Let's pave the way for learning and

Move Forward

Class 10

PHYSICS

State Council of Educational Research and Training (SCERT), Kerala
2022

Preface

Dear students,

The evaluation of the answer scripts of the First Terminal Examination 2022 and the classroom experiences shared by the teachers concerned, have brought to light the fact that our children have suffered some serious learning gap due to the non-availability of proper learning experiences as a result of the unprecedented situation created by the Covid Pandemic from 2019 to 2022. An activity book has been designed to assist children internalize the concepts which they ought to have mastered in the previous classes and with the intention to facilitate further learning. Necessary explanations and activities are included in the booklet to help children bridge the gap. It is hoped that this package will facilitate the learners for self-study or for studying with the help of their teachers and I wish them success in their endeavors to move forward with confidence.

Director

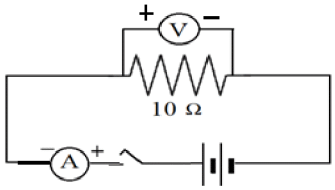
SCERT, Kerala

Ohm's Law

Objective : To understand Ohm's law

Activity : Experiment and completing the work sheet

Materials Required: 10 Ω resistor, connecting wire,4 cells of 1.5 V each, ammeter, voltmeter and a switch.



Procedure

Draw this circuit. Connect the devices as shown in the circuit. Introduce one cell in the circuit. Record the voltmeter reading and ammeter reading in the table. Repeat the experiment by changing the number of cells as 2 cells, 3 cells and 4 cells. Tabulate the voltmeter reading (V) and ammeter reading (I) in each case.

Observation: Tabulate the value of V (Potential difference) and I (Intensity of current) obtained in each case

No: of cells	V	I
1		
2		
3		
4		

Analysis: Complete the table by calculating the ratio of V to I in each case.

No: of cells	V	I	$\frac{V}{I}$
1			
2			
3			
4			

Compare the average value of $\frac{V}{I}$ with the value of resistor in the circuit. We can see that the value of $\frac{V}{I}$ is almost equal to the resistance of the resistor.

Inference

If temperature remains constant, the current through a conductor is directly proportional to the potential difference between its ends. In other words the ratio of potential difference to the current is a constant.

Principle/Law/Concept : Ohm's law

If temperature remains constant, the current through a conductor is directly proportional to the potential difference between its ends. In other words the ratio of potential difference to the current is a constant.

Work sheet:

1. Based on Ohm's Law, complete the table,

No	V	I	$\frac{V}{I} = R$
1	20 V	0.5 A	(a)……..
2	10 V	(b)……..	5 Ω
3	(c)……..	0.2 A	50 Ω
4	30 V	(d)……..	100 Ω

2. Draw the circuit diagram needed to verify the Ohm's law using ammeter, voltmeter, resistor, switch and cell.
3. 20 V potential difference is applied across a 10 Ω resistor in a circuit. What is the current in the circuit?
4. There is a 20 Ω resistor in a circuit. What is the potential difference applied if 0.2 A current flows through the resistor?
5. When a potential difference of 20 V is applied across the ends of a resistor, the current flowing through it is 0.5 A. What is the resistance of the resistor?

Magnetic Field around a Current Carrying Conductor and a Solenoid.

Objective : To understand the Magnetic Field around a Current Carrying Conductor and a Solenoid.

Activity : Experiment.

Materials required : 2 cells of 1.5 V each. 8 blades, 8 press buttons, 8 erasers, insulted copper wire (winding wire of gauge 24 or 26), 8 match boxes, PVC pipe piece of diameter 1.5 inch and length 15 cm, ring magnet and cardboard

Procedure

Arrange all the 8 blades by placing one above the other. Rub them using the ring magnet from one end to the other. Raise the magnet and bring it to the initial position. Repeat the process several times. Thus magnetise the blades. Fix the press buttons at the middle part of each blade. Pierce the pin from the bottom of each eraser in such a way that the bud of the pin is at the bottom of the eraser. Erect the blades by supporting them at the sharp edge of the pin, which is supporting the press button. Now each blade acts as a pivoted magnetic needle.

