



Grade Seven Physics Note

UNIT 6

Temperature and Heat

Introduction

- Temperature is measure of coldness and hotness of a substance
- So far, you studied three basic physical quantity mass, length and time
- In this unit we will learn about the fourth basic physical quantity which is called temperature ,measuring temperature ,temperature scale, conversion of temperature scale, source of heat , effect of heating , evaporation and finally making review exercise on unit six.

6.1 Definition of Temperature

- peoples use the word hot, warm, cool and cold to expression of an object these words are not accurate to tell the temperature of an object.
- Most peoples are confused and they use the words heat and temperature inter changeable but heat and temperature are two different physical quantities
- As we draw our hand from the hot water and put it in the lukewarm water, we feel cold , when we draw our hand from the cold water and put it in to the lukewarm water, we feel warm.

Generally testing the hotness or coldness of a body by feeling is not reliable , because the lukewarm water is called for one person and hot for the other , so you can not conclude that lukewarm water is hot or cold.

- Substance are made up of small particle called atoms and molecule .
- The particle in solid are fixed in position but vibrate back and forth about a fixed point.

The particle in liquids and gases are always in motion .These particles have energy due to their motion called kinetic energy.

- When a substance is heated, the speed of the particles increases and they gain kinetic energy.

-Heat is the total kinetic energy of all particle in a substance, while temperature is the measure of the average kinetic energy of a particle in a substance.

-Temperature is not depend on size of a body.

-Temperature is an intensive property this means it does not depend on the system size, amount or types of particle in a system.

-Temperature ,pressure and density are intensive properties.

-Heat, mass and volume are extensive property and depend on the amount of material in a system.

6.2 Measuring Temperature

-To measure the temperature of body accurately we need especial instrument called thermo meter .

-Thermo mater is a devise used to measure temperature of a body. It measure the temperature in degree (0)

-There are different types of thermo mater , having different range and different substance in it some of them are.

1.Mercury Thermo meter:-It operate based on the expansion of mercury with increasing in temperature.

- Clinical thermo mater and laboratory thermo mater are made of mercury.

- Clinical thermo mater are used by health officer in Hospital and Clinic .

- Laboratory thermo mater :- is used by scientist for research purpose.

2.Alcohol Thermo mater:- It is used to measure very low temperature it range from -80°C to 100°C .

6.3 Temperature Scales

- In grade seven there are three most common temperature scale, namely

1. Centigrade (Celsius) scale

2. Fahrenheit Scale

3. Kelvin Scale

The classification of thermo meter scale is based on lower fixed point (melting point of ice) and upper fixed point (boiling point of water) at sea level.

1.The Celsius scale ($^{\circ}\text{C}$)

- The Celsius scale was devised by Swedish astronomer, Anders Celsius .
- He assigned the value "0" to the ice point and 100 to the boiling point. Each division or unit called degree($^{\circ}$).

2. The Fahrenheit Scale ($^{\circ}\text{F}$)

- The Fahrenheit Scale was devised by German Scientist Daniel Fahrenheit.
- He assigned the value 32 to the ice point and 212 to the boiling point.
- since the difference b/n the ice point and boiling point is 180.

3. The Kelvin Scale (K)

- A new type of temperature scale is called Kelvin scale , is devised by Lord Kelvin.
- He assigned 273 to the ice point 373 to the boiling point.
- The difference b/n the ice point and boiling point is 100.

$$\text{i.e } 373-273=100$$

- This scale is commonly used in scientific work.
- At a temperature of -273°C or Zero Kelvin all the heat energy will be removed from a substance and the particles in the substance stop to move . We call this lowest possible temperature **absolute zero**.

6.4 Conversion of Temperature Scale

- To change the reading of one temperature scale to another we use the following relationship.

