

Force, Work And Energy

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UNIT - V : MOVING THINGS, PEOPLE AND IDEAS

Force is push or pull that makes a body move or stop.

Work is force applied on body to make it move through a distance. Energy is the capacity to work. Machine is a tool that makes work easy.



A worker pushes the table



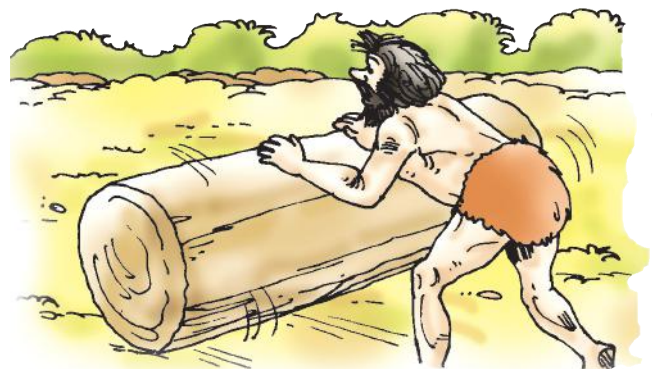
Wind is blowing



Boy catch the fish

FORCE

Look at the following picture. Children in it are using force in play. They are pushing and pulling. Force causes a body to stop and to move. Some kinds of forces are bigger than others. The force in playing tennis is bigger than the force in playing ludo. The force of a storm uproots even big trees. Force can push, pull, lift, squeeze, twist, turn, bend and even break things.



FRICTION

Friction is a force that can stop moving objects. See this picture. In it a worker is pushing a tea-box full of tea-leaves across the floor. As it moves, the bottom of the box rubs against the floor. When two things rub against each other, there is friction. Friction makes it hard to move one body over the other. When a ground is smooth, it makes movement of objects easy.



WORK AND FORCE

When a force acts on a body to shift its position, work has been done. Work is done when a worker lifts a piece of iron from the ground floor and takes it to the roof. When a lift takes persons from one floor to another, it is called work.



Work is done when a force moves something. For example, a coolie carrying a load, a man pulling a hand-cart, a boy picking up a book.

The amount of work done depends upon the amount of force applied and the distance through which the object is moved. Work is done only if the point where force is applied moves to cover some distance.

When a force is applied, the object moves in the direction of the force. When you apply force in the opposite direction, a moving thing stops. This involves friction. While force makes things move, friction makes them stop.

PUSH AND PULL

Pulling means applying force to move an object towards you. If on a door is written 'Pull', you have to apply force to bring it to your side.

If it has the label 'Push', you have to apply force to move it away from you. The following picture shows examples of push and pull :

Do You Know ?

Magnetism is a type of force. A magnet might pull an object towards it or push it away.



Pushing or throwing a ball



Pushing a wheel barrow



Pushing a sea-saw



Pulling a fish

Activity 1

Draw a line on the ground. Ask your friend to stand on one side of it. You stand on the other side. Hold hands and try to push and pull.



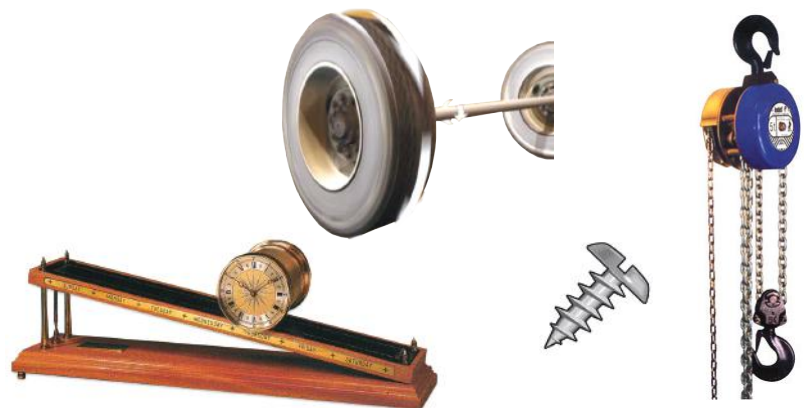
Activity 2



Take a ball. Move it on the floor. Now, try to stop the moving ball with your hand. You will have to apply a force against the direction of the motion of the ball.

