice taken in a funnel.

(B) The distance between the two fixed points is called fundamental interval. It is divided into 100 equal divisions in Celsius scale.

(C) Take a thick walled capillary tube with thin walled glass bulb and fill it with mercury with the help of a funnel.

(D) Mark the upper fixing point with the help of hypsometer.

(E) Place the glass bulb in a hot oil bath while filling the mercury to remove the air bubbles.

A. c a d e b

B. c e a d b

C. c e a b d

D. c d b e a

Answer: B

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24. A ginven substance of mass 'm' is in solid state at certain temperature. Arrange the following steps in proper sequence to calcualte the total heat energy required to just convert the substance completely into gaseous state.

(a). Note down the specific latent heat of vaporization of the substance and calculate the heat supplied to convert from liquid to gaseous state using the formula.

(b) Note down the melting point of the substance and calculate the heat supplied to increase the temperature of the solid to its melting point.

(c) Note down the boiling point of the substance and calculate the heat

supplied to increase the temperature of the substance from melting point to its boiling point.

(d). Add all the heat energies, it gives the resultant hea supplied to the solid to just convert it into gaseous state.

(e) Note down the specific latent heat of fusion of the substance and calculate the heat supplied to convert the substance from solid state to liquid state.

A. b d e c a

B. a c e d b

C. a b c d e

D. b e c a d

Answer: D

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25. Black surface is a

A. good absorber of heat energy.

B. good radiator o heat energy.

C. Both a and b

D. None of these

Answer: C

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26. As the temperature difference between the ends of a conductor increase the heat transfer rate by conduction____

A. increases

B. decreases

C. remains same

D. None of these

Answer: A

27. heat transfer rate is more ini_____

    A. glass

    B. wood

    C. plastic

    D. copper

Answer: D

28. Which of the following statements is (are) true about conduction?

    A. A medium is necessary for the conduction of heat.

    B. The rate of conduction of heat depends upon the nature of the medium.

C. As the particles of a medium conduct heat, they only vibrate in their

own place, they do not leave their original place.

D. All the above

Answer:

29. A piece of ice at $0°C$ is dropped into water at $32°F$. Which of the

following statements is correct?

A. Ice melts

B. Water freezes

C. Both a and b

D. None of these

Answer:

30. Which among the following statement is/are correct?

A. The priciple of a bimetallic strip is unequal expansion of metals.

B. An iron ring is cooled to fix it on a wooden wheel.

C. When the room temperature is raised, a pendulum clock loses time

D. All of the above

Answer:

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Level 2

1. The density of two spheres of equal radius are in the ratio 1:3 and their specific heat capacities in the ratio 2:1 what is the ratio of their heat capacities?

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2. The total distance between the lower fixed point and the upper fiixed point of a thermometer is 12 cm. when this thermometer is palced in a vessel containing 500g water the reading on the scale was 3 cm.. When 10 lead shots at $100° C$ were dropped into this container the mercury level int he thermometer rose to 31 mm. find the average heat capacity o the lead shots. (you may leave the answer as a fraction).

Specific heat capacity of water =4.2 kJ kg^{-1} K^{-1}

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3. When the mercury thread rises to 3/4th of the distance between the two fixed points, what is the temperature indicated by the Fahrenheit scale?

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4. On a certain scale of temperature, the freezing and boiling points of water are maked as 20 and 180 degress, respectively. What is the temperature of a patient suffering with a high fever of $104°F$ on that scale?

5. Two cylinderical bodies 'A' and 'B' have their radii in the ratio of 1:2 and their lengths are in the ratio of 3:2. When equal amount of heat energy is supplied to them, the rise in the temperature of A is found to be double the rise in temperature of B. Determine the ratio of their specific heat capacity. The ratio of density of A and B is 3:1

6. The rate at which ice melts is more at the top when compared to the bottom of the blacier. Explain whether the statement is true capacities.?

7. The density of two identical spheres are in the ratio 2:3 and their specific heat capacities in the ratio 4:5 wha is the ratio of their heat capacities?

