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Experiential Experimental Edutaining

PHYSICS

SAMPLE BOOK

7 GRADE

PHYSICS

I'm the

Intelli Kid

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and

I'm becoming the

Best Version

of myself with

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GRADE-7

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I AM PROGRESSING

(Tick mark the columns after achieving the Learning Milestones)

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 Heat				
 Winds, Storms & Cyclones				
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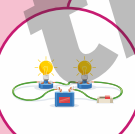 Current Electricity & its Effects				
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PHYSICS

SAMPLE THEORY

CHAPTER 1

HEAT

HEAT (THERMAL) ENERGY

Form of energy which flows between two objects or systems as a result of temperature difference between them.

- S.I. unit is **Joule (J)**. Other commonly used unit is **Calorie (cal)**.
- Calorie is the amount of heat required to raise the temperature of 1 gram of water by 1 °C.
  1 Calorie = 4.18 J ≈ 4.2 J
- Heat naturally flows from high temperature to low temperature.
- If heat can flow between two objects or systems, the objects or systems are said to be in thermal contact.

TEMPERATURE

- The measure of degree of hotness or coldness of a body is called its **temperature**.
- Energy must be either added to or removed from a substance to change its temperature.

- **Thermal equilibrium :** It is a state in which two bodies acquire identical temperatures when they are in physical contact with each other.

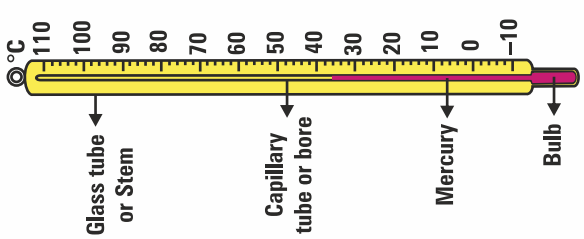
THERMOMETER

- It is an instrument used for measuring the temperature of a substance.

Thermometer

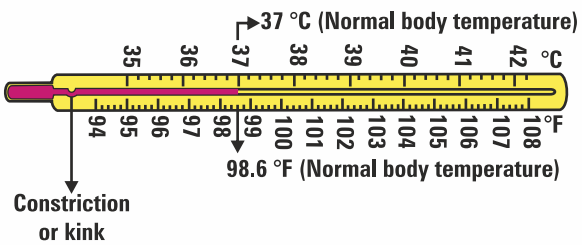
Laboratory thermometer

It is used to measure the temperature of objects other than the human body.
Range : –10 °C to 110 °C



Clinical thermometer

It is used to measure the temperature of human body.
Range : 35 °C to 42 °C, 94 °C to 108 °C
Normal temperature of humay body 37 °C.



SELECTION OF THERMOMETRIC LIQUID

- Alcohol is used for study of atmosphere and weather conditions. This is because alcohol remains a liquid between −112 °C and 78 °C. Therefore, temperatures as low as −100 °C can be measured. At such temperatures, mercury would freeze as freezing point of mercury is −39 °C.
  For common use, mercury is preferred to alcohol for the following reasons:
  - Mercury does not freeze or vaporise easily, i.e., it remains a liquid over a large temperature range. Mercury freezes at −39 °C and boils at 357 °C.
  - Since mercury is a good conductor of heat, it quickly attains the temperature of the body with which it is in contact also it has higher density than water.
  - Mercury does not wet the surfaces in contact thus it does not stick to the inner surface of capillary tube.
  - Mercury is an opaque liquid with shining appearance like silver. Thus, it can be easily observed through the glass.
- **Ice point** :
  - The temperature at which liquid & solid are in equilibrium at 1 atmospheric pressure.
  - For water ice point is (0 °C or 32 °F).
- **Steam point** :
  - The temperature at which liquid & its vapour exist in equilibrium at 1 atmospheric pressure.
  - For water, steam point is (100 °C or 212 °F).
- **Absolute zero** :
  - It is the lowest possible temperature where nothing can be colder and where all heat energy remains in substance.
  - At absolute zero, the temperature where [illegible] completely frozen, there is no motion.
  - Absolute zero occurs at 0 °K or [illegible]

TEMPERATURE SCALES

Fahrenheit scale (°F)

Upper fixed point = 212 °F ; Lower fixed point = 32 °F

Centigrade scale (°C) or Celsius scale

Upper fixed point = 100 °C ; Lower fixed point = 0 °C

Kelvin scale (K), Thermodynamic scale or 'absolute temperature scale'

Upper fixed point = 373 K ; Lower fixed point = 273 K

$$\frac{T-32}{212-32} = \frac{C-0}{100-0} = \frac{K-273}{373-273}$$

$$\frac{F}{9} = \frac{C}{5} = \frac{K-273}{5}$$

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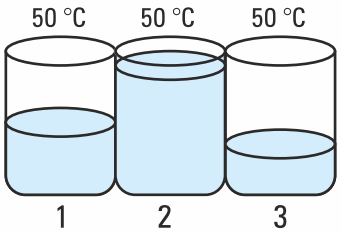
SAMPLE EXERCISE

Directions: Solve each of the following multiple choice questions by choosing the most appropriate option.

