

**SUBJECT - PHYSICS SUB. CODE 40****INSTRUCTIONS FOR PRACTICAL EXAMINATION - 2022****अंक विभाजन व समय विभाजन – (Marking distribution & time distribution)**कुल समय : 3 घंटे  
Exam. time : 3 hours.कुल पूर्णांक : 30  
Maximum marks : 30

	विभिन्न अभ्यास Different Exercise	समय Time	अंक विभाजन Marks Distribution
1.	एक वृहद प्रयोग One Major Experiment	90 मिनट	10
2.	दो क्रियाकलाप Two Activities	60 मिनट	2x4=8
3.	परियोजनाएं/ प्रदर्शन Projects/ Demonstration		4
4.	प्रायोगिक रिकॉर्ड Practical Record	30 मिनट	4
5.	प्रायोगिक क्रियाकलाप (मौखिक) Viva voce		4
			<b>कुल अंक 30</b>

**SUBJECT - PHYSICS****(A) INSTRUCTIONS FOR MAJOR EXPERIMENT**

- 1- Major experiment will be given through By lot method. For this according the number of students prescribed in the batch, the experiment should be written in advance in the answer books and should be allotted to the candidates by the lottery system.
- 2- An experiment, as far as possible, should be given to only one candidate in each batch at a time. Therefore, according to the number of students in a batch, the number of experiments available in the laboratory should be decided in the beginning itself.
- 3- If the allotted experiment has been written by the candidates in his experimental record, it should be changed as soon possible and if necessary, the experiment can be changed only once depending on the lottery system by deducting 2 marks.
- 4- If equipment is not available in the laboratory for any experiment, it can be changed without deducting the experiment.
- 5- The time period not exceeding 90 minutes should be given to complete the Major experiment.
- 6- Major experiment should be written under the following headings
  - (a) Nominated picture, showing the direction of a light beam or current.
  - (b) It is also necessary to give the units in which the signs and symbols are measured, explaining the meaning of the signs used in the principles and formulas.
  - (c) The observation should be according to the number given in the question of experiment. Overwriting should be avoided in writing the observation. One of the observations taken must be checked to the examiner.
  - (d) In the event of drawing of the chart, scale must be mentioned on the graph. Graph should be made, based on the observations taken, and the conclusion obtained from the graph should be expressed in words.
  - (e) Write the correct value obtained from the observation in the formula given under the calculation and correct calculation should be done till the last term to get the result.
  - (f) Result should be written with the unit in SI system.
  - (g) The reasons for precautions and errors should be described briefly in the required no.



- 7- In the event of an observation is not being signed by examiner in the major experiment, the experiment will be considered incomplete and if the experiment is incomplete, only 50 per cent marks can be awarded for writing picture and formulas.
- 8- In the practical exam, the information about division of marks should be given by the examiner to the candidate and it is also necessary to write it on the blackboard.
- 9- Examinee should not talk to each other at all during the examination. The examinee should not leave the laboratory till the end of the examination.
- 10- Examinee should follow the guideline of the SOP for the covid-19.

**(B) Instructions related to the Activity**

- 1- One equipment should be given to a single candidate. Therefore, the equipment should be arranged according to the prescribed number of students in a batch.
- 2- In each batch, the work to be done under the activities for the student should be communicated to the candidate in advance by the examiner and it should be written on the blackboard.
- 3- 30 minutes are scheduled to complete an activity. After completion of the time period, the candidate has to proceed to the activity of the next section. Thus each candidate is required to complete two activities within the prescribed time period of 60 minutes. In this case, it will not be possible to extend the time period.
- 4- On completion of the work described in each activity, it is necessary the observation to be checked by the examiner. Therefore, every candidate should get sign the observation taken in the activity by examiner. It is necessary to visit and sign the observation taken by all the candidates of the batch within 30 minutes of the time prescribed by the examiner.

**(C) Instructions related to the Practical Record**

In the practical session related to the practical record, the marks of the record for the practical work done by the candidate will be given on the following basis.

(1) Neat and clean and clear written record	1 mark
(2) Regularity in checking of record	1 mark
(3) Adequate number of major experiments and activities done by student	2 mark

**(D) Instructions related to the Viva**

Student will be asked the questions related to the major experiments and activities given to them by examiner.

**(E) General Instructions for the candidates**

- 1- Action will be taken as per rules by the candidate using improper means.
- 2- Do not interact during the examination. If you experience any difficulty, contact the lab assistant / internal examiner or external examiner directly.
- 3- Write all the entries in the booklet with ballpen or ink pen, do not write with pencil.
- 4- Use of mobile phones, calculators and electronic gadgets is not allowed.
- 5- Leave the lab in the end of the examination and handover the answer book to the examiner only at the end of the examination.

**(F) Instructions for the school head for the practical examination**

- 1- Provide three copies of the batch of candidates appearing in the practical examination to the examiner.
- 2- The list of experiments conducted by the candidates in the school and the materials and equipment required for the experiments described in the syllabus should be made available in the laboratory and the number of experiments should be equal to the number of candidates taken in the batch.
- 3- Verify the number of candidates present in each of candidates daily.
- 4- Students should not use mobile phones during exam time.



**(G) Instructions for the examiner / laboratory assistant  
in charge of the practical examination**

- 1- The teacher / lab assistant incharge should check that the necessary equipment used in the practical examination is available in the laboratory and working properly.
- 2- Before the commencement of the experimental examination, collect the records of the students present in the batch and make it available to the examiner.
- 3- After the end of the examination, the stamping the graph paper, drawing sheets etc., used by the candidates should be inserted in the middle of the answer book and the supplementary answer book behind it.
- 4- The same answer book should be used for the practical examination, if necessary, the second answer book should be used as a supplementary answer book.

**Special Instruction :-** In the Covid-19 Perspective In this academic session 2021-22, every student has to perform & to write down in the record at last 8 major experiments (4 from each section) and 4 activities (2 from each section)

**(क) वृहद् प्रयोग सम्बन्धी निर्देश**

1. वृहद् प्रयोग भाग्य प्रणाली (By lot) से दिये जायेंगे। इसके लिये बैच में निर्धारित छात्र संख्या के अनुसार पूर्व में ही उत्तर पुस्तिकाओं में प्रयोग लिखा जाकर भाग्य प्रणाली द्वारा परीक्षार्थियों को आवंटित किया जाये।
2. यथा संभव एक प्रयोग, प्रत्येक बैच में एक ही परीक्षार्थी को दिया जाये। अतः एक बैच में निर्धारित छात्र संख्या के अनुसार प्रयोगशाला में उपलब्ध प्रयोगों की संख्या का निर्धारण प्रारम्भ में ही कर लिया जाये।
3. आवंटित प्रयोग को यदि परीक्षार्थियों द्वारा प्रायोगिक रिकॉर्ड में लिखा गया है तो यथासम्भव उसे नहीं बदला जाये तथा अति आवश्यक होने पर 2 अंक काटकर भाग्य प्रणाली के आधार पर प्रयोग को केवल एक बार बदला जा सकेगा।
4. यदि प्रयोगशाला में किसी प्रयोग के लिए उपकरण उपलब्ध नहीं है तो प्रयोग बिना अंक काट उसे बदला जा सकेगा।
5. वृहद् प्रयोग को पूरा करने के लिये निर्धारित समयावधि 150 मिनट से अधिक समय नहीं दिया जाये।
6. वृहद् प्रयोग नमन शीर्षकों के अन्तर्गत लिखा जाये—
  - (अ) नामांकित चित्र, प्रकाश किरण अथवा धारा की दिशा दर्शाते हुए।
  - (ब) सिद्धान्त व नियम सूत्र में प्रयुक्त संकेतों का अर्थ स्पष्ट करते हुये, जिन मात्रकों में संकेत मापे जाते हैं उन्हें देना भी आवश्यक है।
  - (स) प्रेक्षण (तालिकाबद्ध) मय इकाई लिखे जाने चाहिये। इनकी संख्या प्रयोग में वर्णित संख्या के अनुसार हो तथा एक प्रेक्षण के ऊपर दूसरा प्रेक्षण नहीं लिखा जाना चाहिये। लिये गये प्रेक्षणों में से एक प्रेक्षण परीक्षक को दिखलाया जाना आवश्यक है।
  - (द) लेखाचित्र खींचने की स्थिति में पैमाने के निर्धारण को अंकित कर, लिये गये प्रेक्षणों के आधार पर लेखाचित्र बनाया जाये तथा उससे प्राप्त निष्कर्षों को शब्दों में व्यक्त किया जाना चाहिये।
  - (य) गणना के अन्तर्गत दिये गये सूत्र में प्रेक्षण से प्राप्त सही मान लिखें तथा परिणाम प्राप्त करने के लिये अंतिम पद तक सही गणना की जाये।
  - (र) परिणाम SI मात्रक सहित लिखा जाये।
  - (ल) सावधानियाँ एवं त्रुटियों के कारण संक्षिप्त में वर्णित किये जाये।
7. प्रयोग करते समय एक प्रेक्षण परीक्षक को दिखलाकर हस्ताक्षरित न कराने की स्थिति में प्रयोग अपूर्ण माना जायेगा तथा प्रयोग अपूर्ण होने पर चित्र एवं सूत्रों के लिखने पर अधिकतम 50 प्रतिशत अंक ही दिये जा सकेंगे।
8. प्रयोग के अन्तर्गत अंक विभाजन की जानकारी परीक्षक द्वारा परीक्षार्थी को आवश्यक रूप से दी जाये तथा इसे श्यामपट्ट पर भी अंकित किया जाना आवश्यक है।
9. परीक्षा के दौरान परीक्षार्थी आपस में बिलकुल बात न करें। परीक्षार्थी, परीक्षा की समाप्ति तक प्रयोगशाला को छोड़कर न जाये।

**(ख) क्रियाकलाप सम्बन्धी निर्देश**

1. एक उपकरण एक ही परीक्षार्थी को दिया जावे। अतः एक बैच में निर्धारित छात्र संख्या के अनुसार ही उपकरण व्यवस्थित किये जावे।
2. प्रत्येक बैच में छात्र/छात्रा द्वारा क्रियाकलाप के अन्तर्गत किये जाने वाले कार्यों को परीक्षक द्वारा परीक्षार्थी को पूर्व में ही बतलाया जाना चाहिये एवं इसे श्याम पट्ट पर अंकित किया जाना चाहिये।
3. एक क्रियाकलाप को पूरा करने के लिये 30 मिनट का समय निर्धारित है। समय अवधि पूरी होने पर घंटी के बजने पर परीक्षार्थी को अगले अनुभाग के क्रियाकलाप पर जाना है। इस प्रकार निर्धारित समय अवधि 60 मिनट में प्रत्येक परीक्षार्थी को दो क्रियाकलाप (प्रत्येक अनुभाग से एक) पूरा करना आवश्यक है। इसमें किसी भी स्थिति में समयावधि बढ़ाया जाना सम्भव नहीं होगा। एक क्रियाकलाप की अवधि में दूसरा क्रियाकलाप प्रारम्भ नहीं करें।



## वृहद प्रयोगों की सूची (List of Major Experiments)

### भाग — अ SECTION -A

- प्र.1 विभवांतर तथा विद्युतधारा के बीच ग्राफ आलेखित करके दिए गए तार का प्रति एकांक लंबाई का प्रतिरोध ज्ञात करना। (6 प्रेक्षण)  
E1 To determine resistance per unit length of a given wire by plotting a graph of potential difference versus current.
- प्र.2 मीटर सेतु के उपयोग से दिए गए तार का प्रतिरोध ज्ञात करके तार के पदार्थ की प्रतिरोधकता (विशिष्ट प्रतिरोध) ज्ञात करना। (6 प्रेक्षण)  
E2 To determine the resistance of a given wire using a metre bridge and hence determine the resistivity of the material of the wire.
- प्र.3 मीटर सेतु द्वारा प्रतिरोधकों के श्रेणी क्रम संयोजन नियम का सत्यापन करना (अलग-अलग लम्बाई के 2 प्रतिरोध तारों से प्रत्येक तार के लिए दो प्रेक्षण लेवें)।  
E3 To verify the laws of series combination of resistances using a metre bridge.
- प्र.4 मीटर सेतु द्वारा प्रतिरोधकों के पार्श्व क्रम संयोजन नियम का सत्यापन करना (अलग-अलग लम्बाई के 2 प्रतिरोध तारों से प्रत्येक तार के लिए दो प्रेक्षण लेवें)।  
E4 To verify the laws of parallel combination of resistances using a metre bridge.
- प्र.5 पोर्टेशियोमीटर द्वारा दो प्राथमिक सेलों (डेन्यल तथा लैक्लांशो सेल) के विद्युत वाहक बल की तुलना करना। (6 प्रेक्षण)  
E5 To compare the emf of two given primary cells (Daniel and Leclanche cells) using a potentiometer.
- प्र.6 पोर्टेशियोमीटर द्वारा दिये गये प्राथमिक सेल का आंतरिक प्रतिरोध ज्ञात करना। (6 प्रेक्षण)  
E6 To determine the internal resistance of a given primary cell using a potentiometer.
- प्र.7 अर्ध-विक्षेप विधि द्वारा गैल्वनोमीटर का प्रतिरोध ज्ञात करना तथा इसका दक्षतांक परिकलित करना। (6 प्रेक्षण)  
E7 To determine the resistance of a galvanometer by half deflection method and to find its figure of merit.
- प्र.8 (i) दिये गये गैल्वनोमीटर (ज्ञात प्रतिरोध तथा दक्षतांक का) को वांछित परिसर के ऐमीटर में परिवर्तित करना तथा इनका सत्यापन करना। (6 प्रेक्षण)  
(ii) दिये गये गैल्वनोमीटर (ज्ञात प्रतिरोध तथा दक्षतांक का) को वांछित परिसर के वोल्टमीटर में परिवर्तित करना तथा इनका सत्यापन करना। (6 प्रेक्षण)  
E8 (i) To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of a desired range.  
(ii) To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of a desired range.
- प्र.9 सोनोमीटर तथा विद्युत चुंबक द्वारा प्रत्यावर्ती धारा की आवृत्ति ज्ञात करना। (6 प्रेक्षण)  
E9 To determine the frequency of alternating current using a sonometer and an electromagnet.



