



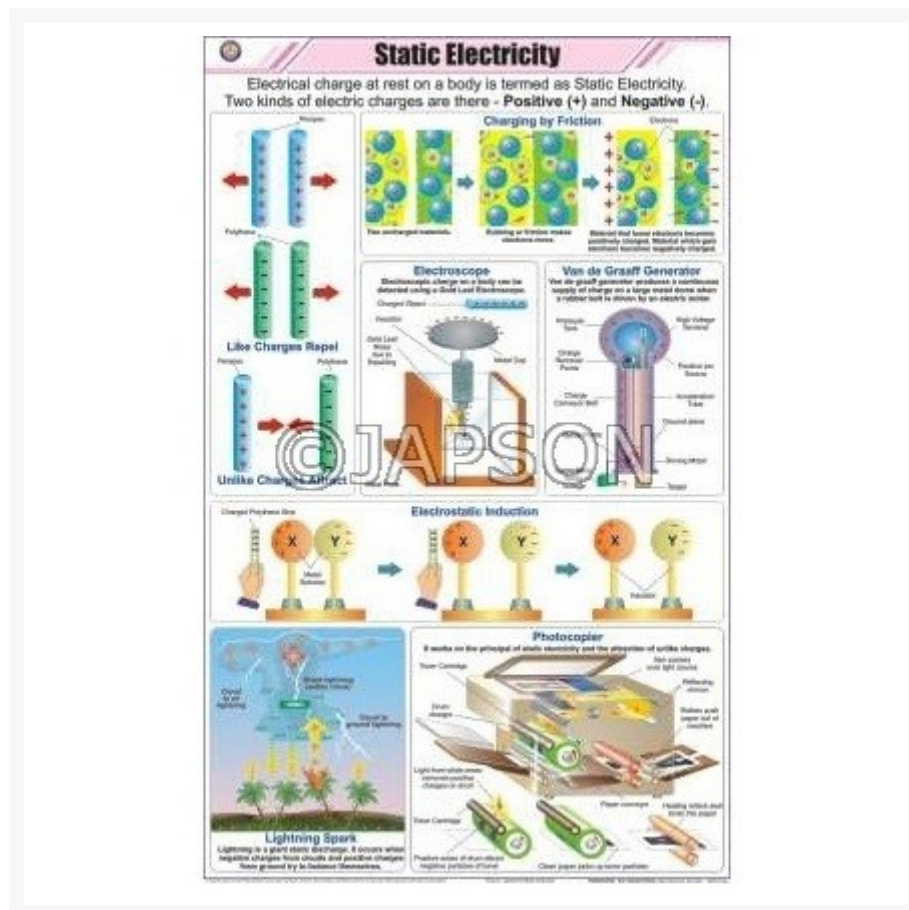
Address:
JAMBU PERSHAD & SONS
6275/22 Nicholson Road,
Ambala Cantt, Haryana,
INDIA
Pin: 133001

Email:
sales@japson.com
japsonambala@yahoo.com

Website:
www.japson.com
Phone:
+91-171-4006897

Physics (II) Charts, School Education

Product Image



Description

Standard Size: 58x90cms

Language: English

Laminated Paper Charts with Plastic Rollers. These Charts have technically accurate and

