**15 June, 2020 JESUS AND MARY SCHOOL AND COLLEGE MODULE 4**

**CLASS – 7**

**PHYSICS**

**CHAPTER- HEAT**

**INTRODUCTION:**

When we go out at noon on a hot summer day or touch a bowl of hot soup, we feel hot. Similarly, we feel warm when we sit in the sun on a cold winter day. This sensation of warmth or hotness is due to a form of energy known as **heat energy**. Since heat is a form of energy, it can neither be created nor destroyed. It can only get transferred from one body to another. This is the reason we feel hot on touching a bowl of hot soup because heat from bowl flows to our hand. If we touch a bowl of ice cream, we feel cold because heat from our hand flows to the bowl. This energy transfers takes place because the two bodies have different temperature. There will be no heat transfer between any two bodies which have the same temperature. Hence, we conclude that there is transfer of energy from one body to another due to a difference in their temperatures. This transferred energy is called heat energy.

**HEAT:**

Take some cold water in a vessel and start heating it making tea. In the beginning, you can easily dip your finger in the water. But, as the water gets more and more heated, you cannot keep your finger in the water. This sensation of feeling cold, warm and hot by touching gives us an idea of the relative hotness and coldness of water. This quality by which we can compare between the relative hotness and coldness of bodies is known as temperature.

The degree of hotness or coldness of a body is called its temperature. The temperature also describes the flow of heat, that is, heat always flows from higher temperature to lower temperature.

When you hold a cup of hot milk, heat energy flows from the cup to your hands and your hands feel hot. If you hold an ice cream cup, energy gets transferred from your hands to the cup and your feel cold.

We feel warmer in summer than in winter because of the difference in the temperature of air surrounding us.

**UNITS OF HEAT:**

As heat is also a form of energy, therefore heat has same units as energy. The SI unit of heat is **joule (J)**. The other commonly used units for heat are calorie (cal) and kilocalorie (kcal).

As discussed before, joule and calorie are related as

1 cal = 4.186 J $≈$ 4.2 J

Or

1 J = 0.24 cal

**1 calorie** is defined as the amount of heat required to raise the temperature of 1 gram of water by 1 ˚C. The bigger unit of heat is kilocalorie. **1 kilocalorie** is defined as the amount of heat required to raise the temperature of 1 kilogram of water by 1 ˚C.

Therefore,

 1 kilocalorie = 1000 calories i.e.,

 1 kcal = 1000 cal

**TEMPERATURE:**

The **temperature** is defined as the measure of degree of hotness or coldness od a body. It tells us about the motion of molecules and atoms in a substance. If the substance has a low temperature, then its constituent particles are moving at low speed or they are vibrating slowly. If the substance has a high temperature, then motion of its constituent particles is fast and they are vibrating vigorously.

**UNITS OF TEMPERATURE:**

The SI unit of temperature is Kelvin (K). Other units used to measure temperature are degree Celsius (˚C), degree Fahrenheit (˚F) and degree Rankine (˚R).

**Thermometer:**

**Thermometer** is a device which is used to measure the temperature of a body. The term is derived from two Latin words *thermo* meaning heat and *meter* meaning a measuring device. A thermometer measures temperature in a degree Celsius, degree Fahrenheit, Kelvin.

A thermometer consists of a graduated glass tube containing a thin, long and uniform capillary tube inside it. The glass tube has a bulb at one end which contains a thermometric liquid either alcohol or mercury.

**Qualities of a Good Thermometer:**

A good thermometer should have the following qualities:

* The thermometric liquid used in the thermometer should
* Have a wide range of temperature, i.e., a low freezing point and a high boiling point so that it can be used over a wide range of temperature.
* Not slick to the walls of the capillary tube.
* Expand uniformly.
* Be opaque and clearly visible.
* Be practically non- volatile.
* The stem of the thermometer should be made of thick glass to protect the capillary tube against any physical damage.
* The bulb of the thermometer should be thin-walled so that the liquid inside it quickly attains the temperature of the body.
* The bore of the capillary should be narrow so that the liquid moves through a large length even if the increase in volume of liquid in the thermometer is small.

