Chapter- 11

THERMAL PROPERTIES OF MATTER

Very Short Answer Type Questions (1 mark)

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

02. The diameters of steel rods A and B having the same length are 2cm and 4cm respectively. They are heated through 100^0c. What is the ratio of increase of the length of A to that of B?

03. Which molecules, the molecules of 0^0c ice or of 0^0c water have more potential energy, and why?

04. Why pendulums made of invar are used in a pendulum clock?

05. A good conductor of heat is a good conductor of electricity. Why?

06. What is the temperature of the triple - point of water on the Fahrenheit scale?

07. Write the S.I unit of Co-efficient of thermal conductivity?

08. Birds are often seen to swell their feathers in winter. Why?

09. Why do Eskimos build double-walled houses of blocks of ice?

10. Is the temperature coefficient of thermal expansion always positive?

11. What is the unit of heat capacity?

12. Why water is taken as a very good coolant?

13. Why does the gap is made between the section of the slab of a bridge?

14. How does the melting point depend on pressure?

Short Answer Type Questions (2 and 3 marks)

15. Briefly describe the various scales of temperature and give the relation between them.

16. Define α and β. Obtain a relation between them.

17. Find the fractional change in the density of glycerine if its temperature is increased from 20^0C to 50^0C. Given the coefficient of cubical expansion for glycerine is $4.9\times10^{-4}\ ^0C^{-1}$. Also, find the % change?

18. What do you mean by the latent heat of fusion and latent heat of vaporization? Also, write its mathematical expression.

19. Define thermal conduction. Discuss the variable and steady-state of a rod being heated at one of its ends.

20. Distinguish between conduction, convection, and radiation.

21. What is Newton's law of cooling? Derive its mathematical relation.

22. A blacksmith fixes an iron ring on the rim of the wooden wheel of a bullock cart. The diameters of the rim and iron ring are 5.243m and 5.231m respectively at 27^0c. To what temperature should the ring be heated so as to fit the rim of the wheel? (" α for iron = 1.2 X $10^{-5}c^{-1}$)

23. Two rods A and B one of equal length. Each rod has its ends at temperatures T_1 and T_2. What is the

24. Two metal strips A and B each of length L_0 and thickness d at temperature 'T^0C' be fastened together so that their ends coincide. The temperature coefficient of linear

expansion of A is α_A and that of B is α_B ($\alpha_A > \alpha_B$). Find the radius of the curvature of the strip when it is heated.

25. How much heat is needed to change 10g of ice at -10^0C to 10g steam at 110^0c?

26. When 0.15kg of ice at 0^0c it mixed with 0.30kg of water at 50^0c in a container, the resulting temperature is 6.7^0C. calculate the heat of fusion of ice.

27. 10gm of water at 10^0c mixed with 10gm of ice at -10^0c. Find the final temperature of the water.

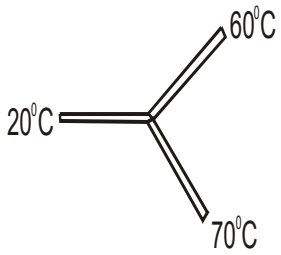
28. A pan filled with hot food cools from 94^0 to 86^0c in 2 minutes. When the room temperature is 20^0c. How long will it take to cool from 71^0c to 69^0c?

Long Answer Type Questions (5 marks)

29. State Stefan's law of radiation for a perfect black body. Derive Newton's law of cooling from it.

30. (a) Define thermal conductivity and write its expressions and find its unit and dimension.

(b) Three identical thermal conductors are connected as shown in the figure. Considering no heat loss due to radiation, find the temperature at the junction point.



31. What is meant by a perfect black body? State and prove Kirchhoff's law leads to the conclusion that good absorbers are good emitters.

MODEL QUESTIONS

Very Short Answer Type Questions*(each question 1 mark)*

01. Water is heated from 0^0C to 10^0C. Draw its (Temp. ~ Volume) and (Temp. ~ density) graph?

02. What do you mean by sublimation?

03. One gram of ice at -10^0c heated to 150^0c. Find the heat required and draw its (heat ~ temp.) graph?

04. Why does one feel cool when keeping on Ice?

05. Which metal has higher thermal conductivity, steel, or iron?

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

07. Explain how does a fish stay alive in a frozen pond in winter?

08. Why does soda water bottles, sometimes burst in summer?

09. Why do some clocks are slow in summer and fast in winter?

10. State Stefan's law.

11. State Wien's displacement law.

Short Answer Type Questions*(each question 2/3 marks)*

12. A sheet of aluminum along has a circular hole of diameter 0.1m cut in it at 0^0c. Calculate the change in (a) the circumference and (b) area of the hole when the sheet is heated up to 100^0c. Given α for Al = $16 \times 10^{-6}/^0$ C .

13. A copper block of mass 2.5kg is heated in a furnace to a temperature of 500^0c and then placed on a large ice block. What is the maximum amount of ice that can melt? Specific heat of copper = 0.39j/g, heat of fusion of water = 335j/g.

14. A brass wine 1.8m long at 27^0C is held that with little torsion between two rigid supports. If the wire it, if its diameter is 2mm? The coefficient of linear expansion of brass is 2 X $10^{-5}k^1$. Young's modulus of brass = 0.91 X 10^{11}pa.