

AS PER THE LATEST SKILL EDUCATION  
CURRICULUM PRESCRIBED BY THE  
CBSE, NEW DELHI

# A Concise course in **Robotics**

**Aligned with  
NEP 2020  
and  
NCF 2023**

For class **3<sup>rd</sup>**

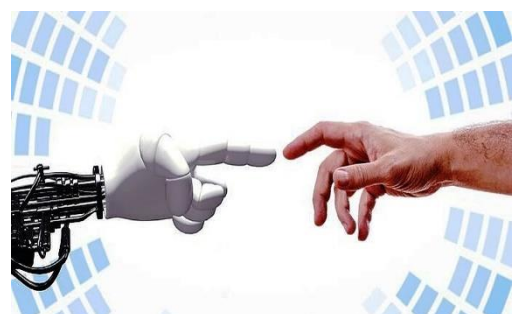
## Includes

**Part A: DIY Science**

Part B: Electronics

**Part C: Robotics**

**Part D: Aeromodelling**



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## UNIT 1

### DIY SCIENCE

#### INTRODUCTION TO DIY (DO IT YOURSELF)

- a) "DIY for kids" refers to engaging in creative activities while learning science ideas.
- b) It's similar to creating cool things, experimenting with craft supplies, or taking on easy tasks where you don't require an adult to assist you in learning basic science principles like wind and reflection.
- c) It all comes down to having fun and utilizing your creativity to create something amazing all by yourself.

#### TOOLS REQUIRED FOR DIY

- a) **Safety Gear**
  - Safety goggles
  - Safety gloves
- b) **Measuring Tools**
  - Scales
  - Inch tape
- c) **Mixing and Stirring**
  - Stirring rods



*Representation of tools for DIY*

- Plastic or wooden spoon
- d) **Containers**
  - Plastic cups or beakers
  - Small plastic containers
- e) **Cutting Tools**
  - Safety scissors.
  - Craft knife (under supervision).



*Representation of Tools of DIY*

## **FORCE**

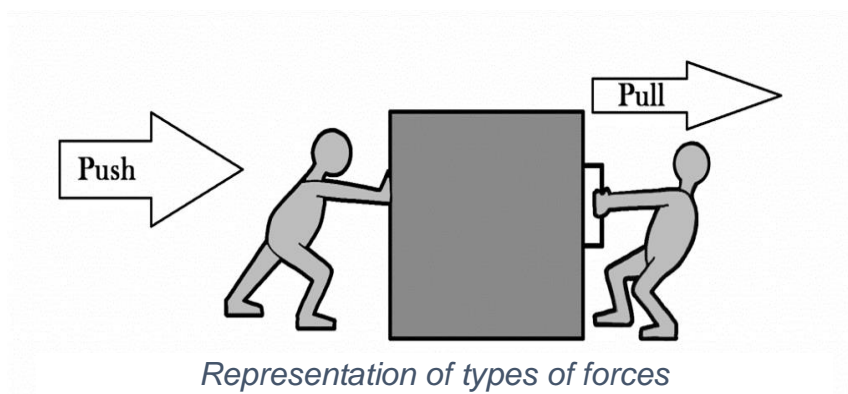
- a) A push or pull has the power to cause something to move, stop, or change its conditions. It is the cause of an object's acceleration or shape changes.
- b) You can use your hands to push or pull, or you can use unseen forces like gravity.
- c) A force's strength is expressed in terms of Newtons.
- d) Kicking a ball, lifting a box, and the Earth's gravity pulling objects toward its center are a few examples of forces.

## **TYPES OF FORCE**

### **Push**

When something is pushed, it moves away from the person or object exerting the force.

**Example:** Pushing a carton box to make it move forward.



*Representation of types of forces*

**Pull**

A pull is a force that causes an object to move in the direction of the person or thing exerting it.

**Example:** Pulling a carton box towards you.

**Gravity:**

The force that pulls objects toward the center of the Earth without being seen is called gravity.

**Example:** Launching a ball from a height and watching it land on the floor.

**ACTIVITY 1<sup>ST</sup>- STRING TOY****SPEED**

The speed at which an object changes position from its starting point in any direction over time. referred to as speed.



km/h

*Representation of Speed*

**Speed = Distance/ Time.**

**KNOW YOUR VEDAS**

*bhaskaracharyall (1114-1185)*

Bhaskar Acharya (12th Century), born in Vijayapura, Bharat, in his Siddhanta Shiromani and Gotabhaya, described motion and kinematics. It is worth mentioning that there were no subsequent attempts to solve these mysteries, nor was there the realization that the invisible cause behind various types of motion could be conceptually generalized and formally characterized and expressed in an abstract way, through a mathematical formula was done by Newton a few centuries later.

## NOTES AT A GLANCE

- **DIY-** DIY stands for "Do It Yourself," referring to the practice of creating or building things independently without professional assistance.
- For DIY projects, essential tools include a versatile toolkit with screwdrivers and pliers, along with power tools like a drill for efficient work. Additionally, safety tools such as gloves and goggles ensure a secure and protected DIY experience.
- Air is an invisible mixture of gases, including oxygen, that surrounds the Earth and is necessary for life.
- Wind is the movement of air caused by uneven heating on the earth's surface, which is often felt as a breeze or gust.
- The speed at which an object changes position from its starting point in any direction over time. referred to as speed.

