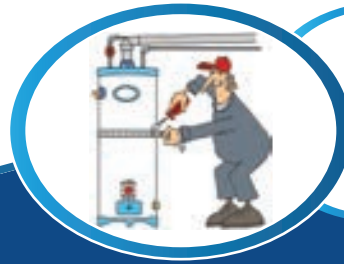


Work and Energy

Unit 3



Learning Objectives

After learning this lesson students will be able to

- ❖ define work
- ❖ understand work and energy
- ❖ know simple machines
- ❖ classify types of machine
- ❖ know about three types of lever



Let us Recall

Teacher : Students, you have studied about force in your lower class. What is force ?

Students : A force is a push or pull that moves an object at rest or stops an object in motion.

Teacher : There are different kinds of force. What are they?

Students : Frictional force, Gravitational force, Muscular force and Magnetic force

A force can cause an object to change its shape, speed or direction.

I. Work

An action in which one exerts a force to move an object is known as **work**. What do you understand from the below pictures?



From these pictures, we understand that a force is applied to do some work.



Think and say

Teacher: Yesterday I was walking back from school. I found some people working to lay the road. I found some items in that place. Can you say something about that place and the machines that were used there?

When can we say that work is done or not?

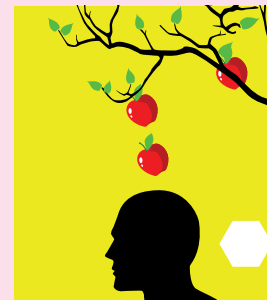
Two main conditions are needed for work to be done.

- A force should act on an object.
- Object should move from one place to another.

When the force acting on the object makes it move, **work** is said to be done.

Try to Answer

Observe the picture and put a tick (✓) if work is done and put a cross (x) if work is not done.



Let us do

Mention whether work is done or not in the following activity.

S. No	Activity	Work done or not done
1.	Pushing the door	
2.	Holding a doll	
3.	Sitting in a bus	
4.	Pushing a wall	
5.	Digging soil	

