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MODEL PAPERS WITH SOLUTION

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NEW STAR BOOK DEPOT
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List of Practicals for Physics SSC-II (Curriculum 2006)

PRACTICAL BASED ASSESSMENT (PBA) PAPERS

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2. To study resistors in series circuit.
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4. To find the resistance of galvanometer by half deflection method.
5. Verify Ohm's law (using wire as conductor).

Part I

EXPERIMENT 1

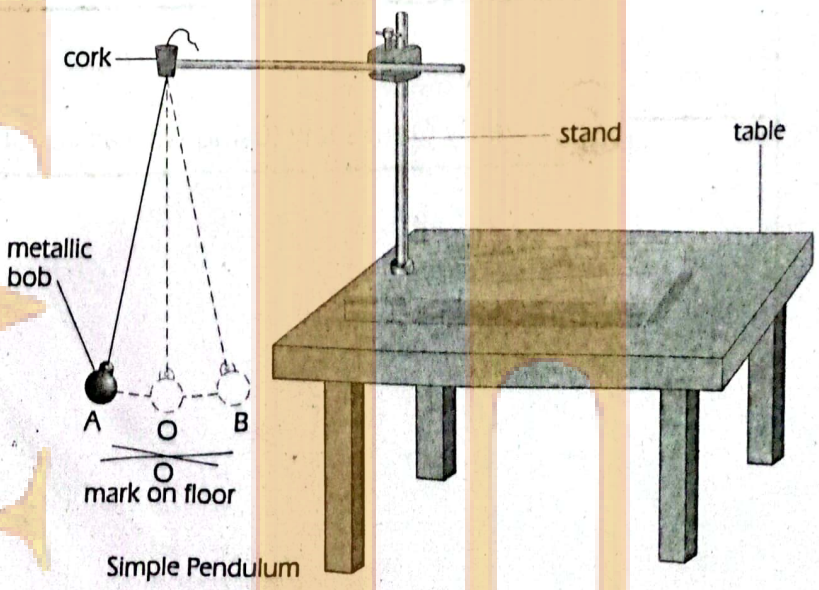
To study the effect of the length of simple pendulum on time and hence find "g" by calculation.

⊙ a metalic bob with a hook ⊙ stopwatch ⊙ thread
⊙ vernier callipers ⊙ an iron stand ⊙ cork
⊙ meter rod ⊙ piece of chalk ⊙ split cork

Procedure

1. Calculate the diameter of the bob with the help of vernier callipers and calculate the radius of the bob.
2. Take a thread of about 1 meter length and tie its one end with the hook of the bob.
3. Place the other end of the thread between the space of the split cork and tie it firmly with the thread.
4. Clamp the cork in the clamp of an iron-stand.
5. Place the iron-stand on the table in such a way that the bob is few centimetre above the floor of the room, or +ve surface of table.
6. Measure the length ℓ_1 of the thread including the hook. So, the length of the

stop watch



Simple Pendulum

pendulum = $\ell = \ell_1 + \text{radius} = \ell_1 + r$

7. Make a cross under the bob on the floor with a chalk. Cut off 4 to 5 cm on either side arm the mean position O, A and B show the extreme position of the bob.
8. Hold the bob at mean position and move it to one side up to point A and then release it gently.
9. The bob will start vibrating about its mean position 'O'.
10. Start counting the vibrations and also note the time for 10 vibrations. Repeat one more time.
11. Take the mean time for 10 vibrations and then calculate the time for one vibration by dividing the total time by 10. So the time period is $T = \frac{t}{10}$
Where 't' is the total time for 10 vibrations. For good result note the time for 20 or 30 vibrations, and then find the time period.
12. Repeat the above experiment by changing the length of the pendulum, there will be a change in the time period.
13. After measuring the value of lengths of pendulum and the corresponding time periods, we can study the relation between them. The length of the pendulum is directly proportional to the square of time period.
i.e. $\ell \propto T^2$ or $\frac{\ell}{T^2} = \text{Constant.}$
14. Calculate the value of acceleration due to gravity g by formula $g = 4\pi^2 \left(\frac{\ell}{T^2}\right)$.

Precautions

1. The bob of the pendulum must be only few cm. above the ground.
2. The vibrations of the bob should be linear.
3. Count the vibrations and time period very carefully.
4. The length of the pendulum must be above 80 cm.
5. Change in length of simple pendulum must be regular.

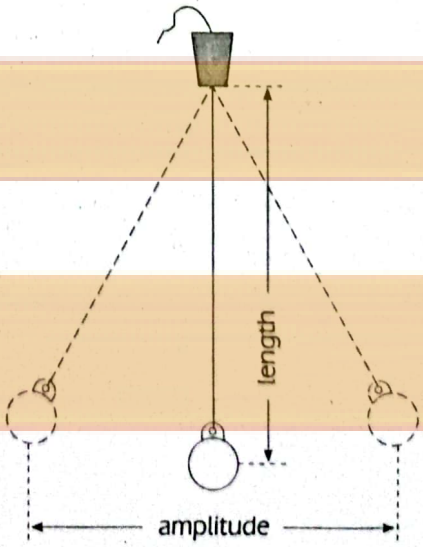
Learn about it

Pendulum

A simple pendulum consists of a small metallic bob suspended by an inflexible thread along with a hook.

The length of the simple pendulum is the length of the thread including the hook plus the radius of the bob.

When we allow a simple pendulum to vibrate, then motion of its bob from one extreme position to the other extreme and then back to initial position is called one vibration. The time taken by the simple pendulum to complete one vibration is called time period.



Observations and Calculations

Diameter of bob = D = 1.2 cm.

Radius of bob = $r = \frac{D}{2}$ = 0.6 cm.

No. of obs.	length of thread including hook ℓ_1 (cm)	Total length of simple pendulum $\ell = \ell_1 + r$ (cm)	Time for 10 vibrations			Time period $T = \frac{t}{10}$ sec	T^2 sec^2	$\frac{\ell}{T^2}$ cm/sec^2	$g = 4\pi^2\left(\frac{\ell}{T^2}\right)$ cm/s^2
			t_1 sec	t_2 sec	$t = \frac{t_1 + t_2}{2}$ sec				
1	84.4	85	18.3	18.5	18.4	1.84	3.4	25	986
2	55.4	56	15.2	15.2	15.25	1.525	2.25	24.88	982
3	49.4	50	14.2	14.2	14.2	1.42	2.02	24.75	976

Mean value of g = 981.3 cm/s^2 = 9.81 m/s^2

Result

Mean value of g = 981 cm/s^2 = 9.81 m/s^2

Part I

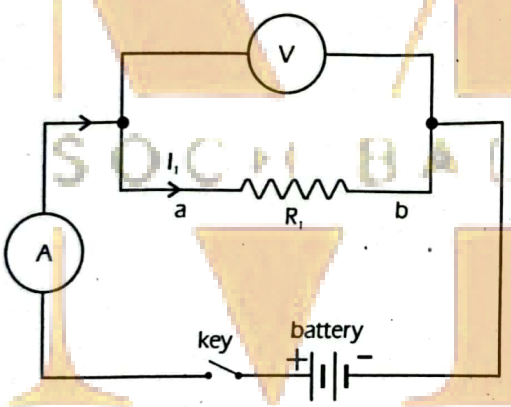
EXPERIMENT 2

To study resistors in series circuit.

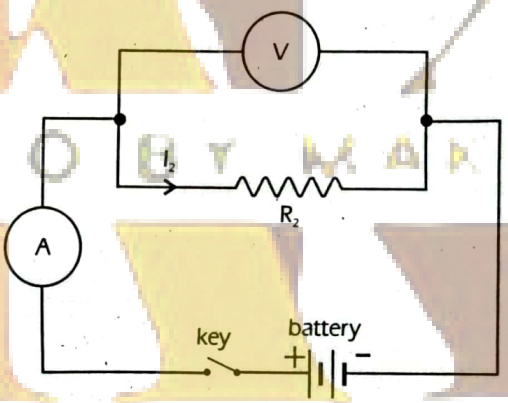
- two resistance R_1 and R_2
- voltmeter
- ammeter
- battery
- sand paper
- connecting wires
- key

Procedure

1. Draw a neat circuit diagram.
2. Make connections according to the circuit shown in the diagram.
3. Take only resistance R_1 and connect it with key, ammeter and battery in series with the help of connecting wires.
4. Remember that the plug of the key should be out while making the connections.
5. Insert the plug in the key, the current will start flowing in the circuit.

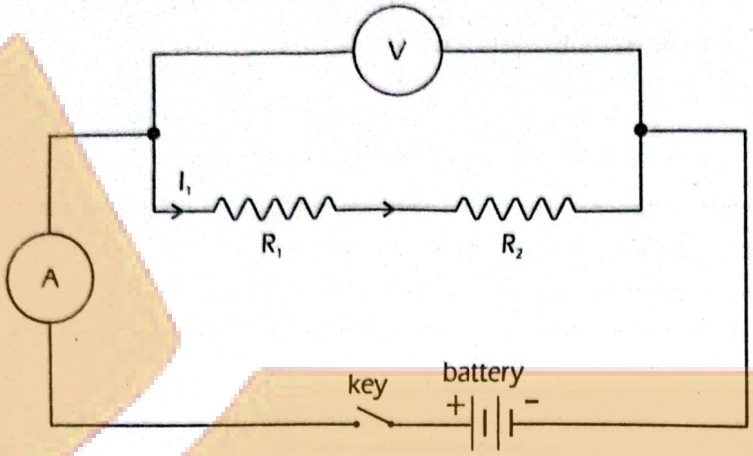


Circuit diagram: Series circuit with R_1



Circuit diagram: Series circuit with R_2

6. Note the reading of voltmeter and ammeter.
7. Determine the value of resistance by Ohm's law. $R_1 = \frac{V_1}{I_1}$
8. Insert the resistance R_2 in place of resistance R_1.
9. Note the readings of voltmeter and ammeter again i.e. V_2 and I_2.
10. Determine the value of R_2 by the formula. $R_2 = \frac{V_2}{I_2}$
11. Connect both the resistance's R_1 and R_2 in series.
12. After inserting the plug in the key note the readings of voltmeter and ammeter.
13. Calculate the combine resistance of R_1 and R_2 by the following formula. $R = \frac{V}{I}$ where V is the voltage across R_1 and R_2 and I is the current flowing through R_1 and R_2.
14. Note that the resistance R will be equal to the sum of the resistance R_1 and R_2. i.e. $R = R_1 + R_2$.



Circuit diagram: Series circuit with R_1 and R_2

Precautions

1. Clean the ends of the connecting wires with the help of sand paper.
2. Connections should be tight.
3. Before connecting the circuit remove the plug of key.
4. Always use a voltmeter and ammeter of low range so that deflection may be read clearly.
5. Read the voltmeter and ammeter readings after removing parallex.

Observations and Calculations

Voltage of battery = V = 6 volts.

No. of obs.	Current I_1 (A)	Voltage V_1 (V)	Resistance $R_1 = \frac{V_1}{I_1}$ (Ω)	Current I_2 (A)	Voltage V_2 (V)	Resistance $R_2 = \frac{V_2}{I_2}$ (Ω)	Current I (amp)	Voltage V (V)	Net Resistance $R = \frac{V}{I}$ (ohm)
1.	0.06	6	100	0.03	6	200	0.02	6	300
2.									
3.									

Result = $R = R_1 + R_2 = 300\ \Omega$

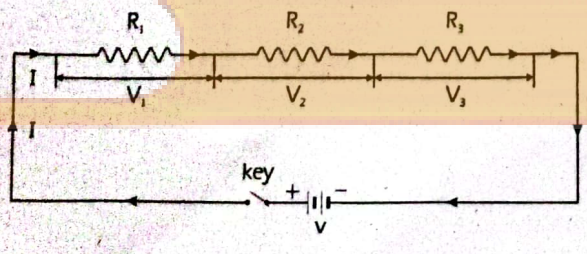
Result

Total resistance is equal to the sum of all resistances in series.

Learn about it

Resistors in series

In A number of resistors R_1, R_2, R_3, in Ohms are said to be connected in series if they are connected end to end consecutively so that the same current I, in Amperes, flows through each.



If R is the combined resistance and V, in Volts, is the total potential difference across the resistors, then

$$V = IR$$

But V = sum of individual pot.diff across R_1, R_2 and R_3.

$$V = V_1 + V_2 + V_3$$

$$V = IR_1 + IR_2 + IR_3$$

$$IR = IR_1 + IR_2 + IR_3$$

therefore dividing by I, we get

$$R = R_1 + R_2 + R_3$$

Part I

EXPERIMENT 3

To study resistors in parallel circuit.

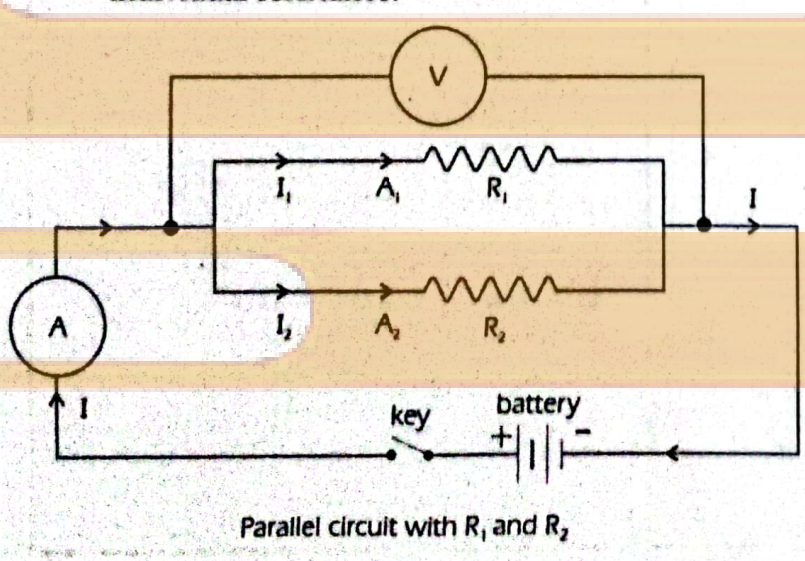
- two standard resistance
- battery
- key
- voltmeter
- ammeter
- connecting wires

Procedure

1. Draw the circuit. The two resistance R_1 and R_2 are connected in parallel, a voltmeter is also connected in parallel to these resistance.
2. An ammeter, key and battery are connected in series. Ammeters A_1 and A_2 joined in series with resistances R_1 and R_2.
3. Insert the plug of key and note the readings of voltmeter and ammeter.
4. Remember that in parallel combinations of resistance and voltage V remains the same but the current through resistance R_1 will be I_1 and through resistances R_2 will be I_2.
5. The voltage across the net resistances will be V and the total current will be I.
   i.e. $I = I_1 + I_2$
6. The net resistence in parallel can be calculated by using the formula:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

From the above we conclude that the reciprocal of the net resistances of a parallel combination is always equal to the sum of the reciprocal of the individual resistance.



Parallel circuit with R_1 and R_2

Precautions

1. Clean the ends of the connecting wires with the help of sand paper.
2. Connections should be tight, before connecting the circuit remove the plug of key.
3. Use a battery of 6 or 9 volts.
4. Always use a voltmeter and ammeter of low range so that deflection may be read clearly.
5. Read the voltmeter and ammeter very carefully.

Observations and Calculations

Voltage of battery = V = 6 volts.

No. of obs.	Voltage V (volts)	Current I_1 (amp)	Current I_2 (amp)	$R_1 = \frac{V}{I_1}$ (Ω)	$R_2 = \frac{V}{I_2}$ (Ω)	Total resistance $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ (ohms)
1.	6	0.06	0.03	100	200	0.015
2.						
3.						

Total resistance = R = reciprocal of $(\frac{1}{R}) = \frac{1}{0.015} = 66.7\ \Omega$

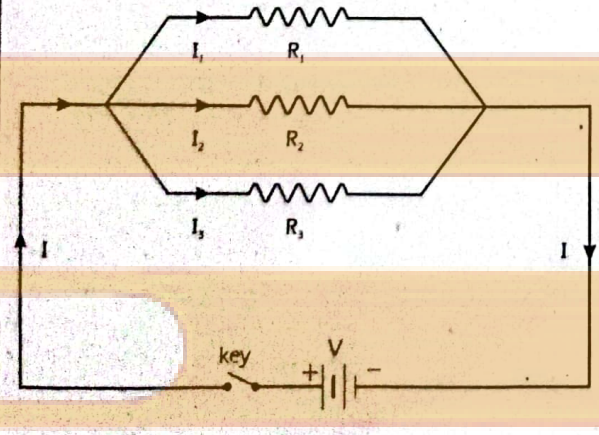
Result

The total resistance is equal to the sum of reciprocal of resistance in parallel.

Learn about it

Resistors in Parallel

Resistors are said to be in parallel when they are placed side by side and their corresponding ends



joined together, as shown in fig.

The same potential difference will thus be applied to each, but they will share the main current in the circuit.

The main current I divides into I_1, I_2, and I_3 though the resistors R_1, R_2 and R_3 respectively and that the common potential difference across them is V.

If R is the combined resistance, we may write

$$I = \frac{V}{R}$$

Total current $I = I_1 + I_2 + I_3$.

$$I = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

Therefore $\frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$

Dividing both sides by V, we get

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Part I

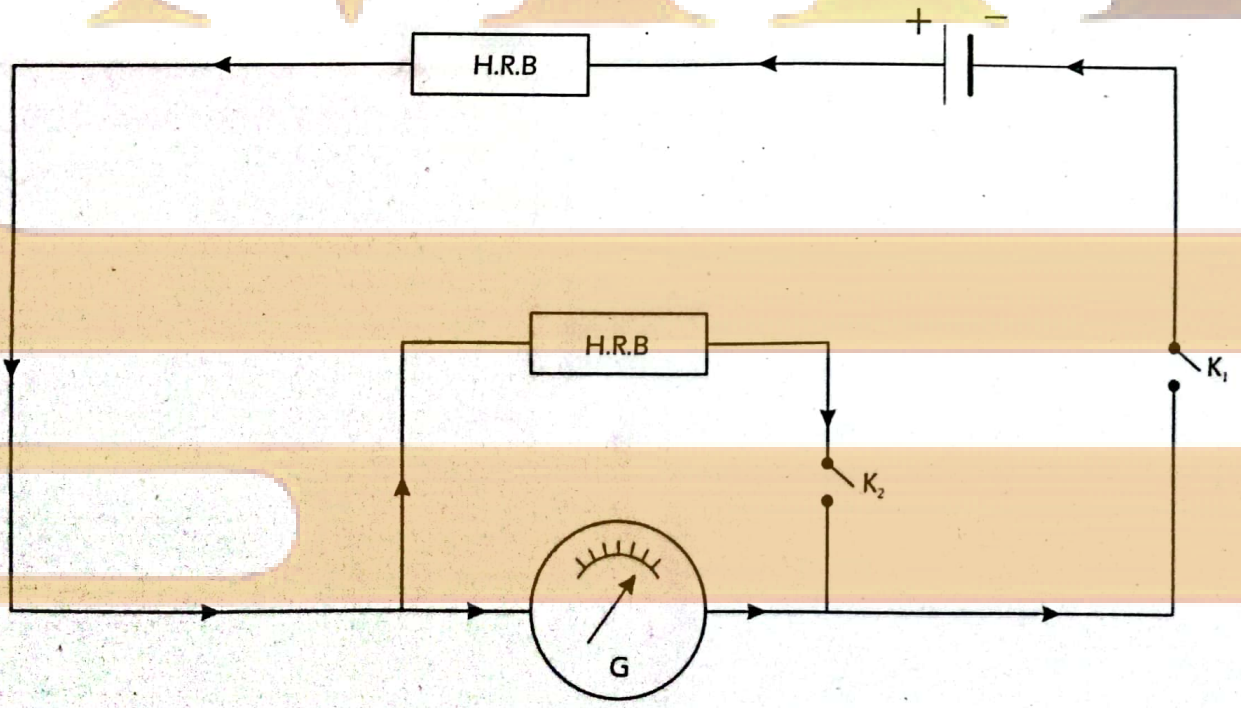
EXPERIMENT 4

To find the resistance of galvanometer by half deflection method.

- galvanometer
- two key plugs
- cell (1.5 volt)
- connecting wires
- a piece of sand paper
- a high resistance box (1-10,000 Ohms) a low resistance box (1-5,000) Ohms

Procedure

1. Draw the neat circuit diagram of connections as shown below.
2. Make tight connections according to the circuit diagram with the key plugs K_1 and K_2 open.
3. Note the zero error in the galvanometer, if any.
4. Take out a high resistance 'R' from high resistance box (H.R.B), close the plug K_1 and keep the plug K_2 open. Adjust the value of R to get maximum deflection within the scale and try to get the deflection in even number of division in the galvanometer.
5. Note the deflection and correct it by subtracting or adding its zero error, if any. Also note down the value of high resistance.



Circuit diagram: Resistance of galvanometer by half deflection method

6. Keeping the value of 'R' unchanged, close the plug K_2. The deflection in galvanometer becomes zero at once, now press the key plugs in shunt resistance box (S.R.B) to get zero detection.
7. Now adjust shunt resistance 'S', so as to get the deflection exactly half of its previous value. Note the deflection and the value of shunt resistance 'S'. The deflection decreases as R decreases.
8. Repeat the experiment three times by changing the value of R.
9. Calculate the resistance of galvanometer 'G' by the formula given in theory.
10. Value of shunt resistance almost remains constant.

Precautions

1. All the connections should be tight and clean. All the plugs in the resistance boxes be tight.
2. K_1 should be closed after a high resistance has been taken out from the resistance box R.
3. The deflection should be in even numbers of scale.
4. The shunt resistance should be decreased to reduce the deflection.
5. Put the plug tightly in K_2 that the shunt has zero deflection.

Learn about it

Galvanometer

The galvanometer is a device which detects the presence of current in a circuit. Galvanometer is a very sensitive device. It can also be converted into ammeter and voltmeter.

Galvanometers are of two types:

1. Moving magnet galvanometer
2. Moving coil galvanometer

Moving coil galvanometer

In a moving coil type galvanometer the magnet is firmly fixed, while the coil is free to rotate: they are generally of two types (i) pivoted coil type and (ii) suspended coil galvanometer.

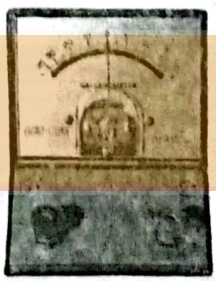
I Pivoted coil galvanometer

A common form of this type of galvanometer used in the laboratory is the pointer–type Weston galvanometer.

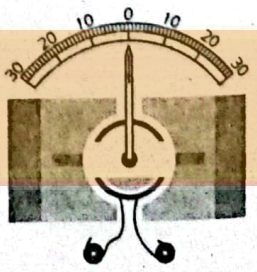
It consists of a small rectangular coil of thin insulated copper wire pivoted between the cylindrical pole pieces of a strong permanent horse–shoe magnet firmly mounted on the base of the instrument as in fig. The field due to the magnet is usually made radial, fig. (a), so that in all positions of the coil, the magnet is parallel to the plane of the coil. To do so the pole pieces are made curved and a soft iron cylinder or sphere is fixed within the poles of the magnet, so that the coil can freely move round this cylinder or sphere without touching it.

Principle

When current is passed through the coil it produces a magnetic field which reacts with the field of the magnet to produce a deflecting couple.



a) Weston type pivoted-coil galvanometer.



b) Section of a pivoted-coil galvanometer

Observations and Calculations

Zero error of galvanometer = NIL

No. of obs.	High resistance from (H.R.B) R (Ohm)	Deflection θ	Shunt resistence S (Ohm)	Half deflection $\theta/_2$	Resistance of galvanometer $G = \frac{R \times S}{R - S}$ (Ohm)
1.	5000	24	110	12	112.4
2.	5500	22	110	11	112.2
3.	6000	20	110	10	112.1

Mean value of G = 112.2 Ohms

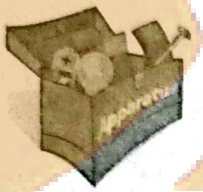
Result

Internal resistance of Galvanometer is 112.2 Ohms.

