CHAPTER 05

Materials and Things

How can you know the different states of materials?

We observe that certain materials can change their shape according to the shape of the containers they are put into, while some retain their shape. Those materials which change shape are mainly liquids such as water, rasam, milk, oil, kerosene, etc.

Those materials, which do not change shape are solids such as wood, rock, brick, plastic objects, and vegetables etc. Classification of Materials: Let us think of different solids, liquids and gases around us and group them.

Solids	Liquids	Gases
Stone	Milk	Smoke
Chair	Water	Air
Sofa	Honey	Helium
Doors	Juice	Oxygen
Book	Rasam	Carbon dioxide
Utensils	Oil	Water vapor
Basket	Petrol	Ozone

A dilemma with sugar: solid or a liquid?

Try to put sugar in a glass, in a bowl and in a vessel. We can observe that sugar takes the shape of the container. We already know that liquids take the shape of the container.

Can we say that sugar is a liquid? What do you think?

Now try to take a single crystal of sugar and add one drop of water. Here you can see the sugar crystal as solid and water drop as liquid. Hence, sugar is a solid although it takes the shape of the container. Sugar is a solid and it dissolves in water to form a solution.

Whenever two or more substances are mixed together and do not form a new substance, the result is called a mixture.

Sometimes **mixing two substances together can form a special kind of mixture called a solution.** This happens if the two substances stay evenly mixed. When ordinary sugar is stirred into a beaker of clean water, it will dissolve and form a solution. The tiny molecules that make up sugar spread apart evenly throughout the water. However, the individual sugar molecules do not break apart. Mixing sugar and water causes a physical change to happen because the sugar and water molecules remain the same. Like all mixtures, solutions can be separated. For example, the water in a sugar-water solution will

eventually evaporate when heated or change from a liquid to a gas, leaving the sugar crystals behind.

Is common salt a solid or a liquid?

Soluble or insoluble in water:

Take five beakers with water. Take small quantities of sugar, salt, chalk powder, sand and saw dust. Add each material to separate beakers and stir. Observe the changes.

S.no	Material	Dissolved (yes/no)
1	Sugar	Yes
2	Salt	Yes
3	Sand	No
4	Saw dust	No
5	Chalk powder	No

We observe that certain materials dissolve when mixed with water. These substances are said to be soluble in water.

The materials that do not dissolve are said to be insoluble.

Sinking or floating in water:

Have you observed some substances float in water and some substances sink. What might be the reason?

Let us assume that a tomato, brinjal, potato, iron nail, sponge, wood, stone, leaf, piece of chalk and paper are given to you. Predict which of them sink or float in water.

Object	Prediction	Finding
Tomato	Floats	Floated
Brinjal	Floats	Floated
Potato	sinks	sank
Iron nail	sinks	sank
Sponge	floats	Floated
Wood	floats	floated
stone	Sinks	Sank
Leaf	Floats	Floated
Piece of chalk	sinks	sank
Paper	Floats	Floated

Now, add a lot of salt to the water in the beaker. Try this same activity with water which is excessively salty.

- ✓ What do you observe?
- ✓ Do you get the same result?

Adding salt to the water increases the density of the solution because the salt increases the mass without changing the volume very much. When enough salt is added to the water, the saltwater solution's density becomes higher than the objects in it.

- In the first case, the density of water is less so no upward force act on the objects to float.
- In the next case, salt water density is more than the normal water, so it exerts upward force on the object. As a result the object floats.

Do iron objects float?

Take some water in a wide mouthed bowl. Put an iron nail in it. What do you observe?

Put an empty iron tin in that bowl. What do you observe?

Try to observe whether a wooden piece floats on water.

What happens when a wooden bowl is dipped in water? What do you conclude from this activity?

The iron nail sinks to the bottom whereas the empty iron tin and wooden piece floats on the water.

Some materials in one shape will sink in water but float on water when they are in other shape. The materials that can sink can be made to float, but all the materials that float cannot be made to sink.

- **The density of an object determines whether it will float or sink in another substance.**
- An object will float if it is less dense than the liquid it is placed in.
- An object will sink if it is more dense than the liquid it is placed in.

It is not the weight of the object but its density compared to the density of water that determines whether an object will sink or float in water.