

Chapter 9. CURRENT ELECTRICITY

MCQ'S (1 Mark Each)

1) Kirchoff's second law (voltage law) is based on

- a) conservation of charge
- b) conservation of mass
- c) conservation of energy
- d) conservation of momentum

Ans: c) conservation of energy

2) When unknown resistance is determined by meter bridge, the error due to contact resistance is minimised by

- a) connecting both the resistances only in one gap
- b) interchanging the position of known and unknown resistances
- c) using uniform wire
- d) obtaining the null point near the ends of the wire

Ans: b) interchanging the position of known and unknown resistances.

3) The SI unit of potential gradient is

- a) V/cm
- b) V-m
- c) V/m
- d) V-cm

Ans: c) V/m

4) Instrument which can measure terminal potential difference as well as electromotive force (emf) is

- a) Wheatstone's meter bridge
- b) voltmeter
- c) potentiometer
- d) galvanometer

Ans.: c) potentiometer

5) When null point is obtained in the potentiometer, the current is drawn from the

- a) main battery
- b) cell battery
- c) both main and cell battery
- d) neither main nor cell battery

Ans.: a) main battery

6) If potential gradient of a wire decreases, then its length

- a) remains constant
- b) decreases
- c) increases
- d) none of the above

Ans.: c) increases

7) Four resistances $4\ \Omega$, $8\ \Omega$, $X\ \Omega$ and $12\ \Omega$ are connected in a series to form Wheatstone's network. If the network is balanced, the value of X is

- a) 24
- b) 18
- c) 12
- d) 8

Ans: a) 24

Very Short Answer (VSA) (1 MARK Each)

- 1) State Kirchhoff's first (current) law.
- 2) State Kirchhoff's second (voltage) law.
- 3) What is the basis of Kirchhoff's current law and voltage law?
- 4) Are Kirchhoff's laws applicable to both AC and DC circuits?
- 5) Define potential gradient.
- 6) On what factors does the potential gradient of the wire depend?
- 7) What is the SI unit of potential gradient?
- 8) State any one use of a potentiometer.
- 9) A voltmeter has resistance of $100\ \Omega$. What will be its reading when it is connected across a cell of emf $6\ \text{V}$ and internal resistance $20\ \Omega$? (**Ans: $5\ \text{V}$**)

10) In a meter bridge, two unknown resistances R and S, when connected between the two gaps, gives a null point is 60 cm from one end. What is the ratio of R and S?

(Ans: 3/2)

Short Answer I (SA1) (2 MARKS Each)

1. What are the disadvantages of a potentiometer over a voltmeter?
2. Distinguish between a potentiometer and a voltmeter.
3. Distinguish between an ammeter and a voltmeter.
4. How do you calculate the shunt required to increase the length small n times?
5. Define: a) electrical circuit b) Junction
6. Calculate the value of the shunt resistance when connected across a galvanometer of resistance 18Ω will allow $1/10$ th of the current to pass through the galvanometer.
(Ans: $S = 2\Omega$)
7. Four resistances $6\Omega, 6\Omega, 6\Omega$ and 18Ω form a Wheatstone bridge. Find the resistance which connected across the 18Ω resistance will balance the network. **(Ans: 9Ω)**
8. The maximum safe voltage that can be measured using a galvanometer of resistance G is V_m . Find the resistance to be connected in series with the galvanometer so that it becomes a voltmeter of range nV_m . **[Ans: $(n-1) G$]**

Short Answer II (SA2) (3 MARKS Each)

- 1) Explain with a neat circuit diagram. How you will determine the unknown resistances using a meter bridge.
- 2) State any two sources of errors in the metre bridge experiment. Explain how they can be minimised.
- 3) What is potential gradient? How is it measured? Explain.
- 4) Describe how a potentiometer is used to compare the emf's of two cells by connecting the cells individually.
- 5) A cell of E.M.F 1.5V and negligible internal resistance is connected in series with a potential meter of length 10 m and total resistance 20Ω . What resistance should be introduced in the resistance box such that the potential drop across the potentiometer is one microvolt per cm of the wire? **3 (Ans: 29980Ω)**
- 6) In a meter bridge, the balance point is found to be at 39.5 cm from the end A when the resistor R is of 12.5Ω (right gap).
 - a) Determine the resistance of X (left gap).
 - b) Determine the balance point of the bridge if X and R are interchanged?

- c) What happens if the galvanometer and cell are interchanged at the balance point of the bridge? (*Ans: a) 8.16 Ω b) 60.5 cm*)
- 7) The emf of a standard cell is 1.5V and is balanced by a length of 300 cm of a potentiometer with 10 m long wire. Find the percentage error in a voltmeter which balances at 350 cm when its reading is 1.8 V. 3 (*Ans: 2.8571 %*)

Long Answer (LA) (4 marks Each)

- 1) Describe with the help of a neat circuit diagram how you will determine the internal resistance of a cell by using a potentiometer. Derive the necessary formula.
- 2) Describe how a potentiometer is used to compare the emf's of two cells by the combination method.
- 3) State the uses of a potentiometer. Why is a potentiometer preferred over a voltmeter for measuring emf?