8. In a new scale of temperature the lower fixed point is marked as 0 corresponding to the melting point of substance which is equal to $25°C$ ad the upper fixed poitn is marked corresponding to the boiling point of a substance which is equal to $175°C$. the total length of scale between the UFP and LFP is divided into 200 equal parts. Determine the temperature in the new scale when the temperature of substance measrued by celsius scale thermometer is $50°C$

9. How is water useful in the protection of fruits and vegetables from damage during storage at sub zero temperature?

10. Two substances P and Q are heated by using similar heating devices. The mass of P and Q are 100 g and 75 g, respectively. The initial temperature of P is $35°C$ whereas the initial temperature of Q is $25°C$. If the temperature of the substance 'P' is increased to $75°C$ in 40 minutes, determine the time required to raise the temperature of Q to the same value. The specific heat capacity of P and Q are 0.9 cal $g°C^{-1}$ and 0.6 cal $g°C^{-1}$, respectively.

11. Why is salt sprinkled under ice cube trays in a refrigerator?

12. The temperature of a body is measured in Kelvin scale, Fahrenheit scale and Celsius scale. Which among them is a more accurate reading? Explain.

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13. It is possible to melt a piece of aluminium placed in a spoon made of zinc.

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14. A new scale fo temperature is introduced. One degree temperature difference on the new scale is found to be equal to $\frac{5}{8}.^{\circ}C$. Determine the temperature in Celsium scale when the new scale and the celsium scale shows the saer eading. The lower fixed point on the new scale is 33° degree.

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15. Convert $55°C$ into Fahrenheit and Kelvin scale.

16. Three metallic spheres A,B and C have their masses in the ratio 1:2:3, specific heat capacities in the ratio 6:3:4. When the initial temperature of the spheres are measrued in Celsius scale, the ratio of their temperature is found to be 1:2:3. Initially the two spheres A and B are brought into contact. when equilibrium temperature is attained, sphere B is brought into contact with 'C'. Determine the ratio of the final temperatures of A,B and C as measured in Celsius scale.

17. If 3360 J of heat is required to melt 10 g of ice, how many kilocalories of heat should be supplied to melt 1 kg ice?

18. Find the amount of heat enegy required to convert 100 g of ice at $-10°C$ into stea at $120°C$.

(Take

$S_{ice} = 0.5 \ \text{cal} \ g^{-1}.°\ C^{-1}$, $S_W = 1 \ \text{cal} \ g^{-1} \hat{}\ (\circ)C^{-1}$, $S_{\text{Steam}} = 0.5 \ \text{ca}$

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19. To obtain of water at $50°C$, how many grams of stea at its stea point must be passed to 70 g of ice at $0°C$.

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Level 3

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1. Quantity of heat gained by 100 kg of iron in raising its temperature by $10°C$ is $11 \times 10^4 cal$. If a heater can supply heat at the rate of 1000 J s^{-1},

how much time does it take to heat an iron block of mass 2.5 kg when the mecury level in a Fahrenheit thermometer rises by 45 divisions.

2. Two containers X and Y are filled with water at different temperature. When 10 g of water from container X is mixed with 20 g of water from container Y, the resultant temperature is found to be $20°C$. When 20 g of water from container X is mixed with 10 g of water from container Y, the resultant temperature is found to be $30°C$. Determine the inital temperature of water in container X and Y.

3. In winters when the lakes start feezing, the weather becomes very pleasant in the surrounding region. Explain.

4. When two heating devices are used to heat two different substance A and B the heat absorbed by A after 2 seconds is found to be equal to the heat absorbed byy B after 3 seconds. The rise in temperature of A after 5 seconds is found to be equal to the rise in temperature of B after 6 seconds.i the ratio of masses o A and B is 1:2, determine the ratio of the specific heat capacities of two substances.

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5. Ice cubes at $0°C$ each of mass 200 g are dropped one after the other into 2 kg water at $30°C$ in such a awayy that after the first one melts completely, the second one is dropped. If the heat energy required to melt 1 g of ice is 80 cal, determine the maximum number of ice ice cubes that can be dropped into the water such that no ice is left in the water without melting.

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6. if specific heat capacity of mercury is 0.033 cal g^{-1} $.^{\circ}C^{-1}$, how much heat is gained by 0.05 kg of mercury when its temperature rises from $68^{\circ}F$ to 313K?