Part I

EXPERIMENT 5

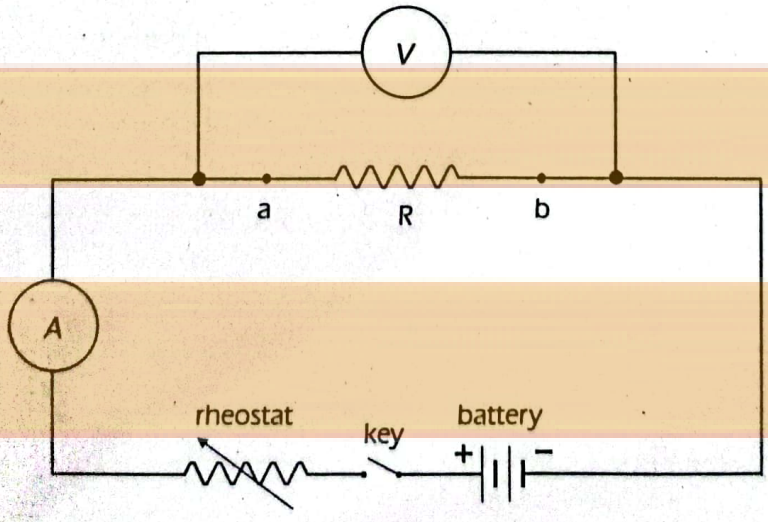
Verify Ohm's law (using wire as conductor).



- resistance wire
- voltmeter
- rheostat key
- ammeter
- battery
- connecting wires

Procedure

1. Draw a neat circuit diagram.
2. Make connections according to the circuit diagram.
3. Connect battery, key, rheostat, ammeter and resistance 'R' by means of connecting wires in series.
4. Connect the voltmeter parallel to the resistance 'R'.
5. Before starting the experiment put the plug in the key and adjust the current in the ammeter with rheostat.
6. Note the value of voltage (V) and current (I) from the voltmeter and ammeter respectively.
7. Change the value of voltage by using the rheostat for second and third reading and note the values of voltage and current.



Ohm's Law

Observations and Calculations

No. of obs	Reading of Voltmeter V (volts)	Reading of Ammeter I (Amp)	$R = \frac{V}{I}$ = constant (ohms)
1.	0.8	0.15	5.3
2.	1.0	0.19	5.2
3.	1.2	0.23	5.2

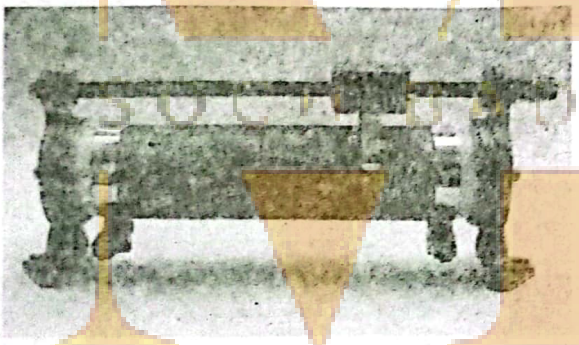
So by knowing the value of V and I we can also calculate the resistance of the wire.

Learn about it

Resistance

The ability of a substance to resist the flow of electricity through it is called resistance. It is denoted by a —/\/\/\/\— symbol . Its units are Ohm's and are written as Ω.

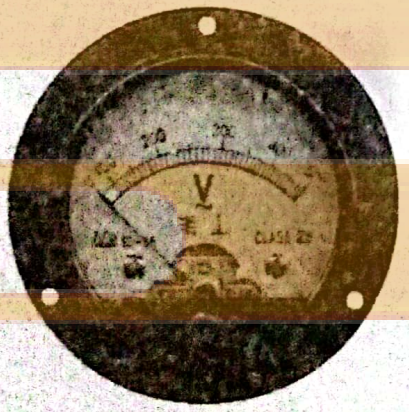
Rheostat



Rheostat is a device which is used to control the current in a circuit. It is a variable resistance.

Voltmeter

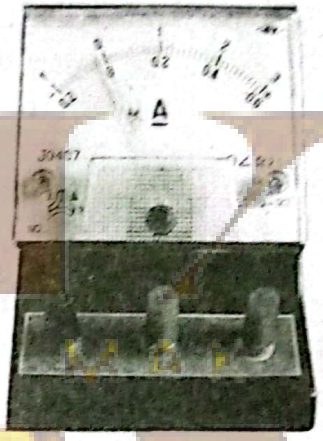
Voltmeter is a device which is used to measure the voltage in a circuit. The unit of a voltage is volt and its symbol is V.



A voltmeter

Ammeter

Ammeter is a device which is used to measure the current in a circuit. The unit of current is Ampere and it is denoted by I.



A ammeter

Ohm's Law

In 1827 Gorge Simon Ohm a German scientist discovered relationship between the voltage V and current I in a circuit. It states that "The current passing through a wire at constant temperature is directly proportional to the voltage between its ends.

Gorge Simon Ohm

$\frac{\text{voltage}}{\text{current}}$ = constant or

$\frac{\text{voltage}}{\text{current}}$ = resistance.

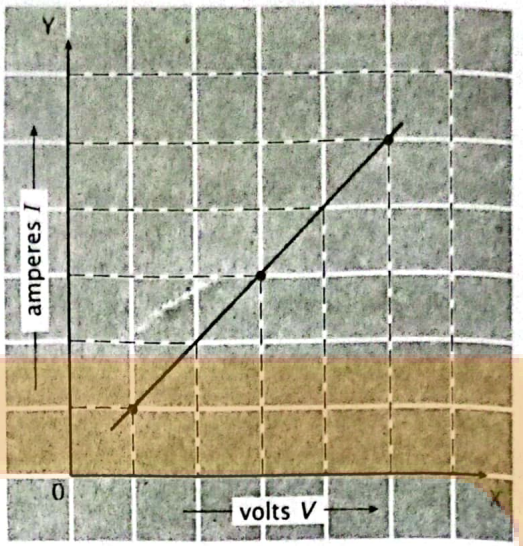
So the resistance is a constant quantity and it is the ratio between voltage and current flowing through it.

$$\frac{V}{I} = R \quad \text{or} \quad I = \frac{V}{R}$$

Graph

A graph between V and I will give us the relationship between V and I.

Take V along the X – axis and I on the Y – axis. When we join the three points we get a straight line. The straight line means that the voltage V and current I passing through resistance R is directly proportional to the voltage, which is Ohm's Law.



Result

The current flowing through a conducting wire is directly proportional to the potential difference across each resistor, if temperature remains constant.

Precautions

1. The ends of wires should be cleaned.
2. Make all the connections tight.
3. Use the key to start and stop the circuit.
4. Pass the current for a short time.
5. Remove the zero error of voltmeter and ammeter.

PART II

Experiment

1. To verify the laws of refraction by using a glass slab.
2. To find the refractive index of water by using concave mirror.
3. To determine the critical angle of glass using glass prism.
4. To trace the path of a ray of light through glass prism and measure the angle of deviation.
5. To verify the truth table of OR, AND, NOT, NOR and NAND gates.

Part II

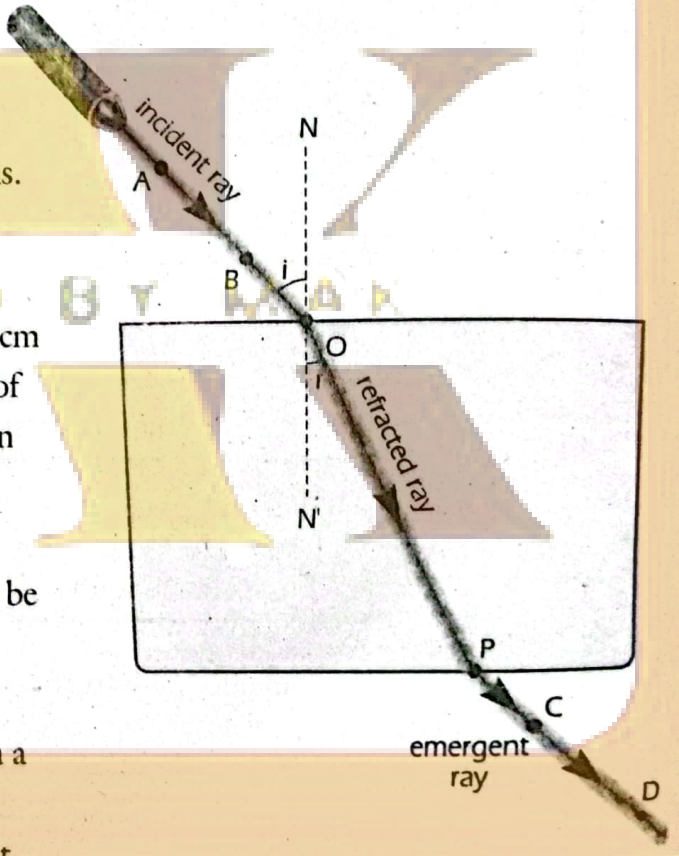
EXPERIMENT 1

To verify the laws of refraction by using a glass slab.

- glass slab
- drawing pins
- common pins
- pencil
- drawing board
- protector
- white paper

Procedure

1. Fix a drawing paper on a drawing board with the help of drawing pins.
2. Place a glass slab on the paper and mark its boundary with pencil.
3. Fix two pins A and B about 5 to 7 cm apart from each other on one side of the slab. The pins should be fixed in such a way that they form an acute angle with the glass slab.
4. The image of the pins A and B can be seen on the other side of the glass slab.
5. Fix two more pins C and D in such a way that the image of A and B and the pins C and D come in a straight line. The distance between C and D should be 5 to 7cm.
6. Remove the pins and encircle the points with pencil.
7. Remove the slab also.
8. Join A and B and produce them to meet on the boundary at O.
9. Also join C and D and produce them to meet on the glass boundary at P.



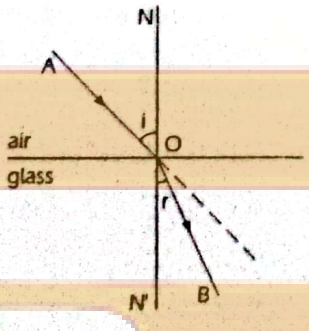
Refraction in a glass block

10. Join O and P.
11. Draw a perpendicular at point O. NON' is the perpendicular and is called as normal.
12. ABO is the incidence ray. OP is the refracted ray. AON is the angle of incidence 'i'. PON' is the angle of refraction 'r'.
13. Measure the angle of incidence 'i' and angle of refraction 'r'. Calculate the ratio of sin i and sin r. The ratio is called the refractive index of glass.
14. Take two more readings by changing the positions of pins.

Learn about it

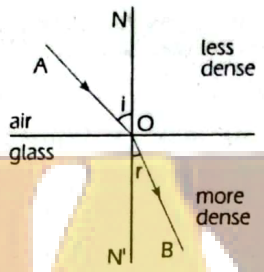
Refraction of Light

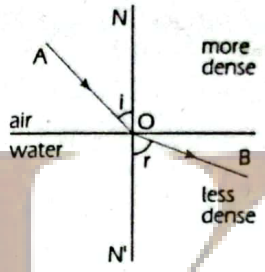
When a ray of light enters from one medium to another medium, it changes its direction. This phenomenon is known as refraction of light and is shown below :



We see that light ray AO is entering from air (one medium) into glass (second medium) by changing its path. AO is the incident ray and OB is the refracted ray. NN' is the normal.

AON is the angle of incidence 'i' and BON is the angle of refraction 'r'.





Remember that when light ray passes from less dense medium to more dense medium it bends towards the normal. When light ray passes from more dense to the less dense medium it bends away from the normal.

Air is less dense than water and water is less dense than glass. In other words we can say that in refraction phenomenon there is not only the change in direction but there is also a change in velocity.

A pond or a swimming pool bath appear much shallower than they actual are due to the refraction of light.

Laws of Refraction

There are two laws of refraction of light:

i. The incident ray, the refracted ray and the normal always lie on the same plane.

ii. The ratio of the sine of angle of incidence to the sine of the angle of refraction is a constant quantity.

i.e. $\frac{\sin i}{\sin r} = n$

Where 'n' is the refractive index of glass. This law is also known as Snell's law.

Observations and Calculations

No. of obs.	Angle of Incidence $\angle i = AON$	Angle of refraction $\angle r = PON'$	Sin i	Sin r	$n = \frac{\text{Sin i}}{\text{Sin r}}$
1.	32°	23°	0.53	0.39	1.4
2.	36°	23°	0.58	0.39	1.5
3.	40°	25.5°	0.64	0.43	1.5

Mean refractive Index = n = 1.5

Verification of Laws of Refraction

We see that the incident ray, the refracted ray and the normal, all lie on the same plane at point O. (So first law is verified).

We will see that in all the three readings the value of the ratio $\frac{\text{Sin i}}{\text{Sin r}}$ will become constant. (So that second law is also verified).

Result

The ratio $\frac{\text{Sin i}}{\text{Sin r}}$ is equal to the refractive index of glass i.e. 1.5.

Precautions

1. The face of the glass slab should be smooth and clean.
2. The boundary of the slab should be marked carefully.
3. All the pins should be vertical.
4. The distance between the pins should be 5 to 7 cm.
5. The directions of all the rays should be marked with an arrow head.

Part II

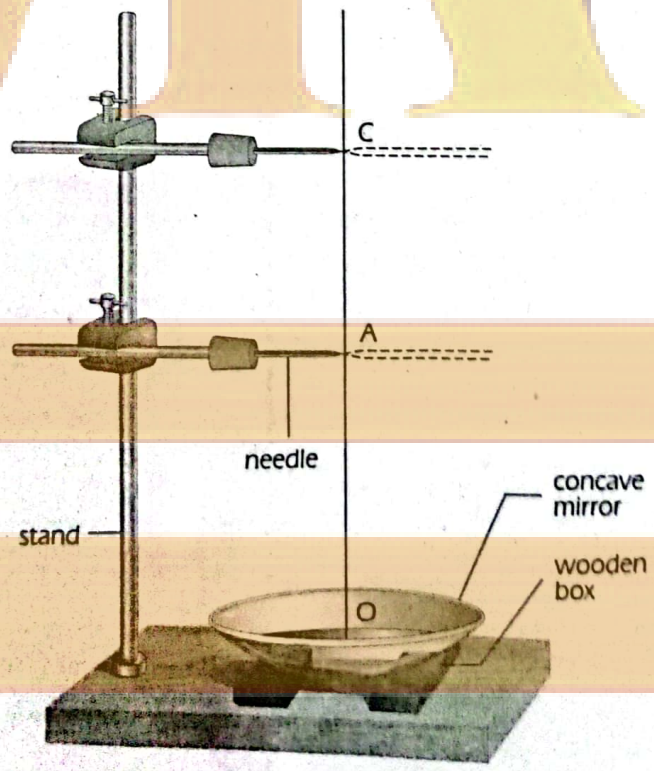
EXPERIMENT 2

To find the refractive index of water by using concave mirror.

- concave mirror of a large focal length
- meter rod ⊙ stand ⊙ knitting needle
- sharp pointed bright needle ⊙ set square

Procedure

1. Measure the length of the knitting needle and find the index correction between concave mirror and needle.
2. Determine the approximate focal length of the concave mirror.
3. Place the concave mirror on the wooden blocks so that its principal axis is vertical.
4. Clamp the parallax needle horizontally in the stand and place it above the mirror at almost twice the approximate focal length.
5. Remove parallax between the tip of the needle and its image. In this position the needle would be at 'C', the center of curvature of the mirror.



Refractive index of a liquid using a concave mirror.

6. Hold a meter rod vertically and with a set square note the position of the needle and the pole of the mirror i.e. OC.
7. Put a few drops of liquid so as to form a small thin layer on the surface of mirror.
8. Again adjust the position of the needle to remove parallax between the tip of the needle and its image at A.
9. Note the position of the needle and applying the index correction between the mirror and the needle i.e. OA.
10. Repeat the experiment twice with concave mirrors of different focal lengths. Finding index of correction in each case.

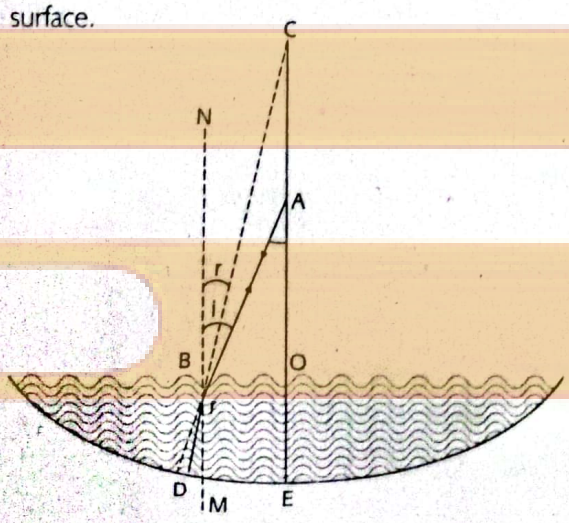
Precautions

1. Use a concave mirror of a large focal length.
2. Mirror should be horizontal and its principal axis vertical.
3. Distance should be measured very carefully.
4. Parallax needle should be well-illuminated.
5. A small quantity of liquid should be used to get a thin layer on the surface of the mirror.

Learn about it

Refractive index of liquid by concave mirror

If a small object is placed above a concave mirror containing some liquid in such a way that the image of the object is formed at the same position as the object itself, then the refractive index of the liquid is given by the ratio of the vertical height of its center of curvature to the height of object both measured from the liquid surface.



Let a ray AB meet the liquid surface B and makes angle of incidence NBA with the normal NM at B. It then turns towards the normal along line BD strikes the concave mirror at D and is reflected back on its path DBA. So an inverted image is formed at A. If we draw back the line BD normally, then it meets at point C.

So from figure,

$\angle NBA$ = alternate $\angle BAO$

$\angle DBA$ = opposite $\angle NBC$ = alternate $\angle BCO$

Refractive index =

$$\frac{\text{Sin } i}{\text{Sin } r} = \frac{\text{Sin} \angle NBA}{\text{Sin} \angle DBA} = \frac{\text{Sin} \angle BAO}{\text{Sin} \angle BCO}$$

$$= \frac{BO}{BA} \times \frac{BC}{BO}$$

$$\text{Refractive index} = \frac{BC}{BA}$$

When the aperture of the mirror is very small as compared with its radius of curvature and the depth of the liquid is very small, the ratio $\frac{OC}{OA}$ of.

$$\text{So refractive index} = \frac{BC}{BA} = \frac{OC}{OA}$$

Observations and Calculations

Length of knitting needle = x = 25 cm

Distance between mirror and parallax needle = y = 25 cm

Index correction for needle = x − y = ± 0cm

Approximate focal length of concave mirror = f = 13.5 cm

No. of obs.	Position of needle at mirror			Distance		Refractive Index $n = \frac{OC}{OA}$
	O cm	C cm	A cm	OC cm	OA cm	
1.	0	26	20	26	20	1.30
2.	0	26	19.5	26	19.5	1.33

Mean refractive index = 1.32

Result

The refractive index of water is 1.33.

Part II

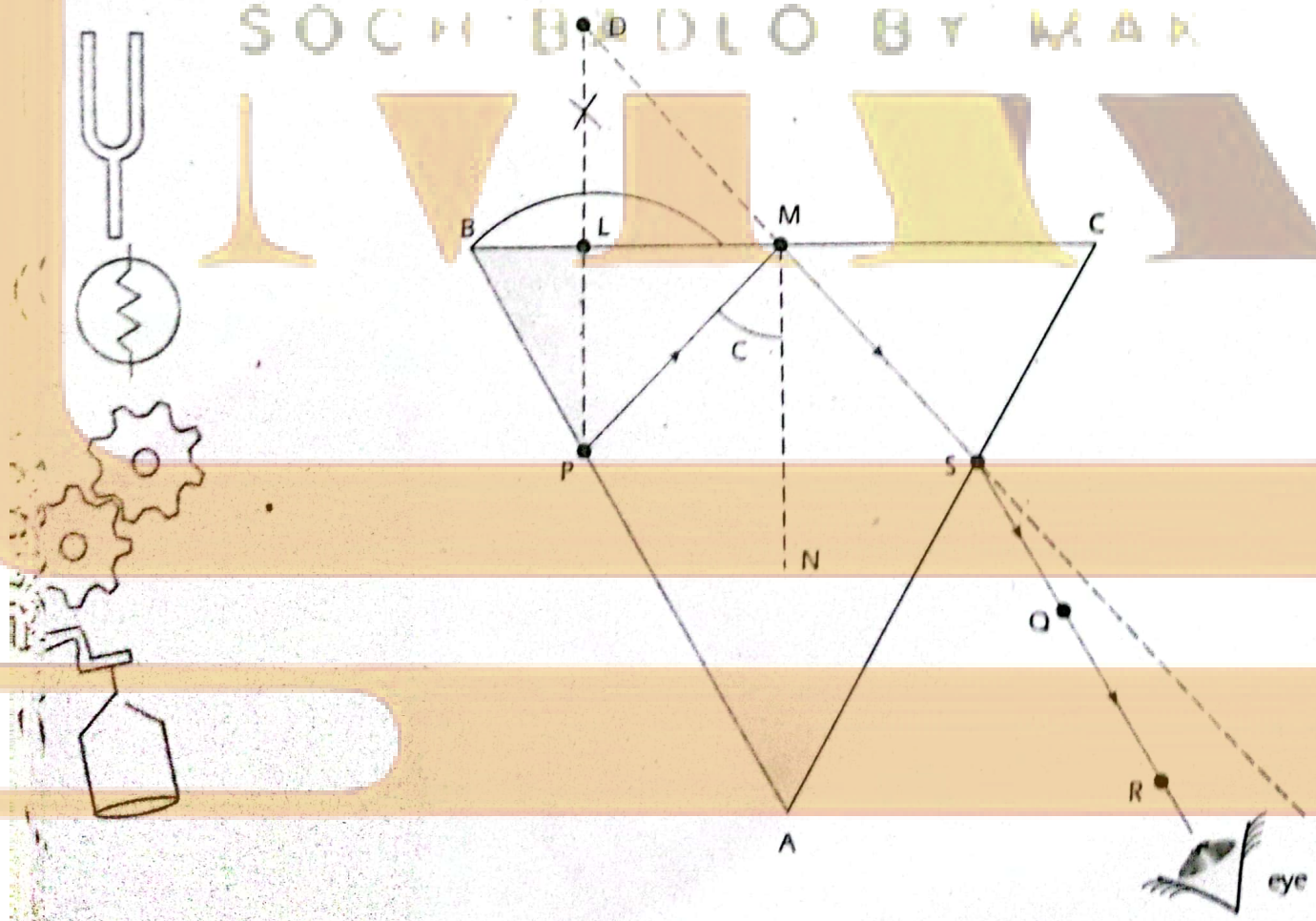
EXPERIMENT 3

To determine the critical angle of glass using glass prism.

- glass prism or semi circular slab
- pencil
- drawing board
- protector
- rubber
- drawing sheet or paper
- common pins
- drawing pins

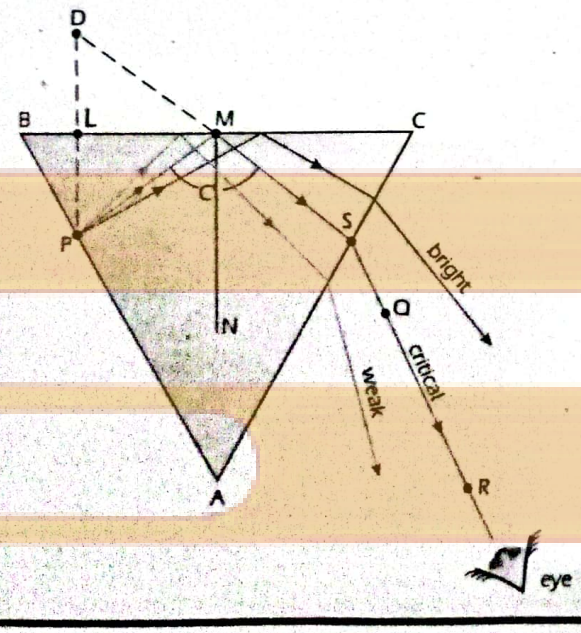
Procedure

1. Fix the drawing paper on the drawing board with the help of drawing pins.
2. Place a prism in the centre of paper in such a way that base is away from you.
3. Mark its boundary ABC with the help of lead pencil.
4. Now remove the prism and fix a pin P on the line AB as shown below.