### वृहद प्रयोगों की सूची (List of Major Experiments)

#### भाग – ब SECTION -B

- प्र.10 अवतल दर्पण में ' $u$ ' के विभिन्न मानों के लिए ' $v$ ' के मान ज्ञात करना तथा इसकी फोकस दूरी ज्ञात करना। (6 प्रेक्षण)  
E10 To find the value of ' $v$ ' for different values of ' $u$ ' in case of concave mirror and to find the focal length.
- प्र.11  $u$  तथा  $v$  अथवा  $1/u$  तथा  $1/v$  के बीच ग्राफ आलेखित करके उत्तल लेंस की फोकस दूरी ज्ञात करना। (6 प्रेक्षण)  
E11 To find the focal length of a convex lens by plotting graphs between  $u$  and  $v$  or between  $1/u$  and  $1/v$ .
- प्र.12 उत्तल लेंस की सहायता से उत्तल दर्पण की फोकस दूरी ज्ञात करना। (6 प्रेक्षण)  
E12 To find the focal length of a convex mirror using a convex lens.
- प्र.13 किसी अवतल लेंस की फोकस दूरी उत्तल लेंस की सहायता से ज्ञात करना। (6 प्रेक्षण)  
E13 To find the focal length of a concave lens with the help of a convex lens.
- प्र.14 आपतन कोण तथा विचलन कोण के बीच ग्राफ आरेखित करके किसी दिये गये प्रिज्म के लिए अल्पतम विचलन कोण ज्ञात करना। (6 प्रेक्षण)  
E14 To determine the angle of minimum deviation for a given glass prism by plotting a graph between the angle of incidence and the angle of deviation.
- प्र.15 चल सूक्ष्मदर्शी द्वारा किसी काँच के स्लैब का अपवर्तनांक ज्ञात करना। (3 प्रेक्षण)  
E15 To determine refractive index of a glass slab using a travelling microscope.
- प्र.16 अवतल दर्पण का उपयोग करके किसी द्रव (जल) का अपवर्तनांक ज्ञात करना। (6 प्रेक्षण)  
E16 To determine the refractive index of a liquid (water) using concave mirror.
- प्र.17 उत्तल लेंस एवं समतल दर्पण का उपयोग करके किसी द्रव (जल) का अपवर्तनांक ज्ञात करना। (6 प्रेक्षण)  
E17 To determine the refractive index of a liquid (water) using convex lens and a plane mirror.
- प्र.18 अग्रदिशिक बायस तथा पश्चदिशिक बायस में किसी  $p-n$  संधि के लिए  $I-V$  अभिलाक्षणिक वक्र आरेखित करना। (6 प्रेक्षण)  
E18 To draw the  $I-V$  characteristic curves of a  $p-n$  junction in forward bias and reverse bias.
- प्र.19 जीनर डायोड के अभिलाक्षणिक वक्र को आलेखित करना तथा इसकी प्रतीप भंजन वोल्टता ज्ञात करना। (6 प्रेक्षण)  
E19 To draw the characteristic curve of a Zener diode and to determine its reverse breakdown voltage.
- प्र.20 उभयनिष्ठ उत्सर्जक  $n-p-n$  (अथवा  $p-n-p$ ) विन्यास वाले ट्रांजिस्टर के अभिलाक्षणिक का अध्ययन करना तथा धारा एवं वोल्टता लब्धि के मानों को ज्ञात करना। (6 प्रेक्षण)  
E20 To study the characteristics of a common emitter  $n-p-n$  (or  $p-n-p$ ) transistor and to find out the values of current and voltage gains.



## क्रियाकलाप ACTIVITIES

### भाग — अ SECTION -A

क्रि.1 किसी विद्युत परिपथ के घटकों का समुच्चयन करना।

A1 To assemble the components of a given electrical circuit.

क्रि.2 एक बैटरी, प्रतिरोधक/धारा नियंत्रक, कुंजी, ऐमीटर तथा वोल्टमीटर- कम से कम इन अवयवों को समाविष्ट करते हुए एक खुले परिपथ का आरेख बनाना। जो घटक उचित क्रम में संयोजित नहीं किये गये हैं, उन्हें चिह्नित कीजिए तथा परिपथ एवं परिपथ आरेख को ठीक कीजिए।

A2 To draw the diagram of given open circuit comprising at least a battery, resistor/ rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.

क्रि.3 किसी प्रेरक का लोह-क्रोड सहित अथवा उसके बगैर प्रतिरोध तथा प्रतिबाधा मापना।

A3 To measure the resistance and impedance of an inductor with or without iron core.

क्रि.4 बहुलमापी (मल्टीमीटर) का उपयोग करके किसी विद्युत परिपथ में प्रतिरोध, वोल्टता (ac/dc), धारा (dc) मापना तथा किसी दिये गये परिपथ के सांतत्य की जाँच करना।

A4 To measure resistance, voltage (dc/ac), current (dc) and check continuity of a given circuit using a multimeter.

क्रि.5 एक घरेलू विद्युत परिपथ का समुच्चयन करना जिसमें तीन बल्ब, तीन ऑन/ऑफ स्विच, एक फ्यूज, एक शक्ति का स्रोत लगे हों।

A5 To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.

क्रि.6 अपरिवर्ती धारा के लिए किसी तार की लंबाई के साथ विभवपात में होने वाले परिवर्तन का अध्ययन करना।

A6 To study the variation in potential drop with length of a wire for a steady current.

### भाग — ब SECTION -B

1. LDR (Light Dependent Resistor, प्रकाश आश्रित प्रतिरोधक) पर प्रकाश की तीव्रता के प्रभाव का अध्ययन करना (स्रोत की दूरी को परिवर्तित करके)।

1. To study the effect of intensity of light (by varying distance of the source) on a LDR (Light Dependent Resistor).

2. डायोड, प्रकाश उत्सर्जक डायोड (LED), ट्रांजिस्टर, एकीकृत परिपथ (IC), प्रतिरोधक तथा संधारित्र को उनके मिश्रित संग्रह में से अभिनिर्धारित करना।

2. To identify a diode, a LED, a transistor, an IC, a resistor and a capacitor from a mixed collection of such items.



3. मल्टीमीटर का उपयोग -

- (A) जाँच करना कि डायोड चालू अवस्था में है तथा इससे बहने वाली विद्युत धारा के एकदिशीय प्रवाह की जाँच करना;
- (B) किसी ट्रांजिस्टर का उत्सर्जक, आधार तथा संग्राहक की पहचान करना;
- (C) n-p-n तथा p-n-p ट्रांजिस्टरों में अंतर करना; तथा जाँच करना कि ट्रांजिस्टर चालू अवस्था में है अथवा नहीं।

3. Use of Multi-meter to

- (A) check whether the diode is in working order and to check unidirectional flow of current in a diode;
- (B) identify emitter, base collector of a transistor;
- (C) distinguish between n-p-n and p-n-p transistors and check whether the transistor is in working order.

4. काँच के स्लैब पर तिर्यक आपतित होने वाले प्रकाश किरण पुंज के अपवर्तन तथा पार्श्विक विस्थापन का प्रेक्षण करना।

4. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.

5. दो पोलैराइडों का उपयोग करके प्रकाश के ध्रुवण का प्रेक्षण करना।

5. To observe polarization of light using two Polaroid's.

6. एक संकीर्ण झिरी द्वारा प्रकाश के विवर्तन का प्रेक्षण करना।

6. To observe diffraction of light due to a thin slit.

7. मोमबत्ती तथा परदे का उपयोग करके उत्तल लेंस द्वारा परदे पर बनाये गये प्रतिबिंब की प्रकृति तथा आकार का अध्ययन करना (लेंस/दर्पण से मोमबत्ती की विभिन्न दूरियों के लिए)

7. To study the nature and size of the image formed by a convex lens on a screen by using a candle and a screen (for different distances of the candle from the lens / mirror).

8. मोमबत्ती तथा परदे का उपयोग करके अवतल दर्पण द्वारा परदे पर बनाये गये प्रतिबिंब की प्रकृति तथा आकार का अध्ययन करना (लेंस/दर्पण से मोमबत्ती की विभिन्न दूरियों के लिए)

8. To study the nature and size of the image formed by a concave mirror on a screen by using a candle and a screen (for different distances of the candle from the lens/ mirror).

9. लेंसों के दिये गये समुच्चय से दो लेंसों का उपयोग करके विशिष्ट फोकस दूरी का लेंसों का संयोजन प्राप्त करना।

9. To obtain a lens combination with specified focal length by using two lenses from a given set of lenses.



# प्रयोग संख्या / Experiment No. 1

3

Date  -  -

## उद्देश्य (Object)

To determine the resistance and resistivity of a given wire by plotting a graph b/w potential difference and current.

Apparatus: An ammeter, a voltmeter, given resistance wire, a rheostat, screw gauge, a battery, a key and connecting wire etc.

## सिद्धान्त अथवा सूत्र (Theory or Formula)

Acc. to Ohm's law - The current flowing in a conductor is directly proportional to the potential difference across it, provided the physical conditions (temp., dimensions etc.) remain unchanged. That means,

$$I \propto V$$

$$V = RI$$

where  $R$  is proportionally constant gives the resistance of the conductor. From the above relation,

$$R = \frac{V}{I} \text{ (ohm).}$$

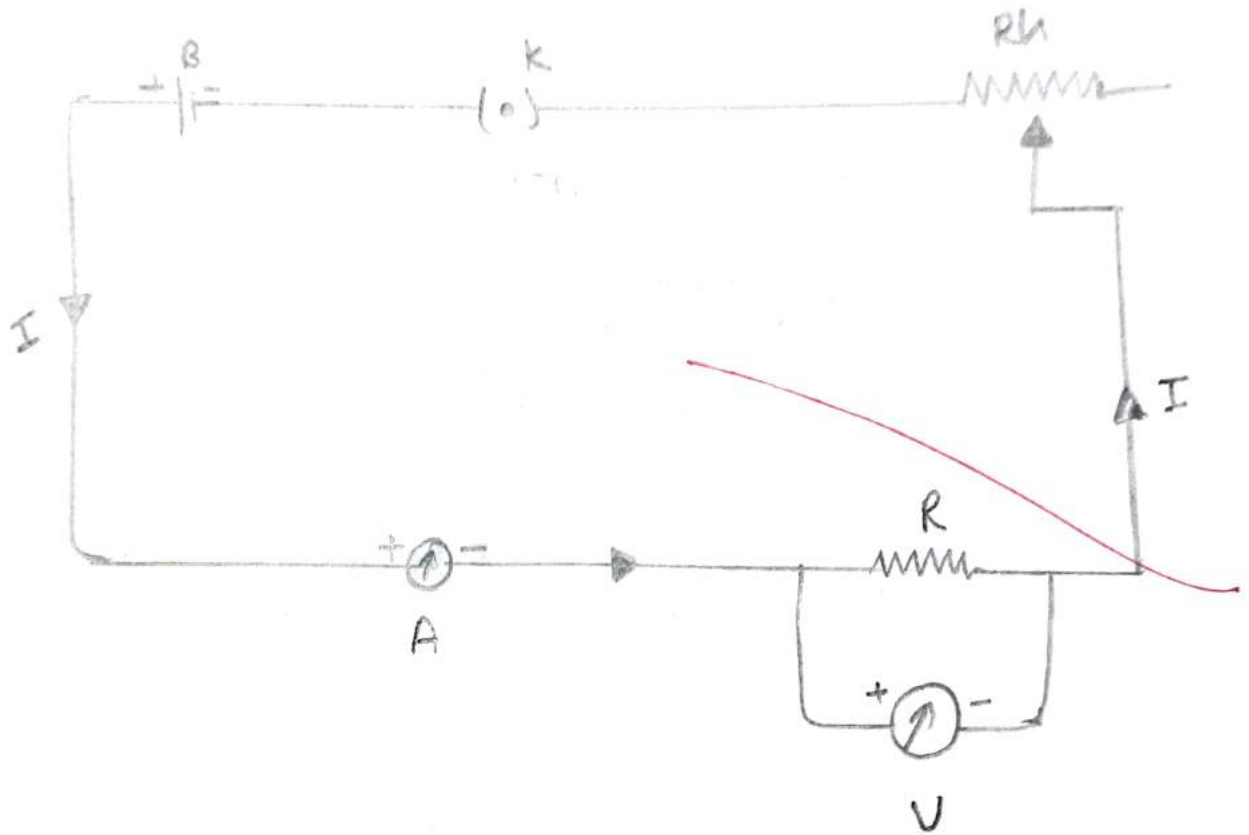
The graph b/w  $V$  (on x-axis) and  $I$  (on y-axis) is obtained as straight line.