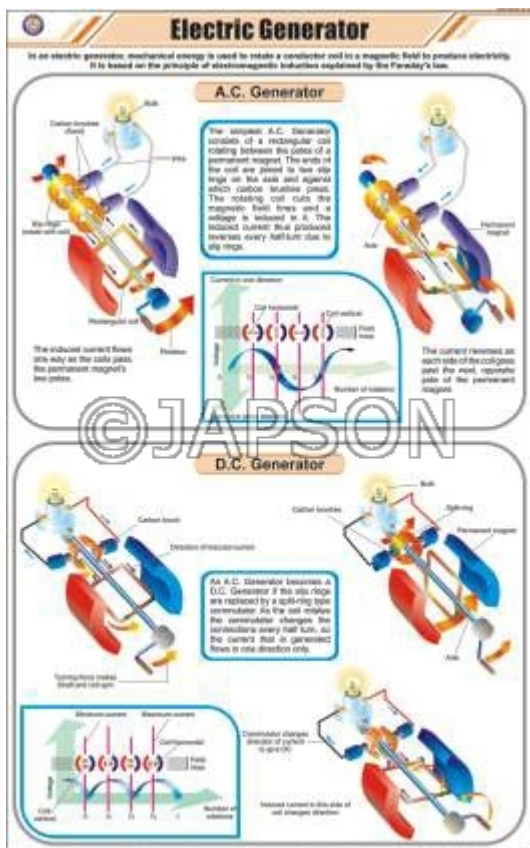
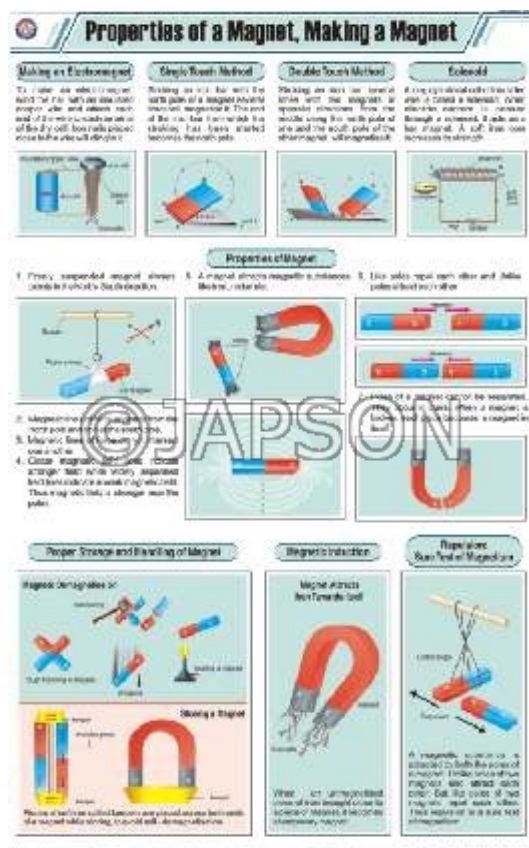
detailed description in vivid colours.

Note: Based on minimum order quantity conditions, Charts can be customized to your requirements in terms of CONTENT, LANGUAGE, SIZE, etc. Please write back to us for discussion.

A. Charts, Properties of a Magnet,

B. Charts, Electric Generator

Marking a Magnet



C. Charts, Electromagnetic Induction

D. Charts, Electric Bell

Electromagnetic Induction

Faraday and Henry discovered that a magnetic field can be used to produce a current.

INDUCED CURRENT BY A MOVING MAGNET
When a permanent magnet is being moved in or out of a coil, an induced current flows in the coil. Induced current always flows in the direction opposite to the subsequent steady current (if any). On reversing the coil, a reverse current flows (reverse induction).

SELF-INDUCTION
In the circuit, the increasing current in the coil gives rise to a changing magnetic field which induces an electromotive force which opposes the original current. A galvanometer in series with such a coil shows a momentary current (induced) in the direction opposite to the subsequent steady current (if any). On breaking the circuit, a reverse current flows (reverse induction).

Primary Circuit
battery, switch, primary coil, galvanometer

Secondary Circuit
secondary coil, galvanometer

MUTUAL INDUCTION
Mutual induction is exhibited when there is a magnetic linkage between two circuits containing inductive elements. Closing the switch in the primary circuit creates a magnetic field in the secondary circuit, giving rise to a momentary current. Opening the switch causes an opposite current in the reverse direction in the secondary circuit.

Fleming's Right Hand Rule (Induced current direction)
If a straight conductor is moving at right angles to a magnetic field, the direction of the induced current produced in the conductor can be found using Fleming's Right Hand Rule.

Applications
Generators, Transformers, Induction Motors, Induction Heating, Induction Cookers.

Electric Bell

There are various types of electric bells, including the single-stroke bell, the trembler bell, the buzzer and a continuously ringing bell, but all depend on the attraction exerted by an electromagnet on a soft iron armature. A typical single stroke bell circuit is shown here.

When the switch is pressed, the current begins to flow. The solenoid gets magnetised and attracts the armature due to which the hammer strikes the gong and the bell rings.

The movement of the armature breaks the contact and the current stops flowing. The electromagnet loses its magnetism and the armature returns back to its original position. This completes the circuit once again and the action is repeated. As a result, the bell continues to ring as long as the push-button is pressed.

Labels: Gong, Hammer, Soft iron core, Metal spring, Iron armature, Switch off, Battery, Bell ringing, Hammer striking the gong, Iron armature, Metal spring with iron core (solenoid) becomes an electromagnet on completion of circuit, Switch on, Battery.

E.Charts, Electric Current - Sources F. Charts, Static Electricity

- Effects

Electric Current - Sources - Effects

Electric current is defined as the rate at which charge flows.