5. Again place the prism in its previous position. Make sure that the pin P just touches the face AB.
6. Look through the face AC of the prism, you will see the image of pin P.
7. Now move your eyes from C to A slowly, you will find that the image of pin P will become fainter and fainter. A point will reach at which the image seems to disappear.
8. Fix two pins Q and R in such a way that the faintest image of pin P and the pins Q and R become in one line.
9. Remove the prism and pins. Encircle the pins P, Q, and R.
10. Join Q and R and produce it to meet base AC at S.
11. From point P, draw a perpendicular PL on the face BC. Produce PL to D such that $\overline{PL} = \overline{LD}$.
12. Join DS which cuts the line BC at M.
13. At M draw a perpendicular MN on the base BC.
14. Measure the total angle <PMS.
15. Critical Angle i.e c is equal to $\frac{1}{2} <$ PMS $=$ < PMN
16. Measure the angle PMN which is the critical angle.
17. Repeat this experiment three times and take the mean value of the critical angle c.
18. Calculate the refractive index of the glass from the following relation $n = \frac{1}{\text{Sin } c}$

Learn about it



Critical Angle

When a light ray comes from a denser medium to a rare medium, then it bends away from the normal. So angle of refraction is large as compared with angle of incidence. Also angle of refraction changes with the change of angle of incidence.

Finally the angle of incidence for which the angle of refraction becomes 90° is called the critical angle. Critical angle is denoted by c.

The relation between the refractive index and critical angle is $n = \frac{1}{\text{Sin } c}$ where 'n' is the refractive index of glass.

Observations and Calculations

No. of obs.	Angle PMS	Critical Angle $C = \frac{1}{2} < PMS = < PMN$
1.	80°	40°
2.	82°	41°
3.	79.5	39.75
4.		

Mean critical angle c = 40.2

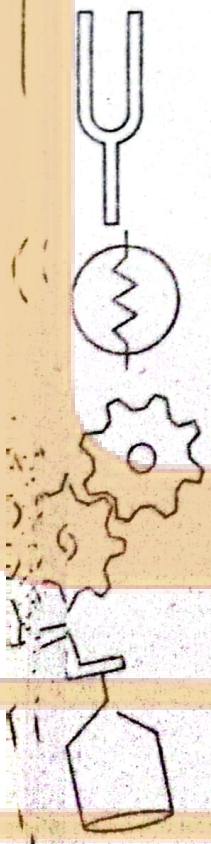
Refractive index $n = \frac{1}{\text{Sin } c} = 1.5$

Precautions

1. Clean the prism with a cotton cloth.
2. Mark the boundary of the prism with a sharp pencil.
3. The pins should be vertical.
4. The distance between the pins Q and R should not be less than 5 cm.
5. The pin 'P' should be in the middle of the line AB of the prism.
6. The pin 'P' must touch the surface of the prism.
7. The base of the prism must be away from you.

Result

The critical angle of glass is 42° and its refractive index is 1.5.



Part II

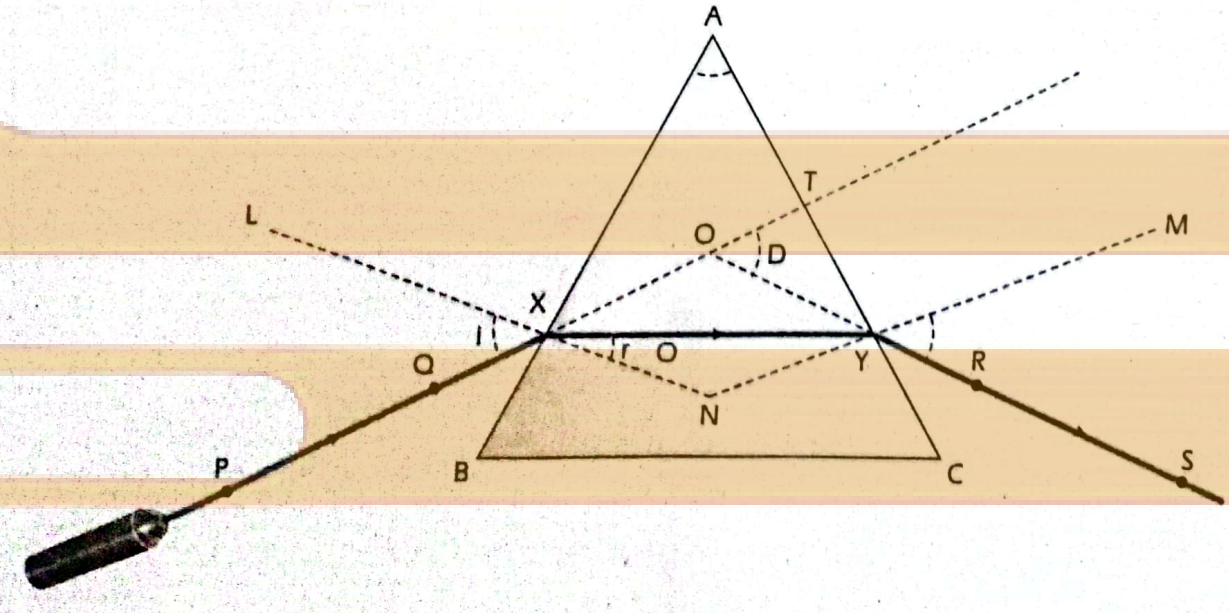
EXPERIMENT 4

To trace the path of a ray of light through glass prism and measure the angle of deviation.

- glass prism
- pencil
- drawing board
- rubber
- common pins
- meter rod
- drawing pins
- protector
- white paper

Procedure

1. Fix a white paper on the drawing board with the help of drawing pins.
2. Place a glass prism in the centre of the paper in such a way that its base is towards you.
3. Mark the boundary of the prism ABC.
4. Mark two pins P and Q on the side AB of the prism in such a way that the line PQ must be slanting to it.
5. Observe the image of these two pins P and Q on the other side of the prism (i.e. AC) as shown below.
6. Fix two more pins R and S in such a way that the images of the pins P and Q and these two pins R and S are in a straight line.
7. The distance between pins P and Q, and R and S should not be less than 5 cm.



Path of a ray of light through a prism (angle of deviation)

8. Remove the prism and pins.
9. Encircle the points of pins P, Q, R, and S.
10. Join P and Q, extend PQ which meets the boundary of the prism AB at X.
11. Also join the points S and R and extend SR which meets the boundary of the prism AC at Y.
12. Join X and Y.
13. PQXYRS represents the path of the ray through the prism.

Precautions

1. Clean the prism with a cotton cloth.
2. The distance between the pins PQ and RS should not be less than 5 cm.
3. Pins should be vertical.
4. Mark the boundary of prism carefully.
5. The prism should not be disturbed during the experiment.
6. The image of pins P and Q must be in a straight line with the pins R and S.
7. The base of the prism should be towards you.

Angle of Deviation

1. Draw perpendiculars at the point X and Y with the help of protector. These perpendiculars are known as normals and they are denoted by NL and MN. These two normals, meet each other at N.
2. Measure the angle of incidence i and angle of refraction r.
3. Extend the incident ray PQ forward and extend the emergent ray SR backward which meet the incident ray at O.
4. TOS will be the angle of deviation and is denoted by D. Measure this angle TOS with the help of protector.

   Repeat this experiment three times and then take the mean of this.

Observations and Calculations

No. of obs.	Angle of incident $< i = < PXL$	Angle of refraction $< r = < NXY$	Angle of deviation $<$ TOS $=$ D
1.	53°	47°	41°
2.	52°	36°	41°

Mean angle of deviation = 41°

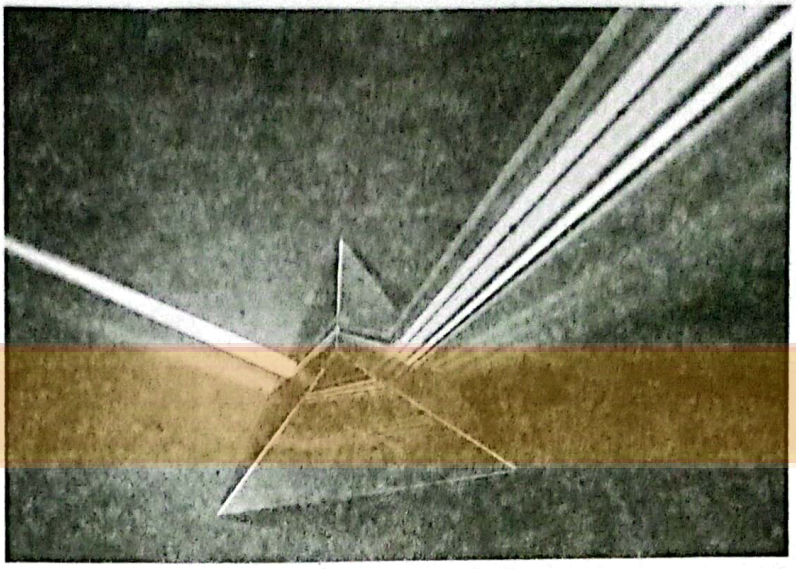
Result

The angle between the incidence ray and emergent ray is called angle of deviation.

Learn about it

Dispersion of light

We know that small fragment of colourless glass and precious stones glitter in bright colours when white light is passed through them. This phenomenon was explained by Newton.



Newton put a glass in the path of a ray of sunlight. He observed an elongated coloured patch of light on the wall. Newton called this a spectrum.

This spectrum consists of seveh colours. So it means that white light is formed from seven colours. The phenomenon in which white light is decomposed into seven colours is called as dispersion of light.

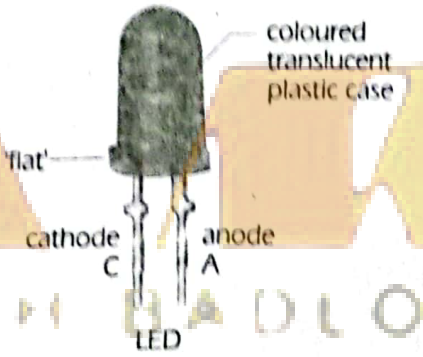
As each coloured light has different wavelength that is why it is deviated at different angles.

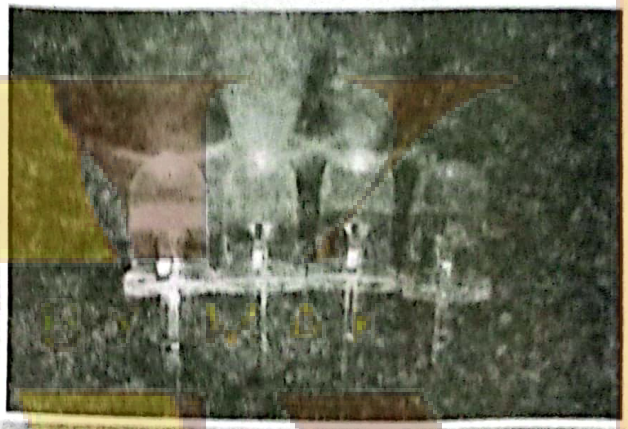
Part II

EXPERIMENT 5

To verify the truth table of OR, AND, NOT, NOR and NAND gates.

- D.C power supply (0-6V)
- OR gate (7432)
- AND gate (7408)
- LED indicator module
- two key plugs
- connecting wires





EXPERIMENT part a **For AND gate**

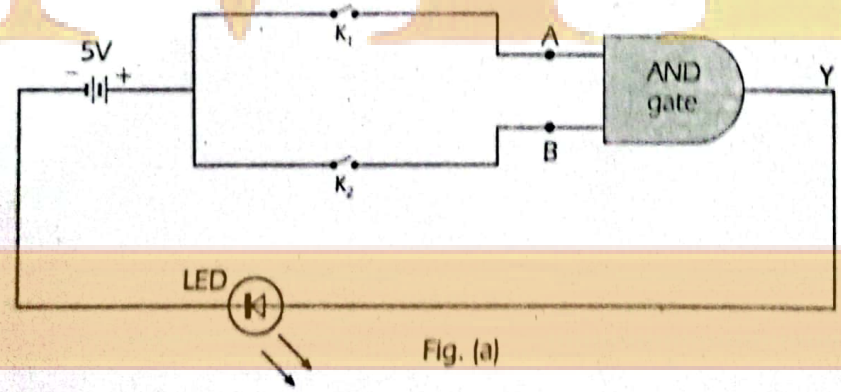


Fig. (a)

Input		Output
A	B	Y
OFF	OFF	OFF
OFF	ON	OFF
ON	OFF	OFF
ON	ON	ON

Truth table for AND gate

Procedure

1. Take an AND gate connect its input terminal A with key K_1 and then with the positive terminal of the power supply. Similarly connect the other input terminal B with key K_2 and then with positive terminal of the power supply.
2. The output terminal of AND gate is connected with LED indicator and then with negative terminal of the power supply.

3. Keep both key plugs K_1 and K_2 OFF, then there is not any current at inputs A and B, the output LED is also in OFF condition.
4. Put the key plug in K_1 and keeping K_2 OFF; then the input terminal A is ON and B is OFF. Then the output terminal 'Y' is also OFF, therefore, LED remains OFF.
5. Put the key plug in K_2 and keeping K_1 OFF then the input terminal A is OFF and B is ON, so output terminal 'Y' is also OFF, therefore, LED remains OFF.
6. Now put the key plugs in both K_1 and K_2, then the both input terminal A and B are ON, at output terminal Y, the LED lighted up which shows that it is ON.

Result

The output of AND gate is ON if A and B inputs are ON.

EXPERIMENT part b **For OR gate**

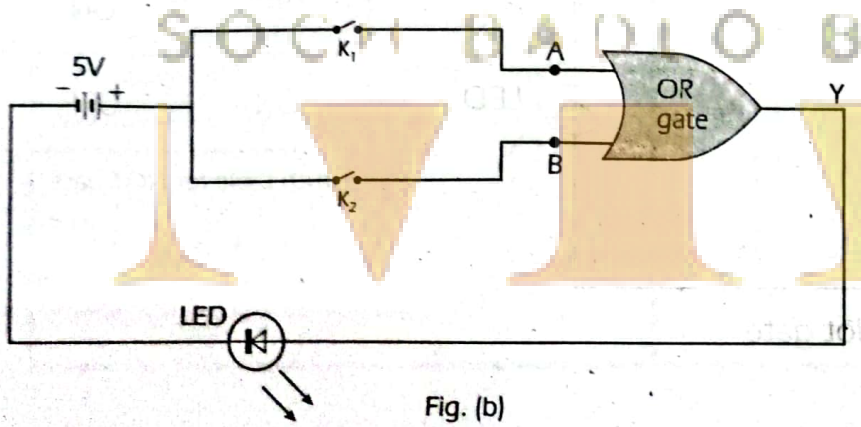


Fig. (b)

Input		Output
A	B	Y
OFF	OFF	OFF
ON	OFF	ON
OFF	ON	ON
ON	ON	ON

Truth table for OR gate

Procedure

1. Take an OR gate, connect its input terminal A with key K_1 and terminal B with key K_2 and then to the positive terminal of power supply.
2. The output terminal of OR gate is connected with LED indicator and then with the negative terminal of the power supply.
3. The working of OR gate is that, if either input is ON or if both are ON, the output is also ON. It can be verified as given.
4. Keeping both key plugs K_1 and K_2 OFF, there is not any current at input terminals A and B. Therefore, the output terminal 'Y' is also OFF, so LED indicator is also OFF.

5. Put the key plug in K_1 and keeping K_2 OFF. The input terminal A is ON and B is OFF. At output terminal Y the LED lighted up which shows it is ON.
6. Put the key plug in K_2 and keeping K_1 OFF. The input terminal A is OFF and B is ON. So at output terminal 'Y' LED is ON.
7. Now put the key plugs in both K_1 and K_2, then both input terminals A and B are ON. At output terminal Y, the LED is ON, which verifies the above truth table.

Result

The output of OR gate is ON if its inputs A or B or both are ON

Experiment part C **For NOT gate**

Input	Output
A	B
OFF	ON
ON	OFF

Truth table for NOT gate

Fig. (c) = Not gate

Procedure

1. Take a NOT gate, it has one input terminal and one output terminal.
2. Connect the input terminal 'A' with the Key K and then to the positive terminal of the 5 volts battery.
3. The output terminal B of the NOT gate is connect with LED indicator and then with negative terminal of the power supply.
4. The working of NOT gate is that if its input is ON, the output is OFF. If its input is OFF, than output is ON.
5. Keeping the Key plug K OFF, the output terminal B is ON, so LED is ON.
6. Put the Key plug in K. The input terminal A is ON. At output terminal B, the LED is OFF.

Result

The output of NOT gate is opposite to its input.

Learn about it

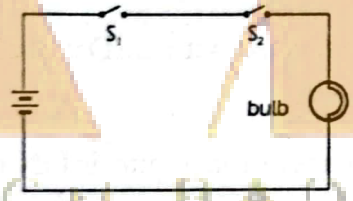
Logic gates

A circuit that determines whether an input can pass through to the output is called a "logic gate". The three basic types are the AND, OR and NOT gates. These circuits are the building blocks for other types of logic gates.

The AND gate

AND gate is a logic gate. It works only if both inputs are ON. It will not work if either of input is OFF. The action of AND gate is summarized in the form of truth table. The function of AND gate is explained by a simple circuit.

The logic symbol for AND gate



The bulb will be lit only if both switches S_1 and S_2 are closed.

The OR gate

OR gate is also a logic gate. It works if either input is ON or if both are ON, the output is also ON. The action of OR gate is described in detail in the OR truth table.

The function of OR gate is explained by the simple circuit, as shown in fig.

The logic symbol for OR gate

The bulb will be lit when either or both of the parallel switches are closed.

Part d For NOR gate

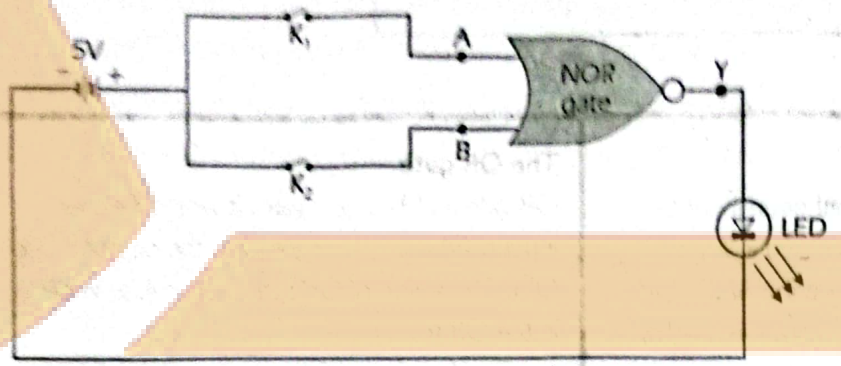


Fig. (d)

Input		Output
A	B	Y
OFF	OFF	ON
ON	OFF	OFF
OFF	ON	OFF
ON	ON	OFF

Truth table for NOR gate

Procedure

1. Connect the input terminal A of NOR gate with Key K_1 and terminal B with Key K_2. The both Keys are connected to the positive terminal of the 5 volt power supply.
2. The output terminal NOR gate is connected with LED and also with the negative terminal of 5 volt power supply.
3. The working of NOR gate is that, if either of its inputs is ON or if both are ON, the output will be OFF. This can be verified by truth table as given below.
4. Keeping both Key plugs K_1 and K_2 OFF, there is not any current at input terminals A and B. therefore at the output terminal Y, the LED lighted up, which shows it is ON.
5. Put the Key plug in K_1 and keeping K_2, OFF. The input terminal A is ON and B is OFF. At the output terminal Y, the LED indicator is OFF which shows Y is OFF.
6. Put the Key plug in K_2 and keeping K_1 OFF. The input terminal A is OFF and B is ON. So at output terminal Y, LED is OFF
7. Now put the key plugs in both Keys K_1 and K_2, then both input terminals A and B are ON. At output terminal Y, the LED is OFF. which verifies the truth table given.

Result

The output of NOR gate is ON when both of its inputs are OFF.

EXPERIMENT part e

For NAND gate

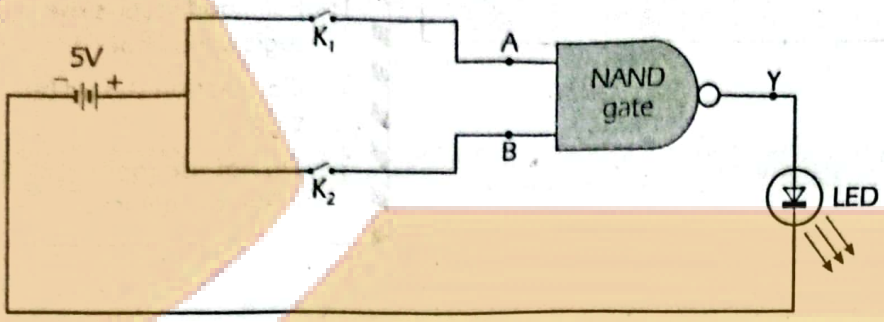


Fig. (e)

Input		Output
A	B	Y
OFF	OFF	ON
ON	OFF	ON
OFF	ON	ON
ON	ON	OFF

Truth table for NAND gate

Procedure

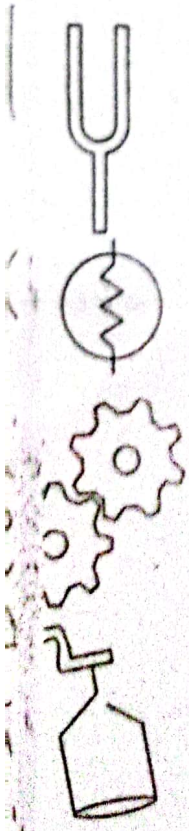
1. Take a NAND gate, connect its both input terminals A and B with the key plugs K_1 and K_2 respectively and then to the positive terminal of a 5 volt power.
2. The output terminal of NAND gate is connected with LED indicator and then with the negative terminal of 5 volt power supply.
3. The working of NAND gate is that, both of its input terminals A and B are ON, the output terminal Y is OFF. It can be verified by truth table as given below.
4. Keeping both Key plugs K_1 and K_2 OFF, there is not any current at input terminals A and B therefore, at the output terminal the LED indicator is ON, which shows the output is ON.
5. Put the key plug in K_1 and Keeping K_2 OFF, the input A is ON and B is OFF. At output terminal the LED lights up which shows it is ON.
6. Put the Key plug in K_2 and Keeping K_1 OFF. The input A is OFF and B is ON. At output terminal Y the LED lights up which shows it is ON.
7. Now put the key plugs in both keys K_1 and K_2. The both input terminals A and B are ON. At output terminal, the LED indicator is OFF which shows it is OFF.

Result

The output of NAND gate is OFF when both of its inputs are ON.