If the length of the given wire is  $l$  m and radius  $r$  m then the resistivity of the material of the wire.

$$\rho = \frac{RA}{l} = \frac{R\pi r^2}{l}$$



नामांकित चित्र (Labelled Diagram)





## गणना (Calculation)

1. For the first set,  $V = 0.25$  volt,  $I = 0.25$  amp.

$$\text{So, } R_1 = \frac{V}{I} = \frac{0.25}{0.25} = 1.0 \text{ ohm.}$$

2. For second set,  $V = 0.5$  volt,  $I = 0.45$  amp.

$$\text{So, } R_2 = \frac{V}{I} = \frac{0.5}{0.45} = 1.11 \text{ ohm.}$$

3. For third set,  $V = 0.75$  volt,  $I = 0.70$  amp.

$$\text{So, } R_3 = \frac{V}{I} = \frac{0.75}{0.70} = 1.07 \text{ ohm.}$$

4. For fourth set,  $V = 1$  volt,  $I = 0.95$  amp.

$$\text{So, } R_4 = \frac{V}{I} = \frac{1}{0.95} = 1.05 \text{ ohm.}$$

5. For fifth set,  $V = 1.25$  volt,  $I = 1.2$  amp.

$$\text{So, } R_5 = \frac{V}{I} = \frac{1.25}{1.20} = 1.04 \text{ ohm.}$$

6. The mean resistance of wire,  $R = \frac{R_1 + R_2 + R_3 + R_4 + R_5}{5}$

$$= \frac{1 + 1.11 + 1.07 + 1.05 + 1.04}{5}$$

$$= 1.054 \text{ ohm.}$$

Resistance of conductor from graph.

$$R = \frac{\Delta V}{\Delta I} = \frac{0.3125}{0.3} = 1.041 \text{ ohm.}$$



Date  -  - 

### प्रेक्षण व प्रेक्षण सारणी (Observation And Observation Table)

The length of given resistance wire  $l = 20$  cm.  
 least count of voltmeter =  $\frac{\text{Range}}{\text{No. of div.}} = \frac{8}{60} = 0.05$  volt.

least count of Ammeter =  $\frac{\text{Range}}{\text{No. of div.}} = \frac{3}{60} = 0.05$  amp.

Observation Table for resistance.

S.No.	Voltmeter Reading V		Ammeter Reading I		Resistance of wire $R = \frac{V}{I}$ ( $\Omega$ )	Mean value of resistance R ( $\Omega$ )
	No. of deflected divisions (n <sub>1</sub> )	count = $V$ (volt)	No. of deflected divisions (n <sub>2</sub> )	count = $I$ (amp)		
1.	5	0.25	5	0.25	$R_1 = 1.00$	
2.	10	0.50	9	0.45	$R_2 = 1.11$	
3.	15	0.75	14	0.70	$R_3 = 1.07$	1.054
4.	20	1.00	19	0.95	$R_4 = 1.05$	
5.	25	1.25	24	1.20	$R_5 = 1.04$	

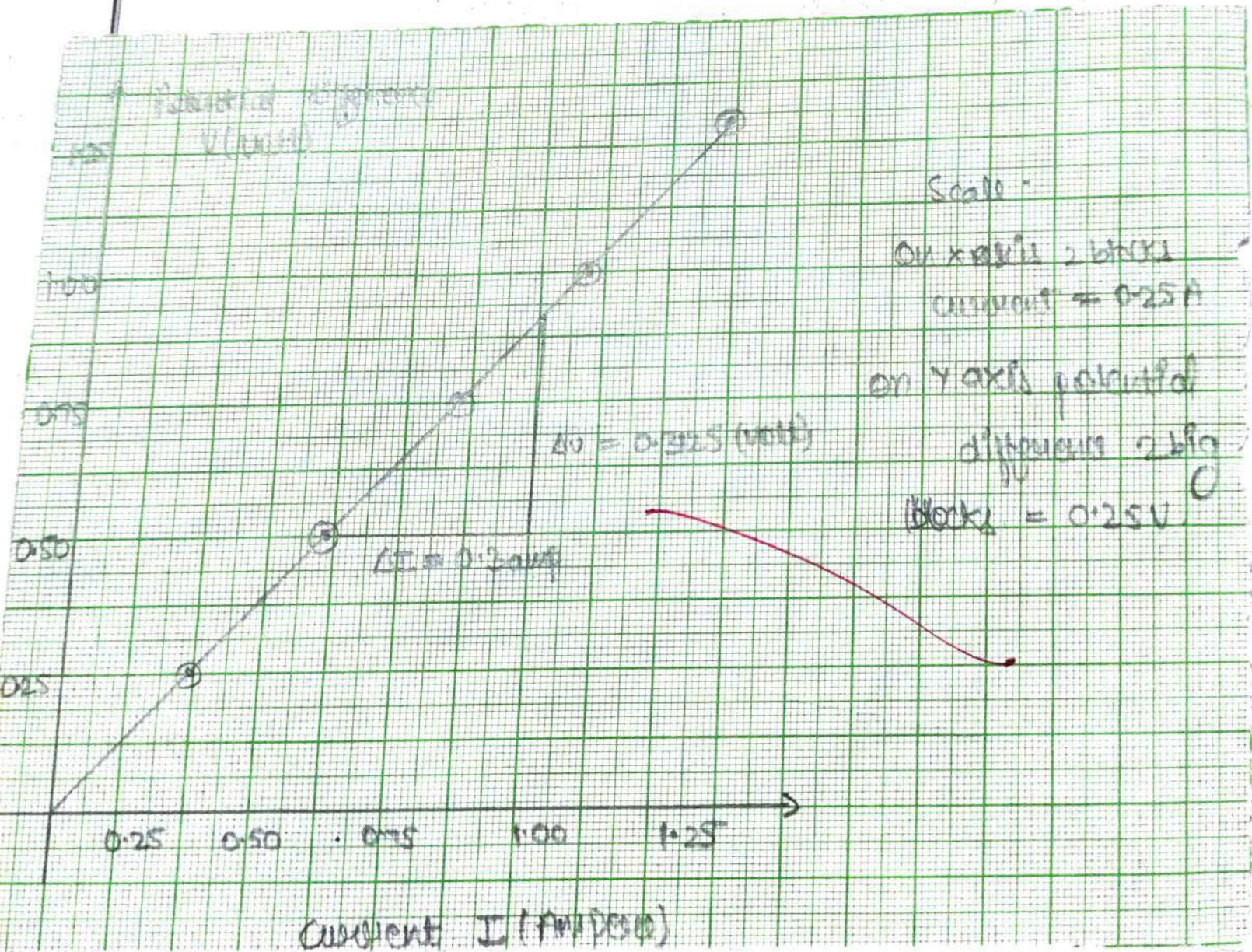
Radius of wire : Diameter of wire = Reading of main scale + corresponding sign on circular scale  $\times$  least count =  $0 + 30 \times 0.001 = 0.030$  cm.



Resistivity of the wire,  $\rho = \frac{RT\alpha^2}{l}$

$$= \frac{1.054 \times 3.14 \times 1.5 \times 10^{-4} \times 1.5 \times 10^{-4}}{0.20}$$

$$= \frac{7.4 \times 10^{-8}}{0.20} = 37.2 \times 10^{-8} \text{ ohm.}$$





Date  -  - 

### परिणाम (Result)

1. From the observation table, it is clear that the current is linearly related to the potential difference.
2. Resistance of the given wire from the observation table:  $R = 1.054 \Omega$
3. Resistance of the given wire from the graph,  $R = 1.041 \Omega$ .
4. Resistivity or specific resistance of the given wire =  $37.2 \times 10^{-8} \Omega \text{m} \times \text{m}$ .

### सावधानियाँ (Precautions)

1. The connection should be tight.
2. Too high currents should not be drawn from the battery and short circuiting must be avoided.
3. A low resistance rheostat should be used.
4. Voltmeter and ammeter should be of proper range and connected in proper order.
5. The key should be an only while taking observation.

Teacher's Signature.....



Date  -  -

**उद्देश्य (Object)**

To find resistance of given wire using meterbridge and determine its specific resistance of its material.

**Apparatus:** A meter bridge, a Leclanche cell or battery, a galvanometer, a resistance box, experimental resistance wire, key, connecting wires etc.

**सिद्धान्त अथवा सूत्र (Theory or Formula)**

1. Meter Bridge works on principle of wheatstone bridge. At the balancing condition of wheatstone bridge unknown resistance  $S = \frac{Q}{P} \times R$ .

The value of unknown resistance can be determined in the balancing condition of a meterbridge using the following formula -

$$S = \left( \frac{100 - l}{l} \right) \times R.$$

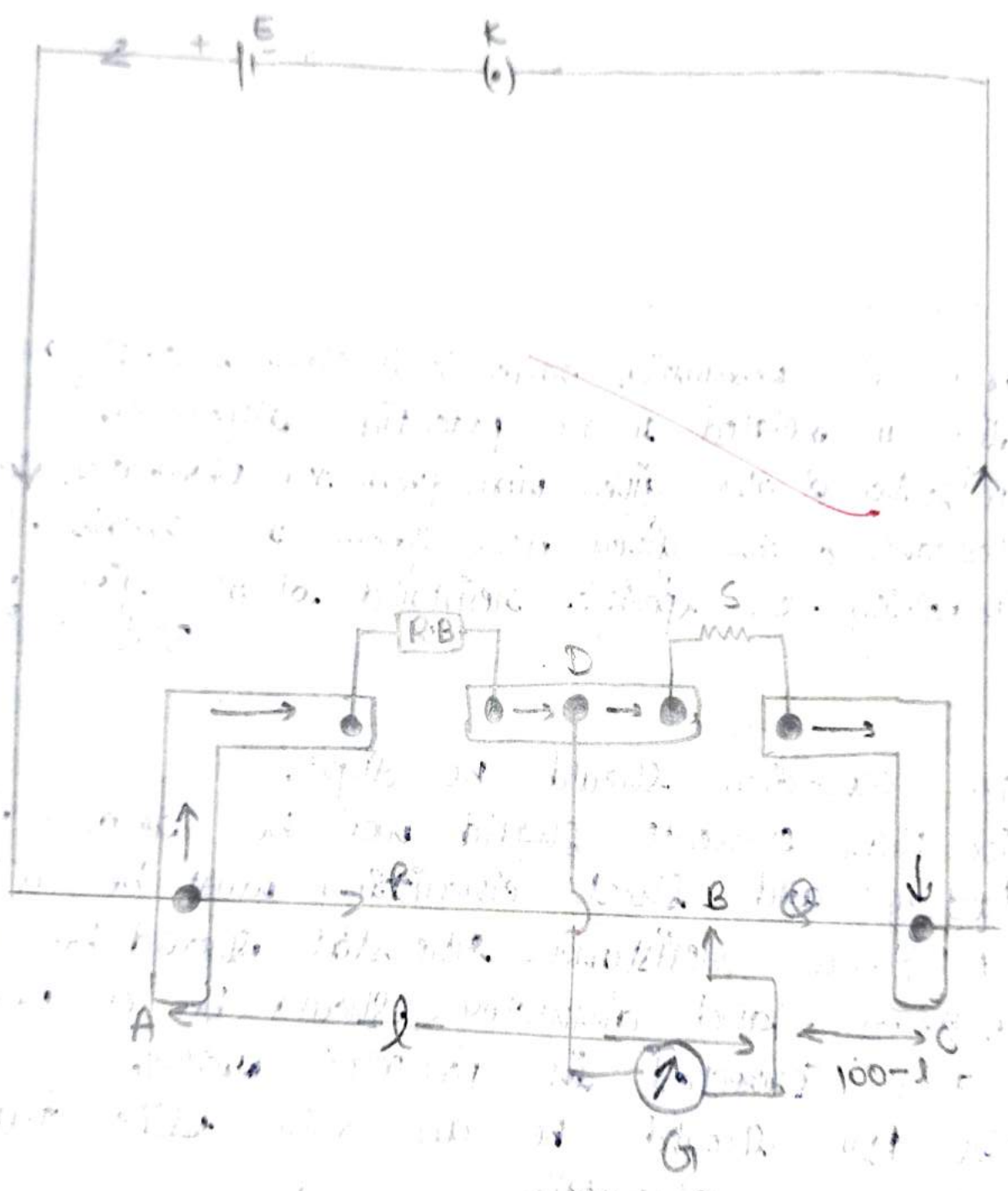
where,  $R =$  resistance drawn from R.B (ohm).

$l =$  distance of null deflection point from the high potential end of a meterbridge. If  $L$  be the length and  $r$  be the radius of resistance wire then specific resistance of its material is given by -

$$\rho = \frac{5\pi r^2}{L}$$



# नामांकित चित्र (Labelled Diagram)





## गणना (Calculation)

1. For the resistance of wire -

From I set,  $l_1 = 30.3 \text{ cm}$ ,  $100 - l_1 = 69.7 \text{ cm}$ ,  $R_1 = 1\Omega$

$$\text{So unknown resistance } S_1 = \left( \frac{100 - l_1}{l_1} \right) \times R$$
$$= \frac{69.7}{30.3} \times 1 = 2.3 \text{ ohms}$$

From II set,  $l_2 = 45.4$ ,  $100 - l_2 = 54.6$ ,  $R_2 = 2\Omega$

$$\text{So, } S_2 = \frac{54.6}{45.4} \times 2 = 2.4 \text{ ohms}$$

From III<sup>rd</sup> set,  $l_3 = 56.5$ ,  $100 - l_3 = 43.5$ ,  $R_3 = 3\Omega$

$$\text{So, } S_3 = \frac{43.5}{56.5} \times 3 = 2.31 \Omega$$

Now, the mean resistance  $S = \frac{S_1 + S_2 + S_3}{3}$

$$= \frac{2.3 + 2.4 + 2.31}{3} = 2.33 \text{ ohms}$$

2. For the radius of wire -

Mean diameter of wire =  $\frac{d_1 + d_2 + d_3}{3}$

$$= \frac{0.344 + 0.346 + 0.345}{3}$$

$$= \frac{1.035}{3} = 0.345 \text{ cm}$$

So, the radius of the wire,  $r = \frac{d}{2} = 0.1725 \text{ cm}$

$$= 0.172 \times 10^{-2} \text{ m}$$



Date --

## प्रेक्षण व प्रेक्षण सारणी (Observation And Observation Table)

1. Observation Table for the resistance of wire.

S.No.	Resistance from $R \cdot B = R (\Omega m)$ .	Balance length on meter bridge wire l (cm).	length (100-l) cm.	unknown resistance $= S (\Omega m)$	Mean Known resistance
1.	1 $\Omega$	30.3	69.7	$S_1 = 2.3$	2.33.
2.	2 $\Omega$	45.4	54.6	$S_2 = 2.4$	
3.	3 $\Omega$	56.5	43.5	$S_3 = 2.3$	
4.	4 $\Omega$	62.9	37.1	$S_4 = 2.36$	
5.	5 $\Omega$	68.0	32.0	$S_5 = 2.34$	

2. length of the wire  $L = 20 \text{ cm}$ .