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7. The heat capacity of a vessel is 300 cal $.^{\circ}C^{-1}$ and the heat capacity of water contained in the vessel is also 300 cal $.^{\circ}C^{-1}$. How much heat (in joules) is required to raise the temperature of water in the vessel by $126^{\circ}F$?

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8. A new scale of temperature called TIME is introduced. The reading on the new scale is twice the reading on the new scale is twice the reading on a celsius scale when the temperature of a certain body is 373 K. The reading on a Fahrenheit scale is found to (17/15)th the reading on TIME

scale when the temperature of a body is $20°C$. Determine the upper fixed point and lower fixed point of the TIME scale.

9. Two thermometers A and B are calibrated in different scales. When both the termometers are placed in a container filled with hot water the mecury thread in the thermometer A has mvoed through divisions whereas the mercury thread in thermometer B has moved though 15 divisions. The reading on thermometers A and B are $20°$ and $40°$, respectively. if the lower fixed point fo the thermometer A is $0°$, determinet he lowe fixed pointt of the thermometer B.

10. Two bodies of differet metals A and B having an equal mass are given equal quantities of heat. Given that the molecular weight of A is greater than that of B, compare the specific heat capacities of the two metals.

(Note that the rise in temperature is a measure of the increase in the average kinetic energy of the molecules.).

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13. If the temperature of a body increases by $10^\circ C$, find the rise in temperature in Fahrenheit scale.

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14. What is riveting? Explain

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15. At what temperature is the reading on a Fahrenheit thermometer twice that on the Celsius scale?

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16. Describe andd experment to determine melting point of ice and boiling point of water.

17. Explain why a constriction is provided in a clinical thermometer, consiering the fact that during expansion mercury level while increasing passes through the sae constriction.

18. Describe an experiment to determine melting point of wax.

19. Alcohol thermometers are preferred to a mercury thermomemter in cold countries.

20. Describe, with a neat diagram, the working of Six's maximum and minimum thermometer.

Concept Application Level 1 Fill In The Blanks

1. If the melting point of ice at a given place is $0°C$, the atmospheric pressure at that place is _____

2. A good conductor of heat will have ____specific heat capacity.

3. Increase in pressure____ the melting point of ice.

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4. In Six's maximum an minimum thermometer, the indices are brought down to the level of the mercury with the help of_____.

> ▶ Watch Video Solution

5. The iron rims are fitted to the wooden wheels of bullock carts and tongas by process of ____

> ▶ Watch Video Solution

6. The normal human body temperature on Fahrenheit scale is $98.4°F$, then its corresponding temperature on Kelvin scale is nearly

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7. The average kinetic energy of the molecules of a sub stance _____ during the process of melting.

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Concept Application Level 1

1. A body at $20° C$ is in thermal equilibrium with a body at 293K.

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2. In six' maximum and minimum thermometer, the thermometric liquid is mercury.

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3. Heat energy can be supplied to a substance without increasing its temperature.

4. Liquefaction is the process in which a solid changes into liquid on supply of heat.

5. When equal masses of water and iron are heated to the same change in temperature, the heat absorbed by iron is more than the heat absorbed by water.

6. A body can have a temperature -10 K.

7. If the heat energy abosrobed by two identical bodies A and B is 1 calorie and 1 joule, repsectively, the rise in temperature of A is greater than the rise in temperature of B.

8. Match the entries given in Column A with appropriate ones in Column B.

Column A		Column B
A. Absolute zero of temperature	( )	a Decrease in melting point on increase in pressure.
B. Number of divisions of celsius scale	( )	b. Average kinetic energy of molecules
C. LFP of a thermometer librated in Kelvin scale.	( )	c. Sum of potential and kinetic energy of the molecules.

Column A		Column B
D. Number of divisions on clinical thermometer calibrated in Fahrenheit.	( )	d. 15
E. Skating	( )	e. High specific heat capacity of water
F. Bimetallic strip	( )	f. 100
G. Temperature of melting ice	( )	g. 273
H. Formation of sea and land breezes	( )	h. Zero kelvin
I. Heat	( )	i. Zero degree celsius
J. Temperature	( )	j. Thermal expansion

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9. Which of the following represents the smallest tem perature change?

