

24. Substances, Objects and Energy

Can you tell?



Write a few lines on the blackboard with a chalk. Now observe the chalk.



What change do you see in the chalk?

Wipe the board with a duster and then tap the duster against the table.

What do you see?

The chalk has become smaller and when the duster was tapped, particles of chalk fell off from it. These particles were of the same colour as the piece of chalk.

This tells us that when you wrote on the board, particles of the chalk stuck to the board and when you wiped the board, they came off.

Try this.



Take small pieces of candy sugar or coal and pound them in a mortar.

What do you notice?

When you pound the coal or the sugar, it turns into a powder, that is, into small particles.



Pounding pieces of coal

All substances we see around us are made up of very tiny particles. You must have seen how sawdust or particles of wood fly when the wood is cut with a saw.



Sawing wood



Grinding

When iron or copper is made smooth with a file, we get particles of iron or copper. All substances like pencil, chalk, paper, wood, wheat grains, iron, copper, coal are all made up of fine particles.

The small particles of various substances that we can see are themselves made up of many tinier particles. These tiny particles are so small that they are not visible to our eyes. Lakhs of particles of any substance must come together to form a particle that can be visible to us.

Use your brain power!



What are the small particles that can be seen in a beam of light that enters a dark room?

Do you know?



The theory that all substances are made of minute particles was proposed long ago by Kanaad Maharshi.

Kanaad Maharshi was born in the 6th century BC at Prabhaas Kshetra near Sorati Somnaath in Gujarat. His given name was Uluk. He proposed that all things in the world can be classified into seven categories. He was also the first to suggest that every object in the universe is made up of minute particles. He named that tiny particle, 'peelav'.

Can you tell?



If there is a sudden shower, we take shelter under a roof at the roadside. Even though the rain does not fall on us directly, we get wet to some extent. Why?

The raindrops that fall on the road, bounce off and break up into droplets. These droplets are also made up of tinier particles of water. They make us wet. It means that liquids are also made of small particles.

Use your brain power!



- (1) Make a list of all the everyday substances that we use in the form of a powder.
- (2) Naphthalene balls are placed in warm clothes. After some days, why do the clothes also smell of naphthalene?
- (3) Naphthalene balls are also placed in toilets. Why do they become smaller after a few days?

Naphthalene is continuously being converted into small particles in the gaseous state. Such small particles from the balls settle on the clothes. So, the clothes too smell of naphthalene. As the particles leave the naphthalene balls, the balls grow smaller in size and slowly disappear.

Particles of rangoli are fine like a flour. Rangoli colours are also available in the form of grains.

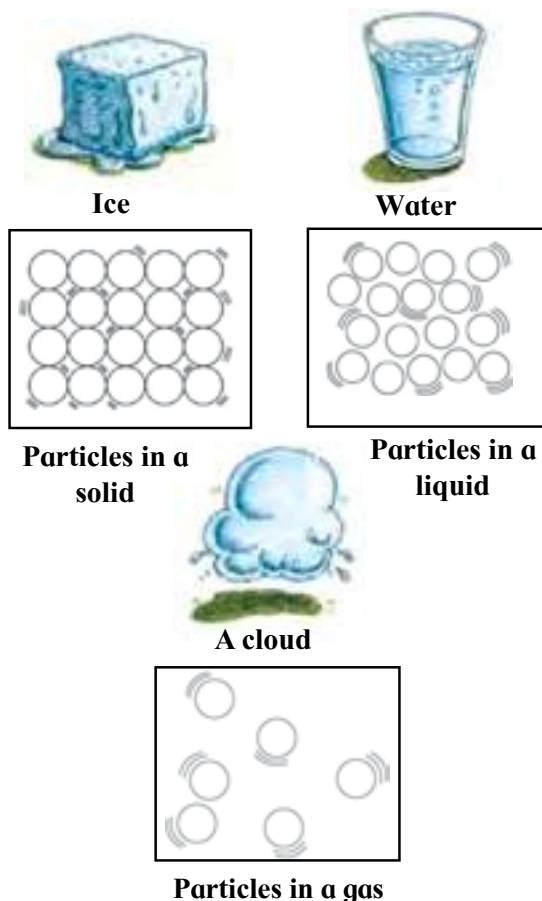


Use your brain power!



