



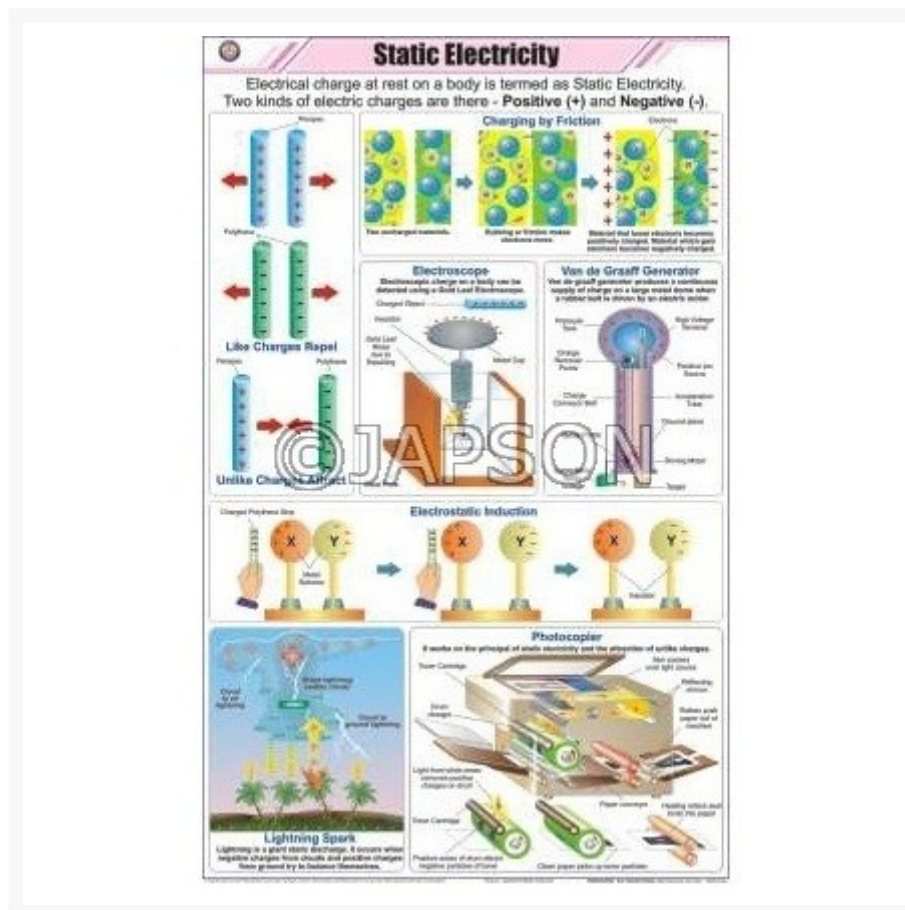
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Physics (II) Charts, School Education

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

Properties of a Magnet, Making a Magnet

Making an Electromagnet: To make an electromagnet, a coil of wire with an electric current through it is wound around a piece of iron. The iron core and electric current together create a magnetic field. The strength of the magnetic field is directly proportional to the number of turns in the coil and the current through it.

Single Touch Method: Taking an iron bar with the north pole of a magnet, the iron bar is touched to the north pole of the magnet. The iron bar becomes a magnet with its north pole towards the north pole.

Double Touch Method: Taking an iron bar with the north pole of a magnet, the iron bar is touched to both the north and south poles of the magnet. The iron bar becomes a magnet with its north pole towards the north pole.

Electroinduction: A coil of wire with an electric current through it is wound around a piece of iron. The iron core and electric current together create a magnetic field. The strength of the magnetic field is directly proportional to the number of turns in the coil and the current through it.

Properties of Magnet:

- Two freely suspended magnets always attract each other's North-South poles.
- A magnet attracts magnetic substances like iron, nickel, cobalt, and steel.
- Like poles repel each other and unlike poles attract each other.
- Like poles of a magnet repel each other and unlike poles attract each other.
- Magnets attract magnetic materials like iron, nickel, cobalt, and steel.
- Magnets attract magnetic materials like iron, nickel, cobalt, and steel.
- Like poles of a magnet repel each other and unlike poles attract each other.
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Proper Storage and Handling of Magnet:

Magnets should be stored in pairs: Magnets should be stored in pairs with their like poles facing each other. This is done to prevent the magnets from losing their magnetic strength.

Storing a Magnet: Magnets should be stored in pairs with their like poles facing each other. This is done to prevent the magnets from losing their magnetic strength.

Magnet's Induction: A magnet's induction is the process by which a magnet induces magnetism in a nearby object. This is done by the magnetic field of the magnet.