II. Energy

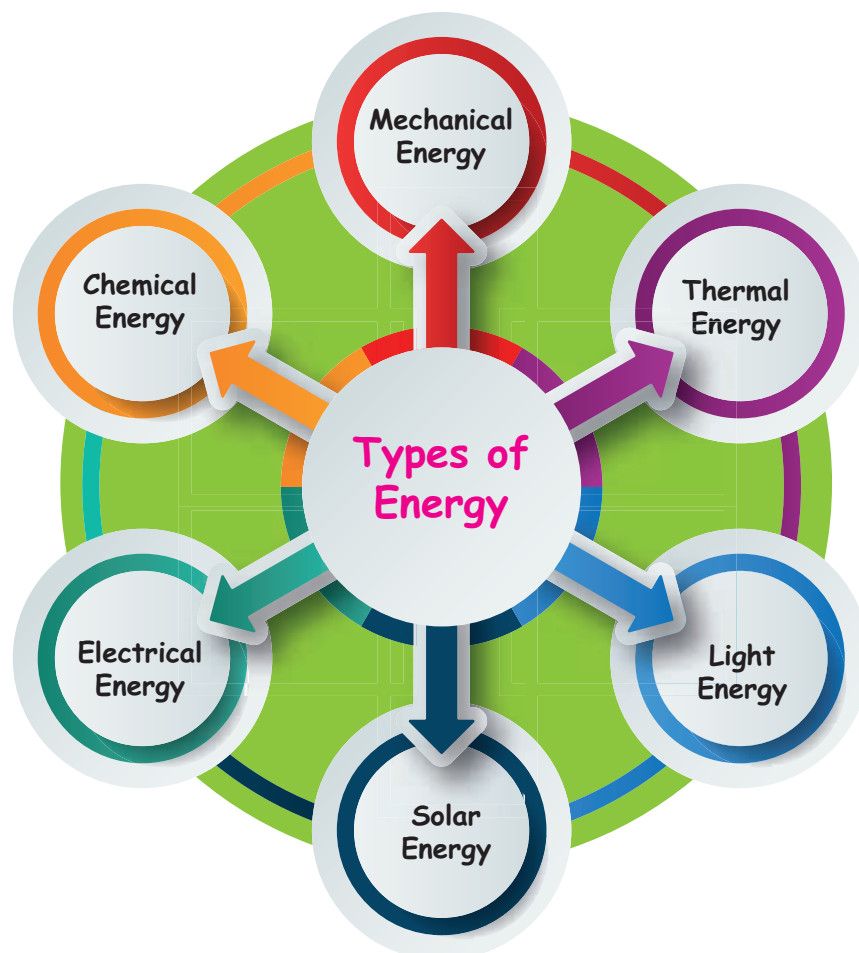


In the above picture

- ★ A man pulls a luggage. To do so he needs some energy. What is the source?
Food gives energy to humans.
- ★ The car moves by the obtained from the burning of fuel.
- ★ The escalator moves by using electricity as energy.

Energy is defined as capacity of doing work.

Energy must be **transferred** to an **object** in order to do **work**.



1. Renewable Resources

Renewable sources of energy are replaced naturally over a period of time. We can keep using these sources for a long period of time. Since the beginning of human life, we have been using these resources. We use these resources for light, transport, cooking, heating. Eg: Sun, Wind and Water.



2. Non-renewable Resources

The resources which are not easily replaced once used are called the non-renewable resources. Eg: Petrol, Coal and Natural gas



More to know



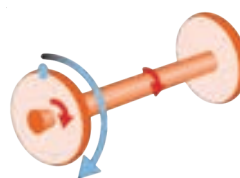
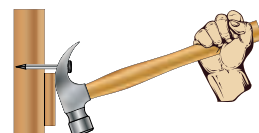
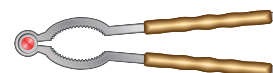
The law of conservation of energy states that energy can neither be created nor destroyed. It can be converted from one form to another.

The **SI unit** of energy is **joule**.

It is named after James Joule who explained about energy.



III. Simple machine



Observe the above pictures.
What are they used for?

In our daily life our effort is saved with the help of some simple machines.

We draw water from the well with the help of a wheel and a rope.

Simple machines are tools which are used to make our work easier. **Some examples for simple machines** are pulley, wedge, inclined plane, screw, lever, wheel and axle.

1. Pulley



Observe the picture. Which is easier? Lifting the load with the help of a pulley or without a pulley?



A pulley is a machine made up of a wheel with a cut around it. A rope or chain passes around the pulley. It rotates in the direction with more force. Eg: crane



2. Inclined Plane



Observe the picture and discuss. Is lifting a box easier than rolling it on a ramp?



An inclined plane is a flat sloping surface with one end higher than another.

Eg: ramp, slide and slope for wheel chair.



3. Wedge

A **wedge** is a tool with a sharp edge which can be used to split materials. It is used to break wooden logs into two pieces.
Eg: knife, scissors and axe.



4. Screw

The **screw** is used to raise weights and to hold objects together.
Eg: pencil sharpener, screw-jack, bottle cap and windmill.



The screw in the bottle cap holds the cap and the bottle together.
The blade and sharpener are held together by screw.

5. Wheel and Axle

Wheel and axle consist of a wheel attached to a small rod so that these two parts rotate together.

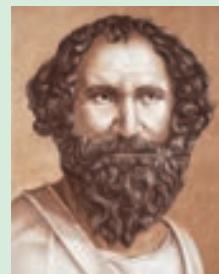
Eg: bicycle wheel, door knob, grinder, axle wheel.



More to know

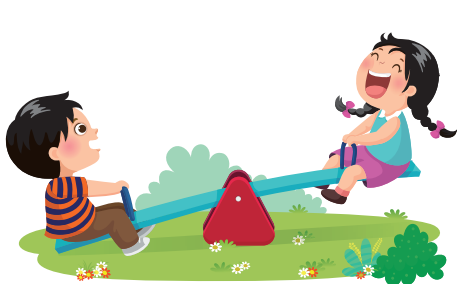


Simple machines usually exchange a smaller force to move a heavy object. The work required is the same, but the force required is less. The idea of a simple machine originated with the Greek philosopher Archimedes around the 3rd century BC.



