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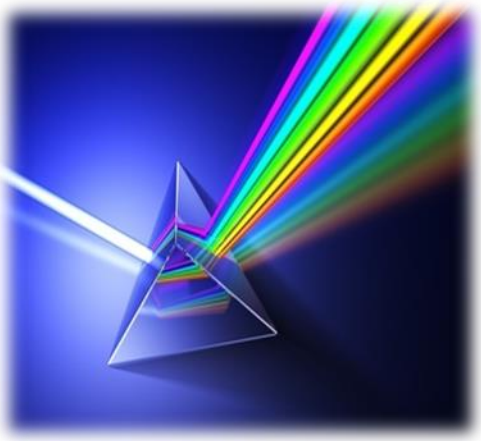
II PUC PHYSICS



VIVA - VOCE

Prof. Ghana Shankara Girija Prasad
Faculty, PHYSICS Department

BASE EDUCATIONAL SERVICES
Basavanagudi, BENGALURU – 560 004

EXPERIMENT 01: OHM'S LAW

01. State Ohm's law.

- Ohm's law states that the electric current flowing through a conductor is directly proportional to the potential difference across its ends provided the temperature and other physical conditions of the conductor remain same.

02. What is resistance of a conductor?

- It is the opposition offered by the conductor for the flow of current through it.

03. What is the SI unit of resistance?

- $ohm\ (\Omega)$

04. How the resistance of the conductor varies with area of cross section of the conductor?

- Resistance of the conductor is inversely proportional to its area of cross section.

05. How the resistance of the conductor varies with length of the conductor?

- Resistance of the conductor is directly proportional to its length.

06. What is the function of rheostat?

- It is a variable resistance device and is commonly used for adjusting the strength of electric current in an electric circuit.

07. Is the rheostat a resistor?

- Yes. It is a variable resistance device.

08. Which physical quantity does the slope of $I-V$ graph gives?

- Conductance.

09. Which physical quantity does the slope of $V-I$ graph gives?

- Resistance.

10. How the resistance of the conductor does vary with the potential difference across it?

- It is independent of potential difference across it.

11. How the resistance of the conductor does vary with the current through it?

- It is independent of current through it.

12. What is the resistance of an open key?

- Infinite.

EXPERIMENT 02: RESISTIVITY OF THE MATERIAL OF THE WIRE

01. What is a Metre bridge?

- It is the modified form of Wheatstone's network.

02. What is the principle of the Metre bridge?

- Balanced Wheatstone's network.

03. What is balance point (null point)?

- It is a point on the bridge wire for which the galvanometer shows null deflection.

04. What is balancing length?

- It is the length of the bridge wire for which the galvanometer shows null deflection.

05. What is the potential difference across the galvanometer at null point?

- Zero.

06. What is resistivity of the material of the conductor?

- It is the resistance of the conductor of unit length and unit area of cross section.

07. How the resistivity of the conductor does vary with area of cross section of the conductor?

- It is independent of area of cross section of the conductor.

08. How the resistivity of the conductor does vary with length of the conductor?

- It is independent of length of the conductor.

09. What is the change in the balancing length, if the resistance of the galvanometer is doubled, under balance condition?

- No change in the balancing length.

10. How do you verify the proper connection in Metre bridge experiment?

- If the galvanometer shows deflections in opposite directions when the jockey is placed at the extreme ends of the Metre bridge, then the connection is proper.

11. What is the balancing length when the length of the bridge wire is doubled?

- Balancing length is also doubled.

12. If Galvanometer and Battery in a Metre bridge circuit are interchanged, does the balancing length change?

- No.

13. When is Metre bridge most sensitive?

- When all the four resistances are of same magnitude.

EXPERIMENT 03 AND 04: COMBINATION OF RESISTANCES

01. What is the need of combination of resistances?

- To get the desired value of resistance.

02. When is the series combination of resistances preferred?

- To increase the effective resistance.

03. When is the parallel combination of resistances preferred?

- To decrease the effective resistance.

04. What is the effective resistance when two equal resistances are connected in series?

- It is equal to $2R$.

05. What is the effective resistance when two equal resistances are connected in parallel?

- It is equal to $R/2$.

06. Why the metal strips are made thick in Metrebridge?

- Thick metal strips have negligible resistance compared to the resistances connected in the gaps.

07. What is the effective resistance when n equal resistances are connected in series?

- It is equal to nR.

08. What is the effective resistance when n equal resistances are connected in parallel?

- It is equal to R/n.

09. Why the jockey should not be pressed too hard on the bridge wire when sliding on it?

- It alters the area of cross section of the wire, which in turn changes the resistance per unit length of the bridge wire.

10. Why the Metre bridge method is better than Ohm's law for resistance measurement?

- It is because the Metre bridge method is a null method. i.e., at null point the current through the galvanometer is zero.

EXPERIMENT 05: FOCAL LENGTH OF A CONCAVE MIRROR

01. When does a concave mirror produce virtual image?

- It is when an object is placed between the principal focus and pole of a concave mirror.

