H.NO.400,Near Jain mandir old awas vikas SRE
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(Curent electricity:DPP 1)

Fill in the Blanks

1. The resistivity's of semi conductors _____ with increasing temperatures.

2. The dimension of temperature co-efficient of resistivity is _____.

3. In nature, free charged particles do exist like in upper strata of atmosphere called _____.

4. Increasing the potential difference between the ends of a conductor result in _____.

5. Two identical metal wires have their lengths is ration 2 : 3. Their resistance shall be in the ratio ___.

6. There is a metal block of dimensions 20 × 10 × 15 cm. The ratio of the maximum and minimum resistance of the block is _____.

7. A cell of emf E and resistance r is connected across an external resistance R. The potential difference across the terminals of a cell for r = R is _____.

8. Kirchhoff 's II law for electric network is based on _____.

9. Kirchhoff 's I law for electric network is based on _____.

10. The value of resistances used in electric and electronic circuit vary over a very wide range. Such high resistances used are usually _____ resistances and the value of such resistances are marked on them according to a colour code.

Answers

1. decrease 2. $(\text{temperature})^{-1}$ 3. Ionosphere 4. increase in the current 5. 2:3 6. 4:1

7. E/2 8. conservation of energy 9. conservation of charge 10. Carbon

(Curent electricity:DPP 2)

MCQ (Ncert based)

Q1.Kirchhoff's junction rule is a reflection of

(a) conservation of current density vector.

(b) conservation of charge.

(c) the fact that the momentum with which a charged particle approaches a junction is unchanged (as a vector) as the charged particle leaves the junction.

(d) the fact that there is no accumulation of charged at a junction.

Q2. Which of the following characteristics of electrons determines the current in a conductor .

(a) Drift velocity alone (b) Thermal velocity alone

(c) Both drift velocity and thermal velocity (d) Neither drift nor thermal velocity.

Q3. Temperature dependence of resistivity r(T) of semiconductors insulators and metals is significantly based on the following factors. [NCERT Exemplar]

(a) Number of charge carriers can change with temperature T.

(b) Time interval between two successive collision can depend on T.

(c) Length of material can be a function of T.

(d) Mass of carriers is a function of T .

Q4. 15. A student connects 10 dry cells each of emf E and internal resistance r in series, but by mistake the one cell gets wrongly connected. Then net emf and net internal resistance of the combination will be

(a) 8E, 8r **(b) 8E, 10r** (c) 10E, 10r (d) 8E, r /10

Q 5. . A metal rod of length 10 cm and a rectangular cross-section of 1cm × 1/2 cm is connected to a battery across opposite faces. The resistance will be [NCERT Exemplar]

(a) maximum when the battery is connected across 1 cm × 1/2 cm faces.

(b) maximum when the battery is connected across 10 cm × 1 cm faces.

(c) maximum when the battery is connected across 10 cm × 1/2 cm faces.

(d) same irrespective of the three faces.

Q6. Two cells of emf's approximately 5 V and 10 V are to be accurately compared using a potentiometer of length 400 cm.

(a) The battery that runs the potentiometer should have voltage of 8V.

(b) The battery of potentiometer can have a voltage of 15 V and R adjusted so that the potential drop across the wire slightly exceeds 10 V.

(C) The first portion of 50 cm of wire itself should have a potential drop of 10 V.

(d) Potentiometer is usually used for comparing resistances and not voltages.

Q7. The drift velocity of the free electrons in a conducting wire carrying a current i is v. If in a wire of the same metal, but of double the radius, the current be 2I, then the drift velocity of the electrons will be

(a) v/4 **(b) v/2** (c) v (d) 4v

Q8. A resistance R is to be measured using a meter bridge. Student chooses the standard resistance S to be 100 Ω. He finds the null point at L_1 = 2.9 cm. He is told to attempt to improve the accuracy. Which of the following is a useful way?

(a) He should measure L_1more accurately.

(b) He should change S to 1000 Ω and repeat the experiment.

(c) He should change S to 3 Ω and repeat the experiment.

