

## Matter In Our Surrounding.

(Along with this refers Classroom notes and diagram)

### Matter :

Anything which has mass and occupy space is called as Matter.

- In 325 B.C , Greek Philosopher gave a view that matter is any substance that has mass and occupy space. Democritus explains that matter is composed of tiny particles called as atomos or atom.
- In 625 B.C , Maharshi Kanad in India gives idea about matter (Padarth). According to him, padarth shows mass and occupy space. He says that matter is composed of tiny particles called as Anu (Atom).

### Properties of matter :

1. Matter has mass
2. Matter occupy space
3. Matter is affected by gravity
4. Matter shows Inertia
5. Matter cannot be destroyed

### Properties of Particles of Matter :

#### **1. Particles of matter are very very small .**

##### **Explanation:**

Take small amount of  $\text{KMnO}_4$  (Potassium Permanganet) solution. Add a particular amount of water to it and make a desire level. Take 5 ml of above solution and again make the Level by adding water to it , we will still get purple colouration.

Again take 5 ml of above solution and repeat the process for 6-7 times. On number of dilution we still get purple shade. The purple shade in solution indicates that there is particles of  $\text{KMnO}_4$  , though we are unable to see it. From above it is clear that particles of matter are very very small.

#### **2. Particles of matter have space between them .**

##### **Explanation :**

Take a glass of water and mark level . Now add one large spoon salt in it and dissolved it. After complete solubility it is observed that the level of water does not rise because all the salt particle occupy that space which is present between water molecule.

### 3. Particles of matter are in constant motion :

#### Explanation :

1. Take a room freshener and sprayed it in a corner of room. In few seconds the smell of perfume spreads all over in room indicating that particles are in constant motion.
2. Take a solid coloured dye and add it to water. It is observed that in few minutes whole water become coloured. This also shows that particles of matter are in constant motion.

### 4. Particles of motion attract each other:

#### Explanation :

Take a glass of water and inclined it. When water falls , it gives a continuous column without a break. It shows that all water molecules remains attach with each other.

If attraction takes place between same types of particles then it is called as cohesive force of attraction and if attraction takes place between different types of particles then it is called as adhesive force of attraction.

#### States of Matter :

1. Solid
2. Liquid
3. Gas
4. Plasma
5. Bose-Einstein Condensate
6. Fermionic Condensate

| Characteristics          | Solid                                     | Liquid  | Gas  |
|--------------------------|---|---|--|
| Shape and Volume         | Solids have fixed shape and fixed volume. | Liquid don't have fixed shape but shows fixed volume. | Gases don't have fixed shape and fixed volume. |
| Arrangement of Particles | Compactly arranged                        | Moderately arranged                                   | Loosely arranged                               |
| Attraction of particles  | Attraction between particles is high      | Moderate  | Very very less attraction                      |
| Kinetic Energy           | K.E is almost zero                        | K.E is moderate                                       | K.E is very high                               |
| Density                  | High                                      | Moderate  | Less   |
| Rigid/Fluid              | Rigid                                     | Fluid   | Fluid  |
| Compressibility          | Do not compressed                         | Compressed to a very little extent                    | Highly compressed                              |
| Density                  | High                                      | Moderate  | low  |
| Filling the Container    | Do not fill the container completely      | Do not fill the container completely                  | Fill the container completely                  |

## **Diffusion :**

Spreading or mixing of particles of one substance to particles of another substance by its motion is called as Diffusion.

Diffusion is due to motion of particles. As the temperature increases , the K.E of particles also increases and thus rate of diffusion also increases.

### **1.Diffusion in Solid :**

In solid rate of diffusion is very slow. It is due to very less Kinetic energy(Almost zero). E.g If we write something on a black board and it uncleaned for a period of time, we will find that it becomes difficult to clean the board afterwards. This is due to the fact that some of the chalk powder diffuses into surface of black board.

e.g If two metal blocks are bound together tightly and kept undisturbed for few years, then the particles of one metal found to have diffused into other metal.

### **2.Diffusion in liquid :**

In liquid rate of diffusion is faster than solid.e.g When a crystal of  $\text{KMnO}_4$  is placed in water then in few minutes whole water gets coloured due to diffusion of  $\text{KMnO}_4$  into water.

e.g.If a drop of ink is poured in water then water gets coloured due to diffusion of ink particles in water

e.g If a crystal of  $\text{CuSO}_4$  is placed in water, it gets blue due to motion of  $\text{CuSO}_4$  particles in water

### **3.Diffusion in Gases:**

In diffusion of gases , the rate is very fast.e.g The fragrance of burning incense stick or perfumes spread all over due to diffusion into air.e.g The smell of hot sizzling food reaches to several meter away by the process of diffusion

### **Change in state of matter :**

The physical state of matter can be change due to

1.Change in temperature

2.Change in Pressure

**1.Melting (Fusion):** The process of conversion of solid into liquid on heating is called as melting.

**2.Boiling :** The process of conversion of liquid to gas on heating is called as Boiling.

**3. Condensation :**The process of conversion of gas to liquid on cooling is called as condensation.

**4.Freezing :** The process of conversion of liquid to solid on cooling is called as Freezing.

**5.Melting Point :** The temperature at which solid melts and gets converted to liquid at atmospheric pressure is called as melting point.