Make a solenoid by winding the winding wire over the PVC pipe piece, covering a length of about 10 cm. (The number of turns shall be about 300 to 400). Remove the insulation from the ends of the wire.

- What do you observe on bringing a magnet near the magnetic needle?
- What do you understand from this?
- Hold a straight wire parallel and close to a magnetic needle and pass current through the wire. What do you observe?
- What will you observe on reversing the direction of current?
- Now hold the wire below the magnetic needle and pass current through the wire. What is the observation?
- Pierce two holes in the cardboard. Pass the copper wire through the holes and make a coil. Arrange the cardboard in such a way that the plane of the coil is in the North -South direction.
- Bring one needle near the centre of the coil and pass current through the coil. What do you observe? Record the result.
- What if the direction of current is revered?

We know that a conducting wire wound in the shape of a helix is a solenoid

Arrange the magnetic needles around the solenoid. (Arrange the needles in different heights using the match boxes.)

- What will happen to the strength of the magnetic field on increasing the number of turns of the coiled conductor?
- Repeat the experiment by introducing soft iron as core of the solenoid. What do you observe now?

- What will you observe when the cell is replaced by 2 cells?
- This arrangement is an electromagnet. If so, what are the methods to increase the strength of an electromagnet?

Inference

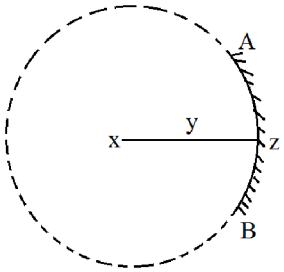
- There is a magnetic field around a current carrying conductor.
- The direction of the magnetic field reverses on reversing the direction of current.
- The magnetic field is three dimensional and not two dimensional.
- The intensity of the magnetic field increases with increase in the current.
- The intensity of the magnetic field increases with increase in the number of turns of coiled conductor per unit length.
- The intensity of the magnetic field increases when soft iron is introduced as core.

Follow up activity: Make an electromagnet and exhibit.

Spherical Mirrors

Objective : To understand the terms related to spherical mirrors

Activity : Completing the worksheet



A spherical mirror AZB is depicted. It can be considered as a part of a sphere. X is the centre of such a sphere. Find out, from within brackets which one does each of the following represents. (focal length, radius of curvature, pole, principal focus, centre of curvature)

- x
- y
- z
- the distance xz

- the distance zy
- what is the relation between the distances xz and zy

Write down a practical definition for each of the following

- Pole
- Principal focus
- Focal length
- Centre of curvature
- Radius of curvature

The mirror APB fell down and broke into two pieces. Now the pole is on which of them?

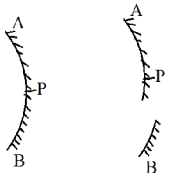


Image Formations in Spherical Mirrors

Objective : To understand the image formation in concave mirrors.

Activity : Experiment

Materials required : Concave mirror, metre scale, candle, matchbox, screen and a mirror stand

Procedure

Make the image of a distant object to fall on a screen. Find out the focal length by measuring the distance from the mirror to the screen.

Arrange a table in a dark room. Draw a straight line on the table. Place the mirror on the stand and place it at one end of the line. On the line, mark the principal focus F such that the distance from the pole of the mirror to this point is the focal length measured earlier and double this distance as C from the pole of the mirror.

Place the lighted candle beyond C. Then adjust the position of the screen to get a clear image on it. Analyse the position, size and nature of the image obtained. Tabulate the results.

Repeat the experiment by placing the object at C, between C and F, at F and between F and P. Tabulate the results.

No	Position of object	Position of image	Size of the image	Nature of the image
1	At a very large distance			
2	Beyond C			
3	At C			
4	Between F and C			
5	At F			
6	Between F and P			

- As we move an object from a very large distance to the principal focus, the size of image goes on increasing. Comment on this statement.
- Draw ray diagrams to show the image formation when an object is kept at different positions, in front of a concave mirror.