A. $1°C$

B. $1°F$

C. 1K

D. Both (a) and (c)

Answer: B

10. If C, F and K are the temperature on Celsius, Fahrenheit and Kelvin scale, $\Delta C, \Delta F$ and ΔK are the change in temperature in celsium, Fahrenheit and Kelvin scale, respectively, the correct relation among the following is:-

A. $\dfrac{C}{5} = \dfrac{F}{9} = \dfrac{K - 273}{5}$

B. $\dfrac{\Delta C}{5} = \dfrac{\Delta F}{9} = \dfrac{\Delta K}{5}$

C. $\dfrac{\Delta C}{5} = \dfrac{\Delta F - 32}{9} = \dfrac{\Delta K - 273}{5}$

D. $\dfrac{C}{5} = \dfrac{F}{9} = \dfrac{K}{5}$

Answer: B

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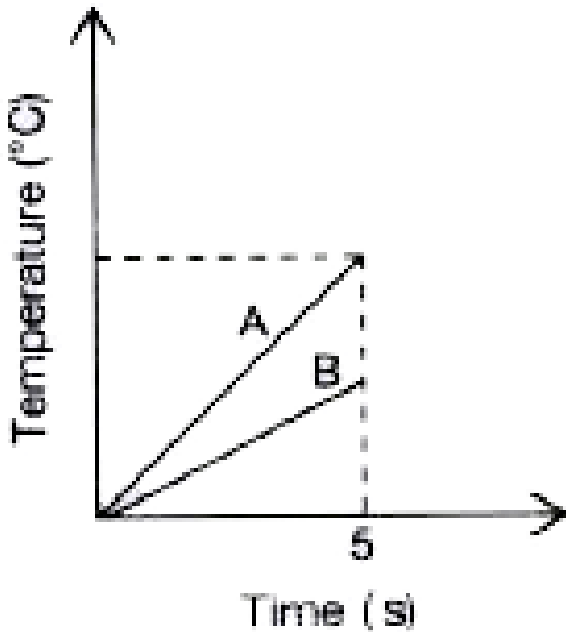**11.** The degree of hotness or coldness of a body is called its

A. heat capacity

B. latent heat capacity

C. temperature

D. None of these

Answer: C

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12. When equal amount of heat is supplied to two different substances A

and B, the rise in temperature with time is graphically represented as

follows. Choose the correct statement.

A. If masses of A and B are equal, specific heat of A is equal to specific

   heat of B.

B. If mass of A is greater than mass of B the specific heat capacity of A

   is greater than the specific heat capacity of B.

C. Heat capacity of A is less than heat capacity of B.

D. None of these

Answer: C

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13. For a certain engineering application, it is required to rise the temperature of a given mass of a body as quickly as possible. The material should have

A. high specific heat capacity.

B. high density.

C. low specific heat capacity.

D. heat capacity.

Answer: C

14. Specific heat capacity of water is

A. $1 calg^{-10}C^{-1}$

B. $4186 Jg^{-10}C^{-1}$

C. $4186 kJkg^{-1}K^{-1}$

D. All the above

Answer: A

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15. Under normal conditions, naphthalene changes its state from_____

A. solid to liquid

B. liquid to gas

C. liquid to solid

D. solid to gas

Answer: D

16. The distance betweent he LFP and UFP of a thermometer is 18 cm. the readint on the thermometer in Fahrenheit scale when the length of the mercury thread is 8 cm is____

A. $212F^{\circ}F$

B. $112^{\circ}F$

C. $80^{\circ}F$

D. $180^{\circ}F$

Answer: B

17. A: At high altitude regions the cooking of food becomes difficult

B: Water boils at lower temperature when the presure is low.