Suppose you do not have rangoli powder. What things can you use as an alternative?

The states of substances : Water is found in nature in three states - solid, liquid and gaseous. In all the three states, the individual particles of water remain the same. However, the arrangement of the particles in each of these states is different.



As a result, we see differences in the properties of solids, liquids and gases. All substances in nature have a particulate form, i.e., they are made up of particles. In nature, every substance occurs in a specific state. Accordingly, that substance is called a solid, liquid or gas. For example, aluminium and coal are solids, kerosene and petrol are liquids while nitrogen and oxygen are gases.

Different substances have different properties. Substances may differ with respect to properties like hardness, transparency, colour, smell, solubility in water, etc.

Substances and objects

Can you tell ?



Asmita went to buy an earthen pot. There she saw many things kept for sale.

How did she identify what she needed?

From what substance had the potter made all the things?

What is the difference between a substance and an object?



Objects have a definite shape. Their parts are put together in a particular way. Objects are made from substances.



Look at the objects in the picture above. What substance are they all made from?

Energy

Can you tell ?



We make useful objects from a variety of substances. Another use of substances is that we get energy from some of them.

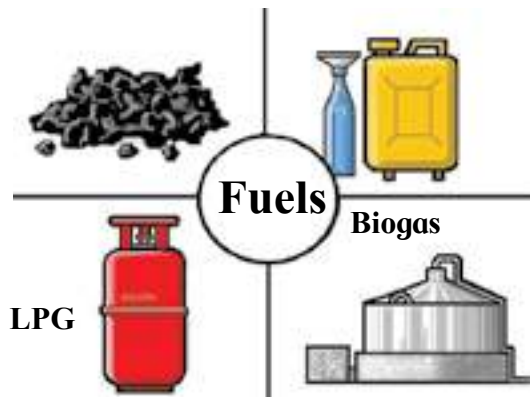
There is a car. Its tank is full of fuel but it does not move. Why is that?

When we have run a long distance, we feel tired. We have to stop. Why is that?



‘Energy’ is required to do work. The capacity of a body to do work is called energy.

When petrol or diesel burns in a motor vehicle, energy gets released. When the petrol is finished or if it stops burning, the vehicle too stops running. When something burns, energy gets released in the form of heat. You have learnt that in our body too energy is obtained by the burning of certain substances.



Many machines can be run using fuels. Coal, diesel, CNG, LPG, petrol are all substances from which energy is obtained in the form of heat.

When a person or vehicle moves, heat energy gets converted into motion. Energy in the form of motion is called kinetic energy.

All moving things have kinetic energy. For example, when the wind blows, the windmills turn, and sailing boats and clouds move from one place to another. This work is possible only because of the kinetic energy of the wind.



Which other machines you know use kinetic energy to do certain tasks? How do they get this kinetic energy?

A ceiling fan, a mixer-grinder, a water pump are machines in which kinetic energy is used. They get kinetic energy from electricity. Electricity is also a form of energy.

Find out

What is the original source of energy for the electricity produced at a thermal power station?

Use your brain power!



What uses of heat energy do we see in our daily life?

Other forms of energy

We use several devices in which work is done using, not heat, but other forms of energy. For example, we use electricity to run the TV. In it, the electricity is converted into light and sound energy. In a solar cooker or solar water heater, solar energy is used.

Plants use sunlight to prepare their own food. In this process, energy from sunlight is stored in the food substance they make. These are the substances that burn in our body and give us all the energy we need for various purposes.