(d) He should give up hope of a more accurate measurement with a meter bridge

Q9. In a Wheatstone bridge, all the four arms have equal resistance R. If resistance of the galvanometer arm is also R, then equivalent resistance of the combination is

(a) R (b) 2R (c) R/ 2 (d) R /4

Q10. A potentiometer is an accurate and versatile device to make electrical measurement of EMF because the method involves

(a) potential gradients **(b) a condition of no current flow through the galvanometer**

(c) a combination of cells, galvanometer and resistance (d) cells.

(Curent electricity:DPP 3)

Very Short Answer Questions

Q. 1. Define the term drift velocity of charge carriers in a conductor. Write its relationship with current flowing through it.

Q2.Define the term 'Mobility' of charge carries in a conductor. Write its SI unit. What is its relation with relaxation time?

Q3. How does the mobility of electrons in a conductor change, if the potential difference applied across the conductor is doubled, keeping the length and temperature of the conductor constant?

Q4. Plot a graph showing variation of current versus voltage for the material GaAs.

Q5. The emf of a cell is always greater than its terminal voltage. Why? Give reason.

Q6. Define the current sensitivity of a galvanometer. Write its SI unit.

Q7. A cell of emf 'e' and internal resistance 'r' draws a current 'I'. Write the relation between terminal voltage 'V' in terms of e, I and r.

Q8. Under what condition will the current in a wire be the same when connected in series and in parallel of n identical cells each having internal resistance r and external resistance R ?

Q9. Nichrome and copper wires of same length and same radius are connected in series. Current I is passed through them. Which wire gets heated up more? Justify your answer.

Q10. For household electrical wiring, one uses Cu wires or Al wires. What considerations are kept in mind?

Q11. Draw a graph to show a variation of resistance of a metal wire as a function of its diameter keeping its length and material co Why are alloys used for making standard resistance coils?nstant.

Q12. Why are alloys used for making standard resistance coils?

(Curent electricity:DPP 4)

Short Answer Questions

Q1. (a) You are required to select a carbon resistor of resistance 47 kΩ ± 10% from a large collection. What should be the sequence of colour bands used to code it? (b) Write the characteristics of manganin which make it suitable for making standard resistance.

Q2. Plot a graph showing variation of voltage Vs the current drawn from the cell. How can one get information from this plot about the emf of the cell and its internal resistance?

Q3. Two cells of emfs 1.5 V and 2.0 V having internal resistances 0.2 Ω and 0.3 Ω respectively are connected in parallel. Calculate the emf and internal resistance of the equivalent cell.

Q4. When 5 V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is 2.5×10^{-4} m/s. If the electron density in the wire is 8×10^{28} m^{-3}, calculate the resistivity of the material of wire.

Q5. Two conducting wires X and Y of same diameter but different materials are joined in series across a battery. If the number density of electrons in X is twice that in Y, find the ratio of drift velocity of electrons in the two wires.

Q6. A conductor of length 'l' is connected to a dc source of potential 'V'. If the length of the conductor is tripled by gradually stretching it, keeping 'V' constant, how will (i) drift speed of electrons and (ii) resistance of the conductor be affected? Justify your answer.

Q7. Two bulbs are rated (P1, V) and (P2, V). If they are connected (i) in series and (ii) in parallel across a supply V, find the power dissipated in the two combinations in terms of P1 and P2.

Q8. A set of 'n' identical resistors, each of resistance 'R' when connected in series have an effective resistance 'X'. When they are connected in parallel, their effective resistance becomes 'Y'. Find out the product of X and Y.