   A. Both A and B are wrong.

   B. A and B are correct and B is not the correct explanation of A.

   C. A and B are correct and B is the correct explana tion of A.

   D. A is correct but B is wrong.

Answer: c

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18. The change in temperature of a body is $20°C$, then the change in temperature of Kelvin scale is :-

   A. 293 K

   B. 25 K

   C. 20 K

D. 253 K

Answer: c

19. In the process of boiling,

A. kinetic and potential energy of water molecules increase.

B. kinetic energy of molecules increases and potential energy of molecules decreases.

C. potential energy of molecules increases and kinetic energy of molecules remains same.

D. kinetic energy of molecules increases and potential energy of molecules remains the same.

Answer: c

20. When the pressure is increased,

A. melting point of ice decreases and boiling point of water increases.

B. melting point of ice and boiling point of water decreases.

C. melting point of ice and boiling point of water increases.

D. melting point of ice increases and boiling point of water decreases.

Answer: a

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21. Food in the pressure cooker is cooked faster, as

A. the boiling point increases due to an increase in pressure.

B. the boiling point decreases due to an increase in pressure.

C. more steam is available at $100° C$.

D. more pressure is available at $100^\circ C$.

Answer: a

22. Given that the ratio of specific heat capacity of alcohol to that of water is 13 : 25, which of the following statements is true?

A: When temperature is raised through $1^\circ C$ the heat energy absorbed by 2 kg of alcohol is less than the heat energy absorbed by 1 kg of water.

B: Heat capacity of 2 kg alcohol is more than the heat capacity of 1 kg water.

A. A is true and B is false.

B. A and B are true.

C. A is false and B is true.

D. A and B are false.

Answer: c

23. $-40°C$ is numerically equal to

A. $-40°$

B. 233K

C. $-32°R$

D. All the above

Answer: a

24. Which of the following properties are suitable for making cooking utensils?

A. High specific heat and high conductivity.

B. Low specific heat and low conductivity.

C. High specific heat and low conductivity.

D. Low specific heat and high conductivity.

Answer: d

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25. The advantage of alcohol is thermometric liquid is due to its

A. low-boiling point.

B. low-freezing point.

C. high-vapour pressure.

D. All the above

Answer: b

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26. The temperature at which molecular movement of matter ceases is called____

    A. normal temperature

    B. zero kelvin

    C. abnormal temperature

    D. None of these

Answer: b

27. Gas thermometers are more sensitive as compared to liquid thermometers, as their

    A. coefficient of expansion is very high.

    B. coefficient of expansion is very low.

    C. density is very high.

D. None of these

Answer: a

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28. Which among the following is the hottest substance?

A. Water at $100^\circ C$

B. Steam at $100^\circ C$

C. Mercury at $100^\circ C$

D. All the above are equally hot.

Answer: d

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29. Mercury is used as thermometer liquid. Which among the following properties of mercury is used in this?

    A. Low specific heat capacity

    B. High boiling point and low melting point

    C. Low vapour pressure

    D. All the above

Answer: d

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30. The difference in temperature of $25°F$ is equal to the difference in temperature of

    A. $25°C$

    B. 25K

    C. $25°R$

D. None of these

Answer: d

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31. Arrange the following steps in proper sequence for the construction and calibration of Celsius thermometer.

(A) Lower fixing point is marked by immersing the bulb of the thermometer in melting ice taken in a funnel.

(B) The distance between the two fixed points is called fundamental interval. It is divided into 100 equal divisions in Celsius scale.

(C) Take a thick walled capillary tube with thin walled glass bulb and fill it with mercury with the help of a funnel.

(D) Mark the upper fixing point with the help of hypsometer.

(E) Place the glass bulb in a hot oil bath while filling the mercury to remove the air bubbles.

A. C A D E B

B. C E A D B

C. C E A B D

D. C D B E A

Answer: b

32. A given substance of mass 'm' is in solid state at certain temperature. Arrange the following steps in proper sequence to calculate the total heat energy required to just convert the substance completely into gaseous state.

(A) Note down the specific latent heat of vapor ization of the substance and calculate the heat supplied to convert from liquid to gaseous state using the formula.

(B) Note down the melting point of the substance and calculate the heat supplied to increase the temperature of the solid to its melting point.

(C) Note down the boiling point of the substance and calculate the heat

supplied to increase the temperature of the substance from melting point to its boiling point.

(D) Add all the heat energies, it gives the resultant heat supplied to the solid to just convert it into gaseous state.

(E) Note down the specific latent heat of fusion of the substance and calculate the heat supplied to convert the substance from solid state to liquid state.