3. observation Table for the radius of wire:

S.No.	Main scale reading $= a (\text{cm})$ .	Circular scale reading No. of div (n) : $n \times LC = b (\text{cm})$ .	True Reading $C = a + b (\text{cm})$	Corrected Reading $d = C + e (\text{cm})$
1.	0.3	44	0.344	$d_1 = 0.344$
2.	0.3	46	0.346	$d_2 = 0.346$
3.	0.3	45	0.345	$d_3 = 0.345$



Q

3. Find the specific resistance of wire.  
It is given by -

$$\rho = \frac{S \pi r^2}{L} = \frac{2.33 \times 3.14 \times (0.172 \times 10^{-2})^2}{20 \times 10^2}$$
$$= \frac{0.218 \times 10^{-2}}{20} = 0.109 \times 10^{-3} \Omega \cdot m.$$

~~$$\rho = 109 \times 10^6 \Omega \cdot m.$$~~



Date --**परिणाम (Result)**

1. The resistance of the given wire is 2.33 Ohms.
2. Specific resistance of its material is  $109 \times 10^{-6}$  ohm meter.

**सावधानियाँ (Precautions)**

1. Connections must be properly tight.
2. The ends of the connecting wires should be rubbed and cleaned with a sand paper.
3. Move the jockey gently over the bridge wire and do not rub it.
4. The balance point should always be obtained near the middle of the wire.
5. The plug in the key should be inserted only when the readings are to be taken.

Teacher's Signature.....



Date  -  -

**उद्देश्य (Object)**

To determine the internal resistance of a primary cell using a potentiometer.

Apparatus: A potentiometer, a galvanometer, a battery, a primary (Leclanche) cell, a resistance box, key and connecting wires

**सिद्धान्त अथवा सूत्र (Theory or Formula)**

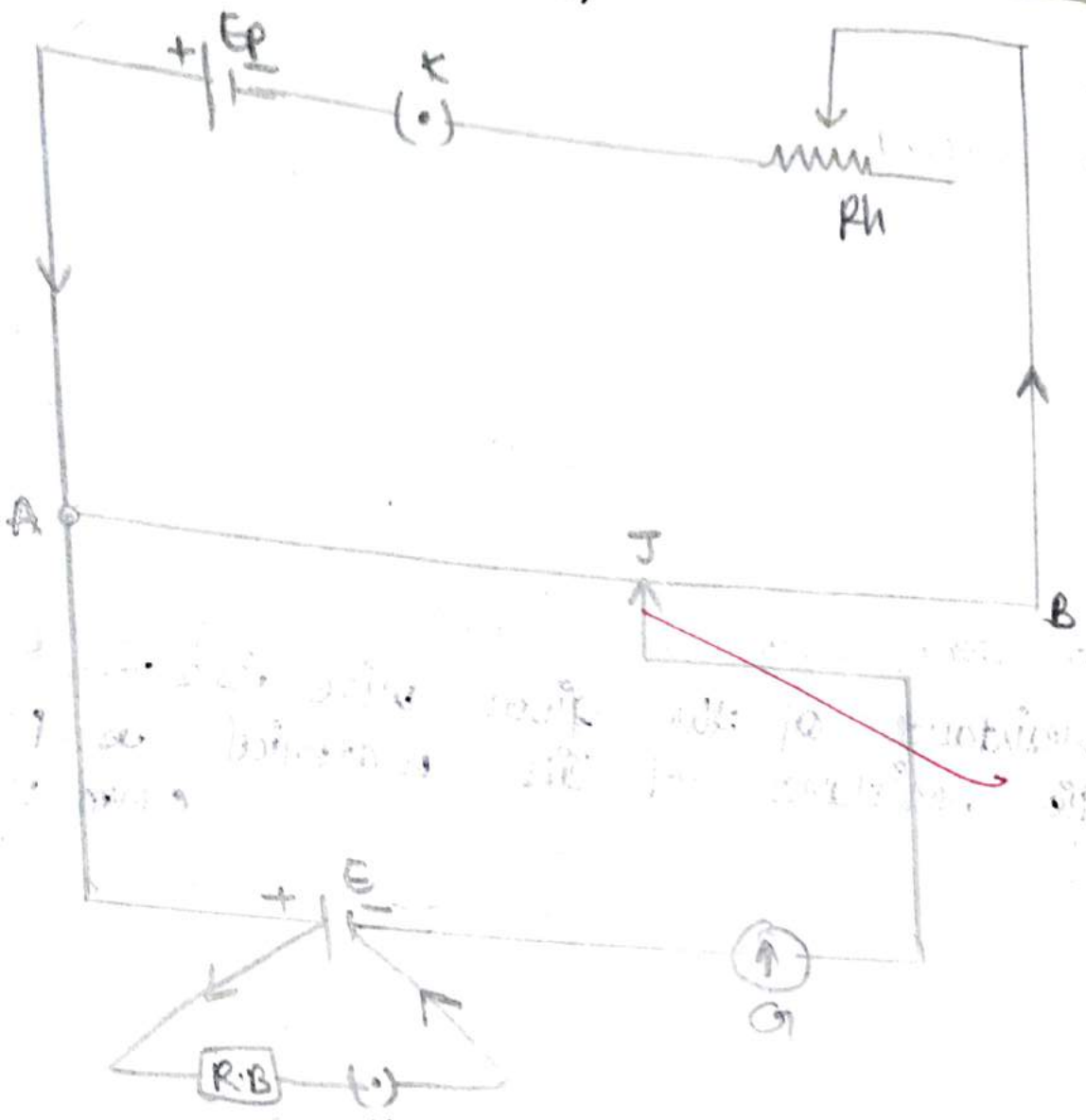
The internal resistance of a cell is given by -

$$r = \left( \frac{l_1 - l_2}{l_2} \right) \times R$$

- Here
- $l_1$  = Balance length in open circuit (cm).
  - $l_2$  = Balance length in closed circuit (cm).
  - $R$  = External resistance (ohm).



Labelled Diagram)



- Here, AB = Potentiometer wire.  
 $E_p$  = Accumulator cell.  
 $K_1, K_2$  = Keys.  
 $R_h$  = Rheostat.  
 $G$  = Galvanometer.  
 $R.B.$  = Resistance box.  
 $J$  = Jockey.

## गणना (Calculation)

From the I set of observation  $d_1 = 957.2 \text{ cm}$ ,  $R = 2 \text{ km}$   
 $d_2 = 150 \text{ cm}$ .

$$\text{So, } r = \left( \frac{d_1 - d_2}{d_2} \right) \times R = \frac{957.2 - 150}{150} \times 2 = 10.76 \text{ km}$$

From the II set of observation  $d_1 = 957.2 \text{ cm}$ ,  $R = 4 \text{ km}$ ,  
 $d_2 = 301 \text{ cm}$ .

$$r = \frac{957.2 - 301}{301} \times 4 = 8.72 \text{ km}$$

From the III set of observation  $d_1 = 957.2 \text{ cm}$ ,  $R = 6 \text{ km}$ ,  
 $d_2 = 467 \text{ cm}$ .

$$r = \frac{957.2 - 467}{467} \times 6 = 6.29 \text{ km}$$

From the IV set of observation  $d_1 = 957.2 \text{ cm}$ ,  $R = 5 \text{ km}$ ,  
 $d_2 = 666 \text{ cm}$ .

$$r = \frac{957.2 - 666}{666} \times 5 = 3.49 \text{ km}$$

From the V set of observation  $d_1 = 957.2 \text{ cm}$ ,  $R = 10 \text{ km}$ ,  
 $d_2 = 826 \text{ cm}$ .

$$r = \frac{957.2 - 826}{826} \times 10 = 1.58 \text{ km}$$



Date --

### प्रेक्षण व प्रेक्षण सारणी (Observation And Observation Table)

S.No	Balancing length of wire when cell is in open circuit (l <sub>1</sub> cm)	Balancing length of wire when cell is in closed circuit (l <sub>2</sub> cm)	Resistance in (R.B) R(Ω)	Internal resistance of cell.
1.	957.2 cm.	150 cm	2 Ω	10.76 Ω
2.	957.2 cm.	201 cm	4 Ω	8.72 Ω
3.	957.2 cm.	467 cm	6 Ω	6.29 Ω
4.	957.2 cm.	666 cm.	8 Ω	3.49 Ω
5.	957.2 cm.	326 cm.	10 Ω	1.58 Ω

Date  -  - **परिणाम (Result)**

1. The internal resistance of the given primary cell varies from 1.58 Ohm to 10.76 Ohm.

**सावधानियाँ (Precautions)**

1. The connections should be clear, correct and tight.
  2. The plug plugs should be inserted in the keys only when the observations are to be taken.
  3. The emf of the battery should be greater than the emf of the two cells.
  4. The positive terminals of all the cells are connected to the same end of potentiometer.
- ⚡ Jockey should be slide gently on the wires

Teacher's Signature.....



Object :

To compare the electromotive force of two primary cells using a potentiometer.

Apparatus :

A potentiometer, a Daniell cell, a cell, a galvanometer, a rheostat, a battery, a two way key, a key and connecting wires.

Theory :

According to the principle of potentiometer the ratio of two electromotive force is given by :

$$\frac{E_1}{E_2} = \frac{l_1}{l_2}$$

where  $E_1$  = emf of Daniell cell (in volt)

$E_2$  = emf of cell (in volt)

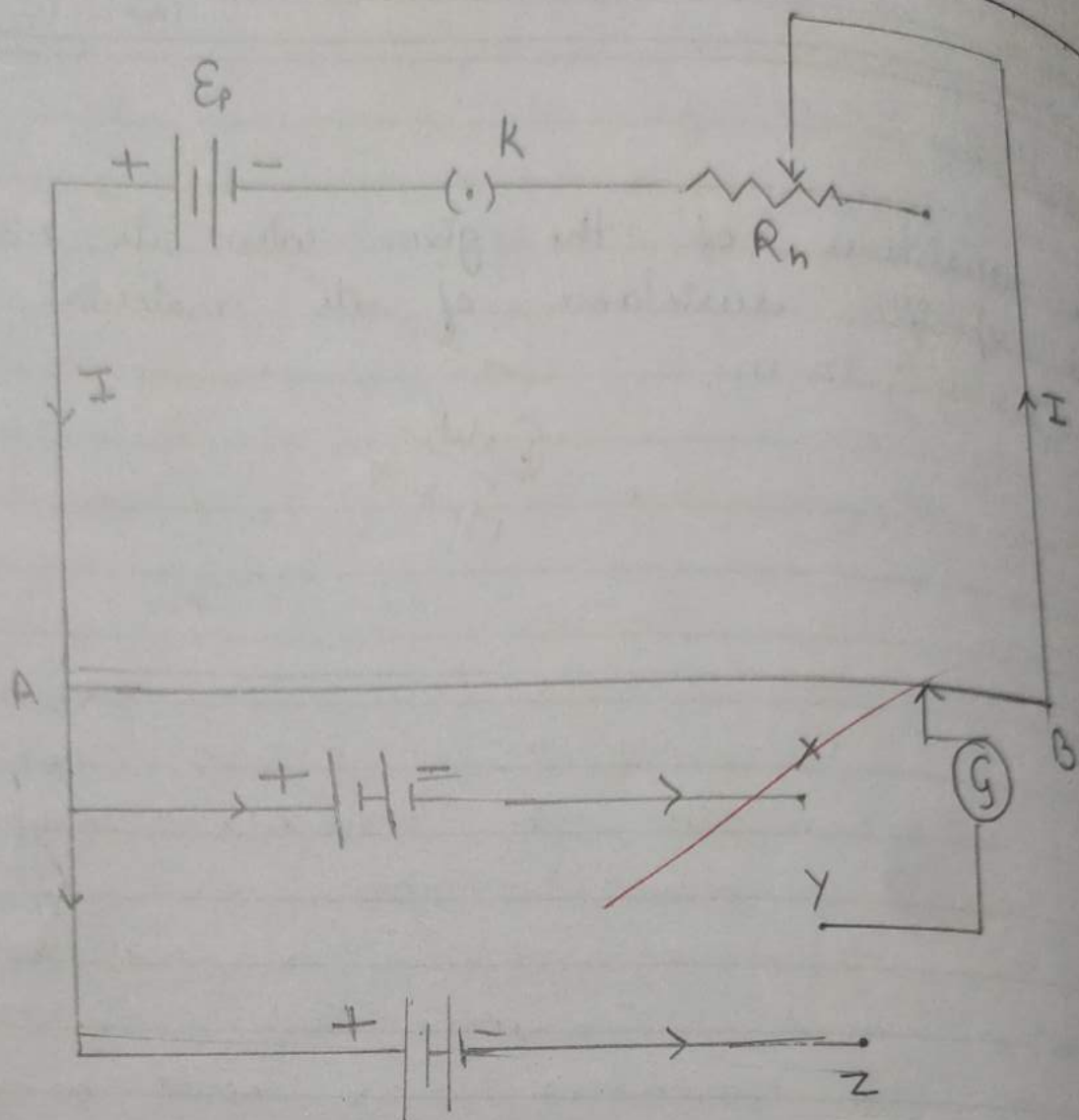
$l_1$  = Balancing length on potentiometer wire of cell

$l_2$  = Balancing length for cell  $E_2$  (in cm).

