

We do various types of work in our day-to-day life. Animals and machines also do work. Some examples for such instances are given in Figure 7.1.



Running a vehicle



Lifting a weight



Rotating
a fan



Running

Figure 7.1 ▲ Different types of work

In addition to those mentioned above, people engage in different types of work in day-to-day life. Can you give some examples for such work?



Assignment 7.1

- Give five examples for instances of doing work in day-to-day life.

It is clear that man, as well as animals and machines do a lot of work. Now, let us consider what does man, as well as other objects need to do work. Let us engage in Activity 7.1 and 7.2 for studying this.



Activity 7.1

You will need :- A piece of bicycle tube (2 cm x 30 cm) or any other stretchable thing of that size, a metre ruler

Method :-

- Give the strip of rubber tube to each student and tell to stretch it as much as possible.
- Note down the maximum length, that each student stretched.



Figure 7.2 ▲

Table 7.1

Name	Maximum length stretched

- The length of rubber strip was stretched differ from student to student. Discuss the reason for this difference.
- What have they applied/used to stretch the rubber tube?



Activity 7.2

You will need :- One metre long thread, a laboratory stand, a small piece of stone

Method :-

- Tie one end of the thread to the piece of stone.
- Tie the other end of the thread on the stand.
- Give the hanging stone a push.
- Observe the motion of the stone for a long period of time.
- What did you apply on the stone to move?

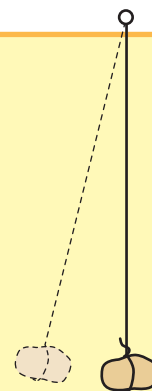


Figure 7.3 ▲
Motion of a hanging stone

- Can you tell the reason for the gradual decrease of motion of the stone?
- Discuss in the classroom,
 - * What do you do to start the motion of stone?
 - * What does the stone gain to start its motion?

Work can be simply explained as a push or a pull, resulting a movement of an object. It is clear that work is done when stretching the strip of rubber tube in Activity 7.1 and moving the stone in Activity 7.2.

- Ability to do work is known as **energy**.
- International unit of measuring energy is **Joule**.

Energy is necessary to perform work. To increase the amount of work done, the amount of energy applied should be increased. For example, you should supply more energy to move the stone further in Activity 7.2.

Energy exists in different forms. Now, let us consider the different forms that energy or the ability to do work can exist. Let us pay our attention to some different types of work done and different forms of energy used.

Carry out Activity 7.3 to find out the different forms of energy used to do different types of work.



Activity 7.3

Identify various forms of energy

Collect following items, as much as you can.

You will need :- A torch bulb, dry cells and some pieces of wire, a battery powered wall clock, a bicycle dynamo, a radio set, various types of winding and battery-powered toys, an electric motor, winding table clock

Method :-

- Study as groups how the above equipment work.
- Identify the main forms of energy that made each equipment work.
- Identify other forms of energy created, when functioning the equipment.
- Complete the following table according to your observations.



Figure 7.4 ▲
Table 7.2

Equipment	Main form of energy that made the equipment work	Other forms of energy Created

By doing Activity 7.3 you may have identified several forms of energy found in most instances. Most of them are used in various tasks. Main forms of energy identified in Activity 7.3 can be listed as given below.

1. Kinetic energy
2. Potential energy
3. Electrical energy
4. Sound energy
5. Thermal or heat energy
6. Light energy
7. Chemical energy

Let us study further about some forms of energy you identified.

7.1 Kinetic energy

In most instances, we see moving things. Wind, a moving vehicle, flowing water and a moving pebble can be given as examples.

Let us find out whether the moving objects have some sort of energy.



Activity 7.4

You will need :- A turbine made by fixing metal blades to a cork stopper, a metal rod, a ball, a moving toy car, a piece of stone, a bowl of water

Method :-

- Hold the turbine under an opened water tap
- Keep the ball on a table and send the toy car towards it.
- Drop the piece of stone into still water.
- Lead a discussion, based on your observation.



Figure 7.5 ▲

You may have observed that some work is done in each of the above activities. Can you say from where the energy was obtained for the work done?

The energy for above work is gained from the moving objects.

e.g.:- flowing water, moving stone

This activity reveals us that moving objects have energy.
Energy that a moving object contains is called the **kinetic energy**.

Electricity can be generated by kinetic energy of sea waves. Grinding grain, pumping water and generating electricity can be done using kinetic energy of wind.

Electricity is generated in a hydropower station using kinetic energy of water.



Assignment 7.2

List out five objects which contain kinetic energy

Energy transformation

When work is done using different forms of energy, it is converted to another form of energy.