## **TRACK YOUR PROGRESS**

### **MULTIPLE CHOICE QUESTIONS**

**1.What does DIY stand for?**

- a. Do It Yesterday
- b. Do It Yourself
- c. Done In Yellow
- d. Doing It Yearly

**2.Which tool is commonly used to tighten screws?**

- a. Hammer
- b. Pliers
- c. Screwdriver
- d. Wrench

**3.What should you wear to protect your eyes during a DIY project?**

- a. Sunglasses
- b. Safety goggles
- c. Reading glasses
- d. Contact lenses

**4.Which of the following is used to measure the length of an object in DIY projects?**

- a. Scale
- b. Thermometer
- c. Compass
- d. Protractor

**5.What is the purpose of sandpaper in DIY projects?**

- a. To measure
- b. To cut
- c. To smooth surfaces
- d. To tighten screw



### **FILL IN THE BLANKS**

(safety goggles, smooth, scale, DIY, screwdriver)

1. \_\_\_\_\_ is the abbreviation for "Do It Yourself."
2. Use a \_\_\_\_\_ to tighten screws.
3. Always wear \_\_\_\_\_ to protect your eyes during a DIY project.
4. \_\_\_\_\_ is used to measure the length of an object in DIY projects.
5. Sandpaper is used to \_\_\_\_\_ surfaces in DIY projects.

### **SHORT ANSWER QUESTIONS**

1. What does DIY stand for?
2. Which tool is commonly used to tighten screws?
3. Why should you wear safety goggles during a DIY project?
4. What is used to measure the length of an object in DIY projects?
5. What is the purpose of sandpaper in DIY projects?

### **LONG ANSWERS QUESTIONS**

1. What are three essential items you might find in a basic DIY toolkit?
2. Why is it important to have a designated workspace for DIY projects?
3. How can you safely store sharp tools when you are not using them?
4. Can you name one DIY project you would like to try at home, and what materials would you need?
5. Why do we wear protective gear like gloves when working on DIY projects?

## UNIT - 2

### ELECTRONICS

#### **LEARNING OBJECTIVES....**

After Completing this Unit Students will able to Understand

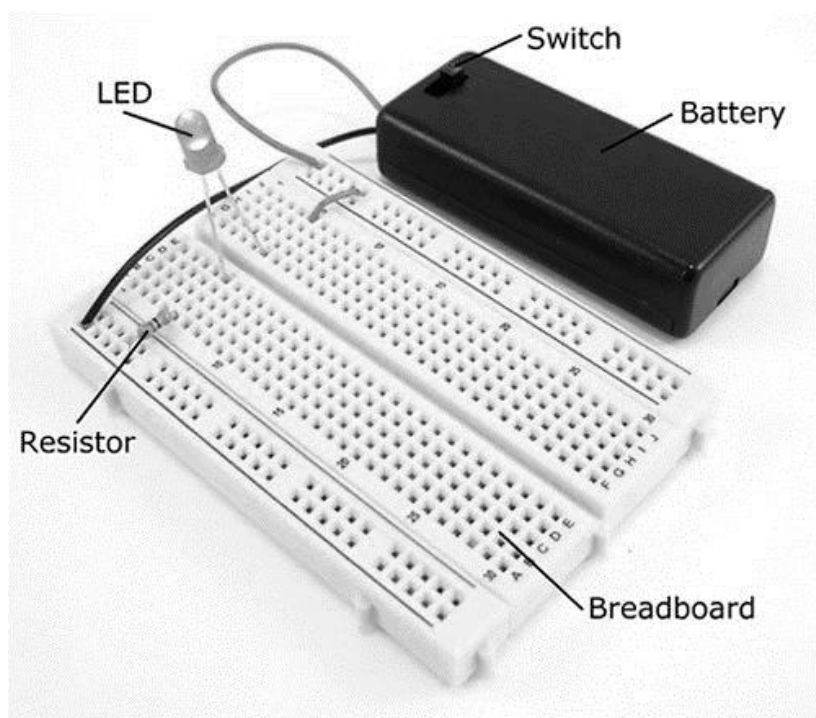
Concept of Electronics and its use

Able to understand about Charge and Current.

Able to differentiate between conductor and insulator & their

#### Electronics

- a) "Electronics is a branch of science in which we learn about the flow of charge. We primarily work with direct current (DC) voltage."
- b) Electronics learning is used to make devices such as remote-controlled cars, calculators, radios, digital watches, TVs, satellites, missiles, autonomous air vehicles, etc.

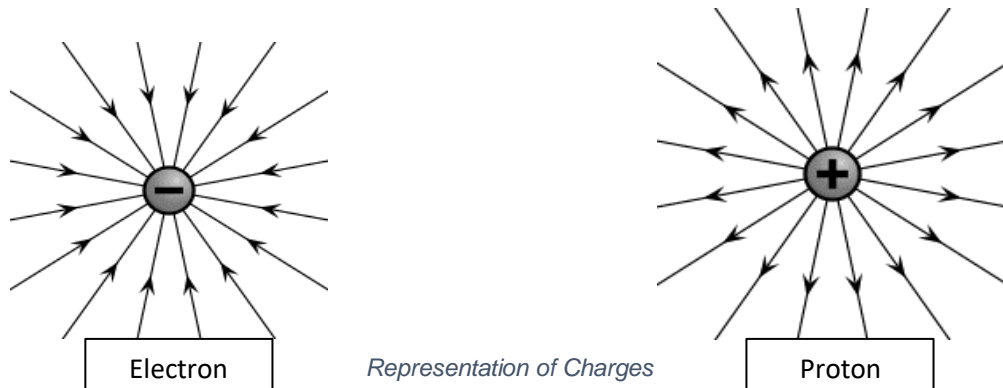


## Charge

**Electric charge** is the physical property of matter. There are two types of electric charge: *positive* and *negative* (commonly carried by protons and electrons).