Precautions

1. For good results use logic bread board.
2. Connection should be tight.
3. Do not use long connecting wires.



Tables for Reference

Table of Measurements

Length

Metric System		Customary System	
1 centimetre (cm)	10 millimetres (mm)	1 foot (ft)	12 inches (in.)
1 decimetre (dm)	100 milimetres (mm) 10 centimetres (cm)	1 yard (yd)	36 inches (in.) 3 feet (ft)
1 metre (m)	1,000 millimetres (mm) 100 centimetres (cm) 10 decimetres (dm)	1 mile (m)	5,280 feet (ft) 1,760 yards (yd)

Area

1 square metre (m^2)	100 square decimetre (dm^2) 10,000 square centimetre (cm^2)	1 square foot (ft^2)	144 square inches ($in.^2$)

Volume

1 cubic decimetre (dm^3)	1,000 cubic centimetre (cm^3) 1 litre (L)	1 cubic foot (ft^3)	1,728 cubic inches ($in.^3$)

Capacity

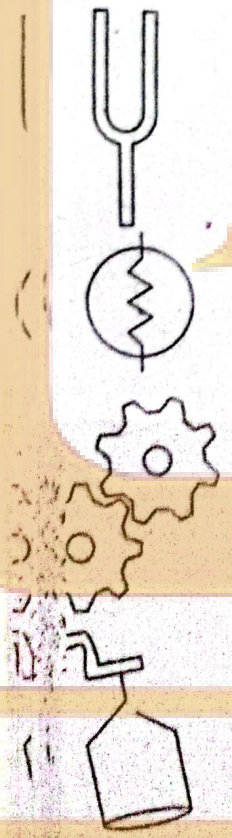
1 teaspoon	5 milliliters (mL)	1 cup (c)	8 fluid ounces (fl oz)
1 table spoon	12.5 millilitres (mL)	1 pint (pt)	16 fluid ounces (fl oz) 2 cups (c)
1 litre (L)	1,000 millilitres (mL) 1,000 cubic centimetres (cm^3) 1 cubic decimetre (dm^3) 4 metric cups	1 quart (qt)	32 fluid ounces (fl oz) 4 cups (c) 2 pint (pt)
		1 gallon (gal)	128 fluid ounces (fl oz) 16 cups (c) 8 pints (pt) 4 quarts (qt)

Weight

1 gram (g)	1,000 milligrams (mg)	1 pound (lb)	16 ounces (oz)
1 kilogram (kg)	1,000 grams (g)		

Time

1 minute (min)	60 seconds (s)	1 year (yr)	365 days 52 weeks 12 months
1 hour (h)	60 minutes (min)		
1 day (d)	24 hours (h)	1 decade	10 years
1 week (w)	7 days (d)	1 century	100 years
1 month	about 4 weeks		



Federal Board

10th

PHYSICS

PRACTICAL BASED ASSESSMENT (PBA) (2025)

MODEL PAPERS WITH SOLUTION

FEDERAL BOARD OF INTERMEDIATE AND SECONDARY EDUCATION
H-8/4, ISLAMABAD

Model Questions Paper Physics SSC-II
Practical Based Assessment (PBA) (2025)

Total Marks: 10 **Time: 45 minutes**

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates the time period of a simple pendulum for calculation of value of 'g' (gravitational acceleration). Figure shows the apparatus.

i) Student measured the time of 10 vibrations of different lengths of thread and recorded the observations in the following table. Complete the table. **[4]**

Radius of metallic bob = r = 2.26 cm

No.s	Length of thread in meters l cm	Length of Simple Pendulum L = l + r (cm)	Time for 10 vibrations		Mean Time t (s)	Time Period $T = \frac{t}{10}$ (s)	$g = \frac{4\pi^2}{T^2} L$ (cms^{-2})
			t_1 (s)	t_2 (s)			
1.	80 cm		18.23	18.22			
2.	90 cm		19.17	19.15			
3.	100 cm		20.01	20.11			

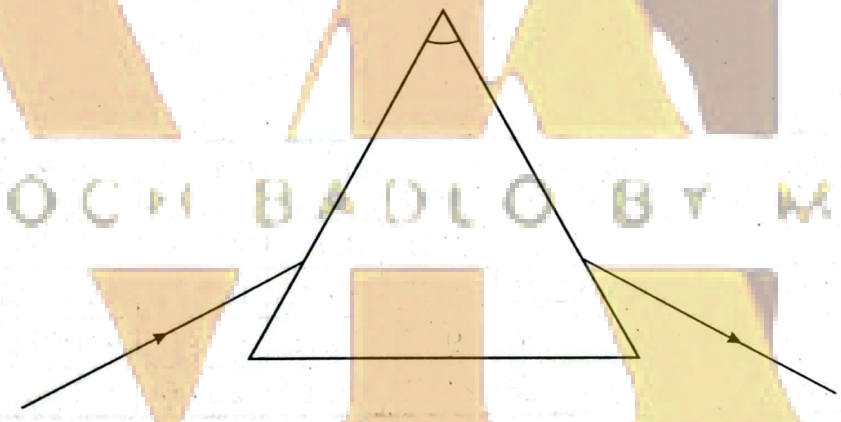
ii) Calculate the mean value of 'g'? **[1]**

iii) Find the percentage error in the calculated value of 'g' (from the table) [1]

SECTION-B

Q2.

i) A student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Complete and label the diagram. Also label on it the angles $\angle i$, $\angle e$ $\angle r$ and $\angle D$. [2]



ii) Measure the values of these angles [1]

a. Angle of incidence = $\angle i$ = _____
b. Angle of emergence = $\angle e$ = _____
c. Angle of refraction = $\angle r$ = _____
d. Angle of deviation = $\angle D$ = _____

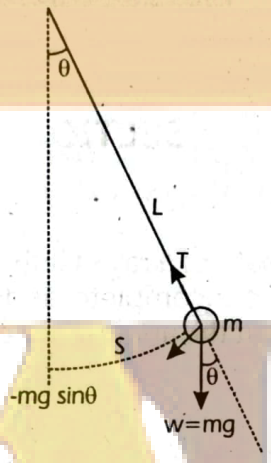
SECTION-A

SOLUTION

Q1. A student investigates the time period of a simple pendulum for calculation of value of 'g' (gravitational acceleration). Figure shows the apparatus.

i) Student measured the time of 10 vibrations of different lengths of thread and recorded the observations in the following table. Complete the table. [4]

Ans Radius of metallic bob = r = 2.26 cm



No.s	Length of thread in meters l cm	Length of Simple Pendulum L = l + r (cm)	Time for 10 vibrations t_1 (s)	Time for 10 vibrations t_2 (s)	Mean Time t (s)	Time Period $T = \frac{t}{10}$ (s)	$g = \frac{4\pi^2}{T^2} L$ (cms^{-2})
1.	80 cm	80+2.26 = 82.26	18.23	18.22	18.225	1.8225	976.5
2.	90 cm	90+2.26 = 92.26	19.17	19.15	19.16	1.916	986.1
3.	100 cm	100+2.26 = 102.26	20.01	20.11	20.06	2.006	996.2

ii) Calculate the mean value of 'g'? [1]

Ans Mean value of 'g' = $\frac{976.5 + 986.1 + 996.2}{3} = 986.27\ cms^{-2}$

iii) Find the percentage error in the calculated value of 'g' (from the table) [1]

Ans Percentage error is given by:

$$\text{Percentage error} = \frac{g_{experimental} - g_{theorretical}}{g_{theorretical}} \times 100$$

Where, $g_{theorretical}$ $980\ cms^{-2}$

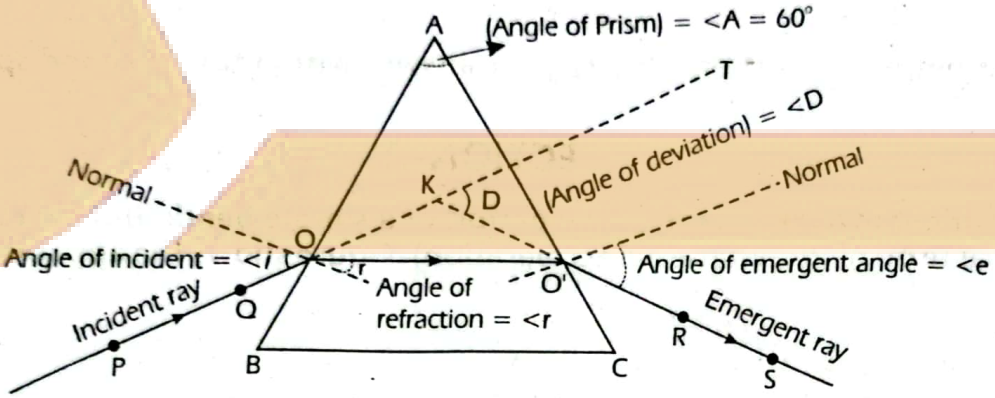
$$\text{Percentage error} = \frac{986.27 - 980}{3} \times 100$$

$$\text{Percentage error} = \frac{6.27}{980} \times 100 = 0.64\%$$

SECTION-B

Q2. Give answers to the following questions.

i) A student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Complete and label the diagram. Also label on it the angles <i, <e <r and <D. [2]



ii) Measure the values of these angles [1]

Ans

a. Angle of incidence = $<i = 52°$

b. Angle of emergence = $<e = 48°$

c. Angle of refraction = $<r = 31°$

d. Angle of deviation = $<D = 40°$

(You will need a protractor to measure these angles from the diagram.)

Calculation of Angle of emergence (<e):

$\Rightarrow$ $<D = <i + <e - <A \Rightarrow <e = <D - <i + <A$

$\Rightarrow$ $<e = 40° - 52° + 60°$ (where, $<A$ = Angle of prism = 60°)

$\Rightarrow$ $<e = 48°$

MODEL QUESTION PAPER No. I

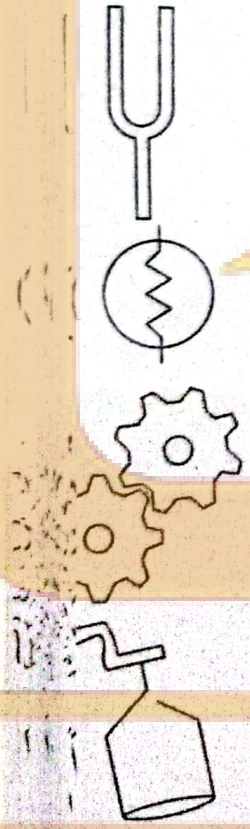
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates the time period of a simple pendulum for calculation of value of 'g' (gravitational acceleration). Figure shows the apparatus.



i) Student measured the time of 10 vibrations of different lengths of thread and recorded the observations in the following table. Complete the table. **[4]**

Radius of metallic bob = r = 2.21 cm

No.s	Length of thread in meters l	Length of Simple Pendulum L = l + r (cm)	Time for 10 vibrations		Mean Time t (s)	Time Period $T = \frac{t}{10}$ (s)	$g = 4\pi^2 \frac{L}{T^2}$ (cms^{-2})
			t_1 (s)	t_2 (s)			
1.	0.48		14.20	14.21			
2.	0.73		17.20	17.18			
3.	0.98		20.10	20.11			

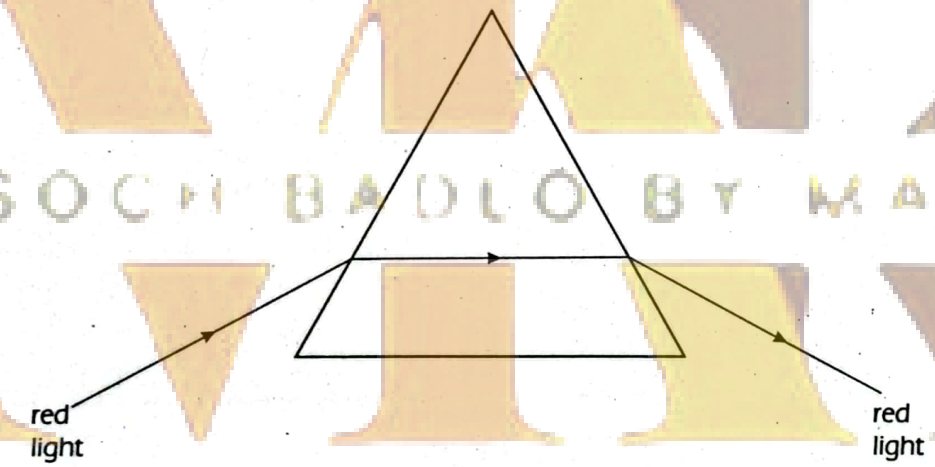
ii) What is the aim of your experiment? **[1]**

iii) How did you ensure accuracy in your measurements? [1]

SECTION-B

Q2.

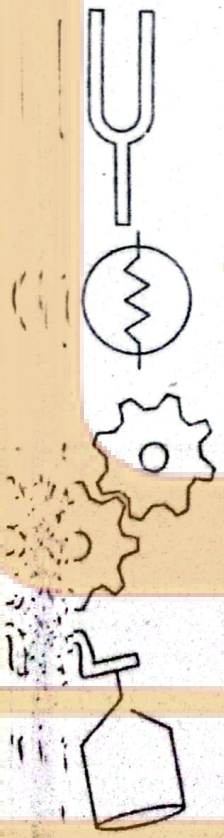
i) A student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Complete and label the diagram. Also label on it the angles $<i$, $<e$ and $<D$. [2]



ii) What is the importance of the refractive index in this experiment? [1]

iii) Why is the refracted ray bent toward the normal when light enters the glass slab? [1]

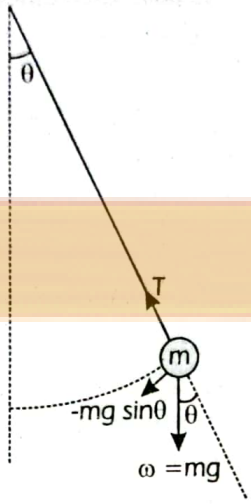
ROUGH WORK



SECTION-A

SOLUTION

Q1. A student investigates the time period of a simple pendulum for calculation of value of 'g' (gravitational acceleration). Figure shows the apparatus.



i) Student measured the time of 10 vibrations of different lengths of thread and recorded the observations in the following table. Complete the table. **[4]**

Ans Radius of metallic bob = r = 2.21 cm = **0.0221 m**

No.s	Length of thread in meters l	Length of Simple Pendulum L = l + r (cm)	Time for 10 vibrations		Mean Time t (s)	Time Period $T = \frac{t}{10}$ (s)	$g = 4\pi^2\left(\frac{L}{T^2}\right)$ (cms^{-2})
			t_1 (s)	t_2 (s)			
1.	0.48	0.50	14.20	14.21	14.21	1.42	9.80
2.	0.73	0.75	17.20	17.18	17.19	1.72	9.79
3.	0.98	1.00	20.10	20.11	20.11	2.01	9.80

ii) What is the aim of your experiment? **[1]**

Ans The aim is to determine the time period of a simple pendulum and use it to calculate the value of gravitational acceleration (g).

iii) How did you ensure accuracy in your measurements? **[1]**

Ans I ensured accuracy by:

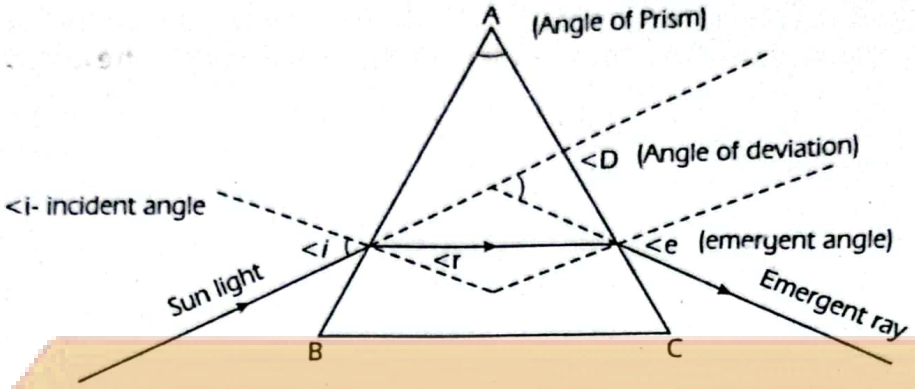
- Using a precise ruler to measure the length.
- Timing multiple oscillations and calculating the average time for better precision.
- Keeping the release angle small to maintain simple harmonic motion.

SECTION-B

Q2.

i) A student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Complete and label the diagram. Also label on it the angles <i, <e and <D. **[2]**

Ans



ii) What is the significance of the angle of minimum deviation? **[1]**

Ans The angle of minimum deviation occurs when the light passes symmetrically through the prism, and at this point, the angle of incidence is equal to the angle of emergence. This is important for determining the refractive index of the material of the prism using the formula:

$$n = \frac{\sin\left(\frac{A+D_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

where n is the refractive index, A is the angle of the prism, and Dm is the angle of minimum deviation.

iii) In this experiment, if the angle of incidence is 40°, the angle of refraction is 25°, and the angle of emergence is 42°, with the prism angle being 60°, calculate the angle of deviation. **[1]**

Ans The angle of deviation D is calculated using the formula:

$$D = i + e - A$$

Substituting the given values:

$$D = 40° + 42° - 60° = 22°$$

Thus, the angle of deviation is 22°.

MODEL QUESTION PAPER No. 2

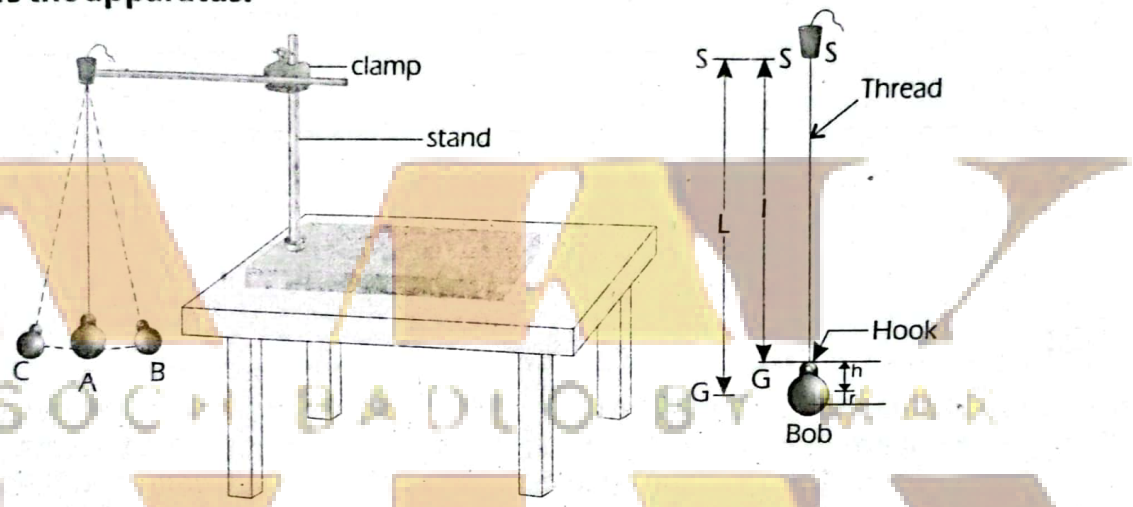
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates the effect of the length of simple pendulum on time period and hence find "g" (gravitational acceleration) by calculation. Figure shows the apparatus.



i) Student measured the time of 10 vibrations of different lengths of thread and recorded the observations in the following table. Find the radius and complete the table. **[4]**

Diameter of metallic bob = D = 1.2 cm

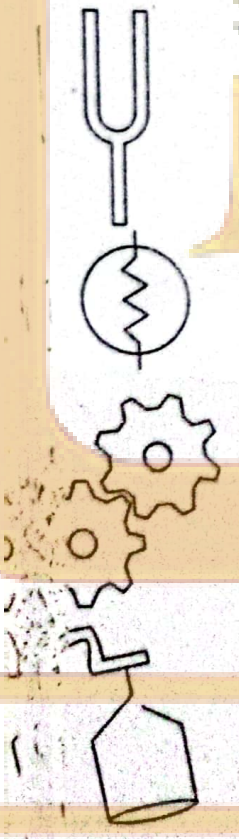
No.s	Length of thread including hook l_1 (cm)	Length of Simple Pendulum $L = l_1 + r$ (cm)	Time for 10 vibrations		Mean Time t (s)	Time Period $T = \frac{t}{10}$ (s)	$\frac{L}{T^2}$ cm / sec^2	$g = 4\pi^2\left(\frac{L}{T^2}\right)$ (cms^{-2})
			t_1 (s)	t_2 (s)				
1.	84.4		18.3	18.5				
2.	55.4		15.2	15.2				
3.	49.4		14.2	14.1				

ii) How does the length of a simple pendulum affect its time period? **[1]**

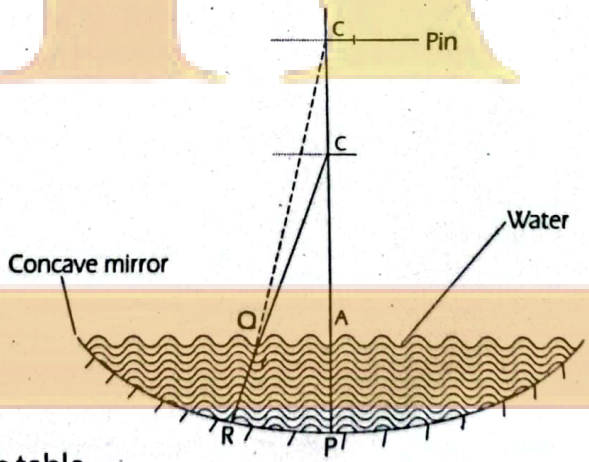
iii) If the length of the pendulum is 0.5 m and the time for 20 oscillations is 28 seconds, calculate the time period and gravitational acceleration g. [1]

SECTION-B

Q2.



i) A student performs an experiment to find the refractive index of water by using concave mirror as shown in the figure below. He first removed parallax between the tip of the needle and its image without water and then with some water on the concave mirror. Some of the data obtained by the student is given in the table.



Complete the table. [2]

No.s	Position of needle of mirror			Distance		Refractive index n = ...
	A cm	C cm	C' cm	AC cm	AC' cm	
1.	0	26	20			
2.	0	26	19.5			
3.	0	25.5	20			

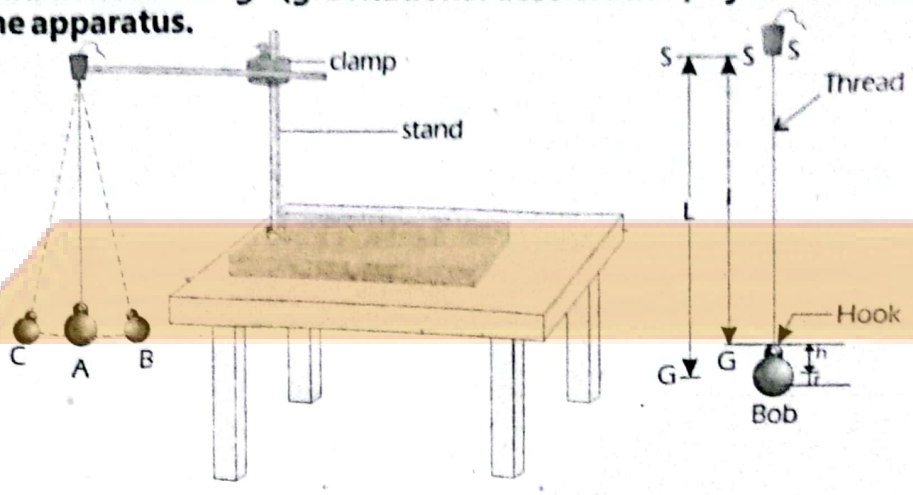
ii) What is the principle behind finding the refractive index of water using a concave mirror? [1]

iii) What is the difference between real depth and apparent depth? [1]

ROUGH WORK

SECTION-A

Q1. A student investigates the effect of the length of simple pendulum on time period and hence find "g" (gravitational acceleration) by calculation. Figure shows the apparatus.



i) Student measured the time of 10 vibrations of different lengths of thread and recorded the observations in the following table. Find the radius and complete the table.

Diameter of metallic bob = D = 1.2 cm **[4]**

Ans $r = \frac{D}{2} = 0.6\ cm$

No.s	Length of thread including hook l_1 (cm)	Length of Simple Pendulum $L = l_1 + r$ (cm)	Time for 10 vibrations		Mean Time t (s)	Time Period $T = \frac{t}{10}$ (s)	$\frac{L}{T^2}$ cm / sec^2	$g = 4\pi^2\left(\frac{L}{T^2}\right)$ (cms^{-2})
			t_1 (s)	t_2 (s)				
1.	84.4	85	18.3	18.5	18.4	1.84	25	986
2.	55.4	56	15.2	15.2	15.2	1.53	24.9	982
3.	49.4	50	14.2	14.1	14.2	1.42	24.8	976

ii) How does the length of a simple pendulum affect its time period? **[1]**

Ans The time period of a simple pendulum is directly proportional to the square root of its length. This means that if the length of the pendulum is increased, the time period also increases. Specifically, doubling the length of the pendulum will increase the time period by a factor of $\sqrt{2}$.

iii) If the length of the pendulum is 0.5 m and the time for 20 oscillations is 28 seconds, calculate the time period and gravitational acceleration g. **[1]**

Ans 1. Calculate the time period T:

$$T = \frac{\text{Total time for 20 oscillations}}{20}$$

$$= \frac{28\ \text{seconds}}{20} = 1.4\ \text{seconds}$$

2. Calculate gravitational acceleration g using the formula:

$$g = 4\pi^2 \frac{L}{T^2}$$

Substituting the values:

$$g = \frac{4\times(3.1416)^2\times0.5}{(1.4)^2}$$

$$= \frac{4\times9.8696\times0.5}{1.96} = 19.73921.96 \approx 10.07\ m/s^2$$

Thus, the calculated value of g is approximately 10.07 m/s^2.