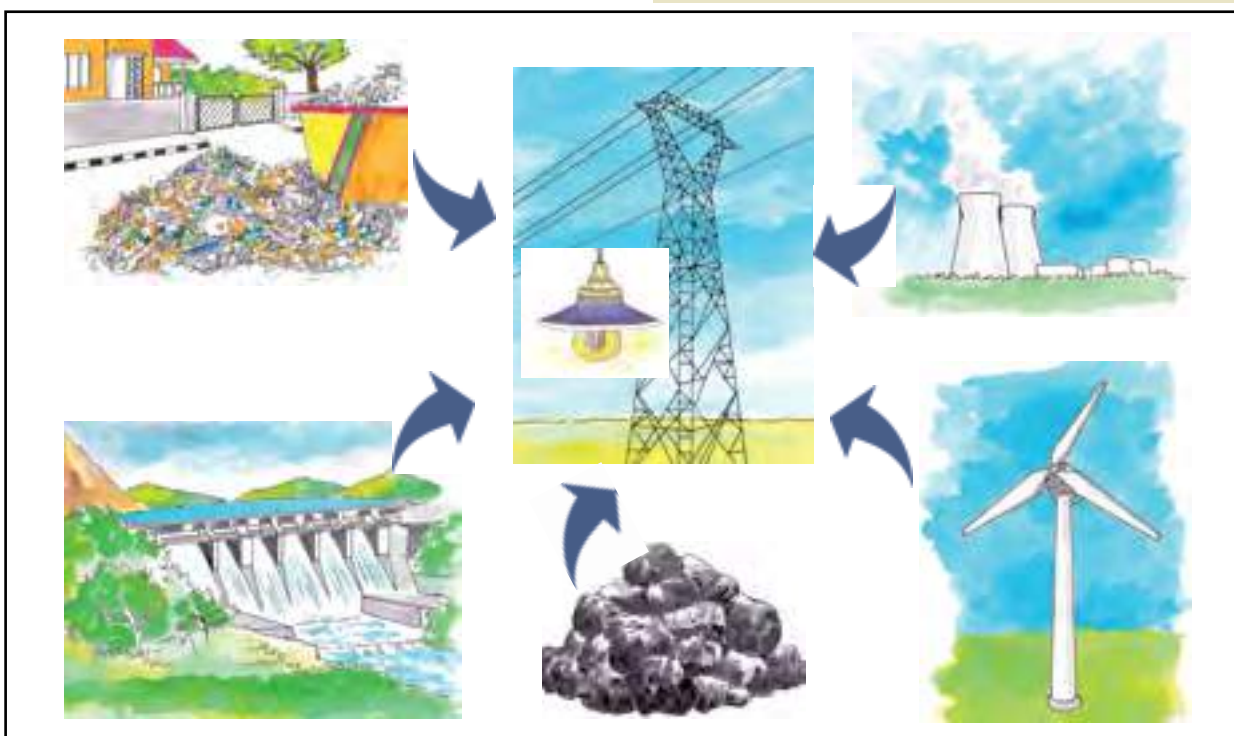
When we burn substances like coal, mineral oil, the stored energy they contain is converted into heat energy.

Sources of energy : We use various forms of energy such as heat, light, sound, electricity and kinetic energy to do different tasks. In today's world, our main sources for all these forms of energy are fuels and electricity. And to produce electricity, many power stations use fuels.

Do you know ?



Stores of coal and mineral oil on earth are limited. In future, we will have to use mainly solar energy and atomic energy for the purpose of producing electricity.



Do you know ?



There are batteries which produce electricity using sunlight. They are called solar batteries.

The heat of the sun, flowing water, and wind do not get depleted. Besides, they do not cause pollution when used to produce electricity. But, producing electricity by these methods is expensive. And in any method of electricity generation, resources from the environment have to be used. Hence, making a habit of using the minimum amount of electricity is necessary in today's world.

Always remember –



Sunlight, wind and water are non-exhaustible sources of energy. They must be used to the maximum extent as alternative sources of energy.

What we have learnt –



- Every substance we see around us is made of minute particles.
- We can make different objects from the same substance.
- Substances are in the solid, liquid or gaseous state.
- The capacity of a body to do work is called energy.
- All moving things have kinetic energy.
- Various forms of energy such as heat, light, sound, electricity are used to do different kinds of work.
- Sunlight, wind and water are non-exhaustible sources of energy.

Exercises

1. What's the solution ?

- (a) We need to make a sherbet quickly for some guests. But we only have sugar candy in the house.
- (b) We need to rub salt on a corncob but only salt crystals are available.

2. Use your brain power !

- (a) Why do tablets of camphor decrease in size day by day?
- (b) How do we save fuel by using public transport?

3. Answer the following questions.

- (a) When and why do clothes smell of naphthalene?

- (b) In which states is water found in nature?
- (c) What is the difference between the solid, liquid and gaseous states of a substance?
- (d) What is meant by energy?

Activities

1. Make different kinds of articles from clay.
2. Visit a wood workshop and observe the work being done there.
3. Obtain some information about the power generation plants in Maharashtra and present it in the classroom.