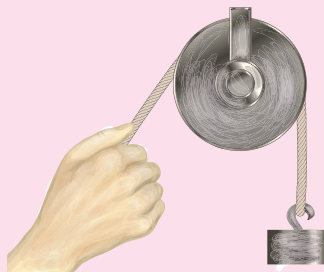
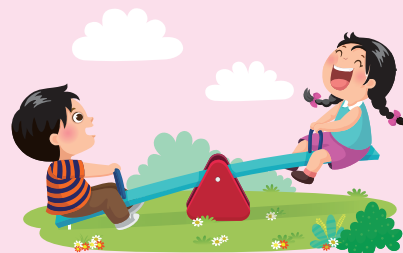
6. Lever

A lever is used to multiply the force we give on an object.
Eg: see saw, nut cracker and plier.



Try to Answer

Identify and mention the types of simple machines.



Let us do

Complete the table.

S. No	Types of Simple Machine	Example
1.	Pulley	
2.	Wheel and axle	
3.	Wedge	
4.	Inclined plan	
5.	Lever	
6.	Screw	

IV. Types of Lever

To understand the lever, we must know the following terms.

Load is the object on which the force is applied.

Effort is the force we apply on the lever.

Fulcrum is the point on which the lever rotates.

Lever is classified into three types according to where the load and effort are located with respect to fulcrum.

The three types of lever

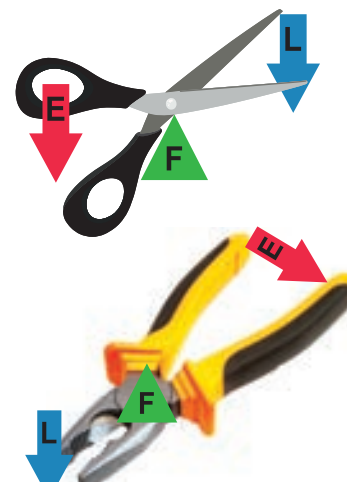
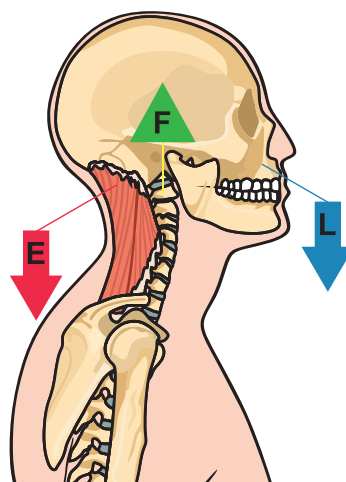
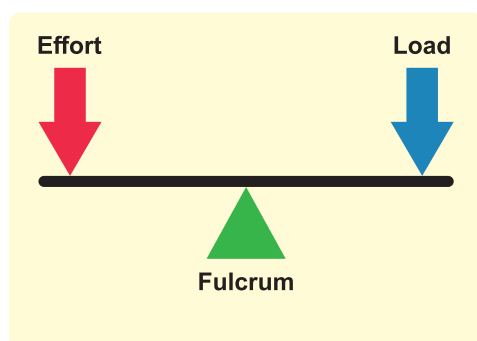
Class I lever

Class II lever

Class III lever

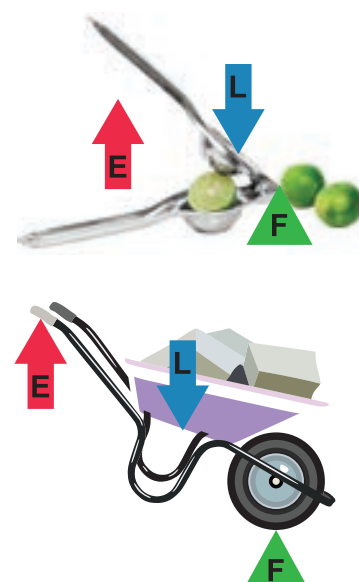
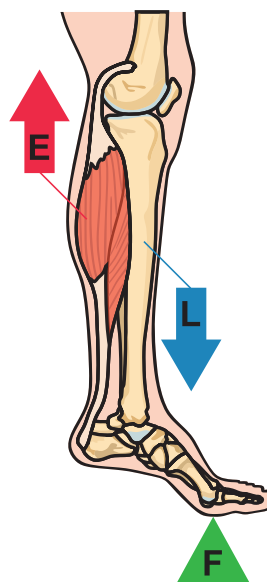
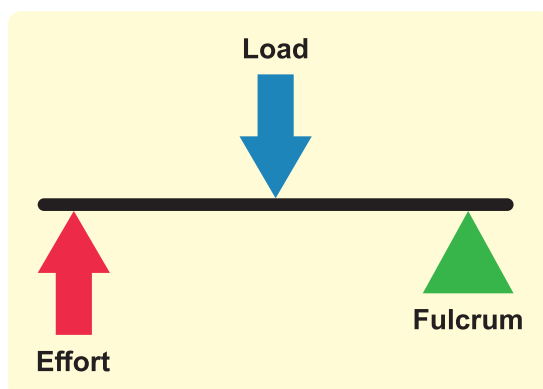
1. Class I Lever