SECTION-B

Q2.

i) Complete the table **[2]**

Ans

No.s	Position of needle of mirror			Distance		Refractive index n = ...
	A cm	C cm	C' cm	AC cm	AC' cm	
1.	0	26	20	26	20	1.30
2.	0	26	19.5	26	19.5	1.33
3.	0	25.5	20	25.5	19.5	1.31

ii) What is the principle behind finding the refractive index of water using a concave mirror? **[1]**

Ans The principle involves placing water in a vessel with a transparent bottom on a concave mirror and focusing light rays. The apparent depth of the water is compared with its real depth. Using the relation between real depth and apparent depth, the refractive index of water can be calculated.

The refractive index is given by:

$$n = \frac{\text{Real depth}}{\text{Apparent depth}}$$

Here, the real depth is the actual depth of the water in the vessel, and the apparent depth is the depth as observed through the concave mirror when focused.

iii) What is the difference between real depth and apparent depth? **[1]**

Ans

- **Real depth:** This is the actual physical depth of the water in the vessel, measured from the surface of the water to the bottom of the vessel.
- **Apparent depth:** This is the perceived depth of the bottom of the vessel when observed through the water. Due to the bending of light (refraction) as it passes from water to air, the bottom of the vessel appears closer to the surface than it actually is.

MODEL QUESTION PAPER No. 3

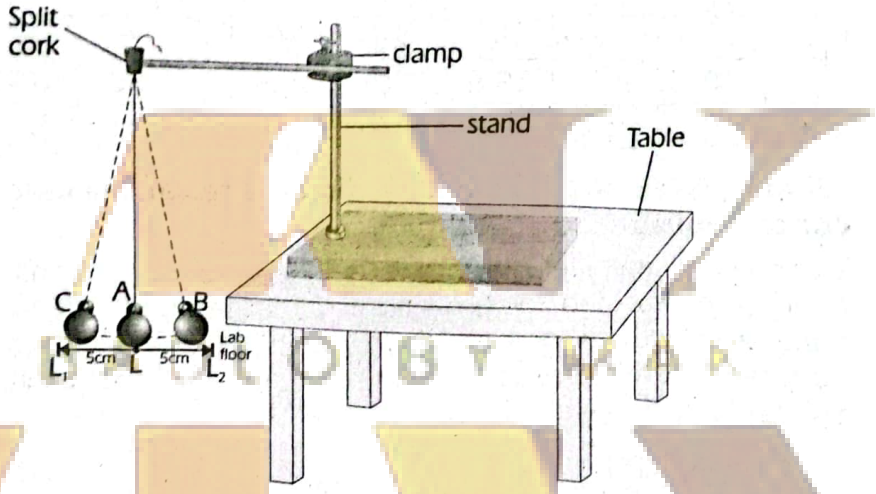
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates the time period of a simple pendulum for calculation of value of 'g' (gravitational acceleration). Figure shows the apparatus.



i) Student measured the time of 10 vibrations of different lengths of thread and recorded the observations in the following table. Complete the table. **[4]**

No.s	Length of thread in l (cm)	Radius of the bob, r (cm)	Length of Simple Pendulum $L = l + r$ (cm)	Time for 10 vibrations		Mean Time t (s)	Time Period $T = \frac{t}{10}$ (s)	$g = 4\pi^2\left(\frac{L}{T^2}\right)$ (cms^{-2})
				t_1 (s)	t_2 (s)			
1.	59.5	0.5		16	15.9			
2.	59.1	0.9		16.1	15.9			
3.	58.8	1.2		16	15.8			

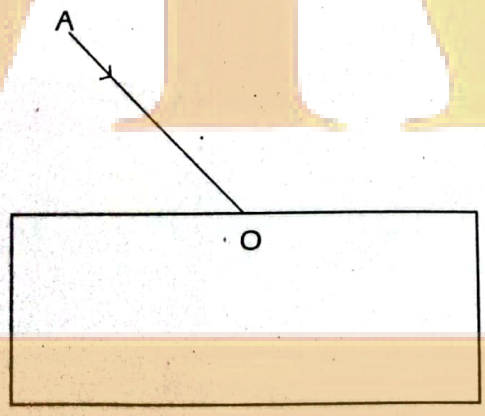
ii) What factors affect the time period of a simple pendulum? **[1]**

iii) Why do we use the average of multiple oscillations instead of measuring a single oscillation? [1]

SECTION-B

Q2.

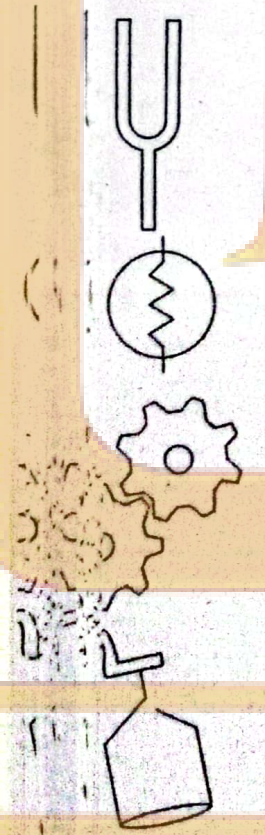
i) A student performs an experiment to verify the laws of refraction by using a glass slab as shown in the figure below. The ray of light enters into the glass slab and then emerges out into the air medium from the base of the glass slab. Complete and label the diagram. Also label on it the angles ∠i, ∠r and ∠e. [2]



ii) What is the aim of the experiment involving a glass slab to verify the laws of refraction? [1]

iii) What is Snell's Law, and how is it verified in this experiment? [1]

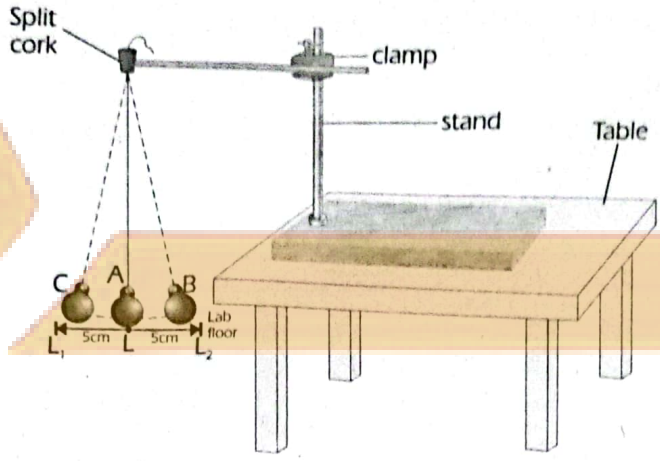
ROUGH WORK



SECTION-A

SOLUTION

Q1. A student investigates the time period of a simple pendulum for calculation of value of 'g' (gravitational acceleration). Figure shows the apparatus.



i) Student measured the time of 10 vibrations of different lengths of thread and recorded the observations in the following table. Complete the table. **[4]**

Ans

No.s	Length of thread in l (cm)	Radius of the bob, r (cm)	Length of Simple Pendulum $L = l + r$ (cm)	Time for 10 vibrations		Mean Time t (s)	Time Period $T = \frac{t}{10}$ (s)	$g = 4\pi^2\left(\frac{L}{T^2}\right)$ (cms^{-2})
				t_1 (s)	t_2 (s)			
1.	59.5	0.5	60	16	15.9	15.7	1.57	973
2.	59.1	0.9	60	16.1	15.9	15.9	1.59	937
3.	58.8	1.2	60	16	15.8	15.8	1.58	949

ii) What factors affect the time period of a simple pendulum? **[1]**

Ans The time period of a simple pendulum is affected by:

- **Length of the pendulum (L):** As the length increases, the time period increases.
- **Acceleration due to gravity (g):** The time period depends inversely on the square root of ggg. It is smaller where gravity is stronger, and larger where gravity is weaker.
- **Amplitude:** For small amplitudes, the time period is independent of the amplitude, but for larger amplitudes, there may be a slight effect.

The mass of the bob and the material of the string do not affect the time period.

iii) Why do we use the average of multiple oscillations instead of measuring a single oscillation? **[1]**

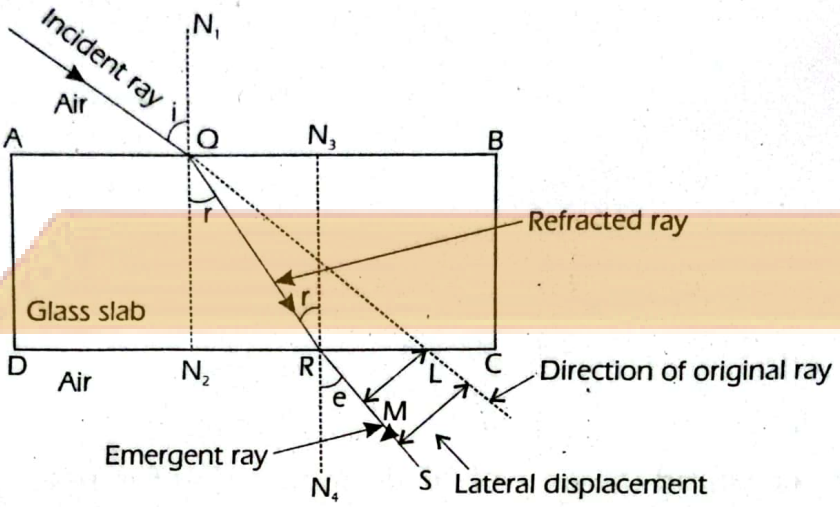
Ans Measuring the time for multiple oscillations and taking the average reduces random human error and improves the accuracy of the time period measurement. Measuring a single oscillation may lead to larger relative errors, especially due to reaction time when starting and stopping the stopwatch.

SECTION-B

Q2.

i) Complete and label the diagram. Also label on it the angles <i, <r and <e. **[2]**

Ans



ii) What is the aim of the experiment involving a glass slab to verify the laws of refraction? **[1]**

Ans The aim of the experiment is to verify Snell's Law by using a rectangular glass slab. This involves measuring the angles of incidence and refraction as light passes from air into the glass and vice versa, and calculating the refractive index of the glass.

iii) What is Snell's Law, and how is it verified in this experiment? **[1]**

Ans Snell's Law states that the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant for a given pair of media, and this ratio is the refractive index:

$$\frac{\text{Sin i}}{\text{Sin r}} = \text{n}$$

To verify Snell's Law, measure several angles of incidence and corresponding angles of refraction. For each pair, calculate sin i / sin r. If the ratio remains constant for all pairs, Snell's Law is verified, and the constant value is the refractive index of the glass.

MODEL QUESTION PAPER No. 4

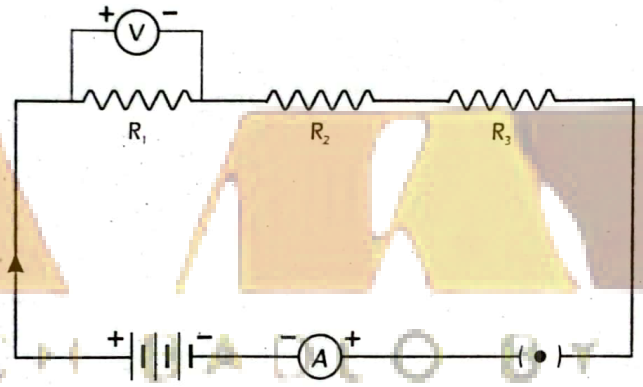
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student measures resistances of three resistors R_1, R_2 and R_3 to study resisters in series circuit. He uses the battery of 6 volts and a current of 0.06 A flowing through the circuit. Different values of voltages in terms of resistors R_1, R_2 and R_3 are shown in the table below.



i) Complete the table. **[4]**

No.s	Net Current $\frac{I}{A}$	(Voltage through R_1) $\frac{V_1}{volts}$	Resistance $\frac{R_1}{\Omega}$	(Voltage through R_2) $\frac{V_2}{volts}$	Resistance $\frac{R_2}{\Omega}$	(Voltage through R_3) $\frac{V_3}{volts}$	Resistance $\frac{R_3}{\Omega}$	Equivalent resistance R_{equ} = ------- Ω
1.		1.21		1.73		3.06		
2.		1.22		1.71		3.07		
3.		1.21		1.74		3.05		

ii) What happens to the total resistance if more resistors are added in series? **[1]**

_____

_____

iii) Explain why the current is the same through both resistors in a series circuit. **[1]**

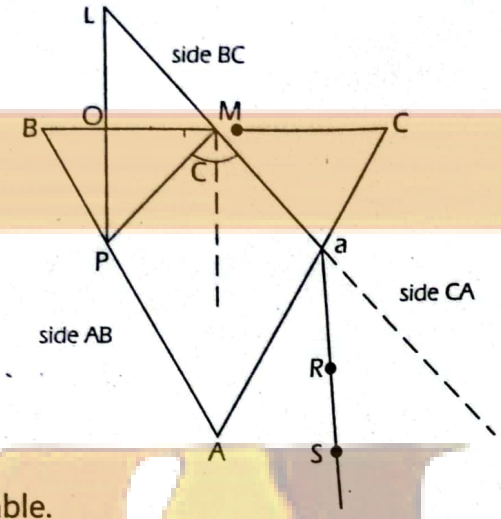
_____

_____

SECTION-B

Q2.

i) A student investigates the critical angle of glass using prism. Figure shows the experimental arrangement. **[2]**



Complete the table.

No.s	Angle PMQ	Critical angle C	Refractive Index n
1.	80°		
2.	82°		
3.	79.5°		

ii) What is the critical angle? **[1]**

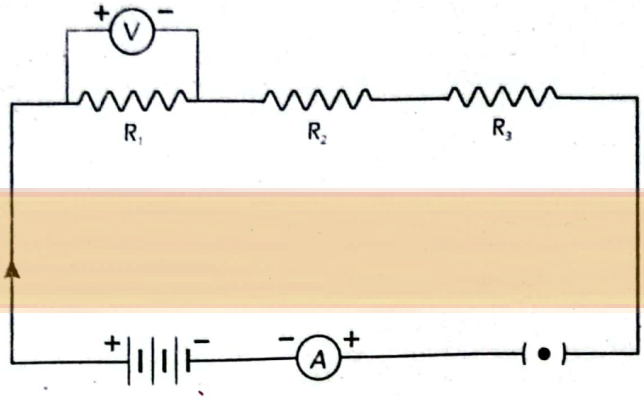
iii) What is the objective of the experiment involving the critical angle using a glass prism? [1]

ROUGH WORK

SECTION-A

SOLUTION

Q1. A student measures resistances of three resistors R_1, R_2 and R_3 to study resisters in series circuit. He uses the battery of 6 volts and a current of 0.06 A flowing through the circuit. Different values of voltages in terms of resistors R_1, R_2 and R_3 are shown in the table below.



i) Complete the table. [4]

Ans

No.s	Net Current $\frac{I}{A}$	(Voltage through R_1) $\frac{V_1}{volts}$	Resistance $\frac{R_1}{\Omega}$	(Voltage through R_2) $\frac{V_2}{volts}$	Resistance $\frac{R_2}{\Omega}$	(Voltage through R_3) $\frac{V_3}{volts}$	Resistance $\frac{R_3}{\Omega}$	Equivalent resistance R_{equ} = ------- Ω
1.	0.06	1.21	20.2	1.73	28.8	3.06	51.0	100
2.	0.06	1.22	20.3	1.71	28.5	3.07	51.2	100
3.	0.06	1.21	20.2	1.74	29.0	3.05	50.8	100

ii) What happens to the total resistance if more resistors are added in series? [1]

Ans The total resistance increases as more resistors are added in series, since the total resistance is the sum of individual resistances.

iii) Explain why the current is the same through both resistors in a series circuit. [1]

Ans In a series circuit, the same current flows through all components because there is only one path for the current to flow.

SECTION-B

Q2.

i) Complete the table [2]

Ans

No.s	Angle PMQ	Critical angle C	Refractive Index n
1.	80°	40°	1.56°
2.	82°	41°	1.52°
3.	79.5°	39.8°	1.56°

ii) What is the critical angle? **[1]**

Ans The critical angle is the angle of incidence at which light, moving from a denser medium (e.g., glass) to a less dense medium (e.g., air), refracts along the boundary between the two media. At this angle, the refracted ray travels parallel to the boundary, and any angle of incidence greater than the critical angle results in total internal reflection (TIR).

The critical angle C is given by:

$$C = \sin^{-1}\left(\frac{1}{n}\right)$$

Where n is the refractive index of the denser medium (e.g., glass).

iii) What is the objective of the experiment involving the critical angle using a glass prism? **[1]**

Ans The objective of the experiment is to determine the critical angle C of a glass prism by observing the angle of incidence at which total internal reflection occurs when light travels from the glass prism (denser medium) into air (less dense medium).

MODEL QUESTION PAPER No. 5

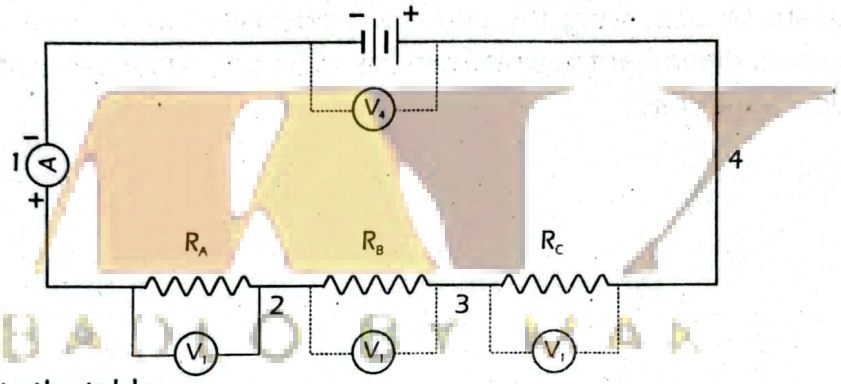
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student measures resistances of three resistors R_A, R_B and R_C to study resisters in series circuit. He uses the battery of 9 volts and a current of 1.2 A flowing through the circuit. Different values of voltages in terms of resistors R_A, R_B and R_C are shown in the table below.



i) Complete the table. [4]

No.s	Net Current $\frac{I}{A}$	(Voltage through R_A) $\frac{V_A}{volts}$	Resistance $\frac{R_A}{\Omega}$	(Voltage through R_B) $\frac{V_B}{volts}$	Resistance $\frac{R_B}{\Omega}$	(Voltage through R_C) $\frac{V_C}{volts}$	Resistance $\frac{R_C}{\Omega}$	Equivalent resistance R_{equ} = ------- Ω
1.		1.93		2.78		4.29		
2.		1.92		2.77		4.31		
3.		1.94		2.78		4.28		

ii) Describe the relationship between the total voltage across the series resistors and the individual voltage drops. [1]

iii) What instrument is used to measure the current in the circuit, and where should it be placed? **[1]**

SECTION-B

Q2.

i) A student investigates to verify the truth table of OR, AND, NOT, NOR and NAND gates. He is provided the assembled circuits of the gates as shown in the figure below. **[2]**

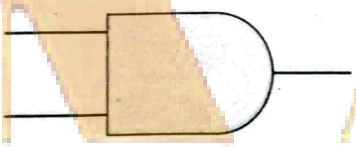


Fig. 5.1

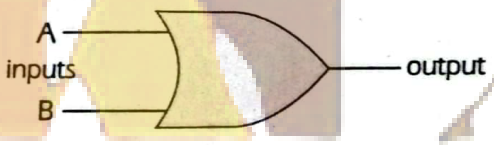


Fig. 5.2

Identify the symbols of the logic circuits in Fig. 2.1 and Fig. 2.2 and complete their truth tables.

Input		Ouput
A	B	Y
0		
1		
0		
1		

Fig. 5.1

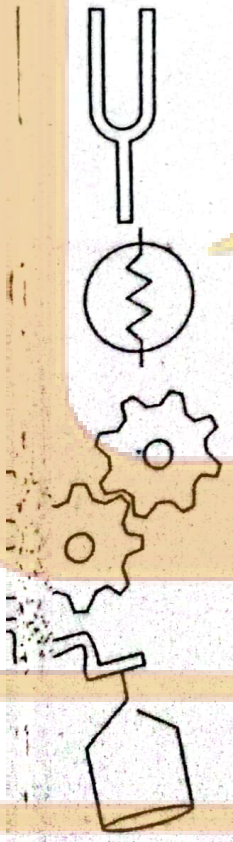
Input		Ouput
A	B	Y
0		
1		
0		
1		

Fig. 5.2

ii) What is the purpose of verifying the truth table of logic gates (OR, AND, NOT, NOR, and NAND)? **[1]**

iii) Why are logic gates essential in digital electronics? [1]

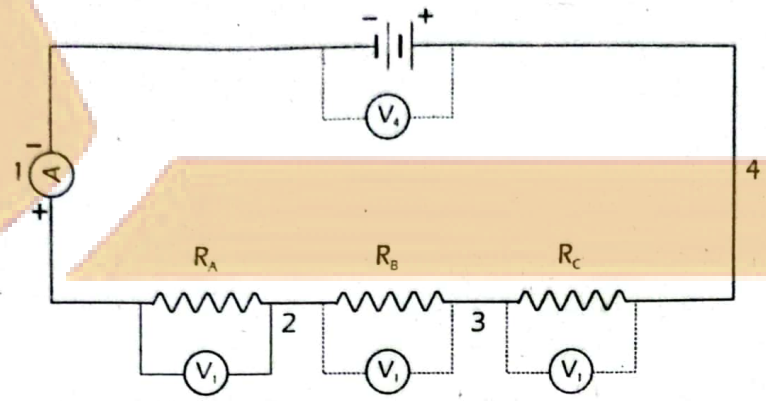
ROUGH WORK



SECTION-A

SOLUTION

Q1. A student measures resistances of three resistors R_A, R_B and R_C to study resisters in series circuit. He uses the battery of 9 volts and a current of 1.2 A flowing through the circuit. Different values of voltages in terms of resistors R_A, R_B and R_C are shown in the table below.



i) Complete the table. **[4]**

Ans

No.s	Net Current $\frac{I}{A}$	(Voltage through R_A) $\frac{V_A}{volts}$	Resistance $\frac{R_A}{\Omega}$	(Voltage through R_B) $\frac{V_B}{volts}$	Resistance $\frac{R_B}{\Omega}$	(Voltage through R_C) $\frac{V_C}{volts}$	Resistance $\frac{R_C}{\Omega}$	Equivalent resistance R_{equ} = ------- Ω
1.	1.2	1.93	1.61	2.78	2.32	4.29	3.58	7.5
2.	1.2	1.92	1.60	2.77	2.31	4.31	3.59	7.5
3.	1.2	1.94	1.62	2.78	2.32	4.28	3.57	7.5

ii) Describe the relationship between the total voltage across the series resistors and the individual voltage drops. **[1]**

Ans The total voltage Vtotal across the series combination of resistors is equal to the sum of the voltage drops across each individual resistor:

$V_{total} = V_1 + V_2$

Where V_1 is the voltage drop across R_1 and V_2 is the voltage drop across R_2

iii) What instrument is used to measure the current in the circuit, and where should it be placed? **[1]**

Ans An ammeter is used to measure the current in the circuit. In a series circuit, the ammeter must be placed in series with the resistors to measure the total current flowing through the circuit.