**6.Boiling Point :** The temperature at which liquid starts to convert to gas at atmospheric pressure is called as Boiling point.

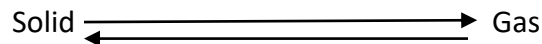
**Latent heat** : The heat energy which is used to change state of substance but does not cause rise in temperature is called as latent heat.

Latent heat helps in breaking intermolecular force of attraction between particles of substance.

**Latent heat of fusion (Melting):** The amount of heat energy in joules required to convert 1 kg of solid to 1 kg of liquid without rise in temperature is called as latent heat of fusion.e.g Latent heat of fusion of ice is  $3.34 \times 10^5$  J/kg

**Latent heat of vaporisation:** The amount of heat energy in joules required to convert 1 kg of liquid to 1 kg of gas without rise in temperature is called as latent heat of vaporisation.e.g Latent heat of fusion of water is  $22.5 \times 10^5$  J/kg

**Sublimation** : The process of conversion of solid to gas without involving liquid state is called as sublimation.



The substance which shows sublimation are called sublime substances. E.g Iodine, naphthalene, Anthracene, ammonium chloride, Camphor etc.

Experiment : Take Naphthalene powder in a china clay dish. Cover it with inverted funnel as shown in figure.heat it gently. It is observed that the naphthalene powder sublimates and get directly converted to gas. On cooling the gas , it gets converted again to solid.

**Evaporation** : The process of conversion of liquid to vapours below its boiling point is called evaporation.

**Factors affecting Evaporation :**

1.Temperature

Temp.                  Evaporation

2.Wind Speed

Wind speed                  Evaporation

3.Surface area

Surface evap.                  evaporation

4.Humidity

Humidity                          Evaporation

e.g.1. Water cools in earthen pot due to evaporation

e.g.2 Desert cooler works on the principle of evaporation

e.g.3 If we put alcohol , acetone or petrol on small part of skin , we feel cooler . It is due to evaporation .

e.g.4 Due to evaporation we feel cooler after sweating

e.g.5 When water is sprinkled on roof or ground , it evaporates and causes cooling

all the above examples are of cooling caused by evaporation.

**How gases can be liquefied :**

Gases can be liquefy by applying pressure and decreasing temperature..

Take nitrogen gas in a container provided by frictionless piston. When pressure is applied to it, all the particles of gas gets closer to each other. Thus at this stage gas attains property similar to liquid.

On decreasing temperature all the particles of gases loses their kinetic energy and gets completely converted to liquid..

**To show presence of water vapour in air :**

Take a cold glass of water along with ice and keep it on surface of table. Allow it undisturbed for few minutes. After few minutes large number of tiny droplets appears on external surface of glass.

The air around us contains water vapour in it. When these water vapours comes in contact with cold surface of glass, they loses their kinetic energy and starts condensation. Due to this small droplets appears on glass surface.

**Plasma :**

- 1.it is the 4<sup>th</sup> state of matter
- 2.It is similar to gas but shows two distinct charged particles.
- 3.The amount of energy in particles of plasma is very very high hence it is also called as super energetic particles.
- 4.Naturally plasma is absent on earth but it is present on sun , star and comets.
- 5.Example: In Neon bulb, we have neon gas . When we pass electrical energy to neon bulb then each neon particle releases one electron and forms positively charged ion (Ne<sup>+</sup> and -vely charged electron). Thus neon bulb on passing electric current forms two distinct charges and gets converted to plasma. The extra energy in plasma is liberated in the form of light i.e glowing of bulb.

**Bose–einstein Condensate:**

- 1.it is 5<sup>th</sup> state of matter
- 2.In this particles of matter are so close that they reach highest level of compactness and hence consider as condensate.
- 3.For the first time Satyendranath Bose and Albert Einstein proposed the idea of new state of matter in 1923 to which we know as Bose Einstein condensate.
- 4.In 1995 Cornell, Ketterle and wiemann by ultracooling prepare a new state of matter. They cool the substance to a extreme or super low temperature , so that all energy of particle released out and particles come closer to highest level.
- 5.as the particles have absolute zero energy it is called as super cooled particles.

|           |        |          |      |           |
|-----------|--------|----------|------|-----------|
| B.E.C     | Solid  | Liquid   | Gas  | Plasma    |
| Super     | Almost | Moderate | high | Super     |
| Cooled    | Zero   |          |      | Energetic |
| Particles |        |          |      | Particles |

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