SOURCES

voltaic cell
A voltaic cell is a device which converts chemical energy into electrical energy. It consists of two half-cells. Each half-cell contains a metal electrode immersed in a solution of its own ions. The two half-cells are connected by a salt bridge. The electrodes are connected by an external circuit. The current flows from the anode (oxidation) to the cathode (reduction).

Daniell Cell
The Daniell cell is a type of voltaic cell. It consists of a zinc electrode (anode) immersed in a zinc sulfate solution and a copper electrode (cathode) immersed in a copper sulfate solution. The two solutions are separated by a porous barrier. The electrodes are connected by an external circuit. The current flows from the zinc electrode to the copper electrode.

D'Arsonval Cell
The D'Arsonval cell is a type of voltaic cell. It consists of a zinc electrode (anode) immersed in a zinc sulfate solution and a copper electrode (cathode) immersed in a copper sulfate solution. The two solutions are separated by a porous barrier. The electrodes are connected by an external circuit. The current flows from the zinc electrode to the copper electrode.

EFFECTS

HEATING AND LIGHTING
The heating effect of electric current is the effect of the current in a wire. The current in a wire produces heat. The heating effect of electric current is used in many applications, such as in electric heaters, electric lamps, and electric irons.

CHEMICAL EFFECT
The chemical effect of electric current is the effect of the current in a solution. The current in a solution produces a chemical reaction. The chemical effect of electric current is used in many applications, such as in electroplating, electrolysis, and the production of chemicals.

MAGNETIC EFFECT
The magnetic effect of electric current is the effect of the current in a wire. The current in a wire produces a magnetic field. The magnetic effect of electric current is used in many applications, such as in electric motors, electric generators, and magnetic storage devices.

Static Electricity

Electrical charge at rest on a body is termed as Static Electricity.

Two kinds of electric charges are there - **Positive (+)** and **Negative (-)**.

Charging by Friction
When two different materials are rubbed together, one material becomes positively charged and the other becomes negatively charged. This is called charging by friction.

Electroscope
An electroscope is a device used to detect the presence of electric charge. It consists of a metal rod with a knob at the top and a series of metal leaves at the bottom. When a charged object is brought near the knob, the leaves are attracted to it and diverge. This indicates the presence of electric charge.

Van de Graaff Generator
A Van de Graaff generator is a device used to produce static electricity. It consists of a large metal sphere on top of a tall insulating column. A belt of material moves up the column, carrying positive charges to the sphere. The sphere becomes positively charged and can produce a large static electric discharge.

Electrostatic Induction
Electrostatic induction is the process by which a charged object can induce a charge in another object without touching it. This is done by bringing a charged object near a neutral object. The charges in the neutral object are redistributed, creating a net charge on the object.

Lightning Spark
Lightning is a natural phenomenon caused by the buildup of static electricity in the atmosphere. The charges are discharged in the form of a large spark, called a lightning spark.

Photocopier
A photocopier is a device used to make copies of documents. It works on the principle of static electricity. A charged drum is used to attract and transfer the ink from the original document to the copy paper.

Gravitation

Universal Law of Gravitation
Everybody in the universe attracts every other body with a force which is directly proportional to the product of their masses & inversely proportional to the square of the distance between them.



$$F_1 = \frac{GM_1M_2}{r^2}$$

Where, G is the universal gravitational constant, M_1 and M_2 are masses of two objects, r is the distance between two masses.

Gravitational Constant G
Henry Cavendish's Torsion Balance provided the first measurement of the gravitational constant G .
Currently accepted value of G is $6.67 \times 10^{-11} \text{ Nm}^2/\text{Kg}^2$

Acceleration Due To Gravity
Gravitational acceleration at a point in space is given as:
$$g = \frac{GM}{r^2}$$

Acceleration due to gravity of the earth, $g = 9.8 \text{ m/s}^2$

Weight
Weight is a force caused by the gravitational attraction.
$$W = mg$$

Weight equals mass times gravitational acceleration.
Also, $\frac{\text{Weight of the object on the moon}}{\text{Weight of the object on the earth}} = \frac{1}{6}$

Weightlessness
When an object is in free fall, it is weightless.

Force

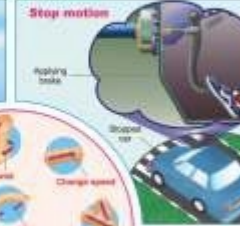
A force is a push or pull that changes the motion, size or shape of an object.