SECTION-B

Q2.

i) Identify the symbols of the logic circuits in fig. 5.1 and fig. 5.2 and complete their truth tables. **[2]**

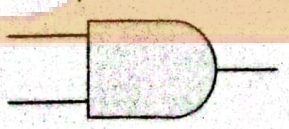


Fig. 5.1

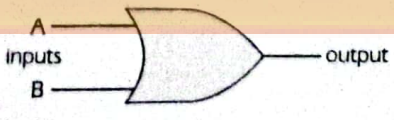


Fig. 5.2

Ans Fig. 5.1. is the symbol of AND gate and Fig. 5.2 is that of OR gate

Input		Ouput
A	B	Y
0	0	0
1	0	0
0	1	0
1	1	1

Fig. 5.1 AND gate

Input		Ouput
A	B	Y
0	0	0
1	0	1
0	1	1
1	1	1

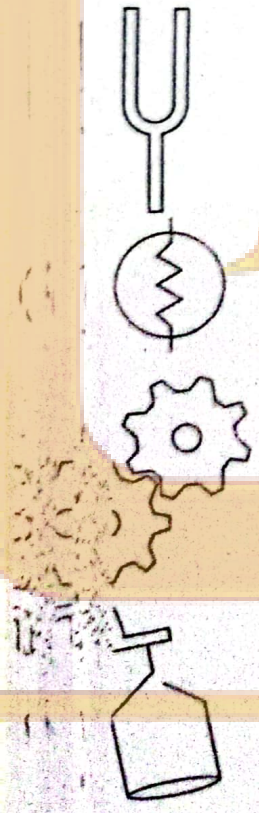
Fig. 5.2 OR GATE

ii) What is the purpose of verifying the truth table of logic gates (OR, AND, NOT, NOR, and NAND)? **[1]**

Ans The purpose of the experiment is to verify the logical operation of basic gates—OR, AND, NOT, NOR, and NAND—by constructing their truth tables. The truth table helps in understanding how each gate processes binary inputs (0s and 1s) and generates corresponding outputs based on their logic.

iii) Why are logic gates essential in digital electronics? **[1]**

Ans Logic gates are the building blocks of digital circuits. They are used in processors, memory devices, and many other digital systems to perform logical operations like addition, comparison, and decision-making. By combining different logic gates, complex digital systems can be designed to carry out various tasks.



MODEL QUESTION PAPER No. 6

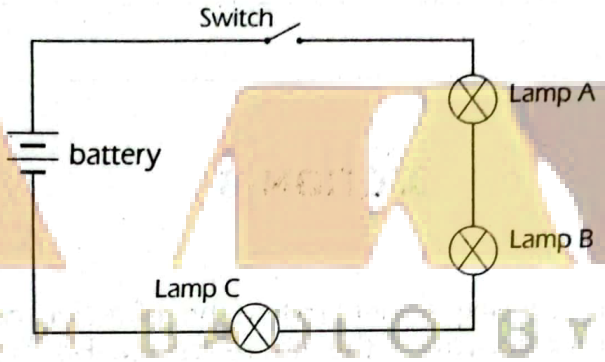
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student measures resistances of three lamps A, B and C with resistances R_A, R_B and R_C to study resisters in series circuit. He uses the battery of 12 volts and a current of 2.3 A flowing through the circuit. Different values of voltages in terms of resistors R_A, R_B and R_C are shown in the table below.



i) Complete the table. **[4]**

No.s	Net Current $\frac{I}{A}$	(Voltage through R_A) $\frac{V_A}{\text{volts}}$	Resistance $\frac{R_A}{\Omega}$	(Voltage through R_B) $\frac{V_B}{\text{volts}}$	Resistance $\frac{R_B}{\Omega}$	(Voltage through R_C) $\frac{V_C}{\text{volts}}$	Resistance $\frac{R_C}{\Omega}$	Equivalent resistance R_{equ} = ------- Ω
1.		2.87		3.52		5.61		
2.		2.85		3.52		5.63		
3.		2.86		3.51		5.63		

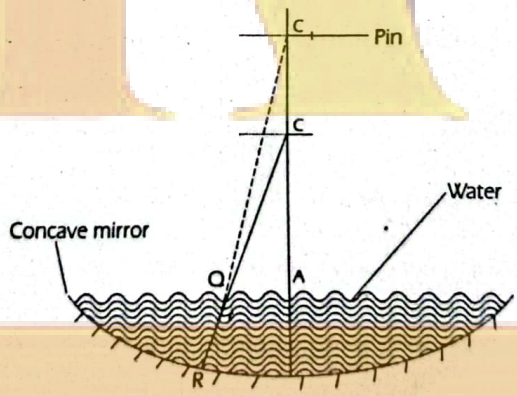
ii) How would you experimentally verify that the current remains the same through each resistor in a series circuit? **[1]**

iii) How would you explain the proportionality between the voltage drop across each resistor and its resistance? [1]

SECTION-B

Q2.

i) A student performs an experiment to find the refractive index of water by using concave mirror as shown in the figure below. He first removed parallax between the tip of the needle and its image without water and then with some water on the concave mirror. Some of the data obtained by the student is given in the table.



Complete the table. [2]

No.s	Position of needle of mirror			Distance		Refractive index n = ...
	A cm	C cm	C' cm	AC cm	AC' cm	
1.	0	25	19			
2.	0	26	20			
3.	0	25.5	19.5			

ii) What is the formula for calculating the refractive index of water in this experiment? [1]

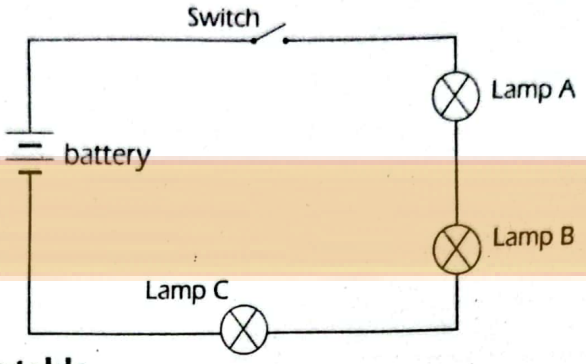
iii) How do you measure the real depth in this experiment? [1]

ROUGH WORK

SECTION-A

SOLUTION

Q1. A student measures resistances of three lamps A, B and C with resistances R_A, R_B and R_C to study resisters in series circuit. He uses the battery of 12 volts and a current of 2.3 A flowing through the circuit. Different values of voltages in terms of resistors R_A, R_B and R_C are shown in the table below.



i) Complete the table. **[4]**

Ans

No.s	Net Current $\frac{I}{A}$	(Voltage through R_A) $\frac{V_A}{volts}$	Resistance $\frac{R_A}{\Omega}$	(Voltage through R_B) $\frac{V_B}{volts}$	Resistance $\frac{R_B}{\Omega}$	(Voltage through R_C) $\frac{V_C}{volts}$	Resistance $\frac{R_C}{\Omega}$	Equivalent resistance R_{equ} = ------- Ω
1.	2.3	2.87	1.25	3.52	1.53	5.61	2.44	5.2
2.	2.3	2.85	1.24	3.52	1.53	5.63	2.45	5.2
3.	2.3	2.86	1.24	3.51	1.53	5.63	2.45	5.2

ii) How would you experimentally verify that the current remains the same through each resistor in a series circuit? **[1]**

Ans To verify that the current remains the same through each resistor in a series circuit:

- Connect an ammeter before R_1 to measure the current entering the first resistor.
- Connect another ammeter between R_1 and R_2 to measure the current between the two resistors.
- Measure the current after R_2 using another ammeter.
- The current readings should be the same at all three points, verifying that the current remains constant in a series circuit.

iii) How would you explain the proportionality between the voltage drop across each resistor and its resistance? **[1]**

Ans In a series circuit, the voltage drop across each resistor is directly proportional to its resistance. This means that a resistor with a larger resistance will have a larger voltage drop. Mathematically, the voltage drop across a resistor is given by:

$V = I \times R$

Since the current is the same through each resistor, a larger resistance results in a larger voltage drop.

SECTION-B

Q2.

i) Complete the table **[2]**

Ans

No.s	Position of needle of mirror			Distance		Refractive index n = ...
	A cm	C cm	C' cm	AC cm	AC' cm	
1.	0	25	19	25	19	1.32
2.	0	26	20	26	20	1.30
3.	0	25.5	19.5	25.5	19.5	1.31

ii) What is the formula for calculating the refractive index of water in this experiment? **[1]**

Ans The refractive index nnn of water is given by the formula:

$$n = \frac{\text{Real Depth}}{\text{Apparent Depth}}$$

Where:

- Real Depth is the actual depth of the object from the water surface,
- Apparent Depth is the perceived depth of the object when viewed through water.

iii) How do you measure the real depth in this experiment? **[1]**

Ans The real depth is the actual vertical distance between the object (pin or coin) and the concave mirror. It can be measured directly using a ruler or meter scale by placing it alongside the container to find the exact depth of the object.

MODEL QUESTION PAPER No. 7

PHYSICS 10th (SSC-II)

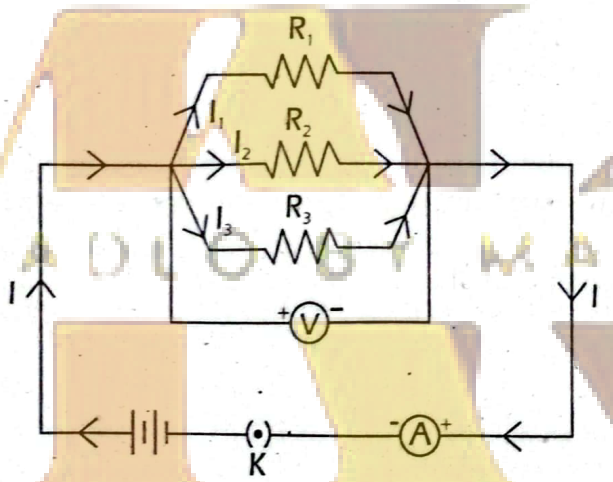
PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student measures resistances of three resistors R_1, R_2 and R_3 to study resisters in parallel circuit. He uses the battery of 6 volts and a current of 0.080A flowing through the circuit. Different values of currents in terms of resistors R_1, R_2 and R_3 are shown in the table below.

i) Complete the table. **[4]**



No.s	Net Voltage $\frac{V}{volts}$	(Current through R_1) $\frac{I_1}{A}$	Resistance $\frac{R_1}{\Omega}$	(Current through R_2) $\frac{I_2}{A}$	Resistance $\frac{R_2}{\Omega}$	(Current through R_3) $\frac{I_3}{A}$	Resistance $\frac{R_3}{\Omega}$	Equivalent resistance R_{eqv} = ----Ω
1.		0.013		0.027		0.040		
2.		0.012		0.027		0.041		
3.		0.013		0.028		0.039		

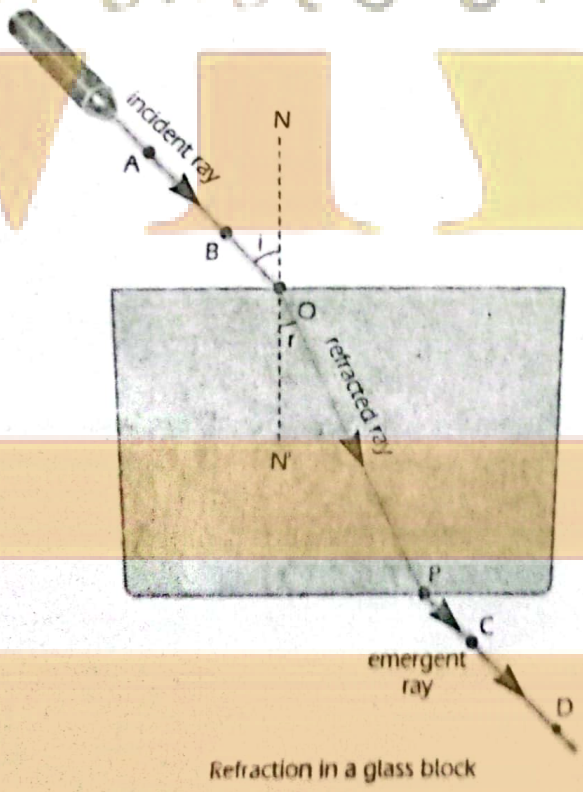
ii) What is the formula to calculate the total resistance of resistors connected in parallel? **[1]**

iii) Why does the total resistance in a parallel circuit decrease when more resistors are added? [1]

SECTION-B

Q2.

i) A student performs an experiment to verify the laws of refraction by using a glass slab as shown in the figure below. The ray of light enters into the glass slab and then emerges out into the air medium from the base of the glass slab. Complete and label the diagram. Also label on it the angles ∠i, ∠r and ∠e. [2]

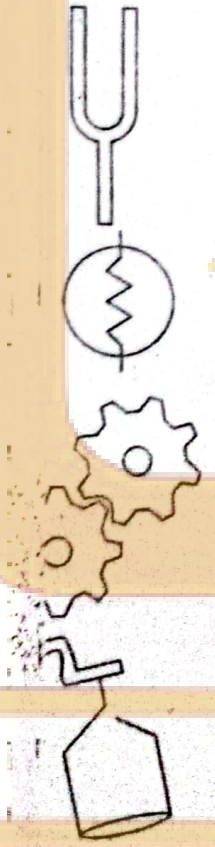


Refraction in a glass block

ii) What is the importance of the refractive index in this experiment? [1]

iii) Why is the refracted ray bent toward the normal when light enters the glass slab? **[1]**

ROUGH WORK



SECTION-A

SOLUTION

Q.1 A student measures resistances of three resistors R_1, R_2 and R_3 to study resisters in parallel circuit. He uses the battery of 6 volts and a current of 0.080A flowing through the circuit. Different values of currents in terms of resistors R_1, R_2 and R_3 are shown in the table below.

i) Complete the table. **[4]**

Ans

No.s	Net Voltage $\frac{V}{volts}$	(Current through R_1) $\frac{I_1}{A}$	Resistance $\frac{R_1}{\Omega}$	(Current through R_2) $\frac{I_2}{A}$	Resistance $\frac{R_2}{\Omega}$	(Current through R_3) $\frac{I_3}{A}$	Resistance $\frac{R_3}{\Omega}$	Equivalent resistance $R_{eq} = \ldots\Omega$
1.	6	0.013	462	0.027	222	0.040	150	75
2.	6	0.012	500	0.027	222	0.041	146	75
3.	6	0.013	462	0.028	214	0.039	154	75

ii) What is the formula to calculate the total resistance of resistors connected in parallel? **[1]**

Ans The total resistance R_{total} for resistors connected in parallel is given by the reciprocal of the sum of the reciprocals of the individual resistances:

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

To find Rtotal, take the reciprocal of the sum:

$$R_{total} = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)^{-1}$$

iii) Why does the total resistance in a parallel circuit decrease when more resistors are added? **[1]**

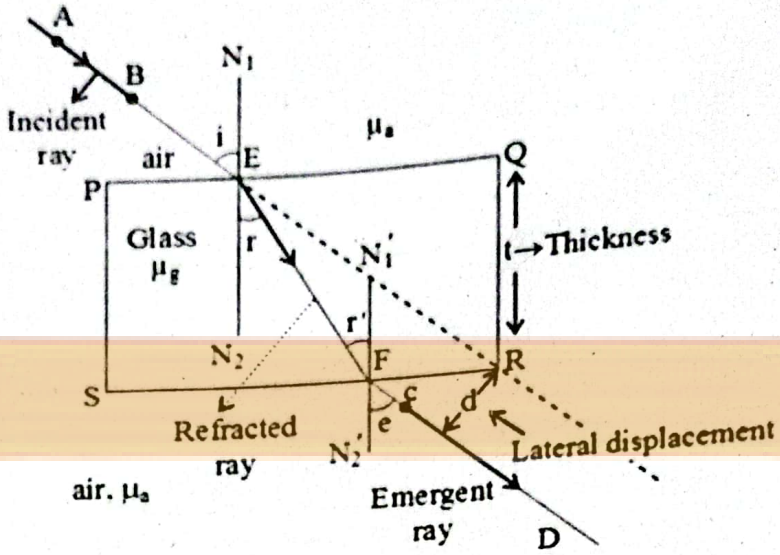
Ans In a parallel circuit, each additional resistor provides an alternative path for current to flow. As more resistors are added in parallel, the overall capacity for current to flow increases, reducing the total resistance. The total resistance in a parallel circuit is always less than the smallest individual resistor.

SECTION-B

Q2.

i) A student performs an experiment to verify the laws of refraction by using a glass slab as shown in the figure below. The ray of light enters into the glass slab and then emerges out into the air medium from the base of the glass slab. Complete and label the diagram. Also label on it the angles ∠i, ∠rand ∠e. **[2]**

Ans



ii) What is the importance of the refractive index in this experiment? [1]

Ans The refractive index determines how much light bends when passing from one medium to another. In this experiment, it helps to verify Snell's law by calculating the ratio of the sine of the angle of incidence to the sine of the angle of refraction, which should remain constant for a given glass slab.

iii) Why is the refracted ray bent toward the normal when light enters the glass slab? [1]

Ans The refracted ray bends toward the normal when light passes from a less dense medium (air) into a denser medium (glass) because the speed of light decreases in the denser medium. This bending toward the normal follows Snell's law.

MODEL QUESTION PAPER No. 8

PHYSICS 10th (SSC-II)

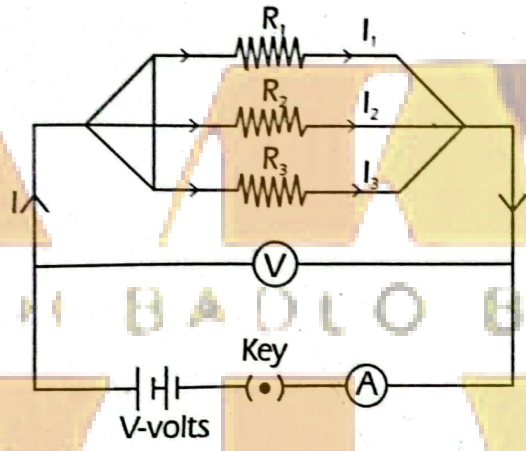
PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student measures resistances of three resistors R_1, R_2 and R_3 to study resisters in parallel circuit. He uses the battery of 9 volts and a current of 1.4A flowing through the circuit. Different values of currents in terms of resistors R_1, R_2 and R_3 are shown in the table below.

i) Complete the table. **[4]**



No.s	Net Voltage $\frac{V}{volts}$	(Current through R_1) $\frac{I_1}{A}$	Resistance $\frac{R_1}{\Omega}$	(Current through R_2) $\frac{I_2}{A}$	Resistance $\frac{R_2}{\Omega}$	(Current through R_3) $\frac{I_3}{A}$	Resistance $\frac{R_3}{\Omega}$	Equivalent resistance R_{eqv} = ----Ω
1.		0.023		0.087		1.29		
2.		0.021		0.087		1.29		
3.		0.022		0.088		1.29		

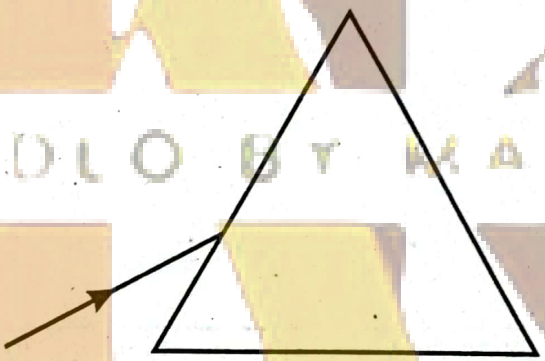
ii) How do the individual currents through each resistor in a parallel circuit compare to the total current? **[1]**

iii) How can you experimentally verify that the voltage across each resistor in a parallel circuit is the same? [1]

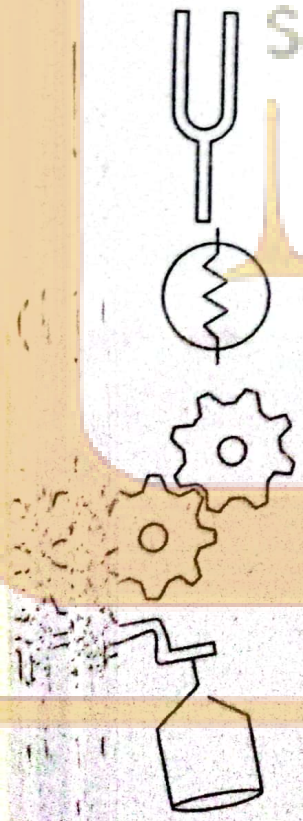
SECTION-B

Q2.

i) A student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Complete and label the diagram. Also label on it the angles $\angle i$, $\angle e$ and $\angle D$. [2]



ii) How do you trace the path of light through the prism? [1]



iii) How do you calculate the angle of deviation from the experimental setup? [1]

ROUGH WORK

SECTION-A

SOLUTION

Q.1 A student measures resistances of three resistors R_1, R_2 and R_3 to study resisters in parallel circuit. He uses the battery of 9 volts and a current of 1.4A flowing through the circuit. Different values of currents in terms of resistors R_1, R_2 and R_3 are shown in the table below.

i) Complete the table. **[4]**

Ans

No.s	Net Voltage $\frac{V}{volts}$	(Current through R_1) $\frac{I_1}{A}$	Resistance $\frac{R_1}{\Omega}$	(Current through R_2) $\frac{I_2}{A}$	Resistance $\frac{R_2}{\Omega}$	(Current through R_3) $\frac{I_3}{A}$	Resistance $\frac{R_3}{\Omega}$	Equivalent resistance $R_{eq} = ----\Omega$
1.	9	0.023	391	0.087	103	1.29	6.98	6.4
2.	9	0.021	429	0.087	103	1.29	6.98	6.4
3.	9	0.022	409	0.088	102	1.29	6.98	6.4

ii) How do the individual currents through each resistor in a parallel circuit compare to the total current? **[1]**

Ans In a parallel circuit, the total current I_{total} is the sum of the individual currents through each resistor:

$$I_{total} = I_1 + I_2 + I_3$$

Each resistor has its own current, which is determined by its resistance and the applied voltage (Ohm's law). The individual currents are not the same unless all resistors have the same resistance.

iii) How can you experimentally verify that the voltage across each resistor in a parallel circuit is the same? **[1]**

Ans To verify the voltage across each resistor:

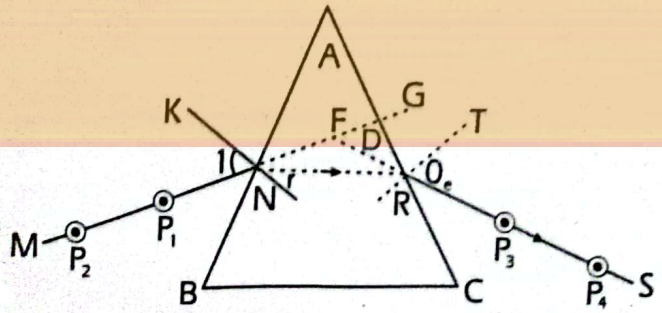
1. Use a voltmeter to measure the voltage across R_1, R_2 and R_3.
2. Connect the voltmeter's probes across the terminals of each resistor, one by one.
3. The voltmeter should show the same reading for each resistor, verifying that the voltage across each resistor is equal to the total applied voltage in a parallel circuit.

SECTION-B

Q2.

i) A student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Complete and label the diagram. Also label on it the angles ∠*i*, ∠*e* and ∠D. **[2]**

Ans



ii) How do you trace the path of light through the prism? **[1]**

Ans Place the prism on a sheet of paper and outline its boundaries.

- Direct a light ray at one face of the prism, marking the points where the ray enters and exits the prism.
- Use pins to mark the path of the ray, ensuring the refracted and emergent rays are clearly visible.
- Draw straight lines to connect the points and trace the complete path of the light ray through the prism.

iii) How do you calculate the angle of deviation from the experimental setup? **[1]**

Ans To calculate the angle of deviation:

1. Extend the incident ray and the emergent ray on the paper until they intersect.
2. The angle between these two rays at the point of intersection is the angle of deviation.
3. Use a protractor to measure this angle directly.