**Advantages of Using Mercury as a Thermometric Fluid:**

* Mercury expands easily and uniformly on heating. It gives an accurate measurement of the temperature.
* Mercury can be used over a wide range of temperatures, as its freezing point is -39˚C and boiling point is 357˚C.
* Mercury is easily visible, being opaque and shiny.
* Mercury does not stick to the sides of a glass tube.
* Mercury is practically non-volatile.

**Temperature Scales:**

There are three temperature scales to measure temperature.

* **Celsius scale:** In Celsius scale, the lower fixed point is 0˚C which is the freezing point of water and the upper fixed point is 100˚C which is the boiling point of water. The interval between the lower fixed point and the upper fixed point is equally divided into 100 degrees.
* **Fahrenheit Scale:** German physicist Daniel Gabriel Fahrenheit proposed a temperature scale which is known as Fahrenheit scale. The lower fixed point of this scale is 32˚F for freezing point of water and upper fixed point is 212˚F for boiling point of water. The interval between these two fixed points is divided into 180 equal parts.
* **Kelvin Scale:** The Kelvin scale is named after Lord Kelvin, who was a Scottish engineer, mathematician and physicist. This scale is based on a single point called absolute zero. Water freezes at 273.15 K and boils at 373.15 K. You will learn more about this in higher classes.

**Scale Conversion:** The values of one scale can be converted to another scale with the help of the following formulae.

* **Conversion of the Celsius scale to the Kelvin scale**

**K = 273 + ˚C**

* **Conversion of the Fahrenheit scale to the Celsius scale**

**˚C =** $\frac{5}{9}$ **(˚F – 32)**

* **Conversion of the Celsius scale to Fahrenheit scale**

**˚F = (**$\frac{9}{5}$**X ˚C) + 32**

**WORKSHEET 4**

**Fill in the blanks.**

1. Heat is the energy transferred between two bodies in contact due to the difference in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Wood, petrol, kerosene oil and LPG are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ substances.
3. Do not wear any \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ while handling fire.
4. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the thermometer should be made of thick glass to protect the capillary tube against any physical damage.
5. The Kelvin scale has its \_\_\_\_\_\_\_\_\_\_\_\_\_\_ set to absolute zero which is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ possible temperature that exists in the universe.

 **Name the following.**

1. The temperature scale that is commonly used.
2. A method of heat transfer in gases.
3. An instrument used to measure temperature.
4. SI unit of heat.
5. SI unit of temperature.

**Answer the following questions.**

1. Give the formulae for interconversion of temperature scales.
2. What is heat?
3. What is temperature?
4. Who invented the Kelvin scale?
5. Name the liquid which is present inside a thermometer.
6. How many types of temperature scale?
7. What is thermometer?

**Note:- Please do this work in your copies which will be checked when the school reopens . Please consider this important.**

**Given below are the answer to Module 3 uploaded on 01/06/2020.**

 **Fill in the blanks.**

1. In an electric bulb, the electrical energy gets converted into **Light energy.**
2. In a microphone, the **sound** energy gets converted into the electrical energy.
3. While burning wood, the chemical energy changes to **Heat energy.**
4. The light energy from the sun is transmitted into **chemical** energy by green plants.

**Name the following.**

1. The capacity to do work - **Energy**
2. The energy stored in the nucleus of an atom - **Nuclear energy**
3. A form of energy produced by vibrating bodies - **Sound energy**
4. The process of changing one form of energy to another - **Energy Conversion**
5. The energy stores in the muscles of our body - **Muscular energy**

 **Match the columns.**

1. Burning of coal
2. Atom Bomb
3. Sun
4. MRI
5. Running water

 **Answer the following questions.**

**Q 1.** What is law of conservation of energy?

**Ans1.** Energy can neither be created nor be destroyed. It can only be converted from one form to another and the sum of all the energy in the universe remains constant.

**Q 2.** What is energy transformation?

**Ans2.** The process of changing one form of energy to another.

**Q 3.** In a dry cell, which energy converted into electrical energy?

**Ans3.** In a dry cell, chemical energy converted into electrical energy.

**Q 4.** In a solar cell, light energy converted into which energy?

**Ans4.** In a solar cell, light energy gets converted into electrical energy.

**Q 5.** Explain energy transformation in a hydroelectric power plant.

**Ans5.** In a hydroelectric power plant, water falling with large force from dams is made to rotate turbines.

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