Machines to slow down movement

Some machines help us to slow down movement. Some such machines are illustrated below :



Test your Self

1. Give few examples of force.

2. What is work ?

3. What is pulling ?

4. What are the two factors on which work depends?

ENERGY

Energy is anything spent or used in doing work. It is the capacity to work. We get it from our food. Plants get energy from the sun and soil. Animals get energy from plants or animals.

Do You Know ?

Sun is known as primary source of energy.

Important Sources of Energy

These are (i) The Sun (ii) Water (iii) Food (iv) Air (v) Fuel (vi) Chemical reactions and (vii) Electricity. Sun is the main source of energy on Earth. Sun heat creates water-cycle in nature. Water-cycle includes rains. Moving water of rains has energy in it. Winds also blow due to the heat of the Sun.

Kinds of Energy

Different machines work by different kinds of energy. Look at the following picture. It shows different kinds of things requiring different kinds of energy to move :



Wind Energy



Electrical Energy



Light Energy



Mechanical Energy



Heat Energy



Magnetic Energy



Sound Energy



Muscular Energy



Mechanical Energy



Light Energy

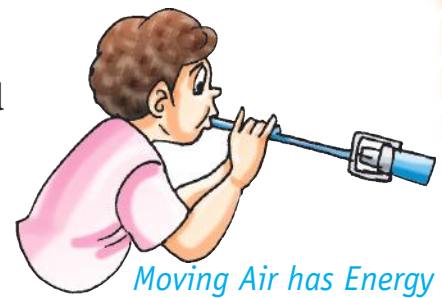
Moving Air has Energy

Activity 3

Take an apparatus as shown in the figure. Blow air against the blades with the force of air in your mouth.

The wheel will rotate due to moving air which has energy.

Energy of moving air can be seen in case of winds, gales and storms. Windmills work on this principle.

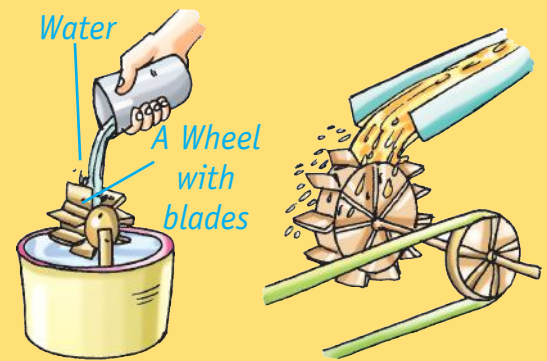


Moving Water has Energy

Activity 4

Take an apparatus as shown in this picture. Pour water on the blades from above. It will apply force on the blades and move the wheels. Water-mills work on this principle.

All these are examples of mechanical energy. The other types of energy are mentioned below :



Light Energy

Green plants use the light energy of the Sun to make food.

Muscular Energy

Our food produces movements in our bones and muscles by means of Muscular energy.



Heat Energy

Heat is a form of energy. When we rub hands, the energy of our hands get converted into heat energy. Heat energy is the source of energy of a steam engine. It pushes the piston back and forth.

CHANGE OF ONE FORM OF ENERGY INTO ANOTHER FORM

By using suitable appliances, one form of energy is converted into another form of energy. In a dam the kinetic energy of falling water is used to produce electric energy. Look at the following picture. In it the electric bulb is converting electricity into light energy. The electric heater converts electric energy into heat energy. The electric motor converts electrical energy into mechanical energy.