MODEL QUESTION PAPER No. 9

PHYSICS 10th (SSC-II)

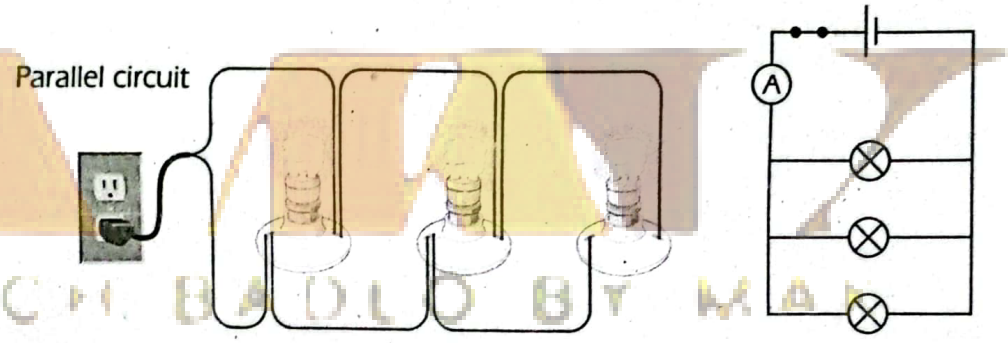
PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student measures resistances of three lamps A, B and C with resistances R_1, R_2 and R_3 to study resisters in series circuit. He uses the battery of 12 volts and a current of 3.6 A flowing through the circuit. Different values of voltages in terms of resistors R_A, R_B and R_C are shown in the table below.

i) Complete the table. **[4]**



No.s	Net Voltage $\frac{V}{volts}$	(Current through R_1) $\frac{I_1}{A}$	Resistance $\frac{R_1}{\Omega}$	(Current through R_2) $\frac{I_2}{A}$	Resistance $\frac{R_2}{\Omega}$	(Current through R_3) $\frac{I_3}{A}$	Resistance $\frac{R_3}{\Omega}$	Equivalent resistance R_{eq} = ----Ω
1.		0.88		1.02		1.70		
2.		0.89		1.03		1.68		
3.		0.87		1.01		1.72		

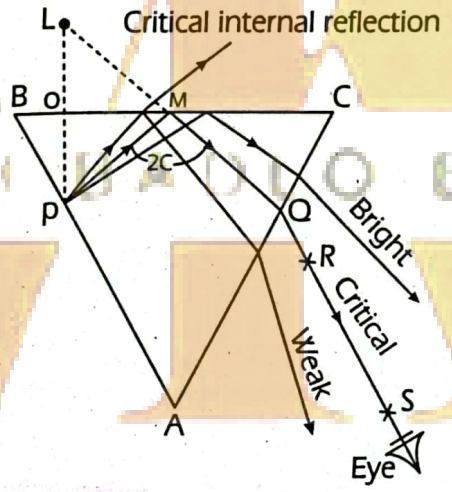
ii) How would you measure the current through each resistor in a parallel circuit? **[1]**

iii) If the resistance of R_2 is doubled in a parallel circuit, how does it affect the total resistance of the circuit? [1]

SECTION-B

Q2.

A student investigates the critical angle of glass using prism. Figure shows the experimental arrangement.



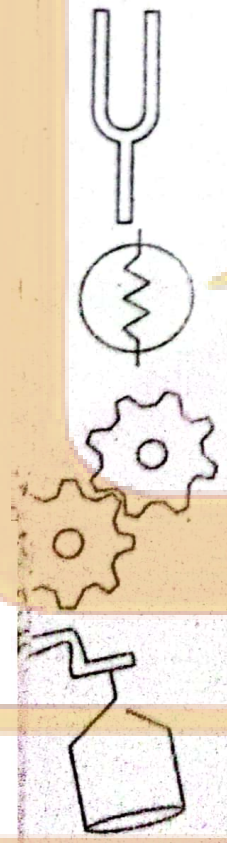
i) Complete the table. [2]

No.	Angle PMQ	Critical angle C	Refractive Index n
1.	81.5°		
2.	82°		
3.	80.5°		

ii) What happens if the angle of incidence is less than the critical angle? [1]

iii) What are the key conditions for total internal reflection to occur in the prism? [1]

ROUGH WORK



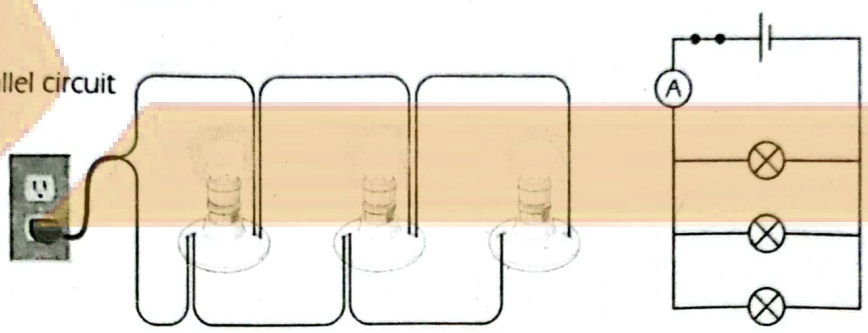
SECTION-A

SOLUTION

Q.1 A student measures resistances of three lamps A, B and C with resistances R_1, R_2 and R_3 to study resisters in series circuit. He uses the battery of 12 volts and a current of 3.6 A flowing through the circuit. Different values of voltages in terms of resistors R_A, R_B and R_C are shown in the table below.

i) Complete the table. **[4]**

Parallel circuit



Ans

No.s	Net Voltage $\frac{V}{volts}$	(Current through R_1) $\frac{I_1}{A}$	Resistance $\frac{R_1}{\Omega}$	(Current through R_2) $\frac{I_2}{A}$	Resistance $\frac{R_2}{\Omega}$	(Current through R_3) $\frac{I_3}{A}$	Resistance $\frac{R_3}{\Omega}$	Equivalent resistance R_{eq} = ----Ω
1.	12	0.88	13.6	1.02	11.8	1.70	7.06	3.3
2.	12	0.89	13.5	1.03	11.7	1.68	7.14	3.3
3.	12	0.87	13.8	1.01	11.9	1.72	6.98	3.3

ii) How would you measure the current through each resistor in a parallel circuit? **[1]**

Ans To measure the current through each resistor:

- Place an ammeter in series with each resistor individually.
- Measure the current through R_1 by connecting the ammeter in series with R_1.
- Repeat the process for R_2 and R_3.
- The sum of the individual currents should equal the total current through the circuit.

iii) If the resistance of R_2 is doubled in a parallel circuit, how does it affect the total resistance of the circuit? **[1]**

Ans Doubling the resistance of R_2 will increase its contribution to the total resistance. However, because resistors in parallel reduce the overall resistance, the impact of doubling R_2 will not significantly increase the total resistance. The total resistance will still be less than the smallest individual resistance in the circuit, but it will be slightly higher than before.

SECTION-B

Q2.

A student investigates the critical angle of glass using prism. Figure shows the experimental arrangement.

i) Complete the table. [2]

Ans

No.	Angle PMQ	Critical angle C	Refractive Index n
1.	81.5°	40.1°	1.55
2.	82°	41°	1.52
3.	80.5°	40.3°	1.54

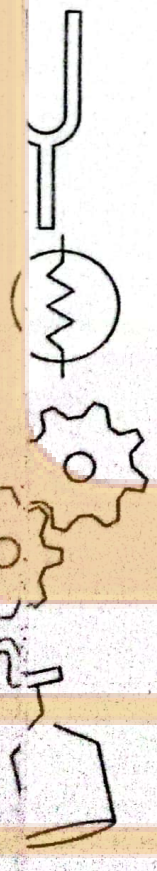
ii) What happens if the angle of incidence is less than the critical angle? [1]

Ans If the angle of incidence is less than the critical angle, the light ray will refract into the less dense medium (air) instead of reflecting internally. The refracted ray will bend away from the normal according to Snell's law, but total internal reflection will not occur.

iii) What are the key conditions for total internal reflection to occur in the prism? [1]

Ans The key conditions for total internal reflection (TIR) to occur are:

1. Light must travel from a denser medium (glass) to a less dense medium (air),
2. The angle of incidence must be greater than the critical angle of the medium.



MODEL QUESTION PAPER No. 10

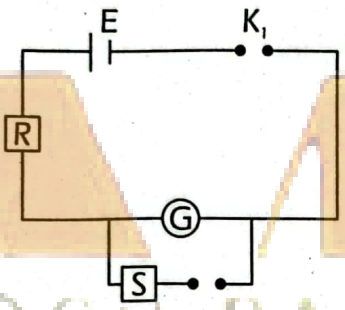
PHYSICS 10th (SSC-II)

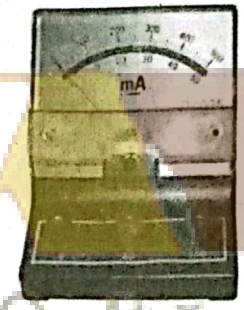
PRACTICAL BASED ASSESSMENT (PBA) (2025)

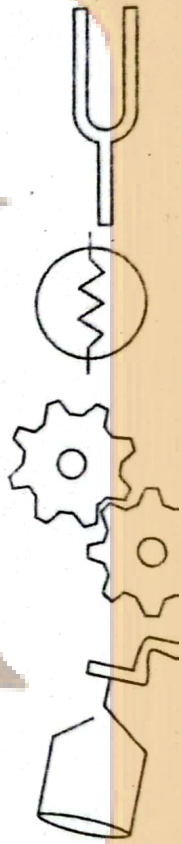
NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates the resistance of galvanometer by half deflection method. He uses the battery of 1.5 volts, High resistance of the range 1-10000Ω, Shunt resistance of the range of 1 to 100 Ω and a galvanometer which measures the current in mA as shown in the figure below. For the deflection of 1 θ, galvanometer shows the value of current equal to 10 mA.







Different values of currents through different high resistances are shown in the table below.

i) Complete the table. **[4]**

No.s	High resistance $\frac{R}{\Omega}$	Current $\frac{I_g}{mA}$	Deflection θ	Shunt resistance $\frac{S}{\Omega}$	Half deflection $\frac{\theta}{2}$	Resistance of galvanometer G = ... Ω
1.	4000	150		54		
2.	5500	100		55		
3.	7000	80		55		

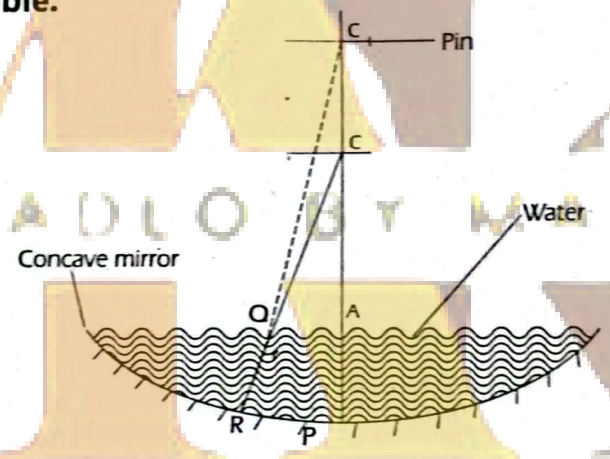
ii) What is the basic principle behind the half deflection method for measuring the resistance of a galvanometer? **[1]**

iii) Why is it necessary to achieve half deflection in this method? [1]

SECTION-B

Q2.

A student performs an experiment to find the refractive index of water by using concave mirror as shown in the figure below. He first removed parallax between the tip of the needle and its image without water and then with some water on the concave mirror. Some of the data obtained by the student is given in the table.



i) Complete the table. [2]

No.s	Position of needle of mirror			Distance		Refractive index n = ...
	A cm	C cm	C' cm	AC cm	AC' cm	
1.	0	26	19.5			
2.	0	26	20			
3.	0	25.5	19			

ii) What could cause errors in determining the refractive index in this experiment? [1]

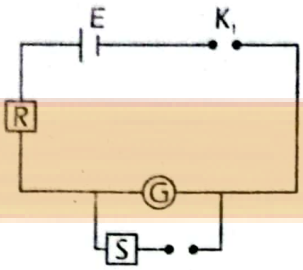
iii) Why does the object appear at a different depth when viewed through water?
[1]

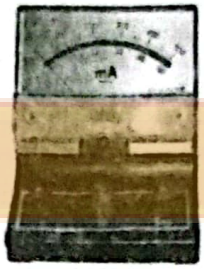
ROUGH WORK

SECTION-A

SOLUTION

Q.1 A student investigates the resistance of galvanometer by half deflection method. He uses the battery of 1.5 volts, High resistance of the range 1-10000Ω, Shunt resistance of the range of 1 to 100 Ω and a galvanometer which measures the current in mA as shown in the figure below. For the deflection of 1 θ, galvanometer shows the value of current equal to 10 mA.





i) Complete the table. **[4]**

Ans

No.s	High resistance $\frac{R}{\Omega}$	Current $\frac{I_g}{mA}$	Deflection θ	Shunt resistance $\frac{S}{\Omega}$	Half deflection $\frac{\theta}{2}$	Resistance of galvanometer G = ... Ω
1.	4000	150	15	54	7.5	56.8
2.	5500	100	10	55	5.0	55.6
3.	7000	80	8	55	4.0	55.4

ii) What is the basic principle behind the half deflection method for measuring the resistance of a galvanometer? **[1]**

Ans The half deflection method is based on the principle that when a known shunt resistor is connected in parallel with a galvanometer, it reduces the current flowing through the galvanometer by half, resulting in half the original deflection of the galvanometer needle. This allows for the calculation of the internal resistance of the galvanometer using the known shunt resistor and the observed deflection.

iii) Why is it necessary to achieve half deflection in this method? **[1]**

Ans Achieving half deflection is essential because it ensures that the current through the galvanometer is halved when the shunt is connected, allowing for an accurate determination of the galvanometer's resistance. This setup provides a balance between the current flowing through the galvanometer and the shunt, making the calculation straightforward and accurate.

SECTION-B

Q2.

A student performs an experiment to find the refractive index of water by using concave mirror as shown in the figure below. He first removed parallax between the tip of the needle and its image without water and then with some water on the concave mirror. Some of the data obtained by the student is given in the table.

i) Complete the table. **[2]**

Ans

No.s	Position of needle of mirror			Distance		Refractive index $n = \frac{AC}{AC'}$
	A cm	C cm	C' cm	AC cm	AC' cm	
1.	0	26	19.5	26	19.5	1.33
2.	0	26	20	26	20	1.30
3.	0	25.5	19	25.5	19	1.34

ii) What could cause errors in determining the refractive index in this experiment? **[1]**

Ans Possible sources of error include:

1. Parallax error while measuring the apparent depth.
2. Inaccurate measurement of real depth.
3. Uneven water surface causing distortion of the image.
4. Misalignment of the object, concave mirror, or viewing angle.

iii) Why does the object appear at a different depth when viewed through water? **[1]**

Ans The object appears at a different (shallower) depth due to the refraction of light when it passes from water (denser medium) to air (less dense medium). The bending of light rays makes the object appear closer to the surface than its actual position.

MODEL QUESTION PAPER No. II

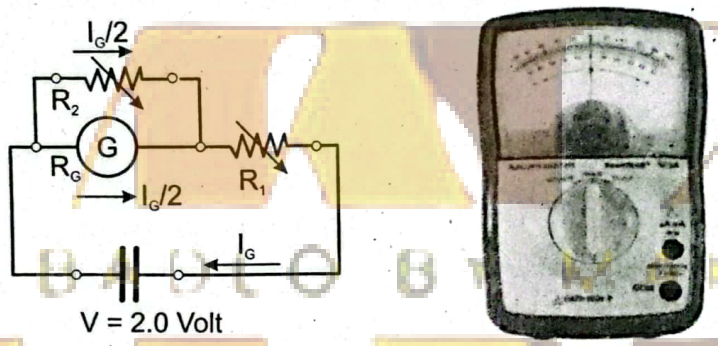
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates the resistance of galvanometer by half deflection method. He uses the battery of 3 volts, High resistance of the range 1-10000Ω, Shunt resistance of the range of 1 to 100 Ω, a rheostat and a galvanometer which measures the current in mA as shown in the figure below. For the deflection of 1 θ, galvanometer shows the value of current equal to 10 mA.



Different values of currents through different high resistances are shown in the table below.

i) Complete the table. **[4]**

No.s	High resistance $\frac{R}{\Omega}$	Current $\frac{I_p}{mA}$	Deflection θ	Shunt resistance $\frac{S}{\Omega}$	Half deflection $\frac{\theta}{2}$	Resistance of galvanometer G = ... Ω
1.	5500	240		90		
2.	6500	180		90		
3.	7500	140		90		

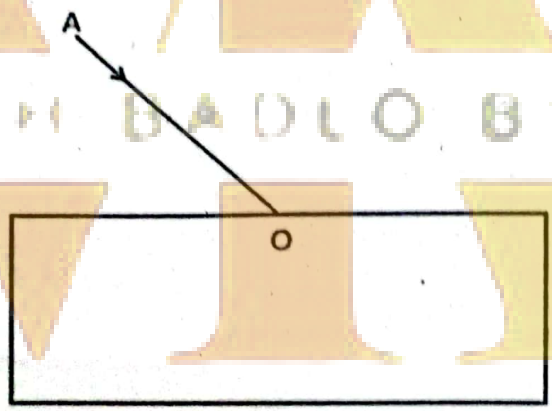
ii) Why is the deflection halved when the shunt resistance is connected across the galvanometer? **[1]**

iii) How can the accuracy of the experiment be improved? [1]

SECTION-B

Q2.

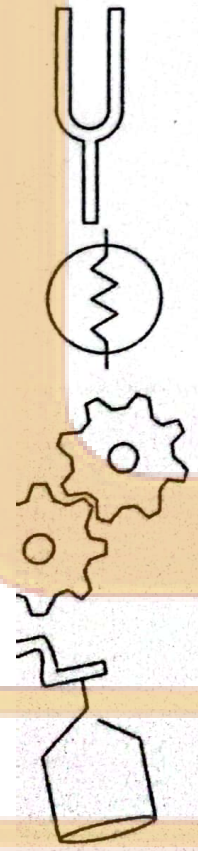
i) A student performs an experiment to verify the laws of refraction by using a glass slab as shown in the figure below. The ray of light enters into the glass slab and then emerges out into the air medium from the base of the glass slab. Complete and label the diagram. Also label on it the angles ∠i, ∠r and ∠e. [2]



ii) What is total internal reflection, and is it observed in this experiment with a glass slab? [1]

iii) How does increasing the angle of incidence affect the angle of refraction? [1]

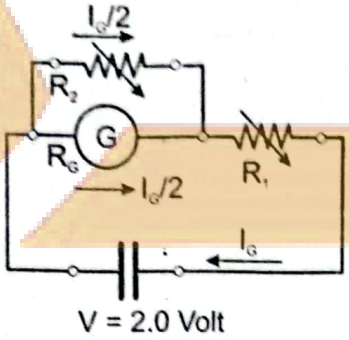
ROUGH WORK



SECTION-A

SOLUTION

Q.1 A student investigates the resistance of galvanometer by half deflection method. He uses the battery of 3 volts, High resistance of the range 1-10000Ω, Shunt resistance of the range of 1 to 100 Ω, a rheostat and a galvanometer which measures the current in mA as shown in the figure below. For the deflection of 1 θ, galvanometer shows the value of current equal to 10 mA.



i) Complete the table. **[4]**

Ans

No.s	High resistance $\frac{R}{\Omega}$	Current $\frac{I_g}{mA}$	Deflection θ	Shunt resistance $\frac{S}{\Omega}$	Half deflection $\frac{\theta}{2}$	Resistance of galvanometer G = ... Ω
1.	5500	240	24	90	12	91.5
2.	6500	180	18	90	9	91.3
3.	7500	140	14	90	7	91.1

ii) Why is the deflection halved when the shunt resistance is connected across the galvanometer? **[1]**

Ans When a shunt resistance is connected across the galvanometer, part of the current is bypassed through the shunt, reducing the current through the galvanometer. Since deflection in a galvanometer is proportional to the current, reducing the current causes the deflection to halve

iii) How can the accuracy of the experiment be improved? **[1]**

Ans The accuracy can be improved by:

1. Using a high-quality rheostat for precise current adjustment,
2. Taking multiple readings and calculating the average,
3. Using a highly accurate shunt resistance,
4. Ensuring good connections to avoid contact resistance.

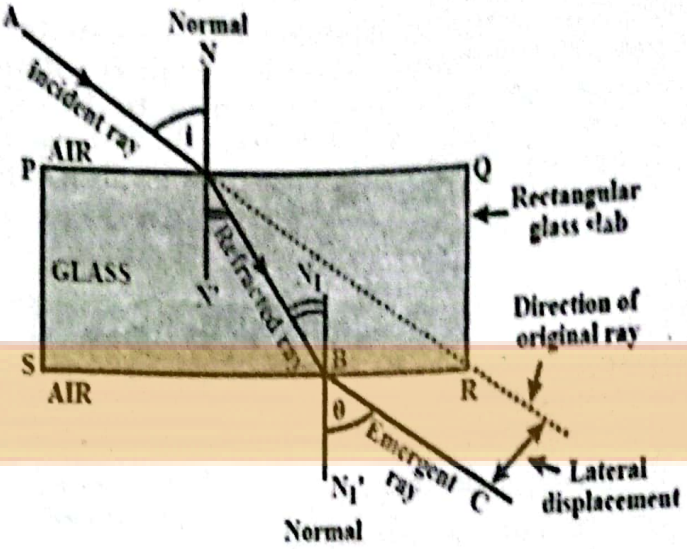
SECTION-B

Q2.

i) A student performs an experiment to verify the laws of refraction by using a glass slab as shown in the figure below. The ray of light enters into the glass slab and then emerges out into the air medium from the base of the glass slab. Complete and label the diagram. Also label on it the angles ∠i, ∠r and ∠e.

Complete and label the diagram. [2]

Ans



ii) What is total internal reflection, and is it observed in this experiment with a glass slab? [1]

Ans Total internal reflection occurs when light tries to move from a denser medium (glass) to a less dense medium (air) at an angle greater than the critical angle, resulting in the light being reflected back into the denser medium instead of refracting. In this glass slab experiment, total internal reflection is not typically observed since the focus is on verifying refraction laws, not reflection.

iii) How does increasing the angle of incidence affect the angle of refraction? [1]

Ans As the angle of incidence increases, the angle of refraction also increases, but not linearly. According to Snell's law, the sine of the angle of refraction is proportional to the sine of the angle of incidence, based on the refractive index of the glass slab. For larger incidence angles, the difference between the angles of incidence and refraction becomes more pronounced.

MODEL QUESTION PAPER No. 12

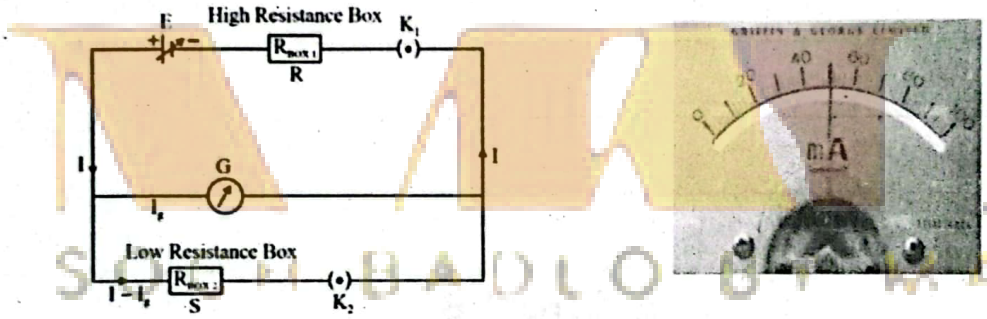
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates the resistance of galvanometer by half deflection method. He uses the battery of 3 volts, High resistance of the range 1-10000Ω, Shunt resistance of the range of 1 to 500 Ω and a galvanometer which measures the current in mA as shown in the figure below. For the deflection of 1 θ, galvanometer shows the value of current equal to 2 mA.



Different values of currents through different high resistances are shown in the table below.

i) Complete the table. **[4]**

No.s	High resistance $\frac{R}{\Omega}$	Current $\frac{I_g}{mA}$	Deflection θ	Shunt resistance $\frac{S}{\Omega}$	Half deflection $\frac{\theta}{2}$	Resistance of galvanometer G = ... Ω
1.	5200	60		125		
2.	5000	56		125		
3.	4800	52		125		

ii) How would you experimentally determine the full-scale deflection of the galvanometer without a shunt? **[1]**

iii) What precautions should be taken while performing the half deflection method experiment? [1]

SECTION-B

Q2.

A student investigates to verify the truth table of OR, AND, NOT, NOR and NAND gates. He is provided the assembled circuits of the gates as shown in the figure below.