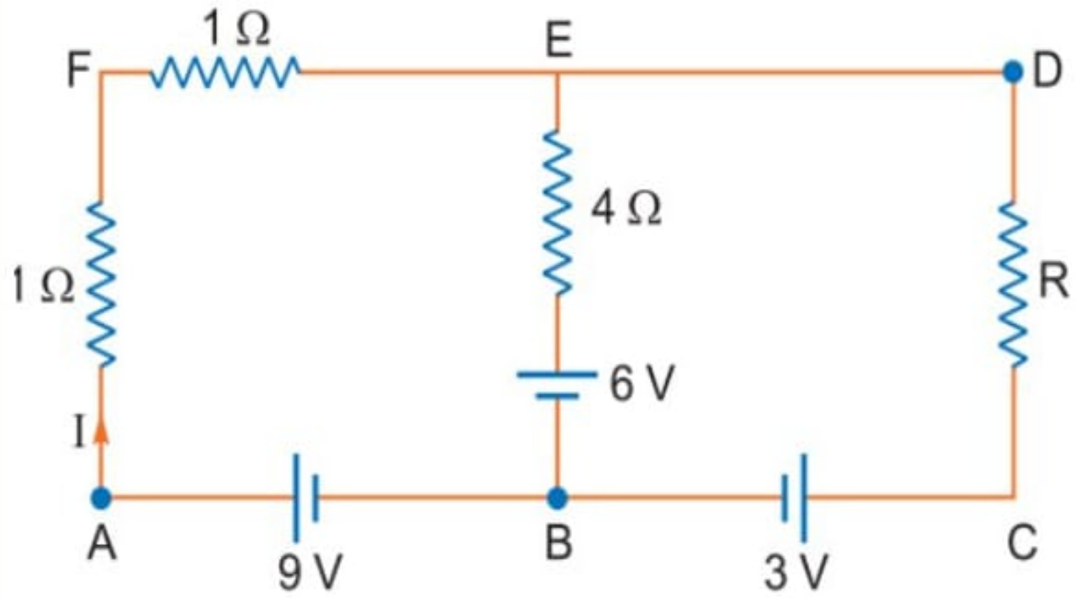
Q9. . In a potentiometer arrangement for determining the emf of a cell, the balance point of the cell in open circuit is 350 cm. When a resistance of 9 Ω is used in the external circuit of the cell, the balance point shifts to 300 cm. Determine the internal resistance of the cell. #(Not in syallabus but important for Neet)

Q10. (a) Why are the connections between the resistors in a meter bridge made of thick copper strips?

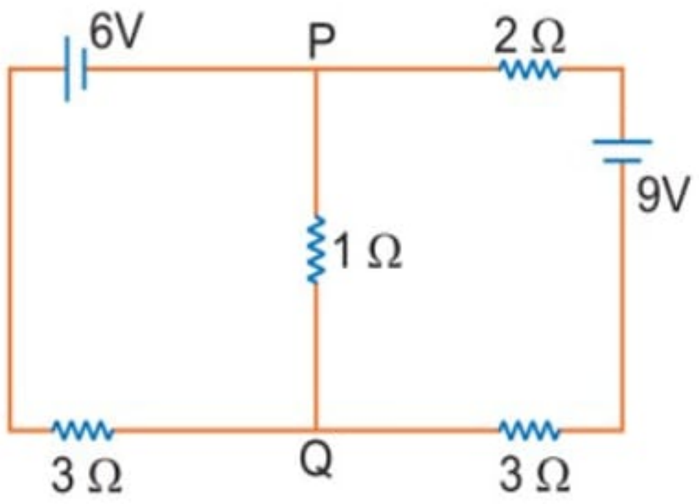
(b) Why is it generally preferred to obtain the balance point in the middle of the meter bridge wire?

(c) Which material is used for the meter bridge wire and why?

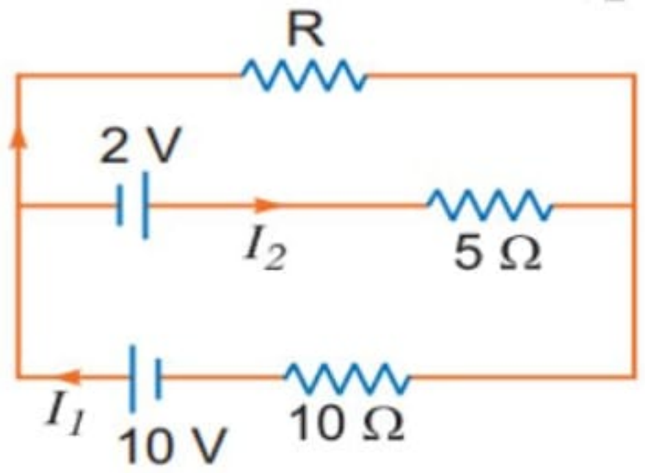
Q11. Using Kirchoff's rules determine the value of unknown resistance R in the circuit so that no current flows through 4 Ω resistance. Also find the potential difference between A and D.