Effects of Force


Change the direction of motion




Stop motion



Set a stationary object in motion



Change of shape or size



Combining Force
Two cars pulling a plane by combining their forces according to parallelogram law.
The force of wind on the sails and the force produced by the boat produces a resultant that drives the boat in the required direction.

Moment and Couple

Moment (Torque)
The turning effect of a force is called a moment. The moment of a force is also called a Torque. It depends on:
(i) the magnitude of the force (bigger force means greater moment),
(ii) the perpendicular distance of the force from the Pivot (further the force acts from the pivot, the greater is its moment).

Moment of Force (Torque) = Force × Moment Arm
(τ) (F) (d)

SI Unit of Moment is Newton meter (Nm) **Dimension $[ML^2T^{-2}]$**


The Principles of Moment

Example 1: $\tau = F \times d$
Example 2: $\tau = F \times d \sin \theta$
Example 3: $\tau = F \times d \sin 90^\circ$
Example 4: $\tau = F \times d \sin 0^\circ$

Equilibrium (Balanced)
 $\tau_1 = \tau_2$
 $F_1 \times d_1 = F_2 \times d_2$

Couple
A special case of moments where two anti-parallel forces (F_1 & F_2) separated by a distance 'd' cause an object to rotate.

Applications of a Couple



Magnetism

The main cause of magnetism is the presence of many circulating subatomic particles (electrons) in the matter which produces the magnetic field.

Earth's Magnetic Field
The earth is a natural magnet. It has a magnetic field. The magnetic field lines are represented by the lines of magnetic force. The magnetic field lines are represented by the lines of magnetic force. The magnetic field lines are represented by the lines of magnetic force.

Magnetic Compass
The needle of a magnetic compass is a bar magnet. It is placed in a container filled with a liquid. The needle is free to rotate. The needle points towards the North Pole.

Artificial Magnet
Artificial magnets are made by magnetizing a piece of iron or steel. They are used in many applications.

Types of Artificial Magnets
1. Bar Magnet
2. Horseshoe Magnet
3. Cylindrical Magnet

Temporary and Permanent Magnets
A magnet is a material that can attract or repel other magnetic materials. A temporary magnet is a magnet that loses its magnetism when the external magnetic field is removed. A permanent magnet is a magnet that retains its magnetism even after the external magnetic field is removed.

Magnetic Field
A magnetic field is a region around a magnet where its magnetic force can be felt. It is represented by magnetic field lines.

Electromagnetism

Electric current through a wire generates a magnetic field which is called electromagnetism. It describes the relationship between electricity and magnetism.

Oersted's Experiment

In 1819, Oersted first discovered the link between magnetism and electric current when he found that a magnetic needle gets deflected when placed near a current carrying conductor.

When current is flowing from A to B, it shows the magnetic needle. The needle gets deflected towards the west.

Towards East

When the direction of current is reversed (current is flowing from B to A) then the magnetic needle, the needle gets deflected towards the east.

Magnetic Field of a Current Carrying Conductor

STRAIGHT CONDUCTOR

SOLENOID

CIRCULAR LOOP

Maxwell's Right Hand Grip Rule

If you hold a current-carrying wire in your right hand such that the thumb points in the direction of the current, then the curled fingers around the wire indicate the direction of the magnetic field.

Direction of Current

Direction of Magnetic Field

Fleming's Left Hand Rule (motor effect)

If the forefinger, middle finger, and thumb of the left hand are extended at right angles to each other, then the forefinger indicates the direction of the field, the middle finger indicates the direction of the current, and the thumb indicates the direction of the motion.

Direction of Field

Direction of Current

Direction of Motion

Applications

ELECTRIC BELL

ELECTRIC MOTOR

SIMPLE ELECTROMAGNET

Electric Motor

An electric motor converts electrical energy to mechanical energy.

Working of a Simple DC Motor

- Current flows through the coil, and the field of the permanent magnet forces the right side of the coil down and the left side up in accordance with Fleming's Left Hand Rule.
- The coil continues to turn towards the vertical and its rotation will carry it beyond this position.
- The coil reaches the vertical position and the current reverses.
- The coil continues to turn and the field of the permanent magnet forces the right side of the coil down and the left side up in accordance with Fleming's Left Hand Rule.