Observations :

emf of cell  $E_1$  as measured by voltmeter  
 $E_1 = 1.41$  volt

emf of cell  $E_2$  by voltmeter  $E_2 = 1.08$  volt



Here,

$E_1$  = Leclanche cell

$E_2$  = Daniel cell

$E_p$  = Primary cell (Storage cell)

$G$  = Galvanometer

$X, Y, Z$  = Primary cell

$R_h$  = Rheostat



### Observation table for balancing length:

S. No.	Balance length $E_1$ cell is in circuit $l =$ cm			Balance length when $E_2$ cell is in the circuit $l_2$ cm			Ratio $\frac{E_1}{E_2} = \frac{l_1}{l_2}$
	1.	2.	meat $l_1$				
1.	505	507	506	416	412	414	1.22
2	722	726	724	505	507	506	1.43
3 <sub>10</sub>	786	790	788	548	548	548	1.93
4	858	856	857	611	606	606	1.41
5	906	904	857	627	645	636	1.42
6	980	960	970	677	679	678	1.43

### Precautions:

The connection should be clear, correct and tight

The plugs should be instead in the keys only when the observations are to be taken.

The emf of battery should be greater than the emfs of the either of two cells.

Two positive terminals of all the cells are connected to the same of potentiometer.

Jockey should be slide gently on the wire.

## Calculation:-

$$1^{\text{st}} \text{ Reading} = \frac{E_1}{E_2} = \frac{l_1}{l_2} = \frac{506}{414} = 1.22$$

$$2^{\text{nd}} \text{ Reading} = \frac{l_1}{l_2} = \frac{724}{506} = 1.43$$

$$3^{\text{rd}} \text{ Reading} = \frac{l_1}{l_2} = \frac{788}{548} = 1.43$$

$$4^{\text{th}} \text{ Reading} = \frac{l_1}{l_2} = \frac{857}{606} = 1.41$$

$$5^{\text{th}} \text{ Reading} = \frac{l_1}{l_2} = \frac{905}{636} = 1.42$$

$$6^{\text{th}} \text{ Reading} = \frac{l_1}{l_2} = \frac{970}{678} = 1.43$$

$$\text{Mean} = \frac{1.22 + 1.43 + 1.43 + 1.41 + 1.42 + 1.43}{6}$$

$$= 1.39$$



Result :

The ratio of the emf's of two cells

$$\frac{E_1}{E_2} = 1.39$$

① Value  
27-7-18

Date  -  -

**उद्देश्य (Object)**

To find the value of  $v$  for different values of  $u$  in case of a concave mirror and to find its focal length.

Apparatus: An optical bench, a concave mirror, two pins with stand, a mirror holder, leveler.

**सिद्धान्त अथवा सूत्र (Theory or Formula)**

If an object (pin) is kept at a distance  $u$  from a concave mirror and its image is formed at distance  $v$  then the focal length of concave mirror is given by -

$$\frac{1}{f} = \frac{1}{-v} + \frac{1}{-u}$$

(As both  $u$  and  $v$  are negative for concave mirror)

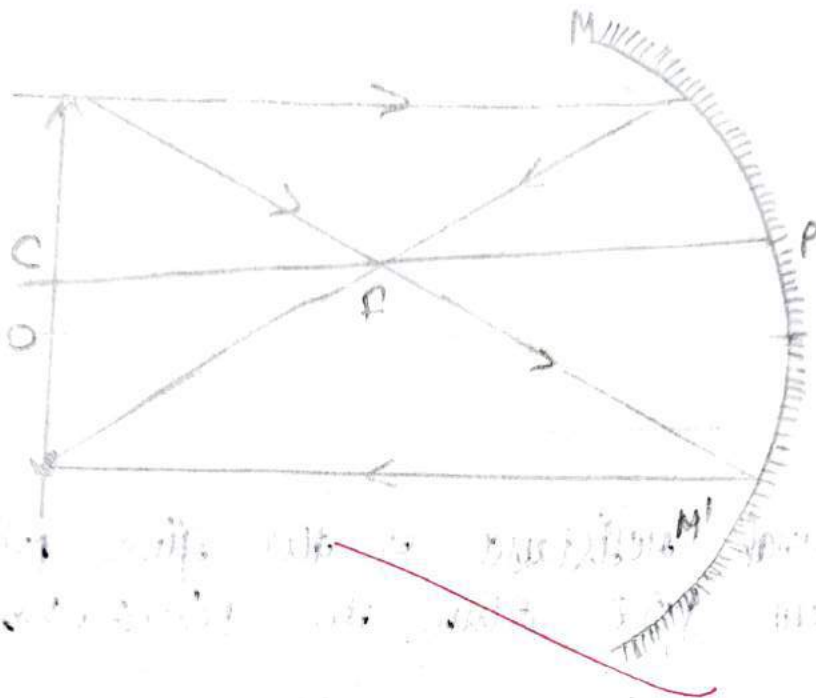
$$\frac{1}{f} = \frac{-1}{u+v}$$

$$\text{focal length } f = \frac{-uv}{u+v}$$

Therefore the focal length of a concave mirror is negative in accordance with the sign convention.



# नामांकित चित्र (Labelled Diagram)



AB = object pin

CD = image pin

MM = concave mirror

A'B' = image of object pin.

## गणना (Calculation)

The formula used,  $f = \frac{-uv}{u+v}$

For the I set  $\rightarrow f_1 = \frac{-40 \times 66}{(40+66)} = -24.9 \text{ cm}$

For the II set,  $f_2 = \frac{-42.5 \times 60.2}{(42.5+60.2)} = -24.9 \text{ cm}$

For the III set,  $f_3 = \frac{-45 \times 56.3}{(45+56.3)} = -25 \text{ cm}$

For the IV set,  $f_4 = \frac{-47.5 \times 52.8}{(47.5+52.8)} = -25 \text{ cm}$

For the V set,  $f_5 = \frac{-50 \times 50}{(50+50)} = -25 \text{ cm}$

Mean focal length  $f = - \frac{(24.9 + 24.9 + 25 + 25 + 25)}{5} = -24.96 \text{ cm}$



Date  -  - 

### प्रेक्षण व प्रेक्षण सारणी (Observation And Observation Table)

1. Rough focal length of concave mirror = 25 cm.

2. observation Table.

S.No.	Position of concave mirror a (cm).	Position of object pin b (cm)	Position of image pin c (cm)	$v = b - a$ (cm)	$v = c - a$ (cm)
1.	85	45	71	40	66
2.	5	47.5	65.2	42.5	60.2
3.	5	50	61.3	45	56.3
4.	5	52.5	57.8	47.5	52.8
5.	5	55	55	50	50

$$f = \frac{-uv}{u+v}$$

$$f_1 = -24.9$$

$$f_2 = -24.9$$

$$f_3 = -25$$

$$f_4 = -25$$

$$f_5 = -25$$

Date  -  - **परिणाम (Result)**

1. The focal length of the given concave mirror is obtained  $f = -24.96 \text{ cm}$ .

**सावधानियाँ (Precautions)**

1. Principal axis of the mirror should be horizontal and parallel to the central line of the optical bench.
2. The uprights should be vertical.
3. The tips of the object and image pins should lie at the same height as that of pole of the concave mirror.
4. Bend's correction for  $v$  and  $v'$  should be applied.
5. The parallex should be removed b/w the image and image pin.

Teacher's Signature.....



Date  -  -

**उद्देश्य (Object)**

To determine angle of min. deviation and refractive index for a given glass prism by plotting a graph between the angle of incidence and the angle of deviation.

Apparatus: A drawing board, a white paper sheet, a glass prism, alpine, drawing pins, a half meter scale and protractor.

**सिद्धान्त अथवा सूत्र (Theory or Formula)**

At the position of minimum angle of deviation:-

$$(i). \angle i = \angle r = \frac{\angle A}{2}$$

ii) Angle of incidence  $\angle i =$  angle of emergence  $\angle e$

iii) The brightness of image formed by prism is maximum.

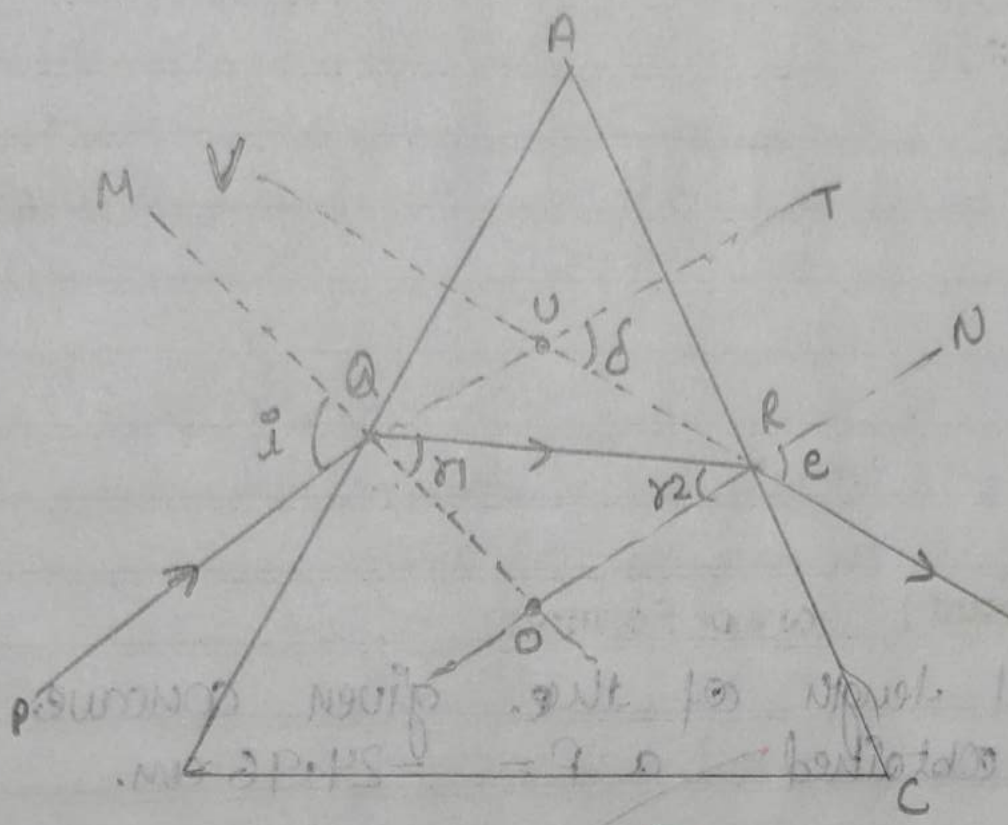
∴ In the condition of minimum deviation, refractive index of the material of prism (glass) with respect to air.

$$\mu = \frac{\sin\left(\frac{A + \delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

Where  $A =$  An angle of the prism.

$\delta_m =$  angle of minimum deviation which can be determined from the  $i/\delta$  graph (S)

# नामांकित चित्र (Labelled Diagram)



where, PQ = Incident ray

QR = Refracted ray

RS = emergent ray

$i = \angle PQM =$  incident angle

$f = \angle TUS =$  angle of deviation

OM and ON = normal.



Date --

## प्रेक्षण व प्रेक्षण सारणी (Observation And Observation Table)

1. The angle of prism  $A = 60^\circ$

2. observation table for angle of deviation.

S.No.	Angle of incidence ( $i$ )	Angle of deviation ( $\delta$ )
1.	$30^\circ$	$48^\circ$
2.	$35^\circ$	$44^\circ$
3.	$40^\circ$	$40^\circ$
4.	$45^\circ$	$38^\circ$
5.	$50^\circ$	$41^\circ$

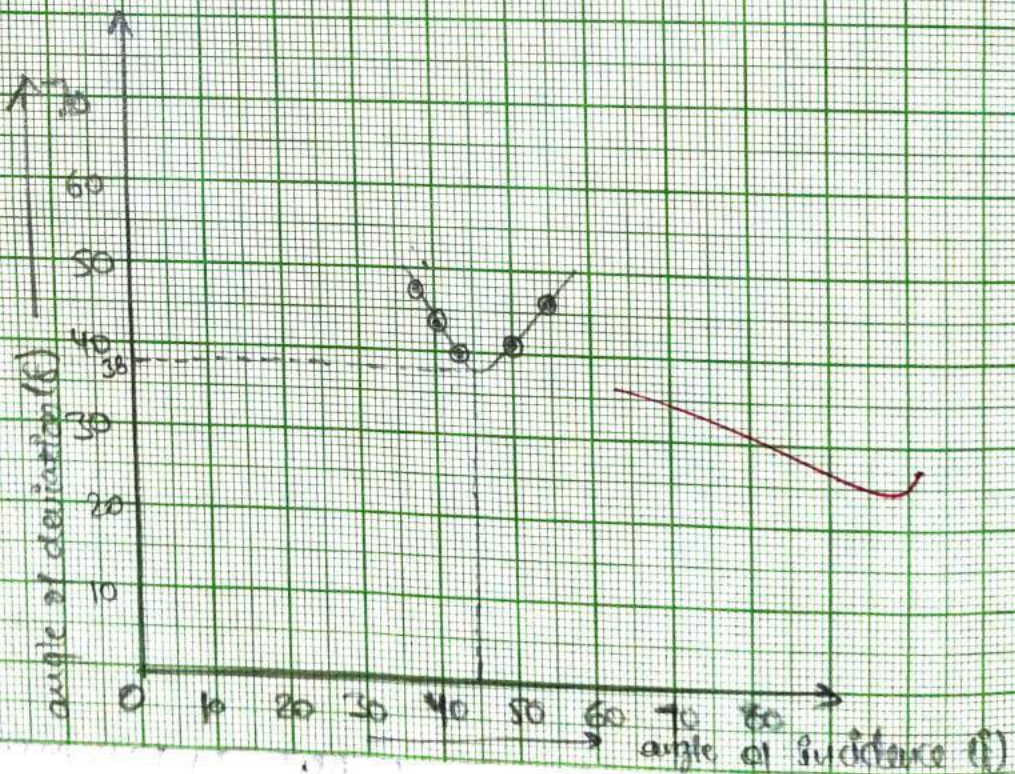


## गणना (Calculation)

The graph between the angle of incidence ( $i$ ) and angle of deviation ( $\delta$ ) is obtained as - from graph, minimum angle of deviation  $\delta_{\min} = 38^\circ$  for  $i = 45^\circ$

let scale -

on x-axis, angle of incidence  $i$ , one box =  $10^\circ$   
on y-axis, angle of deviation  $\delta$ , one box =  $10^\circ$





## 2. Refractive Index

$$\mu = \frac{\sin \left( \frac{A + \theta}{2} \right)}{\sin \left( \frac{A}{2} \right)}$$

$$\mu = \frac{\sin \left( \frac{60 + 38^\circ}{2} \right)}{\sin \left( \frac{60^\circ}{2} \right)} = \frac{\sin 49^\circ}{\sin 30^\circ}$$

$$\mu = \frac{0.7547}{0.5}$$

$$\mu = 1.5 \text{ (unitless).}$$

Date  -  - **परिणाम (Result)**

1. The angle of deviation  $\delta$  first decreases with the increase in the angle of incidence, attains a minimum value and then increases with further.
2. The refractive index of the material of the substance is 1.5 (approx).