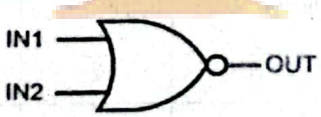


Fig.2.1

Fig.2.2

i) Identify the symbols of the logic circuits in Fig. 2.1 and Fig. 2.2and complete their truth tables. [2]

Input		Ouput
A	B	Y
0		
1		
0		
1		

Fig. 2.1

Input		Ouput
A	B	Y
0		
1		
0		
1		

Fig. 2.2

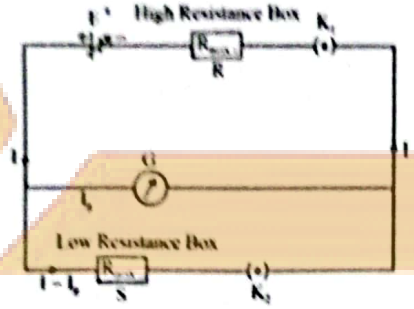
ii) How does a NOT gate work? [1]

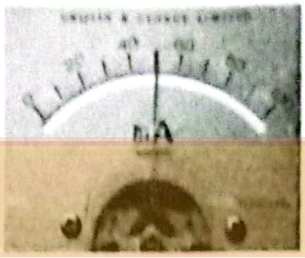
iii) How does a NOR gate differ from an OR gate? [1]

ROUGH WORK

SOLUTION

Q.1 A student investigates the resistance of galvanometer by half deflection method. He uses the battery of 3 volts, High resistance of the range 1-10000Ω, Shunt resistance of the range of 1 to 500 Ω and a galvanometer which measures the current in mA as shown in the figure below. For the deflection of 1 θ, galvanometer shows the value of current equal to 2 mA.





i) Complete the table. **[4]**

Ans

No.s	High resistance R / Ω	Current I_g / mA	Deflection θ	Shunt resistance S / Ω	Half deflection θ / 2	Resistance of galvanometer G = ... Ω
1.	5200	60	30	125	15	128.1
2.	5000	56	28	125	14	128.2
3.	4800	52	26	125	13	128.3

ii) How would you experimentally determine the full-scale deflection of the galvanometer without a shunt? **[1]**

Ans To determine the full-scale deflection θ:

1. Set up the circuit with the galvanometer, battery, and rheostat.
2. Adjust the rheostat to pass a suitable current through the galvanometer such that the needle deflects to a readable position (but not to the maximum).
3. Record the deflection angle θ on the galvanometer scale, which represents the full-scale deflection before the shunt is connected.

iii) What precautions should be taken while performing the half deflection method experiment? **[1]**

Ans Precautions to ensure accurate results:

- Ensure the galvanometer is properly calibrated and the zero position is correctly set.
- Avoid passing excessive current through the galvanometer to prevent damage.
- Make sure the shunt resistor is accurately known and properly connected in parallel with the galvanometer.
- Adjust the current slowly using the rheostat to avoid sudden jumps in deflection.
- Record readings carefully and avoid parallax error when observing the deflection on the galvanometer scale.

SECTION-B

Q2.

A student investigates to verify the truth table of OR, AND, NOT, NOR and NAND gates. He is provided the assembled circuits of the gates as shown in the figure below.

i) Identify the symbols of the logic circuits in fig. 2.1 and fig. 2.2 and complete their truth tables. **[2]**

Ans Fig. 2.1. is the symbol of NOR gate and Fig. 2.2 is that of AND gate.

Input		Ouput
A	B	Y
0	0	1
1	0	0
0	1	0
1	1	0

Fig. 2.1.NOR gate

Input		Ouput
A	B	Y
0	0	0
1	0	0
0	1	0
1	1	1

Fig. 2.2. AND GATE

ii) How does a NOT gate work? **[1]**

Ans A NOT gate inverts the input. If the input is 0, the output is 1, and if the input is 1, the output is 0. The logical expression is A^{-}. Example:

- Input: 1 → Output: 0

iii) How does a NOR gate differ from an OR gate? **[1]**

Ans A NOR gate is the opposite (negation) of an OR gate. It outputs 1 only when both inputs are 0. If either input is 1, the output will be 0. Example:

- If input A = 0 and input B = 0, the output of the NOR gate is 1.

MODEL QUESTION PAPER No. 13

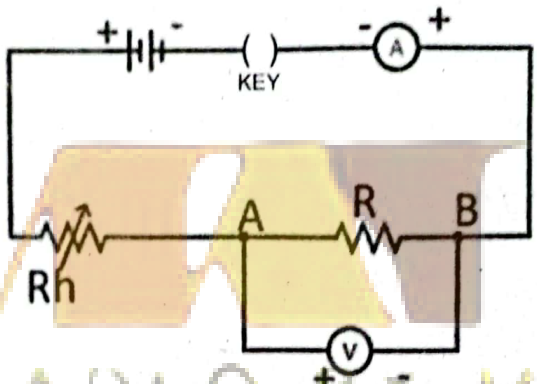
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates to verify Ohm's law (using wire as conductor).He uses battery, voltmeter, ammeter, rheostat and a resistance box in the circuit. Different values obtained by the student are shown in the table below.



i) Complete the table. **[4]**

No.s	Reading of ammeter $\frac{I}{mA}$	Reading of ammeter $\frac{I}{A}$	Reading of voltmeter $\frac{V}{mV}$	Reading of voltmeter $\frac{V}{Volts}$	Resistance (by Ohm's law) $R = \ldots\ldots\ldots \Omega$
1.	1.5×10^{-4}		8.0×10^{-4}		
2.	1.9×10^{-4}		1.0×10^{-4}		
3.	2.3×10^{-4}		1.2×10^{-4}		

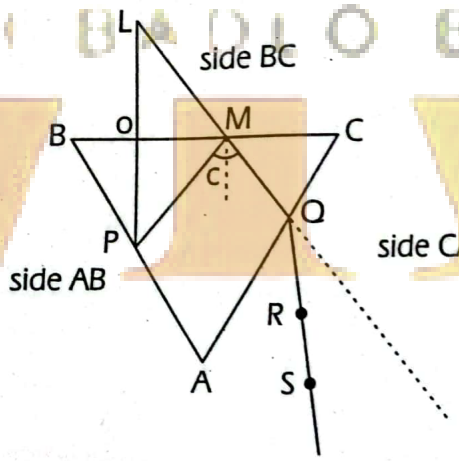
ii) What is the objective of the experiment to verify Ohm's Law? **[1]**

iii) What are the precautions to be taken while performing the experiment to verify Ohm's Law? [1]

SECTION-B

Q2.

A student investigates the critical angle of glass using prism. Figure shows the experimental arrangement.



i) Complete the table. [2]

No.	Angle PMQ	Critical angle C	Refractive Index n
1.	79.5°		
2.	81°		
3.	80.5°		

ii) How do you identify when total internal reflection occurs during the experiment? [1]

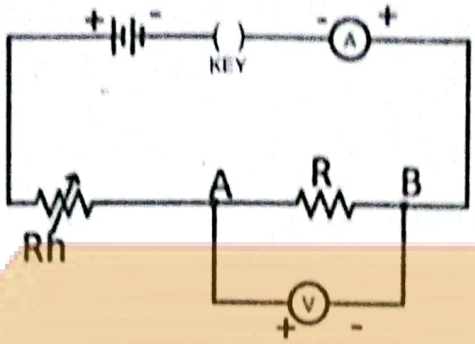
iii) What happens to the refracted ray when the angle of incidence is exactly equal to the critical angle? [1]

ROUGH WORK

SECTION-A

SOLUTION

Q.1 A student investigates to verify Ohm's law (using wire as conductor).He uses battery, voltmeter, ammeter, rheostat and a resistance box in the circuit. Different values obtained by the student are shown in the table below.



i) Complete the table. **[4]**

Ans

No.s	Reading of ammeter $\frac{I}{mA}$	Reading of ammeter $\frac{I}{A}$	Reading of voltmeter $\frac{V}{mV}$	Reading of voltmeter $\frac{V}{Volts}$	Resistance (by Ohm's law) $R = \ldots\ldots\ldots \Omega$
1.	1.5×10^{4}	0.15	8.0×10^{4}	0.8	5.3
2.	1.9×10^{4}	0.19	1.0×10^{4}	1.0	5.2
3.	2.3×10^{4}	0.23	1.2×10^{4}	1.2	5.2

ii) What is the objective of the experiment to verify Ohm's Law? **[1]**

Ans The objective of the experiment is to verify that the current through a wire (conductor) is directly proportional to the voltage across its ends, confirming Ohm's Law. This involves measuring the current for different values of voltage across a wire and plotting a graph of V versus I to check if it is a straight line passing through the origin.

iii) What are the precautions to be taken while performing the experiment to verify Ohm's Law? **[1]**

Ans Precautions to ensure accurate results include:

1. Ensure all connections are tight and secure to avoid fluctuating readings.
2. Keep the wire (conductor) at a constant temperature, as resistance changes with temperature.
3. Adjust the rheostat gradually to prevent sudden changes in current that might damage the apparatus.
4. Use appropriate ranges of the ammeter and voltmeter to avoid overloading the meters.
5. Avoid high currents that could heat the wire, changing its resistance.

SECTION-B

Q2.

A student investigates the critical angle of glass using prism. Figure shows the experimental arrangement.

i) Complete the table. [2]

Ans

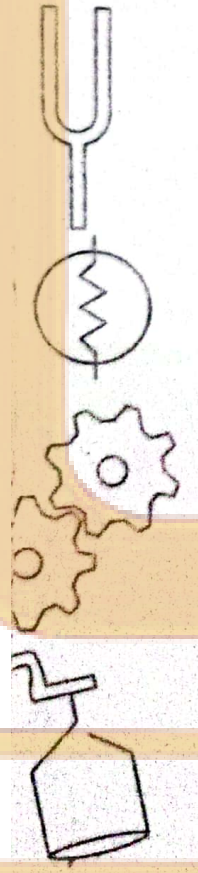
No.	Angle PMQ	Critical angle C	Refractive Index n
1.	79.5°	39.6	1.57
2.	81°	40.5	1.54
3.	80.5°	40.3	1.55

ii) How do you identify when total internal reflection occurs during the experiment? [1]

Ans Total internal reflection occurs when the refracted ray disappears, and all of the light is reflected back into the denser medium (glass). You can observe this by gradually increasing the angle of incidence; at a certain angle, the refracted ray will travel parallel to the surface of the prism, and any further increase will cause total internal reflection.

iii) What happens to the refracted ray when the angle of incidence is exactly equal to the critical angle? [1]

Ans When the angle of incidence is exactly equal to the critical angle, the refracted ray travels along the boundary between the two media (glass and air). This means the refracted ray emerges parallel to the surface, and no light enters the second medium at a downward angle.



MODEL QUESTION PAPER No. 14

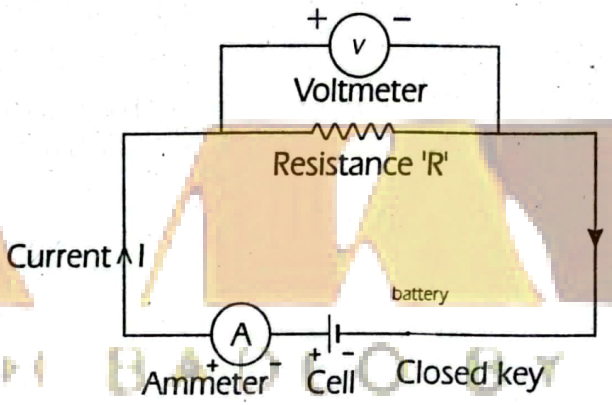
PHYSICS 10th (SSC-II)

PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates to verify Ohm's law (using wire as conductor). He uses battery, voltmeter, ammeter, key and a resistance box in the circuit. Different values obtained by the student are shown in the table below.



i) Complete the table. **[4]**

No.s	Reading of ammeter $\frac{I}{mA}$	Reading of ammeter $\frac{I}{A}$	Reading of voltmeter $\frac{V}{mV}$	Reading of voltmeter $\frac{V}{Volts}$	Resistance (by Ohm's law) $R = \ldots\ldots\ldots \Omega$
1.		0.002			250
2.		0.004			250
3.		0.006			250

ii) What factors affect the time period of a simple pendulum? **[1]**

iii) Why do we use the average of multiple oscillations instead of measuring a single oscillation? [1]

SECTION-B

Q2.

i) A student investigates to verify the truth table of OR, AND, NOT, NOR and NAND gates. He is provided the assembled circuits of the gates as shown in the figure below. [2]

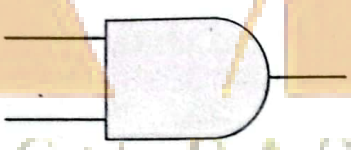


Fig. 14.1

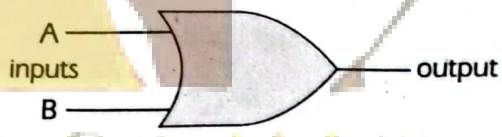


Fig. 14.2

Identify the symbols of the logic circuits in Fig. 14.1 and Fig. 14.2 and complete their truth tables.

Input		Ouput
A	B	Y
0		
1		
0		
1		

Fig. 14.1

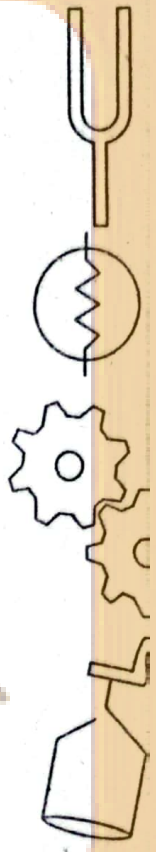
Input		Ouput
A	B	Y
0		
1		
0		
1		

Fig. 14.2

ii) How do you verify the truth table of a NOT gate using a breadboard? [1]

iii) What is the output of a NOR gate when both inputs are 0? [1]

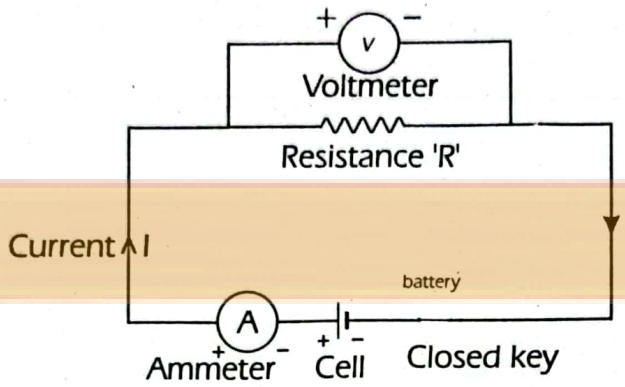
ROUGH WORK



SECTION-A

SOLUTION

Q.1 A student investigates to verify Ohm's law (using wire as conductor). He uses battery, voltmeter, ammeter, key and a resistance box in the circuit. Different values obtained by the student are shown in the table below.



i) Complete the table. **[4]**

Ans

No.s	Reading of ammeter $\frac{I}{mA}$	Reading of ammeter $\frac{I}{A}$	Reading of voltmeter $\frac{V}{mV}$	Reading of voltmeter $\frac{V}{Volts}$	Resistance (by Ohm's law) $R = \ldots\ldots\ldots \Omega$
1.	2	0.002	500	0.5	250
2.	4	0.004	1000	1.0	250
3.	6	0.006	1500	1.5	250

ii) What would happen if the wire (conductor) heats up during the experiment? **[1]**

Ans If the wire heats up during the experiment, its resistance will increase due to the temperature dependence of resistance. This would violate the condition of constant resistance required for Ohm's Law to hold true. As a result, the graph of V versus I might deviate from being a straight line, and the resistance calculated might not remain constant.

iii) How can you ensure that the temperature of the conductor remains constant during the experiment? **[1]**

Ans To ensure constant temperature:

- Use small currents to minimize heating of the conductor.
- Allow the wire to cool between successive readings if necessary.
- Perform the experiment quickly to reduce the chance of significant temperature rise.

SECTION-B

Q.2

i) Identify the symbols of the logic circuits in fig. 14.1 and fig. 14.2 and complete their truth tables. **[2]**

Ans Fig. 14.1. is the symbol of NOR gate and Fig. 14.2 is that of AND gate.

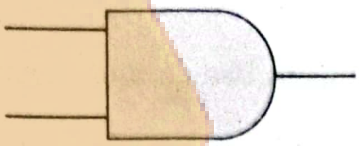


Fig. 14.1

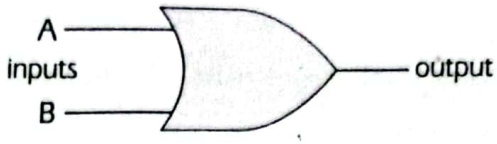


Fig. 14.2

Input		Ouput
A	B	Y
0	0	1
1	0	1
0	1	1
1	1	0

Fig. 14.1 NAND gate

Input		Ouput
A	B	Y
0	0	0
1	0	1
0	1	1
1	1	1

Fig. 14.2 OR GATE

ii) How do you verify the truth table of a NOT gate using a breadboard? **[1]**

Ans To verify the NOT gate:

1. Connect a NOT gate IC to the breadboard.
2. Provide an input (0 or 1) using a switch or button.
3. Measure the output using an LED.
4. When the input is 0, the output should be 1, and when the input is 1, the output should be 0.

iii) What is the output of a NOR gate when both inputs are 0? **[1]**

Ans For a NOR gate, if both inputs are 0, the output will be 1. This is because the NOR gate outputs 1 only when both inputs are 0

MODEL QUESTION PAPER No. 15

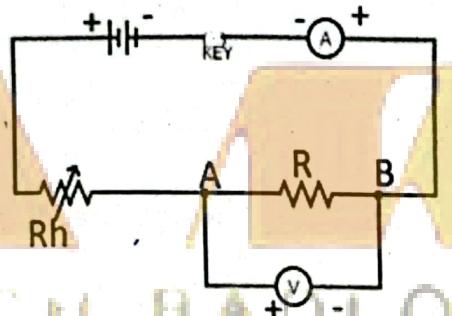
PHYSICS 10th (SSC-II)

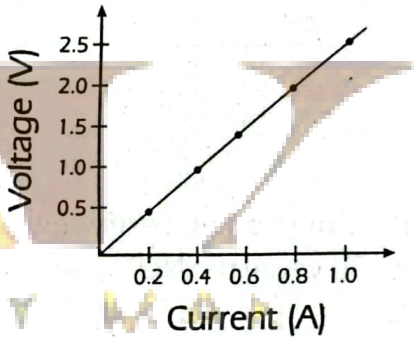
PRACTICAL BASED ASSESSMENT (PBA) (2025)

NOTE: Attempt all questions. Write your answer within the provided space.

SECTION-A

Q1. A student investigates to verify Ohm's law (using wire as conductor). He uses battery, voltmeter, ammeter, rheostat and a resistance box in the circuit. Different values obtained by the student are shown in the table below.





i) Complete the table be checking the values from the graph. **[4]**

No.s	Reading of ammeter $\frac{I}{\mu A}$	Reading of ammeter $\frac{I}{A}$	Reading of voltmeter $\frac{V}{mV}$	Reading of voltmeter $\frac{V}{Volts}$	Resistance (by Ohm's law) R = ... Ω
1.			0.2		
2.			0.4		
3.			0.6		

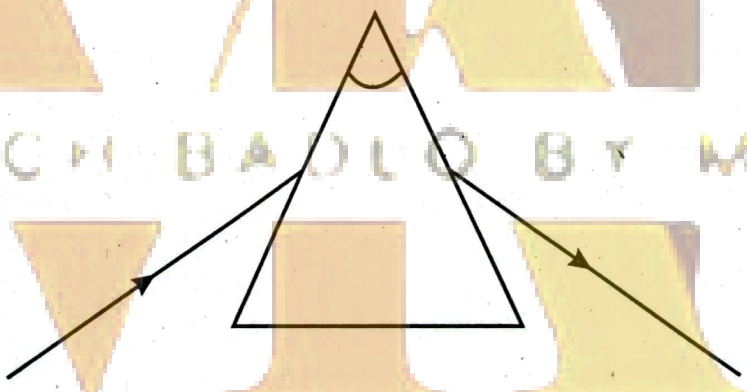
ii) What is the significance of the slope of the V–I graph in the Ohm's Law experiment? **[1]**

iii) If the initial current in the experiment is zero but there is a small voltage present, what could be the reason? [1]

SECTION-B

Q2.

i) A student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Complete and label the diagram. Also label on it the angles $\angle i$, $\angle e$ and $\angle D$. [2]



ii) How is the angle of the prism (apex angle) related to the deviation of light? [1]

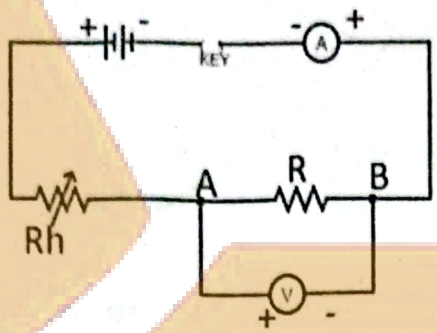
iii) What precautions should be taken during the prism experiment to ensure accurate results? [1]

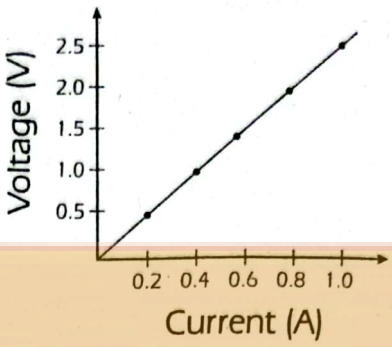
ROUGH WORK

SECTION-A

Q.1 A student investigates to verify Ohm's law (using wire as conductor). He uses battery, voltmeter, ammeter, rheostat and a resistance box in the circuit. Different values obtained by the student are shown in the table below.

SOLUTION





i) Complete the table be checking the values from the graph. [4]

Ans

No.s	Reading of ammeter $\frac{I}{\mu A}$	Reading of ammeter $\frac{I}{A}$	Reading of voltmeter $\frac{V}{mV}$	Reading of voltmeter $\frac{V}{Volts}$	Resistance (by Ohm's law) R = ... Ω
1.	2×10^5	0.2	500	0.5	2.5
2.	2×10^5	0.4	1000	1.0	2.5
3.	2×10^5	0.6	1500	1.5	2.5

ii) What is the significance of the slope of the V–I graph in the Ohm's Law experiment? [1]

Ans The slope of the V–I graph represents the resistance R of the conductor. Mathematically, the slope is:

$$\text{Slope} = \frac{V}{I} = R$$

Thus, the steeper the slope, the higher the resistance of the conductor. The slope is constant for a conductor obeying Ohm's Law.

iii) If the initial current in the experiment is zero but there is a small voltage present, what could be the reason? [1]

Ans If there is a small voltage present when the current is zero, this could be due to:

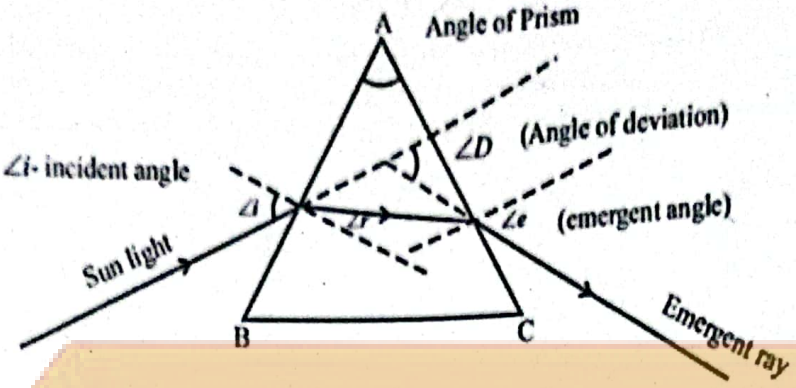
- The internal resistance of the voltmeter,
- A contact potential difference in the circuit,
- Loose or imperfect connections in the circuit.
- Ensuring proper connections and using a well-calibrated voltmeter can help minimize such issues.

SECTION-B

Q2.

i) A student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Complete and label the diagram. Also label on it the angles ∠*i*, ∠*e* and ∠D. [2]

Ans



ii) How is the angle of the prism (apex angle) related to the deviation of light? **[1]**

Ans The angle of the prism (apex angle) influences the amount of deviation. A larger apex angle causes more significant bending of light rays, leading to a larger angle of deviation. The refractive index and the angle of incidence also affect the deviation.

iii) What precautions should be taken during the prism experiment to ensure accurate results? **[1]**

Ans Precautions include:

1. Ensuring the prism is placed steadily on the paper without tilting.
2. Using pins to precisely trace the path of the incident and emergent rays.
3. Aligning the incident ray at a known angle using a protractor for accurate angle measurement.
4. Minimizing parallax error when marking points and measuring angles.
5. Performing the experiment in a well-lit area to clearly observe the refracted rays.