Properties of Bar Magnet: A bar magnet has two poles, North and South. The North pole is attracted to the South pole of another magnet and repelled by the North pole. The South pole is attracted to the North pole of another magnet and repelled by the South pole.

Electric Generator

In an electric generator, mechanical energy is used to rotate a conductor coil in a magnetic field to produce electricity. It is based on the principle of electromagnetic induction explained by the Faraday's law.

A.C. Generator: The simplest A.C. generator consists of a rectangular coil rotating between the poles of a permanent magnet. The ends of the coil are joined to two slip rings on the coil and against which carbon brushes pass. The rotating coil cuts the magnetic field lines and a voltage is induced in it. The induced current that produced reverses every half turn due to slip rings.

D.C. Generator: An A.C. generator becomes a D.C. generator if the slip rings are replaced by a split-ring type commutator. As the coil rotates, the commutator always cut both sides of the current that is generated flows in one direction only.

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 such a way as to oppose the change in flux due to the magnet's motion.

SELF-INDUCTION
In the circuit, the increasing current in the coil gives rise to a changing magnetic field which induces an e.m.f. in the coil itself. This is called self-induction. A galvanometer in series with such a coil shows a momentary current (induced current) in the subsequent secondary circuit (galvanometer). On breaking the circuit, a similar induced current flows (reverse induction).

Primary Circuit
Secondary Circuit

MUTUAL INDUCTION
Mutual induction is said to exist when there is a magnetic linkage between two circuits containing inductive elements. Changing the current in the primary circuit induces a magnetic field in the secondary circuit, giving rise to a momentary current. Closing the switch causes an expansion current in the secondary circuit.

Fleming's Right Hand Rule (Induced current direction)

Applications

Chemical Conversion

Transformers

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.

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

ELECTRIC AND LIGHTING

DANIEL CELL

CHEMICAL EFFECT

MAGNETIC EFFECT

DTY CELL

Lightning Spark

Photo Copier

Chemical Equations:
 $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
 $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
 $2Fe + 3Cl_2 \rightarrow 2FeCl_3$
 $2Fe + 3I_2 \rightarrow 2FeI_3$
 $2Fe + 3Br_2 \rightarrow 2FeBr_3$
 $2Fe + 3F_2 \rightarrow 2FeF_3$

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

Like Charges Repel

Unlike Charges Attract

Electroscope

Van de Graaff Generator

Electrostatic Induction

Photo Copier

Lightning Spark

G. Charts, Gravitation

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.

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

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.

H. Charts, Force

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:** A ball being hit by a bat.
- Stop motion:** Applying brakes to a moving car.
- Set a stationary object in motion:** Pushing a ball to start it rolling.
- Change of shape or size:** Squeezing a lemon.

Combining Force
The combination forces pull the plane by combining the force produced by the jet engines according to parallelogram law.

I. Charts, Moment and Couple

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).

$$\text{Moment of Force (Torque)} = \text{Force} \times \text{Moment Arm (d)}$$

SI Unit of Moment is Newton meter (Nm) **Dimension [ML²T⁻²]**

The Principles of Moment

Equilibrium (Balanced)
 $T_1 = T_2$
 $F_1 \times d_1 = F_2 \times d_2$

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
Turning of a steering wheel, turning of a screw driver, turning of a wheel, turning of a nut, turning of a door handle.

J. Charts, Magnetism

Magnetism

The main cause of ferromagnetism is the presence of many unpaired electrons (spin or intrinsic dipole) in the outer shell of the atoms in the material. The unpaired electrons are attracted to the same, and their spins align in the same direction, producing a net magnetic field.

Earth's Magnetic Field
The Earth's magnetic field is caused by the rotation of the Earth and the presence of a molten iron core.

Magnetic Compass
The needle of a magnetic compass is a bar magnet that aligns itself with the Earth's magnetic field.

Artificial Magnet
Artificial magnets are made of materials that are attracted to the poles of a magnet.

Types of Artificial Magnets
Bar magnet, Horseshoe magnet, C-shaped magnet, Ring magnet.

Temporary and Permanent Magnets
Temporary magnets lose their magnetism when the external magnetic field is removed. Permanent magnets retain their magnetism even after the external magnetic field is removed.

Magnetic Field
Magnetic field lines are imaginary lines that represent the direction of the magnetic force.

K. Charts, Electromagnetism

L. Charts, Electric Motor

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 1820, 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 upwards, it causes the magnetic needle to deflect towards the east.

When the direction of current is reversed, it causes the magnetic needle to deflect towards the west.

Magnetic Field of a Current Carrying Conductor

Maxwell's Right Hand Grip Rule
 For straight conductor, when your right hand grasps the wire in such a way that the direction of the current is the same as the direction of the fingers, then the thumb indicates the 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, the forefinger indicates the direction of the field, the second finger the direction of current and the thumb the direction of the force.