A. B D E C A

B. A C E D B

C. A B C D E

D. B E C A D

Answer: d

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33. Black surface is a

A. good absorber of heat energy.

B. good radiator of heat energy.

C. Both (a) and (b).

D. None of these

Answer: c

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34. As the temperature difference between the ends of a conductor increase the heat transfer rate by conduction____

A. increases

B. decreases

C. remains same

D. None of these

Answer: a

35. heat transfer rate is more ini____

    A. glass

    B. wood

    C. plastic

    D. copper

Answer: d

36. Which of the following statements is (are) true about conduction?

    A. A medium is necessary for the conduction of heat.

    B. The rate of conduction of heat depends upon the nature of the medium.

C. As the particles of a medium conduct heat, they only vibrate in their own place, they do not leave their original place.

D. All the above

Answer: d

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37. A piece of ice at $0°C$ is dropped into water at $32°F$. Which of the following statements is correct?

A. Ice melts.

B. Water freezes

C. Both (a) and (b).

D. None of these

Answer: d

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38. Which among the following statements is/are correct?

A. The principle of a bimetallic strip is unequal expansion of metals.

B. An iron ring is cooled to fix it on a wooden wheel.

C. When the room temperature is raised, a pendu lum clock loses time.

D. Both (a) and (c).

Answer: (b and d)

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Concept Application Level 2

1. The density of two spheres of equal radius are in the ratio 1:3 and their specific heat capacities in the ratio 2:1 what is the ratio of their heat capacities?

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2. The total distance between the lower fixed point and the upper fiixed point of a thermometer is 12 cm. when this thermometer is palced in a vessel containing 500g water the reading on the scale was 3 cm.. When 10 lead shots at $100° C$ were dropped into this container the mercury level int he thermometer rose to 31 mm. find the average heat capacity o the lead shots. (you may leave the answer as a fraction).

Specific heat capacity of water =4.2 kJ kg^{-1} K^{-1}

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3. When the mercury thread rises to 3/4th of the distance between the two fixed points, what is the temperature indicated by the Fahrenheit scale?

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4. On a certain scale of temperature, the freezing and boiling points of water are maked as 20 and 180 degress, respectively. What is the temperature of a patient suffering with a high fever of $104°F$ on that scale?

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5. Two cylinderical bodies 'A' and 'B' have their radii in the ratio of 1:2 and their lengths are in the ratio of 3:2. When equal amount of heat energy is supplied to them, the rise in the temperature of A is found to be double the rise in temperature of B. Determine the ratio of their specific heat capacity. The ratio of density of A and B is 3:1

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6. The rate at which ice melts is more at the top when compared to the bottom of the blacier. Explain whether the statement is true capacities.?

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7. The density of two identical spheres are in the ratio 2:3 and their specific heat capacities in the ratio 4:5 wha is the ratio of their heat capacities?

8. In a new scale of temperature the lower fixed point is marked as 0 corresponding to the melting point of a substance which is equal to $25^\circ C$ and the upper fixed point is marked corresponding to the boiling point of a substance which is equal to $75^\circ C$ The total length of the scale between the UFP and LFP is divided into 200 equal parts. Determine the temperature in the new scale when the temperature of a substance measured by a celsius scale thermometer is $50^\circ C$

9. How is water useful in the protection of fruits and vegetables from damage during storage at sub zero temperature?

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10. Two substances P and Q are heated by using similar heating devices. The mass of P and Q are 100 g and 75 g, respectively. The initial temperature of P is $35° C$ whereas the initial temperature of Q is $25° C$. If the temperature of the substance 'P' is increased to $75° C$ in 40 minutes, determine the time required to raise the temperature of Q to the same value. The specific heat capacity of P and Q are 0.9 cal $g° C^{-1}$ and 0.6 cal $g° C^{-1}$, respectively.

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11. Why is salt sprinkled under ice cube trays in a refrigerator?

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12. The temperature of a body is measured in Kelvin scale, Fahrenheit scale and Celsius scale. Which among them is a more accurate reading? Explain.

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13. It is possible to melt a piece of aluminium placed in a spoon made of zinc.

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14. A new scale fo temperature is introduced. One degree temperature difference on the new scale is found to be equal to $\frac{5}{8}.^{\circ} C$. Determine the temperature in Celsium scale when the new scale and the celsium scale shows the saer eading. The lower fixed point on the new scale is 33° degree.