**सावधानियाँ (Precautions)**

1. The angle of incidence should lie b/w  $35^\circ$ - $60^\circ$
2. The pins should be perfectly vertical.
3. The distance b/w the two pins should not be less than 2cm.
4. Arrow heads should be marked to show the incident and emergent rays.
5. The same angle of prism should be used for all the observations.

Teacher's Signature.....



Date  -  -

**उद्देश्य (Object)**

To draw the I-V characteristics curve of a p-n junction diode in forward bias and reverse bias.

**Apparatus:** A p-n junction diode, collector cell, milli ammeter, micro ammeter, and 2 voltmeter of required range, Rheostat, key, connecting wires etc.

**सिद्धान्त अथवा सूत्र (Theory or Formula)**

i. The current and bias voltage for a diode are related to each other as per following equation-

$$I = I_0 (e^{qV/kT} - 1)$$

where,  $I_0$  = saturation current,  $q$  = charge on electron,  $T$  = absolute Temp. of junction and  $k$  = Boltzmann constant  
 $V$  = applied voltage difference.

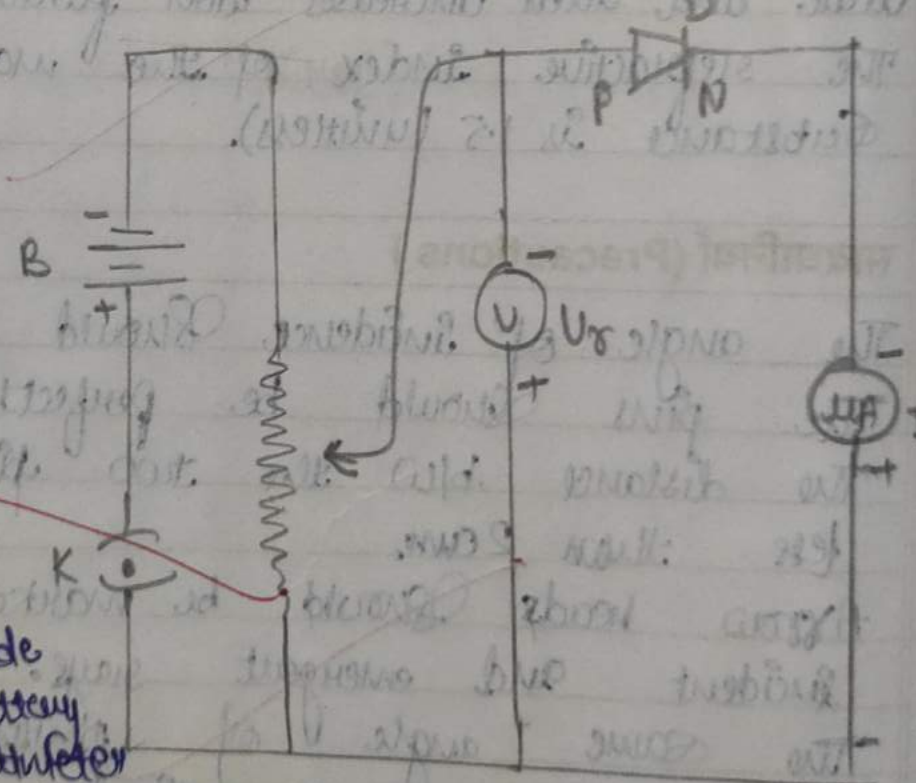
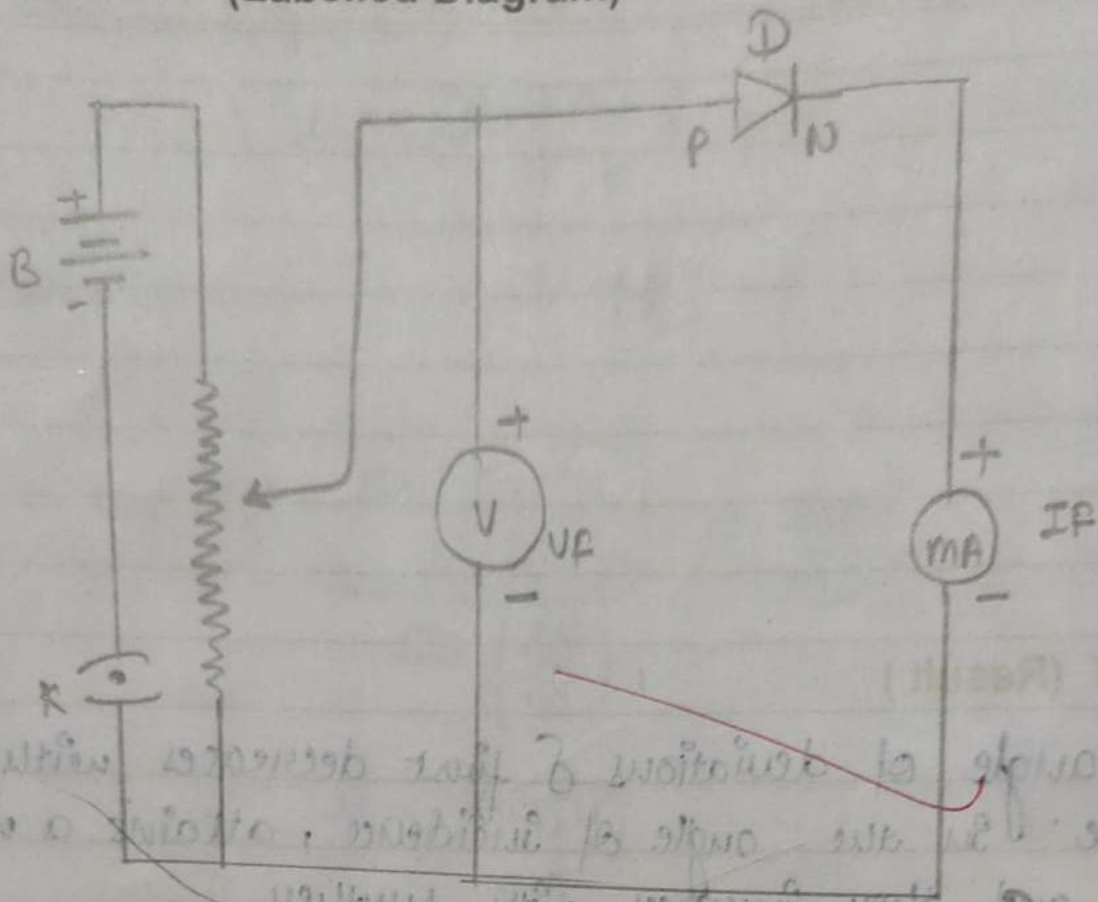
i). Forward Bias arranged  $\rightarrow$  P junction connected to positive end and N junction connected to negative end of the battery  
 $V$  is the so  $e^{qV/kT} \gg 1$

$$I_f = I_0 e^{qV/kT}$$

ii). Reverse Bias arranged  $\rightarrow$  P junction connected to negative end and N junction connected to positive end of battery.  $V$  is -ve so,  $e^{qV/kT} < 1$ .

$$I_r \approx -I_0 = \text{constant.}$$

# नामांकित चित्र (Labelled Diagram)



Where, D = Diode

B = Battery

V = Voltmeter

MA = milliammeter

$\mu A$  = microammeter



Date  -  - **प्रेक्षण व प्रेक्षण सारणी (Observation And Observation Table)**

(A). for forward bias

1. least count of voltmeter =  $0.02$  volt
2. least count of milliammeter =  $0.2$  mA.

(B). for Reverse is.

1. least count of voltmeter =  $0.2$  volt
2. least count of milliammeter =  $1$   $\mu$ A.

(C). observation table.

S.No.	Voltmeter Reading		Milliammeter Reading	
	No. of division $n_1$	Forward voltage $V = n_1 \times LC$ (volt)	No. of divisions $n_2$	Forward current $I_f = n_2 \times LC_m$
1.	15	0.3	6	1.2
2.	20	0.4	12	2.4
3.	25	0.5	18	3.6
4.	30	0.6	28	5.6
5.	35	0.7	38	7.6



# गणना (Calculation)

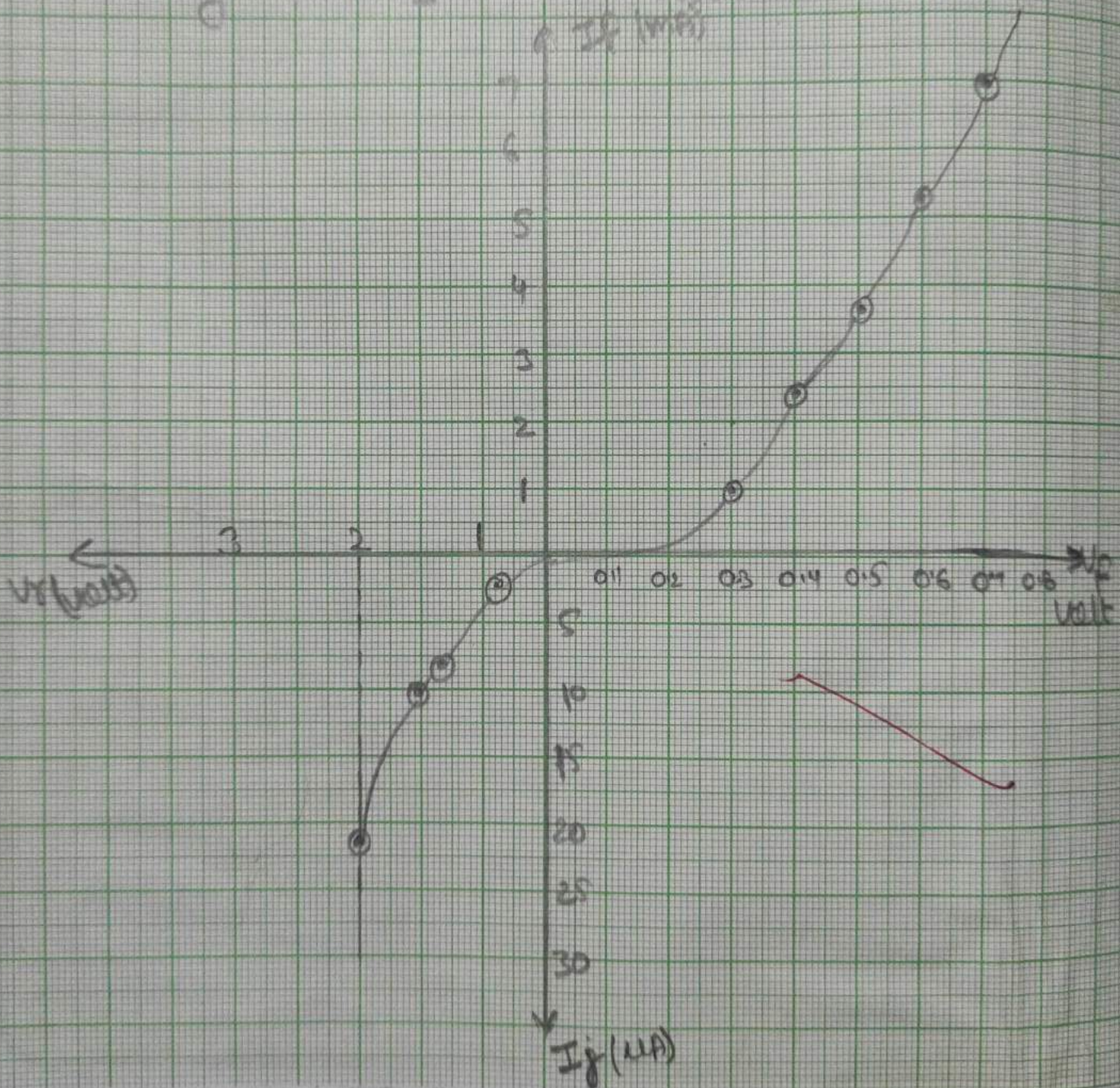
for plot

Forward Bias:

x-axis =  $V_f$  (volts) = overall forward voltage,  
 y-axis =  $I_f$  (mA) = forward current.

Reverse Bias:

- x-axis =  $V_r$  (volts) = reverse voltage  
 - y-axis =  $I_r$  (mA) = reverse current





Date  -  - 

S.No.	Voltmeter Reading		Microammeter Reading	
	No. of divisions $n_v$	Reverse Bias $V_r = n_v \times$ L.C (volt)	No. of divisions $n_i$	Reverse Current $I_r = n_i \times$ L.C (μA)
1.	2	0.4	2	2 μA
2.	5	0.1	7	7 μA
3.	6	1.2	7	7 μA
4.	8	1.6	10	10 μA
5.	10	2.0	22	22 μA

### परिणाम (Result)

→ The characteristics curve for forward and reverse bias for the given P-N junction diode is shown on the graph paper. For diode, breakdown voltage  $V_b = 2$  volt and reverse saturated current  $I_s = 7 \mu A$ .