Commercial Electric Motor

Simple electric motor produces a low turning effect. Commercial motors give a much better performance for the following reasons:

- The current carrying coils having large number of turns wound on a soft iron core are used in them.
- The soft iron core plus the coils are called the armature. Armature when magnetized increases the strength of the magnetic field. This enhances the power of the motor.
- The pole pieces of the magnet enclose the coil and are curved to create a radial magnetic field. This keeps the turning effect of the maximum.

Simple AC Motor

Applications of Electric Motor

Grinder

Fan

Washing Machine

M. Charts, Friction

N. Charts, Work and Power

Friction

Friction is the component of the contact force parallel to the surfaces in contact, which opposes impending or actual relative motion between the two surfaces.

STATIC FRICTION

Opposes impending relative motion

$$f_s \leq \mu_s N$$

KINETIC FRICTION

Opposes relative motion

$$f_k = \mu_k N$$

ROLLING FRICTION

Opposes relative motion during rolling

$$f_r = \mu_r N$$

Where μ_s , μ_k , and μ_r are respectively the coefficients of static friction, kinetic friction & rolling friction. N is the normal force. Also,

$$\mu_r < \mu_k < \mu_s$$

ADVANTAGES

Helps to Write

Produces Heat

Causes Wear and Tear

DISADVANTAGES

Helps to Apply Brakes

Helps to Walk

Causes Skin Abrasions

INCREASING FRICTION

Spiking the Shoes

Using Ball Bearing

Lubricating With Oil

REDUCING FRICTION

Grooving the Tyres

Using Powder

Lubricating With Oil

Work and Power

WORK

If a body is displaced with a given force, a certain amount of work is done.

$$W = (f \cos \theta) d = f \cdot d$$

Where, f is the force, θ is the angle between force and displacement and d is the displacement.

Unit : joule (J)

Dimension : $[M L^2 T^{-2}]$

Amount of work is greater when displacement is greater for the same force applied.

Force

3 meter

2 meter

Amount of work is greater when force applied is greater for the same displacement.

Force

3 meter

3 meter

SPECIAL CASES FOR WORK DONE

- When $\theta = 0^\circ$
Maximum work is done.
- When $\theta = 90^\circ$
No work is done.
- When $d = 0$
No work is done.
- When $f = 0$
No work is done.

POWER

Time rate at which work is done.

$$P = W/t = \frac{f \cdot d}{t} = f \cdot v$$

Where, P is the power, f is the force, d is the displacement and t is the time.

Unit: watt (W)

1 horsepower = 746 watt

O. Charts, Ohms's Law &

P. Charts, Current Electricity

Electrical Resistance

Ohm's Law & Electrical Resistance

Ohm's Law

Georg Simon Ohm found out the relationship between the current flowing in a metallic wire and the potential difference across its terminals. This relationship is called Ohm's Law. He stated that the current flowing through a metallic conductor is directly proportional to the voltage across its ends if the temperature and other conditions are constant.

i.e. $V \propto I$ where V = Potential Difference
or $V/I = \text{Constant}$ where I = Current
or $V/I = R$

Where R is a constant called Resistance. Its SI unit is Ω (ohm).

Factors Affecting Resistance

Low Resistance: Long wire, thick wire, low resistivity material.

High Resistance: Short wire, thin wire, high resistivity material.

Resistance of a System of Resistors

Series Combination

Parallel Combination

Current Electricity

Flow of electric charges through a conductor constitutes current electricity.

Mobile Electrons Are Responsible For Electric Current

Voltage Cell

Wiring of a Plug

Conventional Current

Electric Circuit inside a Torch

Transmission of Electricity

Electric Circuit in a House

Q. Charts, Dynamo

Dynamo

Dynamo Principle

Bicycle Bottle Dynamo

The First Dynamos

FARADAY'S DISC DYNAMO

PICHI'S COMMUTATED DC DYNAMO

Electric Circuit's Component Symbols

Electric Cell

Battery

Switch (Open)

Switch (Closed)

A Wire Jumper

Wires Crossing Without Joining

Bulb

Resistor

Variable Resistance (Rheostat)

Ammeter

Voltsmeter

Fuse

R. Charts, Electric Circuit's Component Symbols

Dynamo

Dynamo Principle

Bicycle Bottle Dynamo

The First Dynamos

FARADAY'S DISC DYNAMO

PICHI'S COMMUTATED DC DYNAMO

Electric Circuit's Component Symbols

Electric Cell

Battery

Switch (Open)

Switch (Closed)

A Wire Jumper

Wires Crossing Without Joining

Bulb

Resistor

Variable Resistance (Rheostat)

Ammeter

Voltsmeter

Fuse

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