Different types of energies are used to do the same work. This is shown in the following picture :



The following table shows different types of work and the kinds of energy used to do them :

Types of Work	Energy used
Working of a tubewell	Electric energy
Playing or cycling	Mechanical energy
Working of steam engine	Heat energy
Working of TV	Electric energy
Cooking food or warming the room in winter	Heat energy
Washing of clothes with hands	Mechanical energy
Washing of clothes with machine	Electric energy

Conversion of Electric Energy

Electric energy is used to work fans, electric motors, geysers, water geysers, electric irons, ovens, fridges and electric railway engines. This is shown below :

1. In the following application electric energy is converted into heat energy :



Iron



Geyser



Oven



Water-heating Rod



Refrigerator

2. In the pictures given below electric energy is converted into the energy of motion :



Drilling machine



Electric locomotives



Fan



Mixer

3. In the following way electric energy can be converted into light energy also :



Neon sign



Television



Electric bulb



Light house

4. In the picture given below electric energy is converted into sound energy :



Radio



Music system



Loudspeaker



Door bell

Test your Self

1. What are the kinds of Energy?

2. Define Heat Energy.

3. How do we use electric Energy?



Know the Keywords :

- Pull : To draw an object towards oneself.
Push : To move a thing forward.
Work : When force is applied on a body to make it move through a distance.
Machine : A tool that makes work easy.
Energy : The ability to do work.

Point to Remember

- Push or pull is called force.
- Force can change the direction or speed of moving objects.
- Force is of many kinds as muscular force, mechanical force, frictional force, gravitational force, magnetic force and elastic force.
- In science, if a push or pull moves an object through a distance, work is said to be done.
- Energy is the ability to do work.
- Different forms of energy are heat energy, muscular energy, electrical energy, wind energy, water energy, solar energy and atomic energy.

EXERCISE TIME

A. Multiple choice questions (MCQs).

Tick (✓) the correct option :

1. The Capacity to do work is called :

a. Friction

b. Force

c. Energy

2. In a battery cell, energy is stored in the form of :

- a. Heat energy b. Light energy c. Chemical energy

3. Which is the chief source of energy ?

- a. Heat b. Sun c. Electricity

4. Electric bulb converts :

- a. Light into chemical energy
b. Electric energy into light energy
c. Light into electric energy

B. Tick (✓) the correct and cross (X) the incorrect ones :

1. Energy cannot be changed from one kind to another.
2. Force and energy are not the same thing.
3. The Sun is the prime source of energy.
4. Moving water has energy to do work.

C. Fill in the blanks :

1. The Sun is the _____ source of energy.
2. Push and pull require _____ to do.
3. We play by _____ energy.
4. TV set runs by _____ energy.
5. Cooking is done by _____ energy.


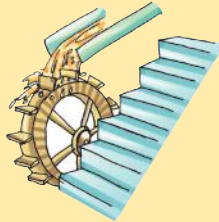
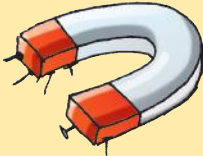

D. What kind of energy is involved in these activities :

Activity	Kind of energy and its source
1. Walking	
2. Riding a bicycle	
3. Playing	
4. Lighting a room	
5. Heating a room	
6. Cooking food	
7. Washing clothes	
(a) by hand	
(b) using a washing machine	

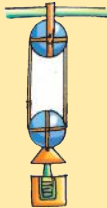



E. Answer the following questions :

1. What is force? Does it involve pull and push?
2. How does friction obstruct force?
3. How is work related to force?
4. What are the main kinds of energy?
5. What are the main sources of energy?

F. Look at these pictures and write down the source of energy under each :

1.		2.		3.		4.	
	_____		_____		_____		_____

G. In the pictures given below are shown the use of some simple machines. Can you identify them :

1.		2.		3.		4.	
	_____		_____		_____		_____

 **Creative Work**

- Show that the energy of falling water can do work.
- Take a round cardboard. Cut and fold it as shown below. Push the nail through the centre of the circle. Tie a thread tightly and hang a small weight. Place the wheel under a tap. Water shall turn the wheel and pull the weight up.