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 turning towards the vertical and its inertia will carry it beyond this position.
- The current in the coil is reversed so that the coil continues to rotate in the same direction.
- The coil continues and there is a gap between the brushes and the commutator. The current is reversed so that the coil continues to rotate in the same direction.

Commercial Electric Motor
 Single 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 encircle the coil and are curved to create a radial magnetic field. This keeps the turning effect of the maximum.

Simple AC Motor
 The AC motor runs only on AC instead of DC.

Applications of Electric Motor

- Blender
- 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
- Helps to Apply Brakes

DISADVANTAGES

- Produces Heat
- Causes Wear and Tear
- Causes Skin Abrasions

INCREASING FRICTION

- Spiking the Shoes
- Grooving the Tyres

REDUCING FRICTION

- Using Ball Bearing
- 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 displacement and d is the displacement.

Unit: joule (J)
Dimension: [M L² T⁻²]

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

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

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.**
 A person holding a pile of books on head steadily for 30s does no work on the load during this time.
- When $f = 0$, **No work is done.**
 A ball rolling on a frictionless smooth surface is not acted upon by a horizontal force, but may undergo a large displacement.

POWER

Time rate at which work is done.

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

Where, f is the force & v is the velocity (instantaneous or average).

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
 I = Current

or $V/I = \text{Constant}$
 or $V = IR$

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

V-Graph for a Nichrome Wire. According to Ohm's Law, it is a straight line plot.

Factors Affecting Resistance

Length: Resistance is directly proportional to the length of the conductor.

Area of Cross-section: Resistance is inversely proportional to the area of cross-section.

Material: Resistance of the conductor depends upon the nature of its material.

Temperature: Resistance also depends upon the temperature of the conductor.

Resistance of a System of Resistors

Series Combination

In combination of resistors in series, the total potential difference $V = V_1 + V_2 + V_3$
 $R = R_1 + R_2 + R_3$

This equivalent resistance of a combination of resistors connected in series is always greater than any individual resistance.

Parallel Combination

In combination of resistors in parallel, the total current $I = I_1 + I_2 + I_3$
 $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

This total resistance in a parallel combination of resistors is always less than any individual resistance.

Current Electricity

Flow of electric charges through a conductor constitutes current electricity.

Mobile Electrons Are Responsible For Electric Current

Free electrons moving randomly in all directions. Under the influence of an electric field, they drift in the direction of the electric field.

Voltage Cell

A simple source of electric current.

Wiring of a Plug

Shows the wiring of a plug with live wire, neutral wire, and earth wire.

Conventional Current

Direction of flow of positive charges is called conventional current. Direction of flow of electrons is opposite to the direction of conventional current.

Electric Circuit Inside a Torch

Shows the internal circuit of a torch with a battery, bulb, and switch.

Transmission of Electricity

Shows the transmission of electricity through power lines, including a transformer and a power station.

Electric Circuit in a House

Shows the electric circuit in a house with a main switch, fuse, and various appliances.

Q. Charts, Dynamo

R. Charts, Electric Circuit's Component Symbols

Dynamo

Dynamo Principle

Magnet, Rotating shaft, Coil, Commutator, Carbon brushes.

Dynamo works on electromagnetic principles. It converts mechanical rotation into pulsed DC through the use of a commutator. It consists of a stationary magnet which produces a magnetic field, and a coil which rotates and turns with it. The coil is connected to the brushes.

Bicycle Bottle Dynamo

Bottle dynamo operates using a roller placed on the sidewall of a bicycle tyre. The movement of the bicycle tyre turns the roller which spins a magnet inside a fixed coil. Electricity is generated in the coil by electromagnetic induction.

Labels: Bottle dynamo, Friction drive, Axis, Coil fixed on iron core, Fixed magnet, Spring contact, Copper.

The First Dynamos

FARADAY'S DISC DYNAMO

Labels: Brass, Copper disk, Magnet, Brass, Hand crank, Output connections.

The first dynamo invented by Michael Faraday in 1831 was a copper disk that rotated between the poles of a magnet.

PICPI'S COMMUTATED DC DYNAMO

Labels: Coil, Fielded on iron core, Magnet, Commutator.

In 1832, Hippolyte Pixii built a dynamo based on Faraday's principles. He used a rotating permanent magnet whose north and south poles passed by a piece of iron wrapped with insulated wire. To convert the AC to DC, Pixii invented a commutator.

Electric Circuit's Component Symbols

Electric Cell		Bulb	
Battery		Resistor	
Switch (Open)		Variable Resistance (Rheostat)	
Switch (Closed)		Ammeter	
A Wire Jumper		Voltmeter	
Wires Crossing Without Joining		Fuse	

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