02. What is focal length of a concave mirror?

- It is the distance between the pole and the principal focus of a concave mirror.

03. What is radius of curvature?

- It is the radius of the sphere of which the spherical mirror forms a part.

04. What is the relation between focal length and radius of curvature?

- The relation between focal length and radius of curvature is $R = 2\ f$.

05. What is the nature of the image formed by a concave mirror when an object is kept between F and $2F$?

- It is real and inverted.

06. How do you distinguish between convex and concave mirror without touching?

- If the image formed by the mirror is small in size and erect for all possible positions of the object then it is a convex mirror otherwise it is a concave mirror.

07. How does the focal length of the concave mirror vary with object / image distance?

- It is independent of object / image distance.

08. How does the focal length of the concave mirror vary with colour / wavelength of light?

- It is independent of colour / wavelength of light.

09. How does the focal length of the concave mirror vary with surrounding medium?

- It is independent of surrounding medium.

10. What is parallax?

- The relative side way shift between two objects, at unequal distances from the eye, when the eye is moved sideways is called parallax.

EXPERIMENT 06: REFRACTIVE INDEX OF GLASS

01. What is Normal shift?

- It is the apparent shift in the position of the object due to normal refraction.

02. Define absolute refractive index of a medium.

- It is the ratio of velocity of light in air or vacuum to that in a given medium.

03. Define relative refractive index.

- It is the ratio of the velocity of light in medium (1) to that in medium (2).

04. What is the value of refractive Index of glass, water and air?

- Refractive Index of glass is about 1.5
- Refractive Index of water is about 1.33
- Refractive Index of air is about 1

05. What is meant by least count of TM?

- It is the least measurement that can be done in TM.

06. Does normal shift produced by a medium depend on the position of an object below the surface?

- No. It depends only on the thickness and refractive index of the medium.

07. Define refractive index of glass.

- It is the ratio of the velocity of light in vacuum to the velocity of light in glass.

08. What are the factors on which the refractive index of glass depends?

- It depends on the material, colour / wavelength of light and refractive index of surrounding medium.

09. How does the refractive index of glass vary with its thickness?

- It is independent of its thickness.

10. How does the refractive index of glass vary with wavelength of light?

- It decreases with the increase in the wavelength of light.

11. On what factors, apparent depth depends?

- Nature of medium (R.I.)
- Thickness of medium (actual depth)

- Colour of light

12. In general, for which colour we take the refractive index of a material?

- Yellow colour, since it is the mean colour of visible spectrum.

13. What may be refractive index for hollow glass slab?

- It is about 1.

EXPERIMENT 07: FIGURE OF MERIT OF GALVANOMETER

01. What is a galvanometer?

- It is a device used for detecting very small electric current in circuits.

02. Why the galvanometer has zero centered scale?

- The pointer can deflect on either side of zero in the middle.

03. Do you have positive and negative terminal in the galvanometer?

- No.

04. Which part of the galvanometer offers resistance?

- The coil of the galvanometer offers resistance.

05. What do you mean by figure of merit of a galvanometer?

- It is the current required to produce a deflection of one division on the galvanometer scale.

06. Define current sensitivity of a galvanometer.

- It is the number of division deflection produced per unit current.

07. What is the SI unit of figure of merit?

- $A\,div^{-1}$ (ampere per division).

08. What is the SI unit of current sensitivity?

- $div\ A^{-1}$ (division per ampere).

09. How the current sensitivity and figure of merit of galvanometer related to each other?

- They are reciprocal to each other.

10. Why the divisions of galvanometer scale are equally spaced?

- Because, the deflection of the needle is directly proportional to the current.

11. Why the method of finding the resistance of galvanometer is called half deflection method?

- It is because the deflection is made half by using a shunt resistance.

EXPERIMENT 08: GALVANOMETER INTO VOLTMETER

01. What is a voltmeter?

- A voltmeter is a device used for measuring potential difference between two points in a circuit.

02. How is a voltmeter to be connected in a circuit?

- It is to be connected in parallel with circuit element across which the potential difference is to be measured.

03. Why is a voltmeter used in parallel in a circuit?

- The potential difference to be measured is maintained at the terminals of the voltmeter.

04. What should be the resistance of the voltmeter?

- A voltmeter should have a very large resistance (infinite, if possible).

05. Why should a voltmeter have a very large resistance?

- It should not draw much current from the circuit when connected.

06. How do you convert the given galvanometer into a voltmeter?

- A galvanometer can be converted into a voltmeter by connecting a high resistance in series with the galvanometer.

07. On what factors the value of high resistance connected in series depends?

- It depends on the range of the required voltmeter and resistance of the galvanometer.

08. What is the resistance of an ideal voltmeter?

- Ideal voltmeter has Infinite resistance.

EXPERIMENT 09: FOCAL LENGTH OF CONVEX LENS

01. What is a convex lens?

- It is a lens which converge parallel beam of light passing through it is called convex lens.

02. What is the nature of virtual image produced by a convex lens?

- It is magnified and erect.