Let us consider the generation of electricity by kinetic energy of wind. Here kinetic energy is converted to electrical energy by the dynamo fixed to the wind mill.

Conversion of one form of energy to another form of energy is called energy transformation.

Energy transformation that occurs when electricity is generated by wind can be given as below.

Kinetic energy \longrightarrow Electrical energy

Self assesment

Write the energy transformation associated with the following instances?

Obtaining light from an electric bulb

Generating electricity by a dynamo

7.2 Potential energy

Let us consider a water stream. We already know that it contains kinetic energy and it can do work.

e.g.:- turning a turbine

How did that water get energy for flowing?
Does water in any place have the potential to flow?

Always water in a higher position can be subjected to flow.

e.g.:- water in a tank or reservoir at a higher elevation.

It is clear that water at a higher elevation contains energy and it has the ability of doing work.

Let us consider a toy car, operates by winding a spring.



After winding



Before winding

Figure 7.7 ▲ Spiral spring

Energy stored in an object because of the change of positions or the change of shape is known as potential energy.

Now, it may be clear to you that the energy stored in water of a reservoir at a higher elevation and a wound spring is potential energy.



Figure ▲ 7.6 Water flows from higher elevation

When turning the spiral spring, it winds. Energy is supplied to the instrument by the wound spring. When winding, energy is stored in the spring. While winding, the shape of the spring is changed and energy is stored.



Figure ▲ 7.8 Inside a clock, that works by potential energy stored in a spring

When a spring is being unwound, potential energy stored in it is gradually converted to kinetic energy. Thus, unwound spring does not contain potential energy.



Activity 7.5

Making a toy cart

You will need :- An empty tin can or a thread bobbin, a rubber band, a strong metal wire of 20 cm long

Method :-

- Make two holes in the tin can, as shown in the figure, and send the rubber band through the holes.
- Bend the metal wire and tie the rubber band to its ends.
- Turn the wheel of the toy cart you made, to wind the rubber band.
- Now place the toy cart on a table and observe. Think of a way to construct your toy cart more creatively.
- How did the toy cart gained energy to move?

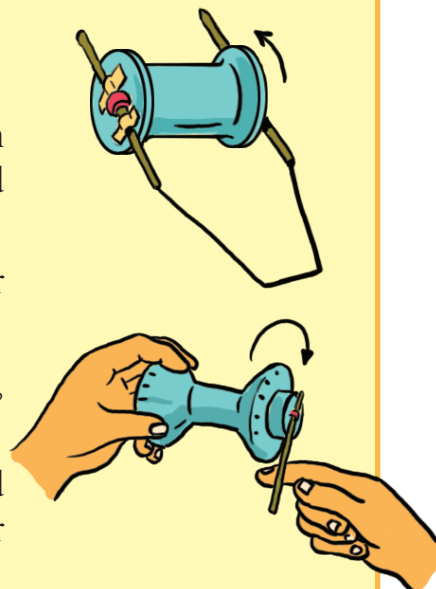


Figure 7.9 ▲

Self assesment

1. Name five instances, where there is potential energy.

Potential energy and kinetic energy are commonly known as mechanical energy.

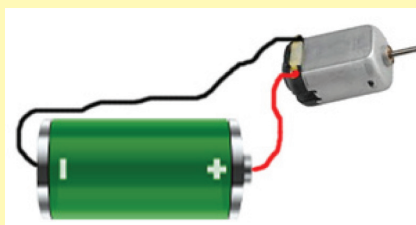
7.3 Electrical energy

You may have learnt electricity as a useful energy form. Let us do Activity 7.6 keeping what you have already learnt in mind.



Activity 7.6

- List out instances where electricity is used, recalling the work done using electricity.
- Discuss the facts that your group listed out in the classroom.
- Check whether any of the points you noted down are illustrated in figures given below.



Rotating a motor



Running a toy car



Lighting a bulb



Ironing clothes

Figure 7.10 ▲

You will not hesitate to mention electricity as a form of energy used to do various types of work. Electrical energy can be used for various purposes like rotating electrical fans, pumping water, lighting and heating.

Some appliances that work using electricity are given in Table 7.3 below. Complete the table.

Table 7.3

Appliance	Usage of appliance
Small electrical motor	
Computer	
Electrical iron	



Activity 7.7

Making a bell functioned by electricity

You will need :- A cork or rubber stopper, a piece of wooden plank (10 cm x 10 cm), an electrical motor, a bell cover, a piece of metal sheet, two dry cells, iron nails, piece of wire

Method :-

- Fix the bell cover on the wooden plank using nails.
- Fix the stopper to the end of motor.
- Fix the electrical motor to the wooden plank using the piece of metal sheet, in such a way that the stopper just touches the bell cover.
- Supply electricity to the motor using dry cells.
- Adjust the positions of motor and bell cover to make the bell ring
- Write down the energy transformation that occurs when the bell is working
- Discuss the ways you can follow to develop this set-up you made.