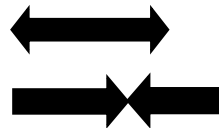
Charges are of two types

- a) Negative or Electron ( - )
- b) Positive or Proton ( + )



## Properties of Charge

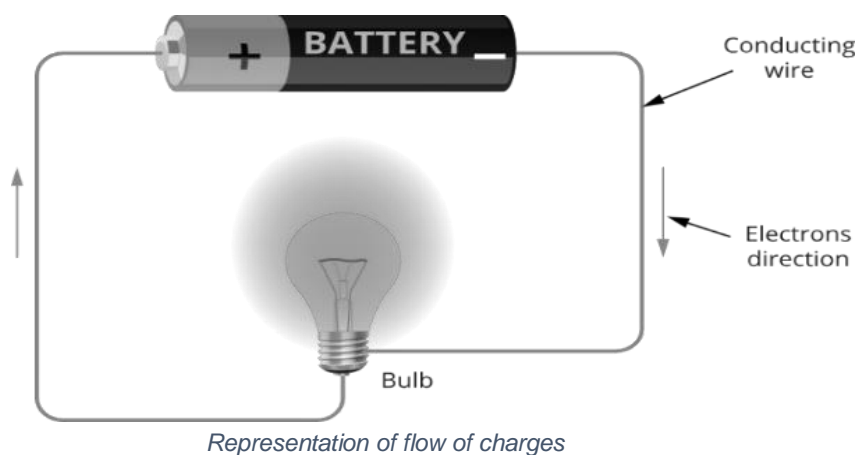
- a) Same Charges Repel Each Other
- b) Different Charges Attract Each Other



## Current

**“Current is flow of Charge.”** Current measured in **Ampere**.

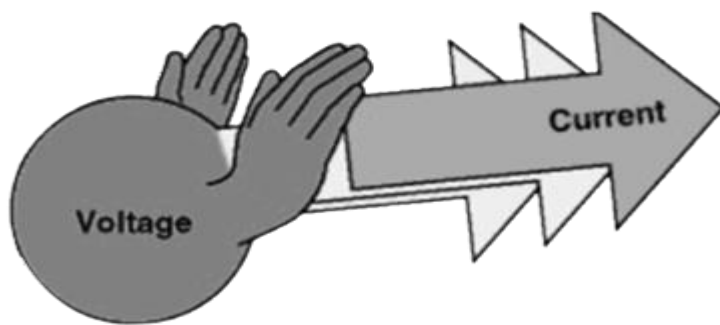
Current is the movement of electric charge along a pathway, much like water flowing in a river. In a circuit, electrons flow from the negative terminal of a battery, through wires, and back to the positive terminal.



## Voltage

**"Voltage is the pressure that pushes charges." Voltage measures in **Volt**.**

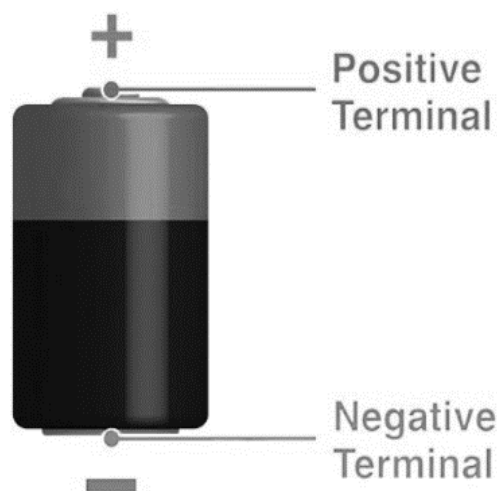
For example, consider a water tank on a hill. The higher the tank is placed, the greater the pressure of the water flowing out of the tap at the bottom of the tank. Similarly, in an electrical circuit, a higher voltage provides more "push" for electric charges to move through the circuit. This push is what drives current flow, just as higher pressure drives water flow in a pipe.



*Representation of Voltage*

## Battery

A battery is like a little power pack. They provide electricity to devices like toys, remotes, or phones. Each battery has a positive (+) and negative (-) end.



*Representation of Battery*

## Conductor

Conductors are materials through which electricity can flow. If water flows through the pipe, then the pipe will be a conductor for the water.

Examples of conductors include metals like **gold, silver, wires, iron, water**, etc.



*Representation of Conductors*

## Insulator

An insulator is like a barrier that stops electricity from flowing through it. Think of it as a roadblock for electric current.

Examples of insulators are wood, glass, bottle etc.



*Figure 5- Representation of Insulator*

## Wire

A wire is a pathway for electricity, like a road for cars, allowing electricity to flow from one place to another.

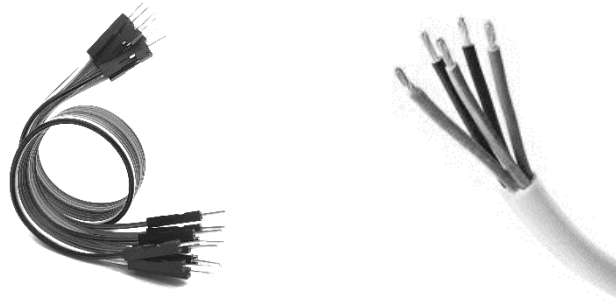
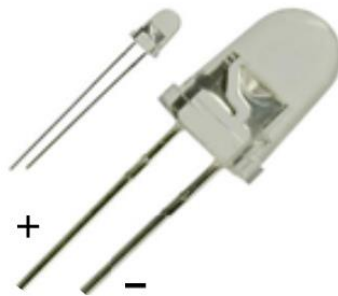


Figure 6- Representation of Wire

## LED

**LED stands for "Light Emitting Diode."**

When an electric current passes through a light-emitting diode (LED), it emits light.



Representation of LED

## Buzzer

A buzzer is a device that makes a loud buzzing sound when electricity passes through it.