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15. Convert $55°C$ into Fahrenheit and Kelvin scale.

16. Three metallic spheres A,B and C have their masses in the ratio 1:2:3, specific heat capacities in the ratio 6:3:4. When the initial temperature of the spheres are measrued in Celsius scale, the ratio of their temperature is found to be 1:2:3. Initially the two spheres A and B are brought into contact. when equilibrium temperature is attained, sphere B is brought into contact with 'C'. Determine the ratio of the final temperatures of A,B and C as measured in Celsius scale.

17. If 3360 J of heat is required to melt 10 g of ice, how many kilocalories of heat should be supplied to melt 1 kg ice?

18. Find the amount of heat enegy required to convert 100 g of ice at $-10^\circ C$ into stea at $120^\circ C$.

(Take

$S_{ice} = 0.5$ cal $g^{-1}.^\circ C^{-1}$, $S_W = 1$ cal g^{-1} ^ (∘)C^{-1}, $S_{Steam} = 0.5$ ca

)

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19. To obtain of water at $50^\circ C$, how many grams of stea at its stea point must be passed to 70 g of ice at $0^\circ C$.

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Concept Application Level 3

1. Quantity of heat gained by 100 kg of iron in raising its temperature by $10^\circ C$ is $11 \times 10^4 cal$. If a heater can supply heat at the rate of 1000 J s^{-1},

how much time does it take to heat an iron block of mass 2.5 kg when the mecury level in a Fahrenheit thermometer rises by 45 divisions.

2. Two containers X and Y are filled with water at different temperature. When 10 g of water from container X is mixed with 20 g of water from container Y, the resultant temperature is found to be $20°C$. When 20 g of water from container X is mixed with 10 g of water from container Y, the resultant temperature is found to be $30°C$. Determine the inital temperature of water in container X and Y.

3. In winters when the lakes start feezing, the weather becomes very pleasant in the surrounding region. Explain.

4. When two heating devices are used to heat two different substance A and B the heat absorbed by A after 2 seconds is found to be equal to the heat absorbed byy B after 3 seconds. The rise in temperature of A after 5 seconds is found to be equal to the rise in temperature of B after 6 seconds.i the ratio of masses o A and B is 1:2, determine the ratio of the specific heat capacities of two substances.

5. Ice cubes at $0°C$ each of mass 200 g are dropped one after the other into 2 kg water at $30°C$ in such a awayy that after the first one melts completely, the second one is dropped. If the heat energy required to melt 1 g of ice is 80 cal, determine the maximum number of ice ice cubes that can be dropped into the water such that no ice is left in the water without melting.

6. if specific heat capacity of mercury is 0.033 cal g^{-1} .$^{\circ}C^{-1}$, how much heat is gained by 0.05 kg of mercury when its temperature rises from $68^{\circ}F$ to 313K?

7. The heat capacity of a vessel is 300 cal .$^{\circ}C^{-1}$ and the heat capacity of water contained in the vessel is also 300 cal .$^{\circ}C^{-1}$. How much heat (in joules) is required to raise the temperature of water in the vessel by $126^{\circ}F$?

8. A new scale of temperature called TIME is introduced. The reading on the new scale is twice the reading on the new scale is twice the reading on a celsius scale when the temperature of a certain body is 373 K. The reading on a Fahrenheit scale is found to (17/15)th the reading on TIME

scale when the temperature of a body is $20°C$. Determine the upper fixed point and lower fixed point of the TIME scale.

9. Two thermometers A and B are calibrated in different scales. When both the termometers are placed in a container filled with hot water the mecury thread in the thermometer A has mvoed through divisions whereas the mercury thread in thermometer B has moved though 15 divisions. The reading on thermometers A and B are $20°$ and $40°$, respectively. if the lower fixed point fo the thermometer A is $0°$, determinet he lowe fixed pointt of the thermometer B.

10. Two bodies of differet metals A and B having an equal mass are given equal quantities of heat. Given that the molecular weight of A is greater than that of B, compare the specific heat capacities of the two metals.

(Note that the rise in temperature is a measure of the increase in the average kinetic energy of the molecules.).

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