Figure 7.11 ▲

7.4 Sound energy

You may have experienced that, doors and windows of your house vibrate when thundering. High tones of vehicles are unbearable to ears. We like the sounds like chirps of birds and sweet melody of music. But we don't like to hear unbearable sounds. Energy contains in pleasant and unpleasant sounds also. Let us do Activity 7.8 to understand this property of sound.



Activity 7.8

You will need :- A radio set, a sheet of paper, small pieces of polystyrene

Method:-

- Place the front side of the radio set upside and increase the volume.
- Put few pieces of polystyrene on the sheet of paper and hold it above the radio.
- Note down the observations.



Figure 7.12 ▲

- You can observe the vibration of the sheet of paper and the motion of polystyrene particles. Thus, it is clear that sound also contains energy.
- Energy contained in sound is scientifically known as **sound energy**. Energy transformation that occurs when a radio set operates is given below.

Electrical energy \longrightarrow Sound energy



For extra knowledge

When addressing a mass gathering, sound energy produced by human voice is not sufficient. Therefore, sound is amplified using electricity. Appliance used for this purpose is called loud speaker set.



Assignment 7.3

Name four instances where sound energy is used

7.5 Light energy

Light is very important for vision. Therefore, since ancient days various methods were used to produce light. Green plants use light energy for

the process of manufacturing food, called photosynthesis.



Assignment 7.4

Tabulate the materials used in various light sources to produce light.



Table 7.4

Figure 7.13 ▲

Source of light	Materials used to produce light
Electric torch	Dry cells
Candle	.....
Torch made of dried coconut leaves (Hulu aththa)	.....
Kerosene lamp	.....

In addition to get sight there are other purposes received from light. One of them is the generation of electricity.



Activity 7.9

You will need:- A solar panel, an electric motor, a torch bulb

Method:-

- Connect the electric motor to the solar panel and expose to light.
- Note down the observations.
- Remove the electric motor and connect the torch bulb.
- Discuss what is revealed by the observations.

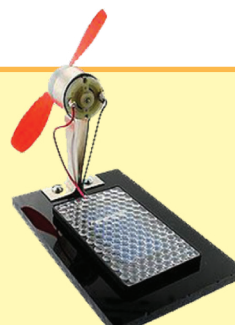


Figure 7.14 ▲

The electric motor and the torch bulb were operated by light energy. Thus, it is clear that light energy can be used for various purposes.

The main source of light to the earth is the sun.

Though a large amount of light energy, falls on the earth from the sun,

only a very small amount of light energy is utilized. So, there is an increasing interest to use light energy in large scale today.

Energy transformation that occurs when electricity is generated in a solar cell is given below.

Solar energy \longrightarrow Electrical energy

Do you know?

Green plants manufacture food using light energy. This process is known as photosynthesis. Here, light energy is stored in plant as food. Energy is supplied to the whole living world by this food, produced by plants.

Self assesment

List out some other instances where light energy is used

7.6 Heat/thermal energy

What do you feel when you bring your hand close to a flame? What you feel is the heat energy.

Heat is a form of energy, which is very important in doing various types of work like cooking food.

Let us do Activity 7.10 to understand more about heat energy.



Activity 7.10

You will need :- A glass bottle (750 ml), vessel to dip the bottle, a balloon

Method :-

- Fix the balloon to the empty bottle.
- Take hot water to the vessel and dip the bottle into it slowly.
- Note down the observations
- Discuss the reasons for the observations.



Figure 7.15 ▲

The balloon is inflated because of the increase of the volume of air inside the balloon due to the energy of heat.

More things can be done by heat. This will be clear to you by carrying out Activity 7.11.



Activity 7.11

You will need :- A candle, PVC tube, a piece of paper, a boiling tube with water, a test tube holder, a pair of crucible tongs

Method:-

- Light the candle
- Hold the piece of paper to the flame of the candle. Observe what happens.
- Heat and fold the PVC tube.
- Heat the boiling tube with water.
- Note down the observations of each instance.
- Discuss the reasons for the observations.



Figure 7.16 ▲

Deformation of things, melting, burning and evaporation can be caused by heat. The reason is the energy contained in heat.

Today heat energy is used to generate electricity, to drive steam engines and many other purposes. Let us construct a set-up that works by energy of heat.