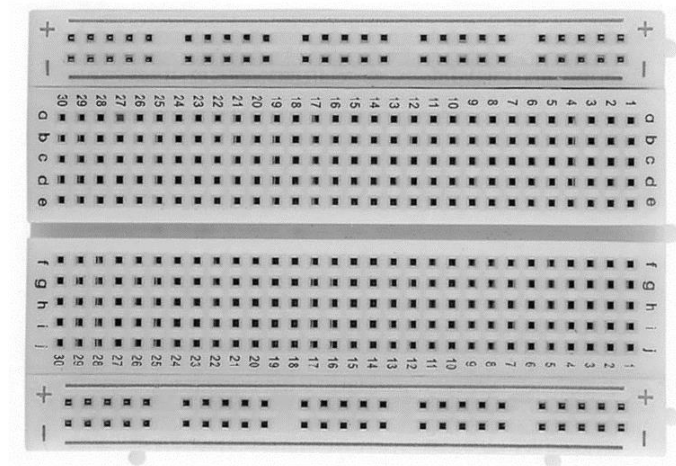


Representation of Buzzer

## Breadboard

A breadboard, or protoboard, is a construction base to build semi-permanent electronic circuits.

## Activities



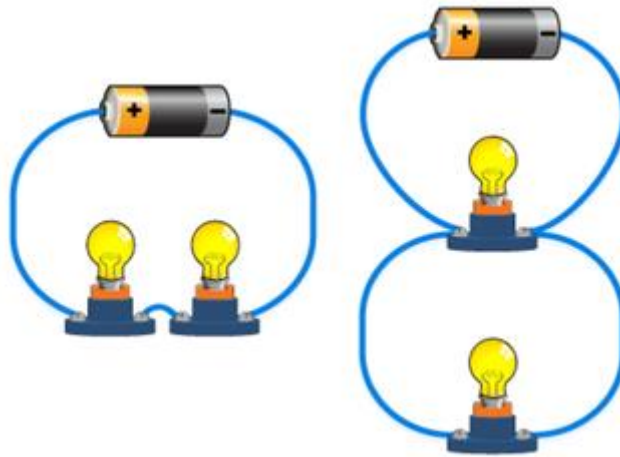
*Representation on Breadboard*

(LED Glow & Dimming LED)

## Electrical Connections:

“Electrical Connections are of two types given below.”

1. Series (Cascade) Connection.
2. Parallel (Shunt) Connection.



*Representation of Series and Parallel*

## Resistor

A resistor is an electronic component that opposes the flow of charge (current). It's just like a traffic light or a breaker on the road.

For your knowledge, resistance is the measure of breaker height on the road (conductor).

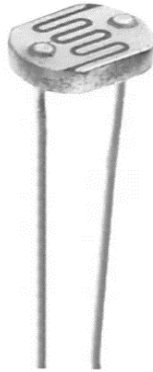


*Representation of Resistor*



### LDR (Light Dependent Resistor)

An LDR, or **Light Dependent Resistor**, is a component which senses light.



## NOTES AT A GLANCE

- Electronics is a branch of science that deals with electricity and the behaviour of electrons in different materials.
- Conductors are materials that allow electricity to flow easily, like metal.
- Insulators are materials that do not let electricity pass through easily, like plastic or rubber.
- Wires are like roads for electricity; they carry it from one place to another.
- Switches are like traffic signals for electricity. They can turn the flow of electricity on or off.
- Batteries are like power stations for small devices. They provide the electricity needed for things like toys or flashlights.
- It's important to be safe with electricity. We should not touch wires or electrical devices with wet hands and should ask adults for help.

## **TRACK YOUR PROGRESS**

### **MULTIPLE CHOICE QUESTIONS (MCQs)**

**1) What is a conductor in electronics?**

- a. A person who conducts experiments.
- b. A material that allows electricity to flow through easily
- c. An electronic device with buttons.

**2) Which of the following is an example of a conductor?**

- a. Plastic.
- b. Copper.
- c. Wood.

**3) What do we use to connect electrical devices and create a pathway for electricity?**

- a. Toys.
- b. Wires.
- c. Books.

**4) What does a switch do in an electronic circuit?**

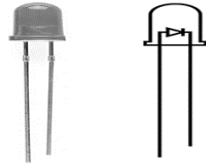
- a. Turn on and off the lights.
- b. Make noise.
- c. Changes colours.

**5) Which material is commonly used to make electrical wires?**

- a. Rubber.
- b. Glass.
- c. Copper.

## FILL IN THE BLANKS

**Q1. Write the terminal names of LEDs. (Use Pencil Only)**



**Q2. Complete the following circuit. (Use Pencil Only)**



## SHORT ANSWER QUESTIONS

1. Define Current?
2. Define Voltage?
3. What is “Flow of Charge”?
4. What is an insulator?
5. What is LDR?

## LONG ANSWER QUESTIONS

1. Write down the material that opposes the flow of electricity? With a few examples.
2. Explain the following topics in short
  - I. Charge and its types.
  - II. LED.
  - III. Buzzer.
  - IV. Conductor.

## UNIT- 3<sup>RD</sup>

### ROBOTICS

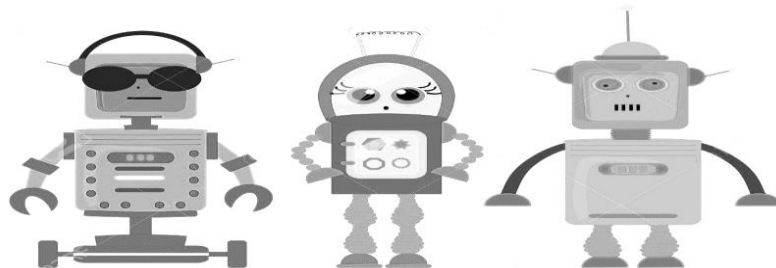
#### LEARNING OBJECTIVES

After completing this module students will be able to understand.