❖ Ratio of interval between boiling point and ice point =ratio of difference between the lower and the unknown point.

$$\text{i.e } \frac{\text{Interval} \in \text{celsius}}{\text{Interval} \in \text{Fahrenheit}} = \frac{T_c - \text{ice point} \in \text{celsius}}{T_F - \text{ice point} \in \text{Fahrenheit}}$$

$$\Rightarrow \frac{100}{180} = \frac{T_c - 0}{T_F - 32}$$

1. To convert Celsius scale to Fahrenheit scale or vice-versa , we use the relation

$$T_F = \frac{9}{5} T_c + 32^\circ$$

$$T_c = \frac{5}{9} (T_F - 32)$$

2. To convert Celsius scale to Kelvin or vice-versa use the relation.

$$T_k = T_c + 273^\circ$$

$$T_c = T_k - 273^\circ$$

Eg1 The temperature of a room is 20°C , What is the temperature of the room in

a, Fahrenheit Scale?

b, Kelvin Scale?

Solution

$$\text{a. } T_F = \frac{9}{5} T_c + 32$$

$$= \frac{9}{5} \times 20 + 32$$

$$= \underline{\underline{68^\circ\text{F}}}$$

$$\text{b, } T_k = T_c + 273$$

$$= 20 + 273$$

$$= 293\text{k.}$$

Eg2. What will be the temperature reading in Celsius scale when the reading Fahrenheit scale is zero?

$$\text{Soln } T_c = \frac{5}{9} (T_F - 32^\circ)$$

$$= \frac{5}{9} (0 - 32)$$

$$= \underline{\underline{-17.8^\circ\text{C}}}$$

Activity 1

1. Explain the term "temperature"
2. Describe the difference between temperature and heat?
3. How we relate temperature of a body with kinetic energy of its particle?
4. Temperature is an intensive property of a body , while heat is an extensive quantity

explain it.

5. Do you know how much heat is the normal human body temperature in degree

Celsius ?

6. How many divisions are there b/n the lowest and the upper fixed point in each

scale?

7. Write the mathematical relation b/n Celsius and Fahrenheit Scales?

8. Convert 56°C to $^{\circ}\text{F}$ and K

9. Convert 210°F to $^{\circ}\text{C}$ and K

10. Change- 300°C to K

6.5 Source of Heat

- Heat is a form of energy and it is produced by energy change .

- The source of heat energy in our country are fire wood, sun, charcoal, petroleum fuel,

electric heater etc.

-The most plentiful source of heat is the sun.

-Heat is transferred from hotter body to the colder one.

-The SI unit of heat energy is Joule.

6.6. Effects of Heating

-When we heat a body different effect may be happen.

- When we heat a body it either burns , or melt, expand , rise in temp, glow in to red or

class may be break.

❖ The effect of heating can be grouped in to the following three categories

1. Temperature rise

2. Expansion

3. Changing of state.

1. Temperature rise

- As heat increase , the kinetic energy of the particle increase, this causes an increasing temperature of a substance , a body receives heat it temperature rise.

2. Heating cause Expansion

Since heat increase the kinetic energy of the molecule, the molecule moves faster and faster and further apart , this results over increasing in the size of the substance.

-Expansion is an increasing the size of the body.

-Gase, liquids and solids are expand when they heat and shrink when cool.

3. Heating Cause Changing Of States

The solid particles are denser than liquid and liquid is denser than gases.

-Water is most commonly found liquid substance on earth . It can exist in solid , liquid and gase state.

- Solid water (ice) exist below 0°C
- Liquid water (water)...b/n 0°C -- 100°C
- Gaseous water(vapor)exist from 100°C and above.

❖ The changing of solid water to water and changing of water to vapor are called changing of state.

Solid melting → liquid boiling → Gaseous

Activity 2

1. what happens to a body , when we heat it?
2. Explain the difference between evaporation and boiling
3. What are the three factors that affect evaporation?
4. What is the difference between boiling and melting ?
5. what is the temperature reading in Kelvin scale if the reading in Celsius is 50°C
6. The temperature of an object is 40°C .What is the temperature in Fahrenheit Scale?
7. Change 310K to Fahrenheit.
8. What are the boiling and melting point of water ?
9. What device do you use to measure temperature?
10. Covert 210°C to K and $^{\circ}\text{F}$