When the fulcrum is between the effort and the load, it is known as Class I lever.
Eg: scissors, pliers, seesaw.



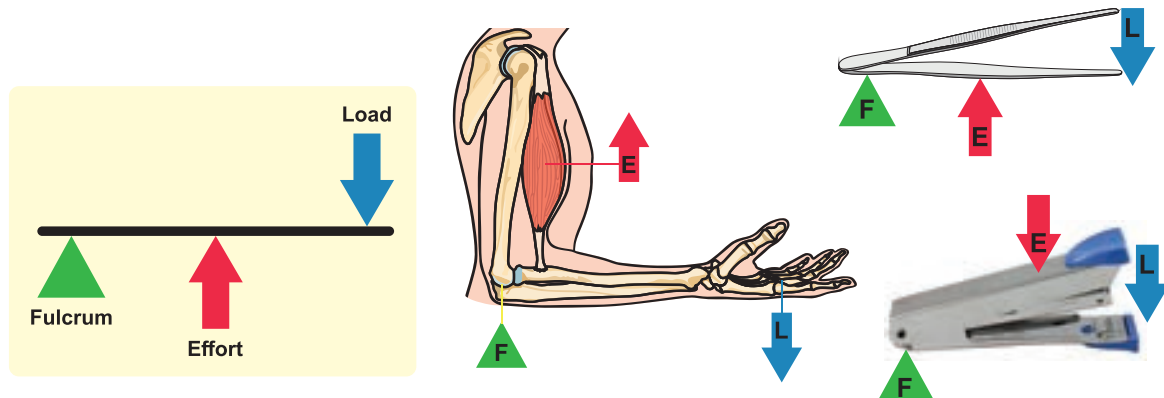
2. Class II Lever

When the load is between the effort and the fulcrum, it is known as Class II lever.
Eg: wheel barrow, lemon squeezer, nut cracker.



3. Class III Lever

In this lever, the effort is between the load and the fulcrum.
Eg: stapler, tongs, broom stick, hockey stick.



Try to Answer

Name the load, effort and fulcrum.



1. _____
2. _____
3. _____



1. _____
2. _____
3. _____



1. _____
2. _____
3. _____

Evaluation

I. Use the correct word to fill the blanks.

(Ramp, Simple machines, Work, Energy, Pulley)

1. _____ is said to be done when a force is acting on it.
2. The ability to do work is _____.
3. _____ is a machine made up of wheel and rope.
4. _____ help us to make work easier.
5. An example for inclined plane is _____.



II. Rearrange the letters and find out the names of the tools.



E D G E W

--	--	--	--	--



R L E V E

--	--	--	--	--



E W C R S

--	--	--	--	--

III. Match.

- | | | |
|-----------------------|---|---------------|
| 1. Class II lever | - | Drawing water |
| 2. Pulley | - | Bicycle |
| 3. Class I lever | - | Nut cracker |
| 4. Wheel and axle | - | Wind |
| 5. Renewable resource | - | Seesaw |

IV. Classify the things below.

Sl. No	Examples	Class of Lever
1.	Spade	
2.	Seesaw	
3.	Wheel barrow	
4.	Plier	
5.	Nail cutter	

V. Answer the following.

- What is the unit of energy?
- Name some simple machines.
- What is a first order lever?
- Lemon juicer belongs to which type of lever? Why?
- Define work.
- Write any three types of energy.