- Concept of robotics and its use.
- Able to understand about energy and its types.
- Able to differentiate between different energy and their generation methods.
- Able to understand core concepts of motor and wheels

### ROBOTICS

- Robotics is the branch of science that involves the circuit-making, design, and manufacture of movable robots.
- The objective of the robotics field is to create intelligent machines that can assist humans in a variety of ways.



### ENERGY

- Energy is the ability to do work.
- It is of various types, such as light, heat, and motion.
- We use energy to power our homes, schools, and vehicles.
- Energy can be stored and converted from one form to another, like when sunlight is converted into electricity in solar panels.



*Representation of Energy*

## WHY DO WE NEED ENERGY?

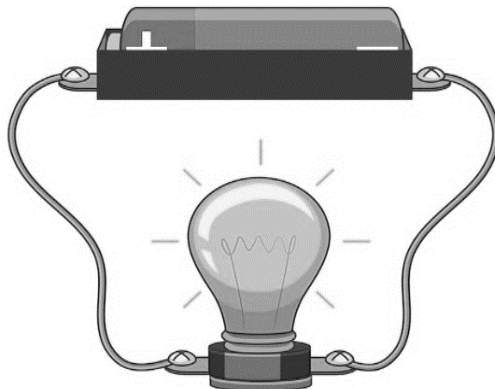
- a) We need energy for everything we do, from moving and playing to powering our homes and devices.
- b) It's like the fuel that gives us the ability to live, work, and enjoy our daily activities.



*Representation of energy*

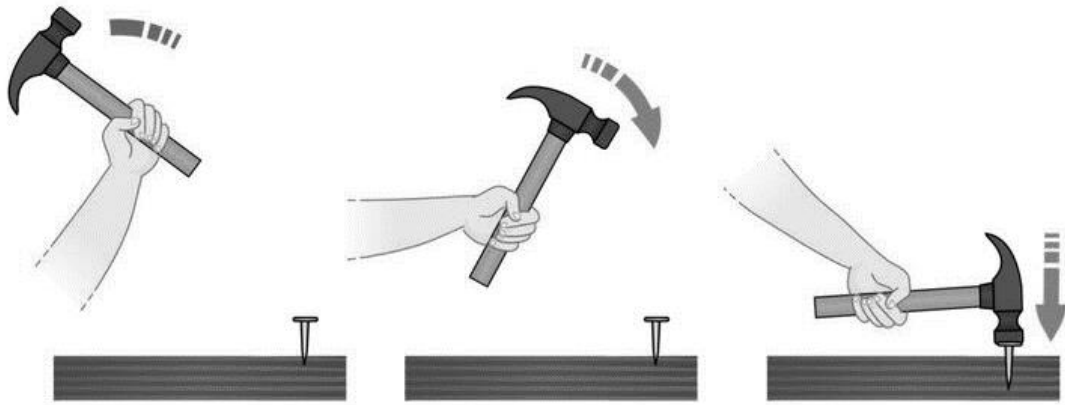
## TYPES OF ENERGY

1. **Electrical Energy:** Electrical energy is the ability to do work through the movement of electric charges, typically generated and utilized in electrical circuits for powering devices and systems. It is a form of energy resulting from the flow of electrons.



*Representation of electrical energy*

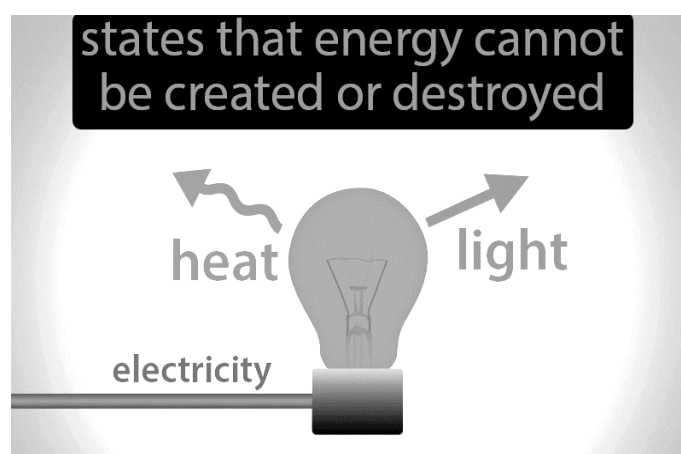
2. **Mechanical Energy:** Mechanical energy is like the power that helps things move or stay still, whether it's a toy rolling on the floor or a swing going back and forth. It's a mix of the energy that makes things go and the energy they store when they're not moving.