1. Three glasses containing water at the same temperature, are placed side by side touching each other as shown in the given figure. Given that glass 1 contains 0.3 kg of water, glass 2 contains 0.5 kg of water and glass 3 contains 0.1 kg of water. Which of the following statements is true ?

(1) Heat flows from glass 1 to glass 2 and from glass 2 to glass 3.
(2) Heat flows from glass 2 to glass 1 and from glass 2 to glass 3.
(3) Heat flows from glass 1 to glass 2 and from glass 3 to glass 2.
(4) Heat does not flow among these three glasses.



2. In a thermos flask, heat loss by conduction, convection and radiation can be avoided by

(1) providing vacuum between the two walls of the flask.
(2) filling the space between the two walls of the flask with cork which is a bad conductor of heat.
(3) providing a shining glass.
(4) All the above

3. – 40 °C is numerically equal to

(1) – 40 °F (2) 243 K (3) – 32 K (4) All the above

4. Absolute zero is the condition at which

(1) molecular motion ceases. (2) gas becomes liquid.
(3) matter becomes massless. (4) random motion of molecules occur.

5. A hot and a cold body are kept in vacuum separated from each other. Which of the following will cause decrease in temperature of the hot body ?

(1) Radiation (2) Convection
(3) Conduction (4) Temperature remains unchanged

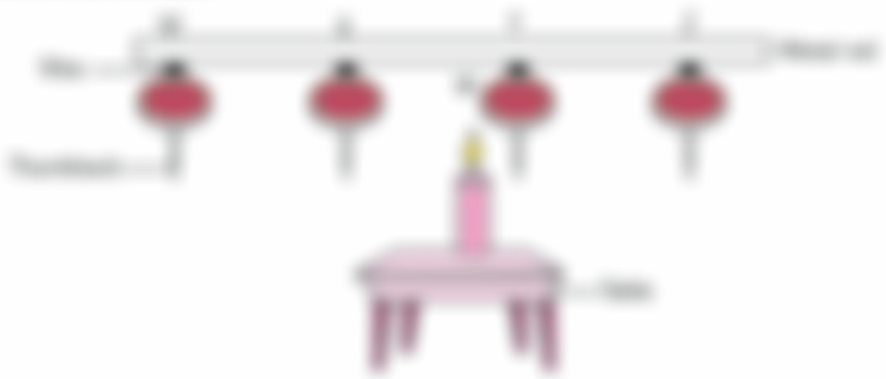
6. If C, F and K are the temperatures on Celsius, Fahrenheit and Kelvin Scale, ΔC, ΔF and ΔK are the change in temperature in Celsius, Fahrenheit and Kelvin scale respectively. The correct relation among the following is

(1) $\frac{C}{5}=\frac{F-32}{9}=\frac{K-273}{5}$ (2) $\frac{\Delta C}{5}=\frac{\Delta F}{9}=\frac{\Delta k}{5}$

(3) $\frac{\Delta C}{5}=\frac{\Delta F-32}{9}=\frac{\Delta K-273}{5}$ (4) $\frac{C}{5}=\frac{F}{9}=\frac{K}{5}$

7. Rohan set up an experiment as shown here.

He placed the lightest candle below the metal rod at position W. He used the same amount of wax to hold all the thumbtacks at positions W, X, Y and Z on the rod. Arrange the thumbtacks according to the time they take to drop from the rod, from the first to the last.



(1) Y, X, W, Z

(2) X, Y, W, Z

(3) Y, X, Z, W

(4) W, Z, Y, X

8. In which mode of transfer of heat, molecules pass on heat energy to neighboring molecules without actually moving from their positions?

(1) Conduction

(2) Convection

(3) Radiation

(4) None of these

9. A body was supplied 6.28 joules of heat. Express this amount in calories.

(1) 1500 cal

(2) 15.28 cal

(3) 1.5 cal

(4) 1.43 cal

10. How much heat is required to raise the temperature of 2 kg of water from 0 °C to 50 °C?

(1) 100 kJ

(2) 84 kJ

(3) 42 kJ

(4) 21 kJ

11. A sphere, a cube and a thin plate, all of same material and same mass are heated at same high temperature. Then

(1) plate will cool fastest and cube the slowest.

(2) sphere will cool fastest and cube the slowest.

(3) cube will cool fastest and sphere the slowest.

(4) cube will cool fastest and plate the slowest.

12. How much amount of heat is required to raise the temperature of 100 g of water from 30 °C to 100 °C? The specific heat of water = 4.2 J/g °C.

(1) 28 J/kJ

(2) 28 kJ

(3) 30 kJ

(4) 40 kJ

13. When two bodies are in thermal contact, the direction of flow of heat is determined by its_____.

(1) density

(2) temperature

(3) heat capacity

(4) mass