Activity 7.12

.Making a steam turbine

You will need :- A small tin can, a sheet of aluminium, a cork stopper, few pieces of thick wire, a tripod, a burner

Method:-

- Bore a small hole at the middle of the lid of tin can.
- Put a small amount of water into the can and close the lid
- Make a turbine fixing pieces of aluminium blades to the cork stopper. Using the pieces of thick wire, hold the turbine above the hole of the tin can.
- Place the set-up on the tripod and heat it using the burner
- Discuss the reasons for what you observe



Figure 7.17 ▲

Electricity is generated in thermal power stations by rotating dynamos, connected to large turbines, which are driven by steam.

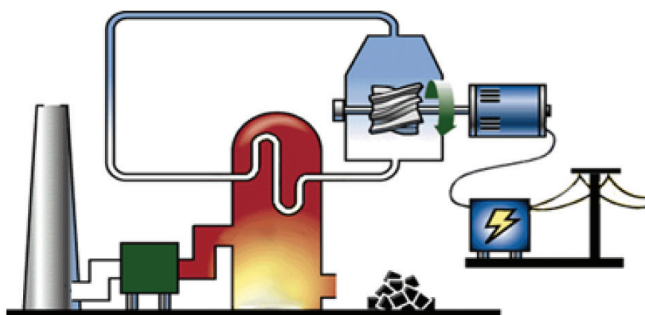


Figure ▲ 7.18 :- Parts in a thermal power station

Self assesment

Write down the energy transformation that occurs in a thermal power station

It is heat energy, that is responsible for occuring winds, driving water cycle, drying of clothes and so on.



Assignment 7.5

List out five occasions where heat energy is used

7.7 Chemical energy

Chemicals can exist as solids, liquids or gases. Large amount of energy is stored in most of the chemicals.

Energy stored in chemicals is known as chemical energy.

Let us carry out Activity 7.13 to understand facts about chemical energy.



Activity 7.13

You will need :- A candle, a box of matches, dilute hydrochloric acid, a piece of magnesium ribbon, a test tube

Method:-

- Light the candle and fix it on the table. Observe it for a few minutes and note down the observations.
- Put the piece of magnesium ribbon into the test tube with hydrochloric acid. Note down the observations.



Figure 7.19 ▲

The candle, dilute hydrochloric acid, the piece of magnesium ribbon are all chemical substances. There are chemical substances in the dry cell also. What is released, in the Activity 7.13 is the energy stored in chemicals.



Assignment 7.6

Write down instances where chemical energy converts to other forms of energy.

It is the chemical energy, that is stored in the food, kerosene oil, fuels like fire wood, fire crackers and match sticks. It is also the chemical energy, that is stored in destructive objects such as bombs.

Self assesment

The energy transformation that occurs in a dry cell is given below.

Chemical energy \longrightarrow Electrical energy

There are more forms of energy, other than those we have studied so far. They may be considered in the future.



Summary

- Energy is necessary to do work.
- There are various forms of energy, which are utilized to do various types of work. Some of them are mechanical energy (potential and kinetic), electrical energy, light energy, heat energy, sound energy and chemical energy.
- Conversion of one form of energy to another form is called energy transformation.
- Most of the appliances we use, work by various forms of energy.
- One form of energy is transformed to other forms during the operation of various appliances.

Exercise

1. Chandrakantha comes to school by bus. Its horn has a high tone. There are electric bulbs to illuminate the bus. When the bus runs for a long time, the engine is heated.

I. Write four forms of energy you identified in the bus.

II. What is the basic form of energy used for generation of various forms of energy in the bus?

III. List out three uses of each form of energy you mentioned above.

2. Complete the table given below.

Equipment	Form of energy given to the equipment	Other forms of energy generated in the equipment
Electric bulb	Electrical energy	.....
TV set	.....	.....
Electric bell	.....	.....
Winding clock	.....	.....
Hydropower station	Kinetic energy of water	.....

Technical Terms

Work	- கார්යம்	- வேலை
Energy	- ஊர்ஜம்	- சக்தி
Heat energy	- தாப ஊர்ஜம்	- வெப்ப சக்தி
Electrical energy	- විද්‍යුත් ඊර්ජමය	- மின் சக்தி
Kinetic energy	- චාලක ඊර්ජමය	- இயக்க சக்தி
Potential energy	- විභව ඊර්ජමය	- அழுத்தச் சக்தி
Light energy	- ආලෝක ඊර්ජමය	- ஒளிச் சக்தி
Chemical energy	- රසායනික ඊර්ජමය	- இரசாயனச் சக்தி
Sound energy	- ශබ්ද/ ධ්වනි ඊර්ජමය	- ஒலிச் சக்தி