### सावधानियाँ (Precautions)

- All the connections should be clear and tight.
- Key should be opened when the circuit is not being used.  
The safe values of current and voltage for the diode should be known.
- The polarities of microammeter and voltmeter should be proper in order to get deflection.
- The diode should be connected according to the bias applied.

Teacher's Signature.....

Object:

To draw the characteristic of a zener diode and to determine its reverse breakdown voltage.

Apparatus:

A zener diode battery, high resistance rheostat, two 0-10 voltmeters, a 0-100 mA ammeter, one  $20\ \Omega$  resistance, one way key and connecting wire.

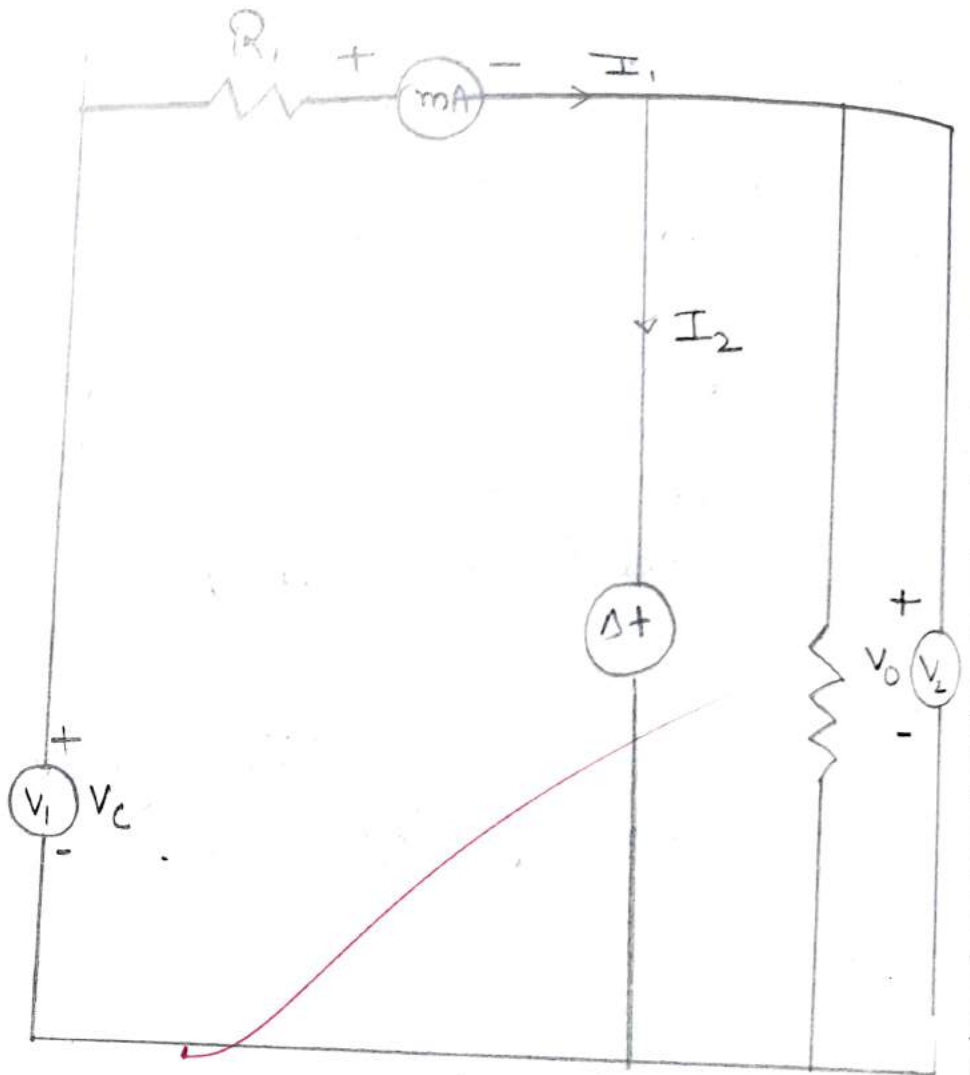
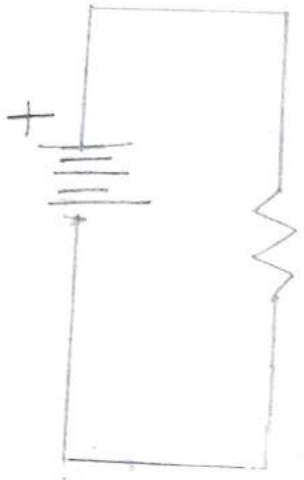
Theory:

Zener diode is a semiconductor diode in which the n-type and p-type sections are heavily doped. It results in a low and sharp value of reverse breakdown voltage. Its value is also called zener voltage and denoted by  $V_z$ . The current that flows in diode at  $V_z$  is known as zener current  $I_z$ .

If the input resistance is  $R_1$  and output current be  $I_1$ , then the current passing through the outer ends resistance  $R_z$  will be

$$I_z = I_1 - I_2$$





where,  $I_z =$  zener current

Also the output voltage  $V_o$  will be

$$V_o = I_z R_z = V_i - R_i - I_i$$

where,  $V_i =$  input voltage

Initially, when  $V_i$  increase  $I_i$  increase (small increase) so that  $V$  increase but at breakdown as  $V_i$  increase,  $I_i$  increase. So that  $V_o$  becomes constant and this value of  $V_o$  is equal to zener voltage ( $V_z$ )

Observation:

Least count of milli ammeter = 3160

Least count of voltmeter = 0.25 V

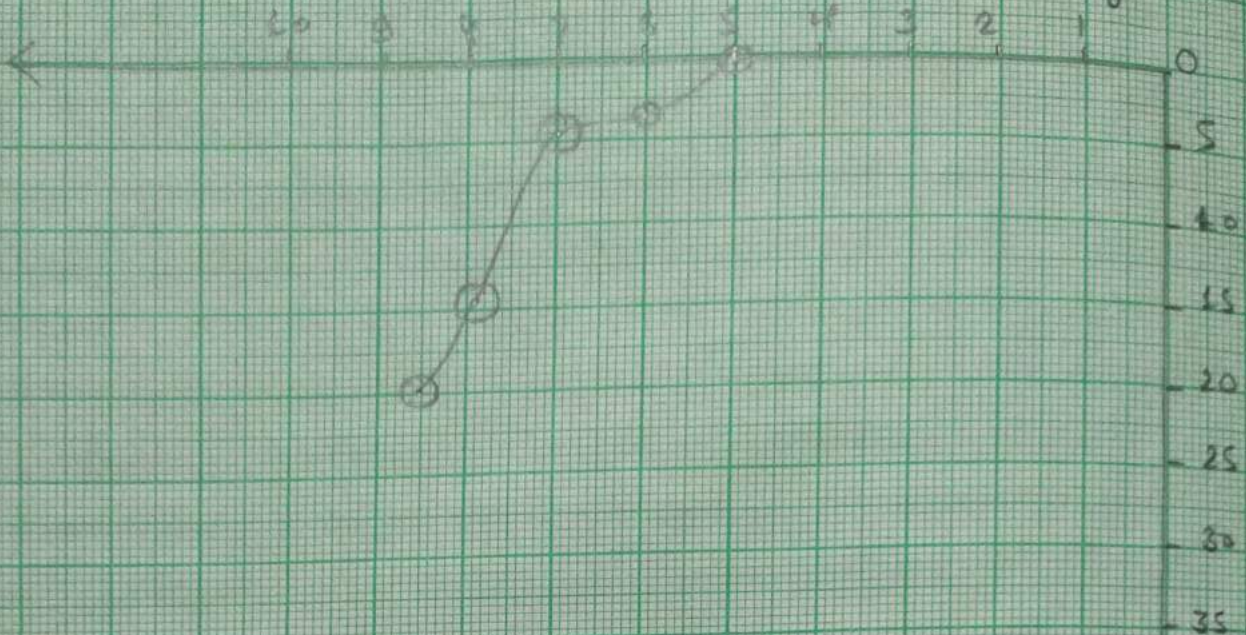
Least count of voltmeter = 0.5 V

Observation Table

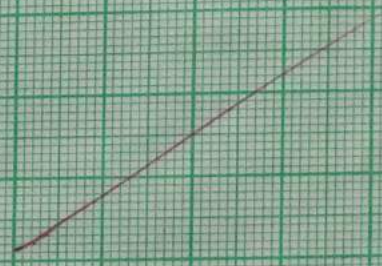
S <sub>20</sub> No.	Voltmeter Reading $V_o = n_1 \times c_v$ (Volt)		Milimeter Reading $I_1 = n_2 \times 1c$ (mA)	No. of col $n_1$	No. of col $n_2$
	$n_c$	$V_c$			
1	20	5	0	20	0
2 <sub>25</sub>	25	6.25	0.5	25	1
3	30	7.5	1	30	2
4	35	8.75	1.5	35	2.8
5	42	10.5	3.0	42	6.0



# Voltmeter Reading



Millimetre Reading





## Precautions

5 All the connection should be clean and tight. Key should be closed only when the circuit is being used.

The ranges of voltmeter and milliammeter should be appropriate.

10 The correction of zero error in the meter (if any) should be made before taking the observation.

The value of input voltage should be increase gently and gradually after zener voltage.

## Source of errors

15 Zener diode may not be connected in reverse bias.

The connection may be loose anywhere. The ranges and least counts of the meters may not be proper.

## Result :

25 The breakdown voltage or zener voltage of diode is obtained as  $V = 0.59 \text{ V}$

*Dalit*  
14-9-18



Date --

## Activity No. 1

**Object:** To draw the circuit diagram of an open circuit which has at least one battery, resistance / rheostat, key, ammeter and voltmeter and to mark the elements wrongly connected, correct the circuit and draw correct circuit diagram.

### Observations:

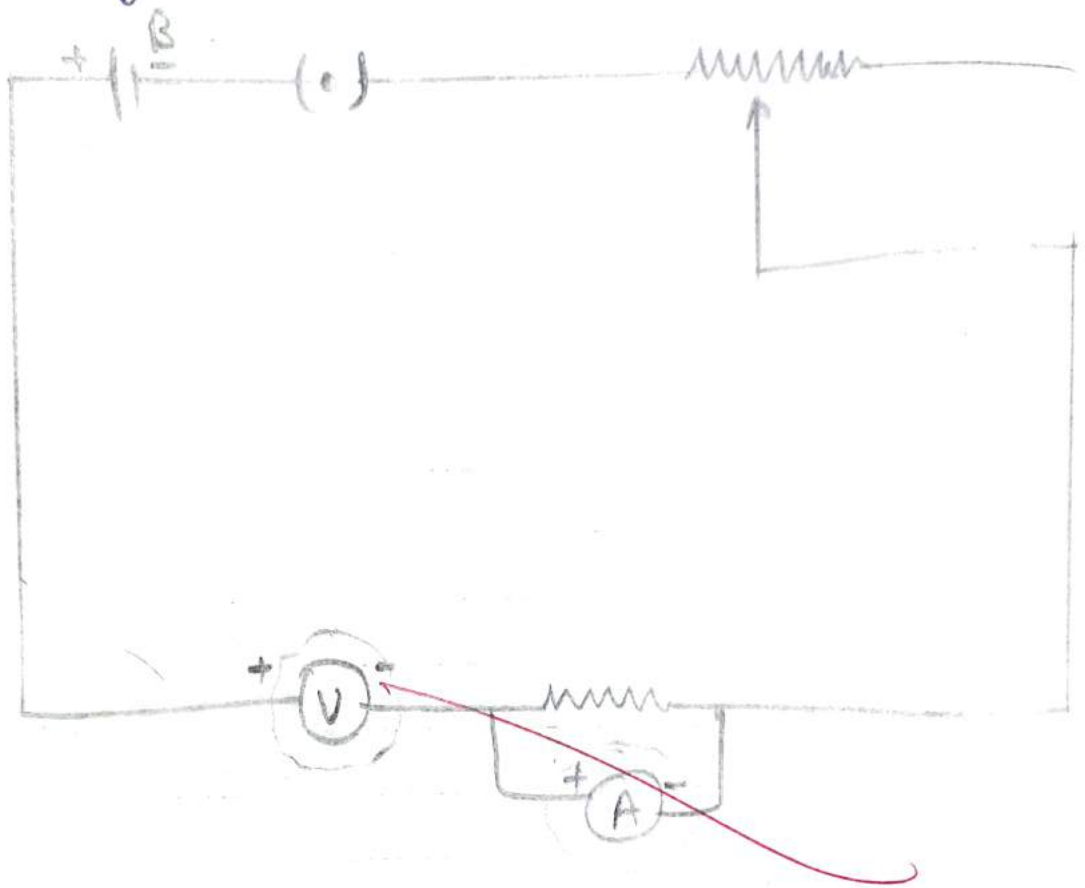
1. Voltmeter is connected in series in the circuit.
2. Ammeter is connected in parallel combination to the resistance.