*Representation of Mechanical Energy*

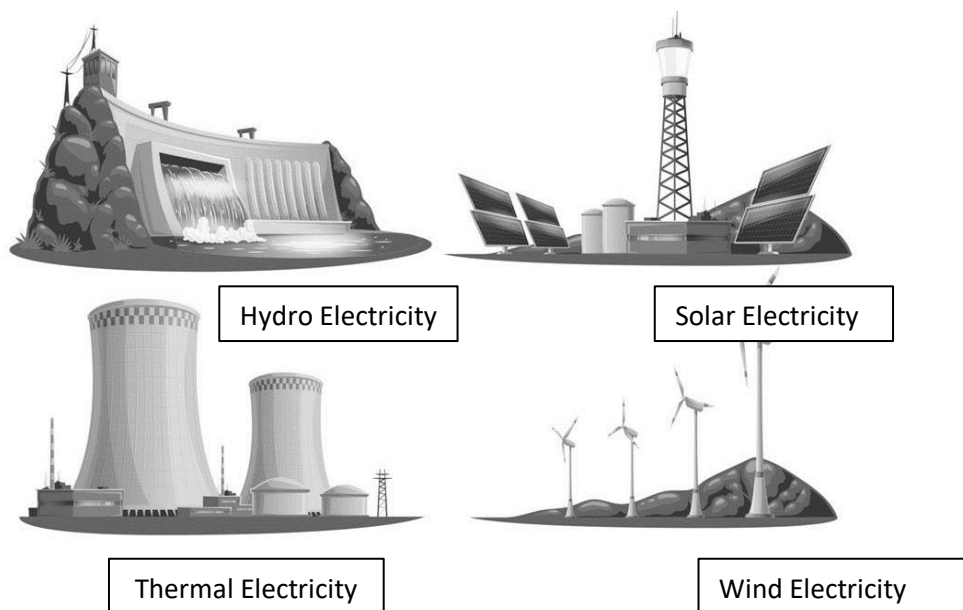
### **FUN FACT ABOUT ENERGY**

ENERGY CAN NEITHER BE CREATED NOR BE DESTROYED, IT ONLY TRANSFER FROM ONE FORM OF ENERGY TO ANOTHER FORM OF ENERGY.



## **GENERATION OF ELECTRICITY**

Electricity generation typically involves converting various forms of energy (such as mechanical, chemical, or solar energy) into electrical energy through processes like burning fossil fuels, harnessing nuclear reactions, or utilizing renewable resources like wind or solar power.



*Representation of Types of Energy*

### **1ST ACTIVITY - Electricity Generation**

#### **Fan**

- a) A propeller is a device whose blades turn around a central hub.



- b) It's common in many different kinds of applications, like aircraft, ships, submarines, and fans.

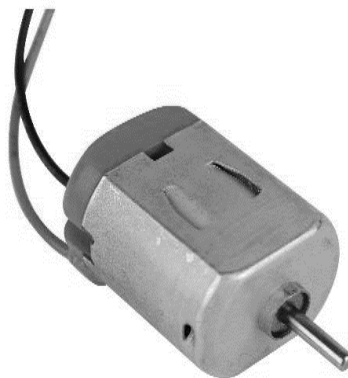


*Representation of Propeller*

- c) The primary function of a propeller is to generate push or motion by speeding up air or water in the opposite direction.

## **DC MOTOR**

A DC motor is an electric device that converts electrical energy into mechanical energy.



*Representation of Toy Motor*

## **WHEELS**

A wheel is a circular object that rotates around an axle, often used for facilitating movement or transportation.



*Representation of Wheel*

## 2<sup>ND</sup> ACTIVITY -Operating the DC motor

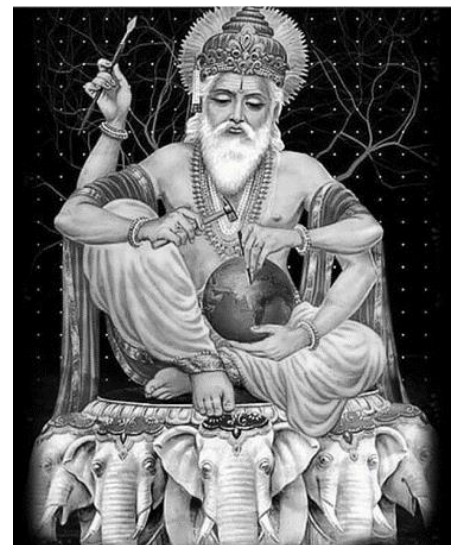
### KNOW YOUR VEDAS

A Hindu god, the divine architect He is considered as Swayambhu and Creator of the world. He constructed the holy city of Dwarka where Krishna ruled, the Maya Sabha of the Pandavas, and was the creator of many fabulous weapons for the gods.

He is also called the divine carpenter, is mentioned in the Rig Veda, and is credited with Sthapatya Veda, the science of mechanics and architecture.

These are the amazing creation of lord Vishwakarma

- Jagannath Puri Temple
- Dwarka
- Pushpak Viman
- Trishul
- Sudarshan Chakra
- Vajra



### NOTES AT A GLANCE

- Robotics is the versatile field that includes the design, operation, and application of robots for automotive projects.
- Energy is the capacity to do work. We found energy in various forms such as kinetic, electrical, and mechanical energy.

- A motor is a device that converts electrical energy into mechanical energy by rotating the shaft of a motor.
- Wheels are circular objects that rotate around an axle that allows a smooth and efficient wheel rotation in various applications, such as transportation or any moveable components.

## **TRACK YOUR PROGRESS**

### **MULTIPLE CHOICE QUESTIONS (MCQ):**

**1. What is robotics?**

- A) Branch of biology
- B) Branch of engineering and computer science
- C) Branch of physics
- D) Branch of chemistry

**2. What is energy?**

- A) Ability to rest
- B) Ability to do work
- C) Ability to sleep
- D) Ability to eat

**3. Which form of energy results from the flow of electrons?**

- A) Mechanical energy
- B) Electrical energy
- C) Thermal energy
- D) Kinetic energy

**4. What is the main function of a motor?**

- A) Convert electrical energy into mechanical energy
- B) Convert mechanical energy into electrical energy
- C) Convert thermal energy into electrical energy
- D) Convert electrical energy into thermal energy

**5. How does a DC motor operate?**

- A) Runs on alternating current (AC)
- B) Runs on direct current (DC)
- C) Runs on solar power
- D) Runs on wind energy

**FILL IN THE BLANKS**

1. Robots are machines that can use \_\_\_\_\_ to move and perform tasks without human intervention.
2. They are designed to perform specific \_\_\_\_\_, and some robots use motor wheels to help them \_\_\_\_\_ easily.
3. Robots with motor wheels have parts like sensors, \_\_\_\_\_, and a computer brain called a \_\_\_\_\_.
4. Sensors help robots with motor wheels \_\_\_\_\_ their surroundings and make decisions about how to \_\_\_\_\_.
5. Motor wheels act as the \_\_\_\_\_ of a robot, allowing it to move forward, backward, and sometimes even \_\_\_\_\_.