03. When is the image virtual and enlarged in a convex lens?

- It is when an object is placed between the principle focus and pole of a concave mirror. $(u < f)$

04. When is the image real and enlarged in a convex lens?

- When the object is between F and $2F$. $(f < u < 2f)$

05. When is the image real and diminished in a convex lens?

- When the object is beyond $2F$. $(u < 2f)$

06. Does a convex lens produce virtual and diminished image?

- No.

07. What is focal length of convex lens?

- It is the distance between the principle focus and optic centre of a convex lens.

08. What are the factors on which the focal length of a convex lens depends?

- Refractive index of lens
- Refractive index of surrounding medium
- Radii of curvature of lens

- Colour / wavelength of light

09. Does focal length of a convex lens depends on its thickness?

- Yes. A thick lens has small focal length and a thin lens has large focal length.

10. Is convex lens a diverging or a converging lens?

- It is a converging lens.

11. Define principle focus of a convex lens?

- It is a point of convergence of parallel beam of light parallel to the principal axis on the principal axis.

12. Can a convex lens be used as a magnifier?

- Yes. For $u < f$, the image is virtual and enlarged. Hence it can be used as a magnifier.

13. How does the focal length of the convex lens vary with object / image distance?

- It is independent of object / image distance.

14. How does the focal length of the convex lens vary with wavelength of light?

- It decreases with the decrease in wavelength of wavelength of light.

15. How does the focal length of the convex lens vary with colour of light?

- It is in the increasing order of VIBGYOR.

16. How does the focal length of the convex lens vary with surrounding medium?

- It increases with the increase is refractive index of surrounding medium.

EXPERIMENT 10: SEMICONDUCTOR DIODE

01. What is a Diode?

- It is a junction between $p-$type and $n-$type semiconductor.

02. What is biasing of a junction?

- Applying an external potential difference more than potential barrier on the faces of the junction, is called biasing of the junction.

03. Name the two types of the biasing.

- Forward biasing and reverse biasing.

04. Why is forward bias so called?

- Because it makes free charge carriers to move forward towards junction.

05. Why is reverse bias so called?

- Because it makes free charge carriers to move reverse away from junction.

06. Define a hole.

- A place vacated by an electron, is called a hole. It is associated with a positive charge.

07. Define an intrinsic semiconductor.

- It is a pure semiconductor in which number of electrons is equal to number of holes.

08. Which materials are commonly used as semiconductors?

- Silicon and germanium are commonly used as semiconductors.

09. Define an extrinsic semiconductor.

- It is an impure semiconductor in which number of electrons is not equal to number of holes.

10. Why is $n-$type semiconductor so called?

- In $n-$ type semiconductor, electrons are the majority charge carriers which are negative.

11. Why is $p-$type semiconductor so called?

- In $p-$ type semiconductor, holes are the majority charge carriers which are positive.

12. What is junction potential barrier?

- It is the potential difference across the junction.

13. Why is junction potential barrier so called?

- Because it prevents free charge carriers from entering the depletion layer by themselves.

14. How does the bias affect the thickness of the depletion layer?

- Forward bias decreases the thickness of depletion layer.
- Reverse bias increases the thickness of depletion layer.

15. How does the bias affect the junction resistance?

- The forward bias makes junction resistance less.
- The reverse bias makes junction resistance more.

16. Define characteristic of a junction diode.

- A graph of current versus bias voltage is called characteristics of the diode. It reveals the character (way of behavior) of the junction diode.

17. What is the order of resistance of diode in forward bias condition?

- It is of the order of $5-10\,\Omega$.

18. What is the order of resistance of diode in reverse bias condition?

- It is of the order of $10000\,\Omega$.

QUESTIONS FOR PRACTICAL EXAMINATION

Ohm's law

Determine the resistance per unit length of given wire by plotting the current versus potential difference.

02. Resistivity

Determine the resistance of the given wire and hence to find the resistivity of the material of the given wire.

Length of the wire $= L = 0.5\ m$

Diameter of the wire $= d = 0.35 \times 10^{-3}\ m$

03. Series combination of resistances

Verify the law of combination of resistances in series using a metre bridge.

$R_1 =$ Ω $R_2 =$ Ω

04. Parallel combination of resistances

Verify the law of combination of resistances in parallel using a metre bridge.

$R_1 =$ Ω $R_2 =$ Ω

05. Focal length of concave mirror

Determine the focal length of a given concave mirror by $u-v$ method

06. Refractive index of glass slab

Determine the refractive index of glass slab using travelling microscope.

07. Figure of merit

Determine the resistance of given galvanometer by half deflection method and to find its figure of merit.

08. Conversion of galvanometer into voltmeter

Convert the given galvanometer into a voltmeter of range $0-3\,V$ and verify the same.

Figure of merit of galvanometer $= K = 20\times10^{-6}\ A\,div^{-1}$

Resistance of galvanometer $= G = 120\ \Omega$

09. Focal length of convex lens

Determine the focal length of a given convex lens by plotting a graph of v versus u.

10. Semiconductor diode

Draw the $I-V$ characteristics curve of a semiconductor diode in forward bias condition and to find its forward resistance and cut in voltage.