### Conclusion:-

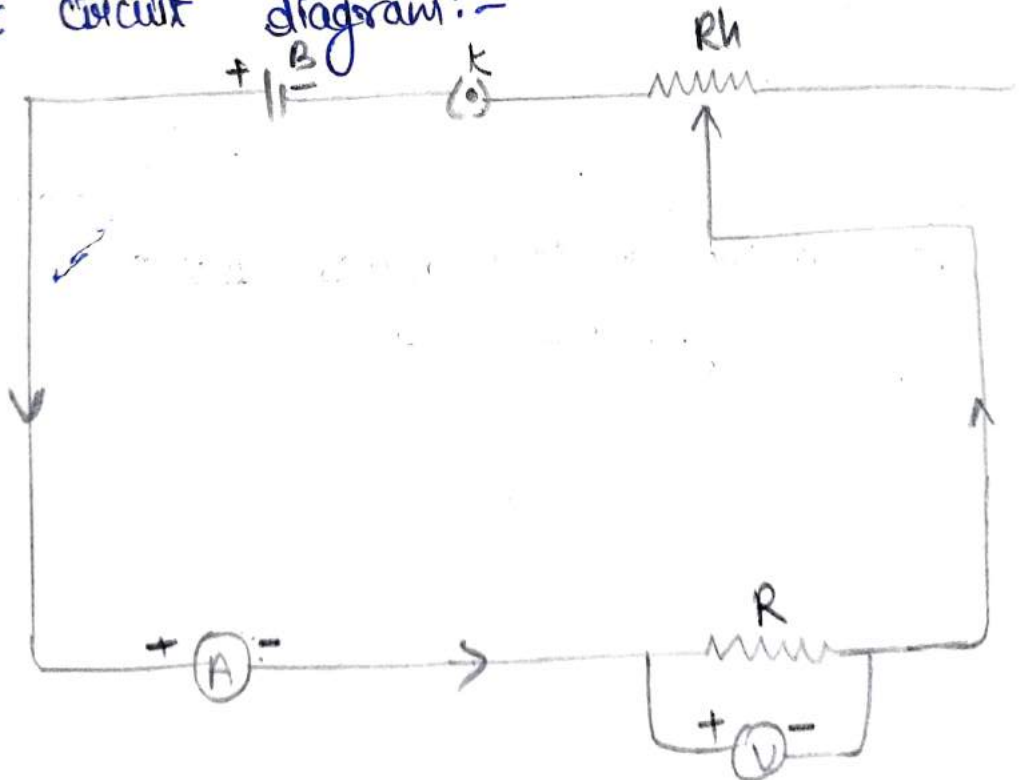
In the given circuit the voltmeter was connected in series and ammeter parallel to the resistance. They were connected in proper order and the circuit connection was corrected.

Teacher's Signature.....

Current Diagram with Errors: →



Correct Circuit diagram: -





Date  -  - 

## Activity = 2

Object = Making a domestic electric circuit using three bulbs, three (on/off) switches, a fuse and an electric source.

Material : Three bulbs (100 W, 220 V) three holders, three switches a fuse (5 ampere), 200 pin plug, A.C electric source, flexible connecting wires with black and red insulation.

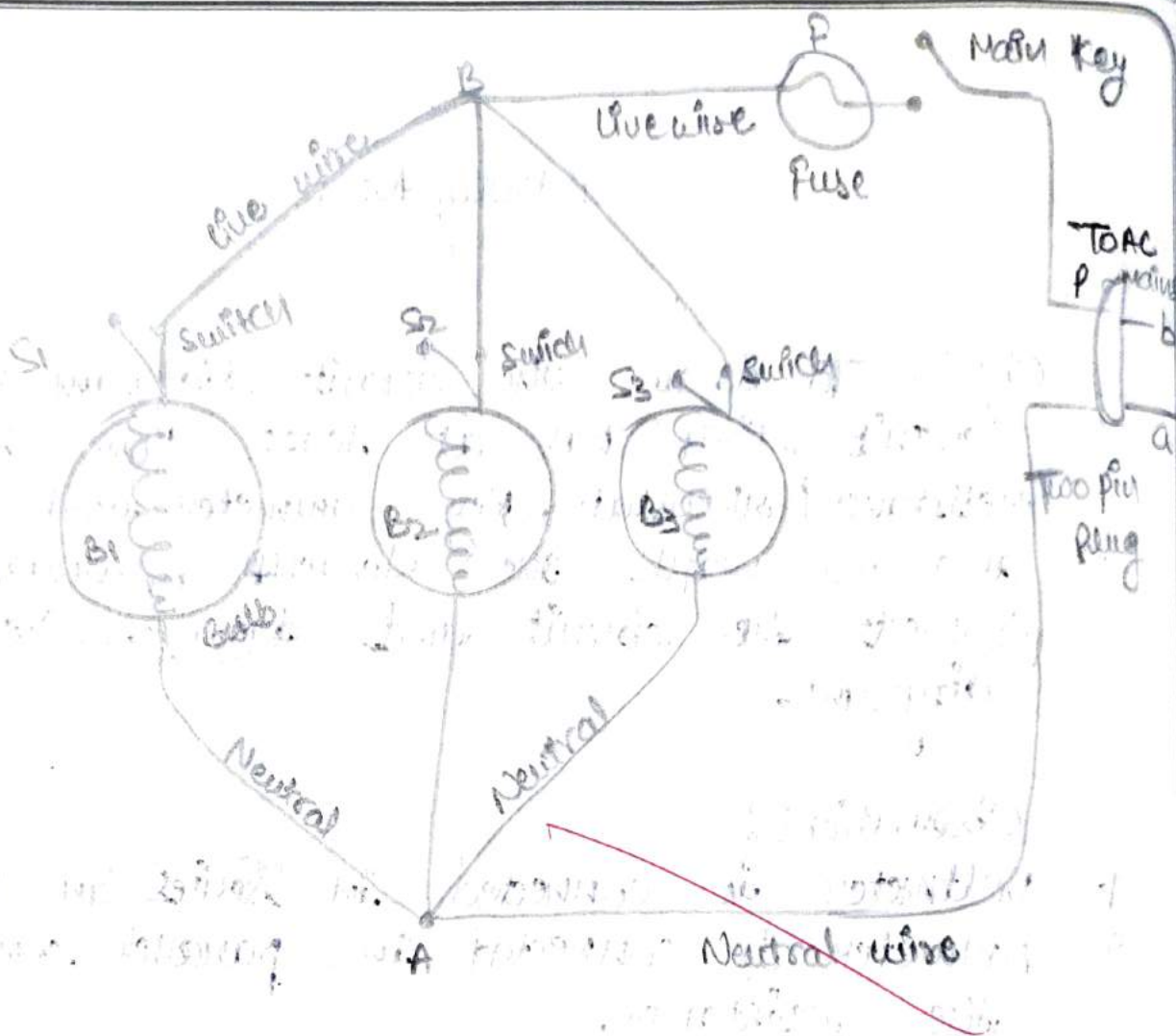
## Observation :

1. Power of bulbs :  
 $P_1 = 100 \text{ watt}$  .  $P_2 = 100 \text{ watt}$      $P_3 = 100 \text{ watt}$
2. Applied voltage.  
 $V = 200 \text{ volt}$ .
3. After connection separate bulbs are switched on/off with separate switches.

## Conclusion :

Acc. to the circuit diagram domestic circuit was constructed and switching on and off of separate bulbs by separate switches was tested. Domestic circuit was correctly made.

Teacher's Signature.....



Conclusion:

Total power used in the circuit is

$$P = P_1 + P_2 + P_3$$

$$P = 100 + 100 + 100 = 300 \text{ watt}$$

Current in the circuit.

$$I = \frac{P}{V} = \frac{300}{220} = 1.4 \text{ ampere.}$$


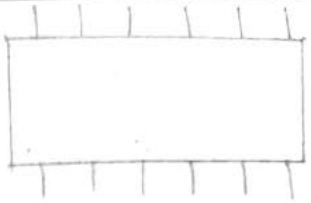
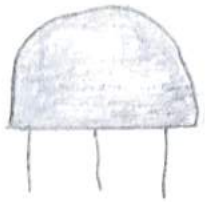
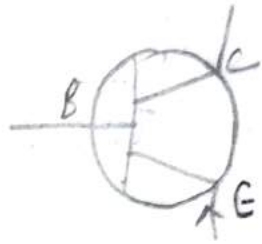






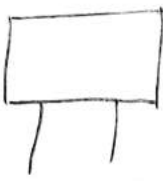



### Activity - 3

Aim - To identify a diode, a LED, a transistor, an integral circuit, a resistor and a capacitor from a mixed collection of such items.

Apparatus - A mixed collection of diode, a transistor, an IC, a resistor, a capacitor.

Theory → Resistor, capacitor and diode are two terminal and transistor has three terminal and IC has minimum of eight legs. Most of the IC package have end flat backs, one can easily separate an IC out of a mixture of the mentioned components by a transistor being a three terminal device can be identified just by looking at the various capacitor when connected in d-c-circuit a multimeter set at  $R$  show initially a full scale current which decay to zero very quickly. Diode only shows in directional flow of current when connected such that terminal end marked it at higher potential the diode is forward biased it conducts.

Name of Device	Diagram	Symbol of circuit diagram
① IC Integrated circuit		
② Transistor		
③ Carbon Resistor		
④ Diode		
⑤ LED		
⑥ Capacitor		



Number of legs

Device

- |    |             |                               |
|----|-------------|-------------------------------|
| 1. | More than 3 | I.C.                          |
| 2. | 3           | Transistor                    |
| 3. | 2           | Capacitor, diode or resistor. |

No. of possible current flow ~~flow~~ Device

- |    |  |                          |
|----|--|--------------------------|
| 1. | Unidirectional Exist no light                            | Diode                    |
| 2. | Both directional steady initially high but decay to zero | LED, Resistor, Capacitor |

Datt  
14-9-16

## Activity - 81

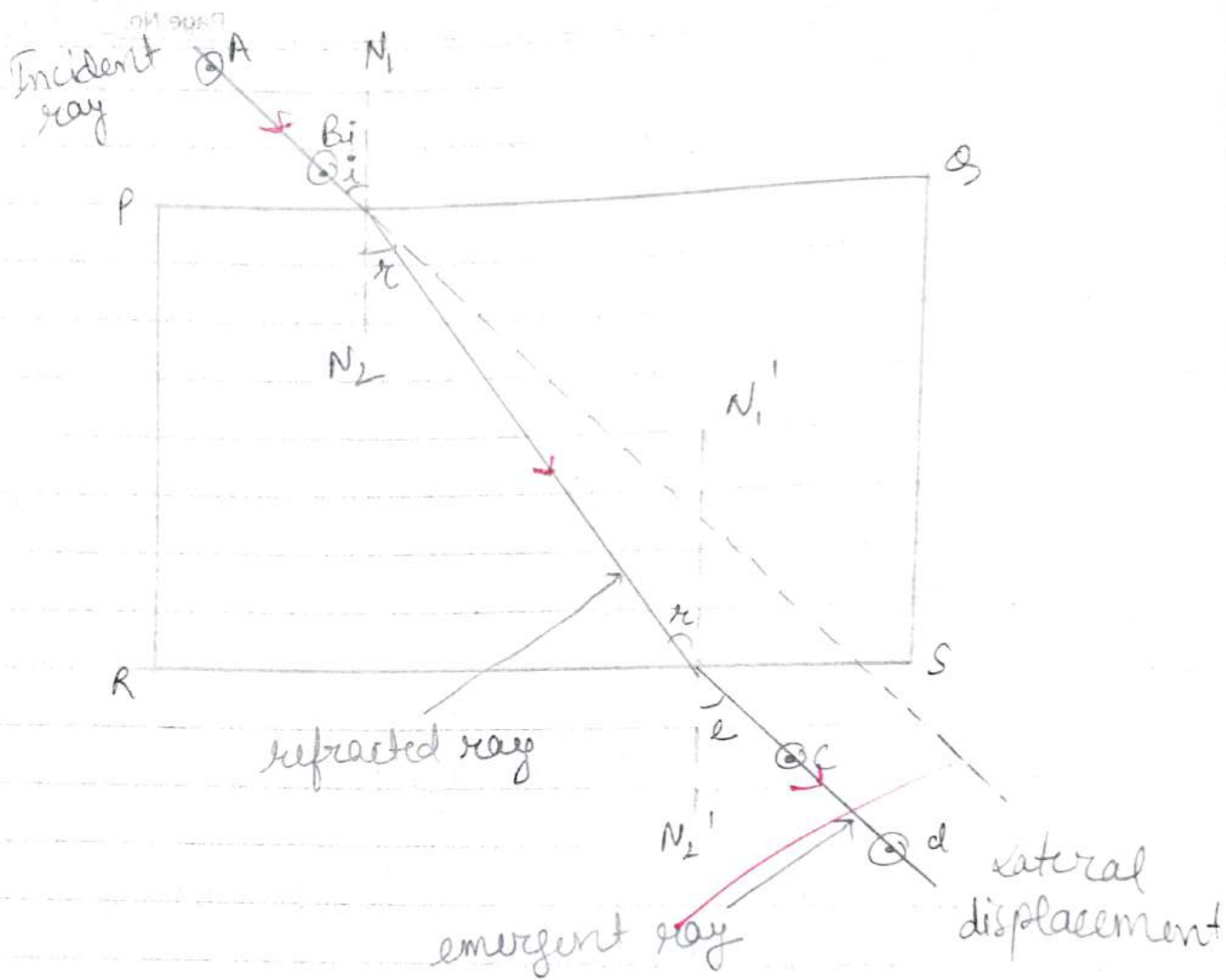
Aim:- To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.

Apparatus:- A sheet of white paper, glass slab, drawing board, two thin but long knitting needles, meter scale, pencil, etc.

Theory  $\rightarrow$  Reflection through a rectangular glass slab like let PQRS represent a glass slab consist that a ray light enter a glass slab along AE. It means that light is travelling from rarer medium to denser medium. Thus the refracted ray if bends towards the normal, EN, making an angle less than the angle. The angle which the ray makes with the normal at the point of emergence is called the angle of emergence & denoted by  $i_e$ .

- (a) The emergent ray is parallel to the incident ray.
- (b) Though, the emergent ray is parallel to the incident ray, it is laterally displaced by a distance 'd' from it.





Result:-

- ① The ray of light emerging from a glass slab is parallel to the incident light and it is laterally displaced.
- ② The lateral displacement of the emergent ray increases with the increase of thickness of the slab.

Date  
5-10-18