**SHORT ANSWER QUESTIONS**

1. What is the objective of the field of robotics?
2. What is energy?
3. Why is energy essential in our daily lives?
4. Can energy be created or destroyed, according to the law of conservation of energy?
5. What are the two main types of energy discussed in the text?

**LONG ANSWER QUESTIONS**

1. What is the function of a motor?
2. What is the difference between mechanical energy and electrical energy?
3. How are wheels utilized in various applications?
4. What is the purpose of electricity generation?

5. How does a DC motor function?

## UNIT -4

### AEROMODELLING

#### LEARNING OBJECTIVES

After completing this module students will be able to understand

- Concept of Aeromodelling and its use
- Able to understand about forces and its types
- Able to understand about matter and their types
- Able to understand core concepts of Newton's law

#### AEROMODELLING

- a) Aeromodelling is a creative activity that involves designing, building, and flying model aircraft.
- b) In this unit, students will be able to understand the basic principles of aerodynamics, engineering, and creativity while constructing replicas of real planes.
- c) This unit will hand over the experience, foster a passion for aviation, and hone skills in craftsmanship and precision.

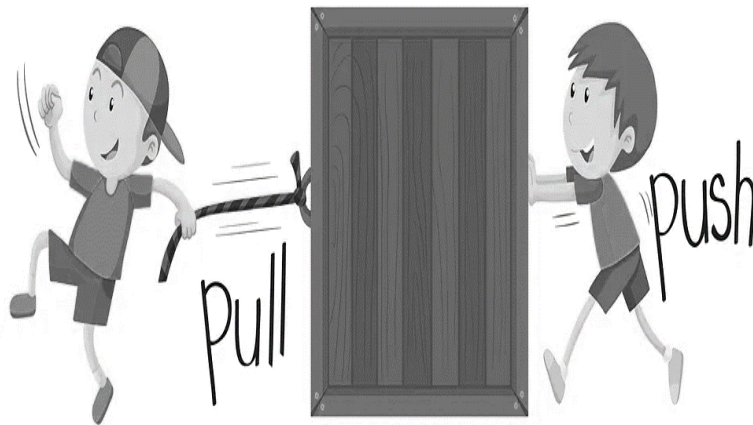


*Representation of Aeromodelling*

## FORCES

- a) Force is a powerful concept that helps us understand how things move objects from one place to another.
- b) There are two types of forces. **Push and pull** can make objects speed up, speed down, or change direction.

**For example, pulling or pushing a block.**

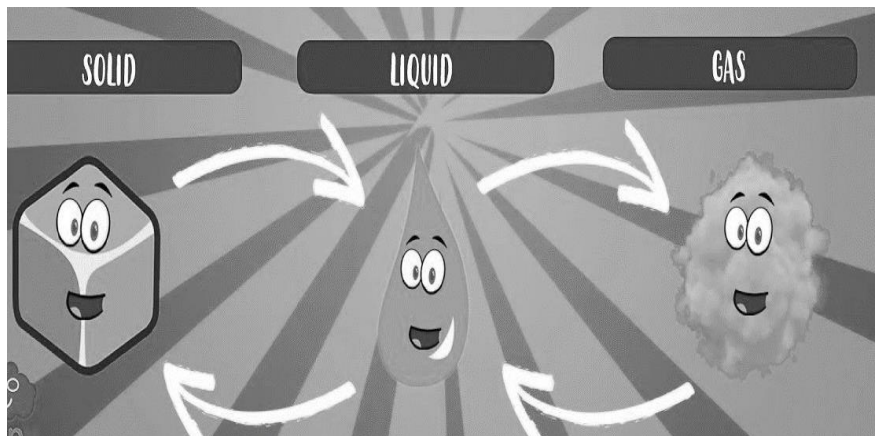


*Representation of force*

## MATTER

- a) Matter is everything around us that has mass and takes up space.
- b) It includes everything that you can touch, see, or feel.

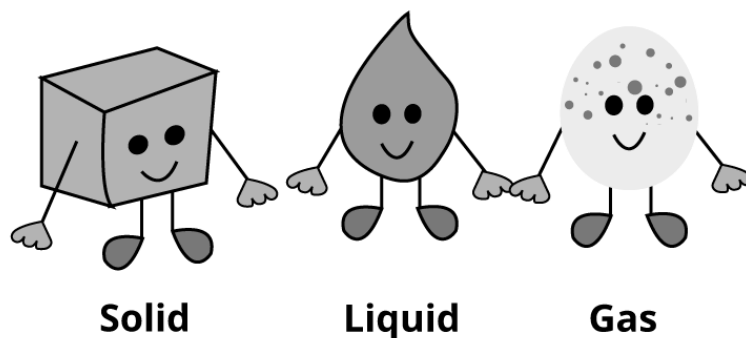
**For example, you can touch books and hold books, drink water, feel the air, or everything that you can feel is known as matter.**



## TYPES OF MATTER

- a) Matters can be classified into three main types: solids, liquids, and gases.
- b) Liquids have a definite volume but can occur in any shape according to the container, while Gases don't have a definite volume and shape and Solids have a definite shape and volume.

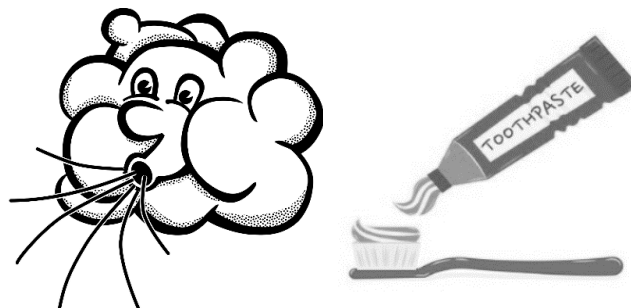
# 3 States of Matter



*Representation of states of Matter*

## FLUIDS

- a) Fluids are substances that can flow and can take the shape of their container.
- b) They include all types of liquids and gases, like water and air.
- c) Fluids don't have a fixed shape or volume. Liquids, such as Petrol, have a definite volume but can change shape.
- d) Gases, like the air we breathe, can fill any space and adapt to the container's shape.
- e) Real-life examples of Fluids are Air, Petrol, Toothpaste, Custard Oil etc.

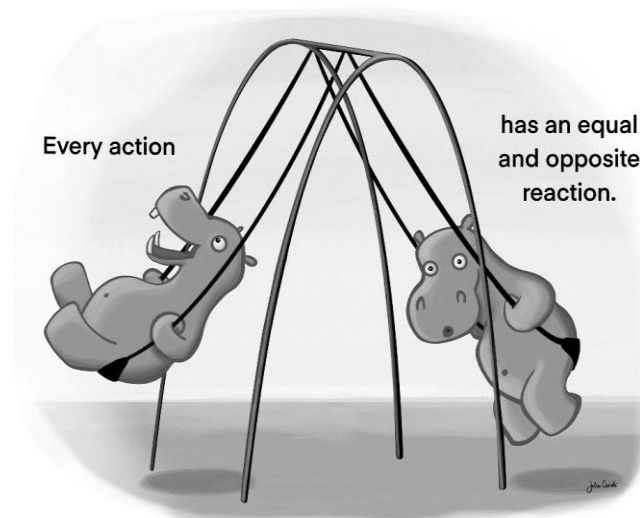


*Representation of Fluids*



## NEWTON'S LAW

- Newton's 3rd law states that for “every action, there is an equal and opposite reaction.”.
- This means that when one object applies force to another, the second object will also apply force in the opposite direction. It highlights the balanced nature of forces in interactions between objects.



*Representation of Newton's Law*

## GRAVITY

- Gravity is like a magical force that pulls everything with mass towards each other.
- Imagine you're playing with a toy on a slide; it slides down because of gravity! It's what keeps us and everything on Earth grounded.



### *Representation of Gravity*

#### **DRAG FORCE**

Drag force is like when you're pushing a heavy box across the floor, and it feels harder to move because the floor is pushing back on it. That pushing back force is called **drag force**.

So, when a bird flies or a fish swims, they have to work against this force to move through the air or water.

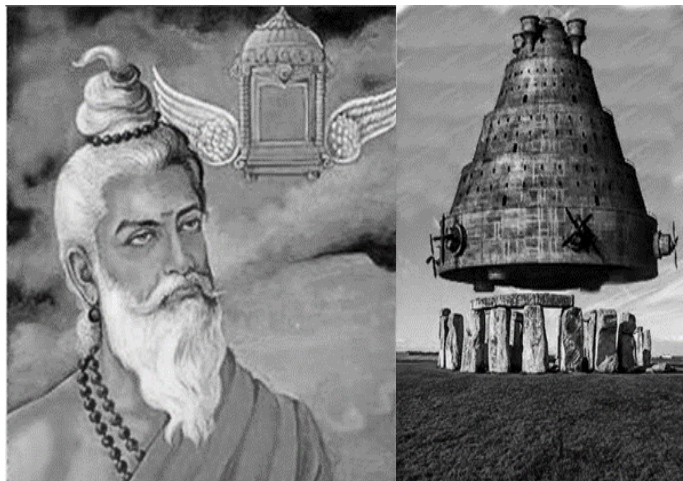


### *Representation of Drag Force*

## KNOW YOUR VEDAS

In long-ago India, there were tales about special flying machines called vimanas. These vimanas were like chariots, but they could zoom through the sky! Isn't that amazing? Back then, people wished they could fly like birds, so they wrote stories about it in books like the **Vaimānika Śāstra**.

This book is all about how vimanas were built and how they worked. It tells us about the smart people who made them and how they flew using special materials and magical words called mantras.



The Vaimānika Śāstra provides insight into ancient Indian perspectives on flight. They were highly educated and imaginative, and they dreamed of exploring the skies long before airplanes existed.

While we don't have flying chariots like vimanas anymore, studying about them reminds us of our ancestors' wonderful ideas. So, let us keep our minds open and our imaginations flying as we delve into the intriguing world of ancient Indian aeronautics!

## NOTES AT A GLANCE

- **Aeromodelling:** It is a process of making flying objects.
- **Forces:** A Push or pull that makes things move or change shape.
- **Matter:** Anything that occupies space and has volume.
- **Types of Matter:** Different kinds of substances like solid, liquid, gases.
- **Fluids:** Things that can flow, like liquids and gases.
- **Newton's Law:** It states that every action has an equal and opposite reaction.

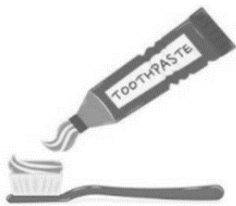
## TRACK YOUR PROGRESS

### ANSWER IN ONE WORD

1. Identify the force type



2. Is it a fluid, yes or no?



3. Which law states that every action has an equal and opposite reaction.
4. What type of force does this image represent?



5. Is air fluid? Yes / No.

### SHORT ANSWER QUESTIONS

1. What do you mean by modelling in aeromodelling?
2. Define Aeromodelling?
3. Define drag force?
4. How many types of forces are there?
5. Which force is better: push or pull?

### LONG ANSWER QUESTIONS

1. Define gravity in detail.
2. Write down steps of constructions of any one activity in detail.