Q12. Using Kirchoff's rules determine the value of unknown resistance R in the circuit so that no current flows through 4 Ω resistance. Also find the potential difference between A and D.



Q13. Two cells of emf 10 V and 2 V and internal resistance 10 Ω and 5 Ω respectively, are connected in parallel as shown. Find the effective voltage across R.



(Curent electricity:DPP 5)

Long Questions.

Q1. First a set of n equal resistors of R each are connected in series to a battery of emf E and internal resistance R. A current I is observed to flow. Then the n resistors are connected in parallel to the same battery. It is observed that the current is increased 10 times. What is n?

Q2. (i) Derive an expression for drift velocity of free electrons. (ii) How does drift velocity of electrons in a metallic conductor vary with increase in temperature? Explain.

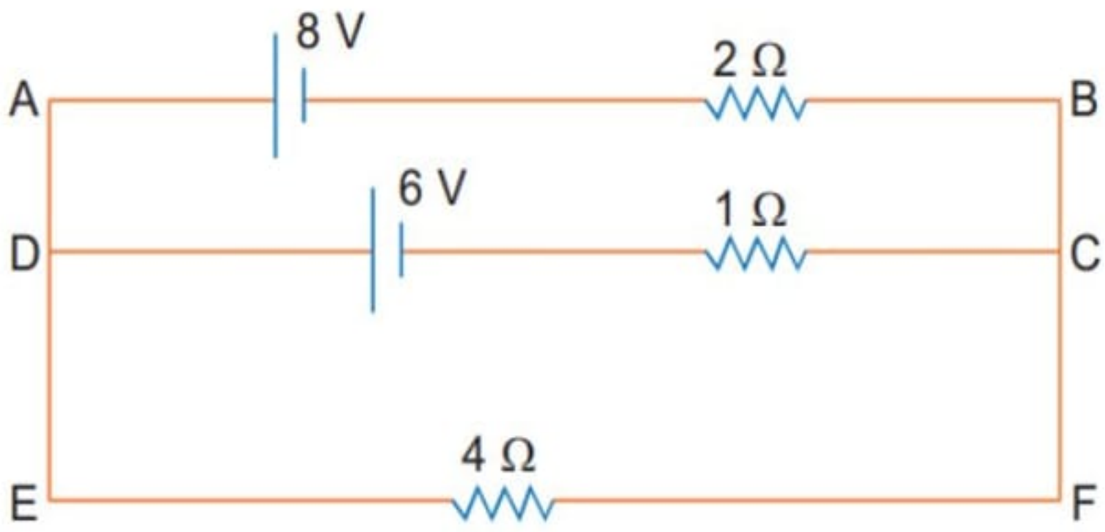
Q3. (a) State Kirchhoff's rules and explain on what basis they are justified.

(b) Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 are connected in parallel. Derive the expression for the (i) emf and (ii) internal resistance of a single equivalent cell which can replace this combination.

Q4. Explain how the average velocity of free electrons in a metal at constant temperature, in an electric field, remains constant even though the electrons are being constantly accelerated by this electric field.

Q5. (a) Give reason:

(i) Why the connections between the resistors in a metre bridge are made of thick copper strips, (ii) Why is it generally preferred to obtain the balance length near the mid-point of the bridge wire. (b) Calculate the potential difference across the 4W resistor in the given electrical circuit, using Kirchhoff's rules.



Q6. Prove that the current density of a metallic conductor is directly proportional to the drift speed of electrons.

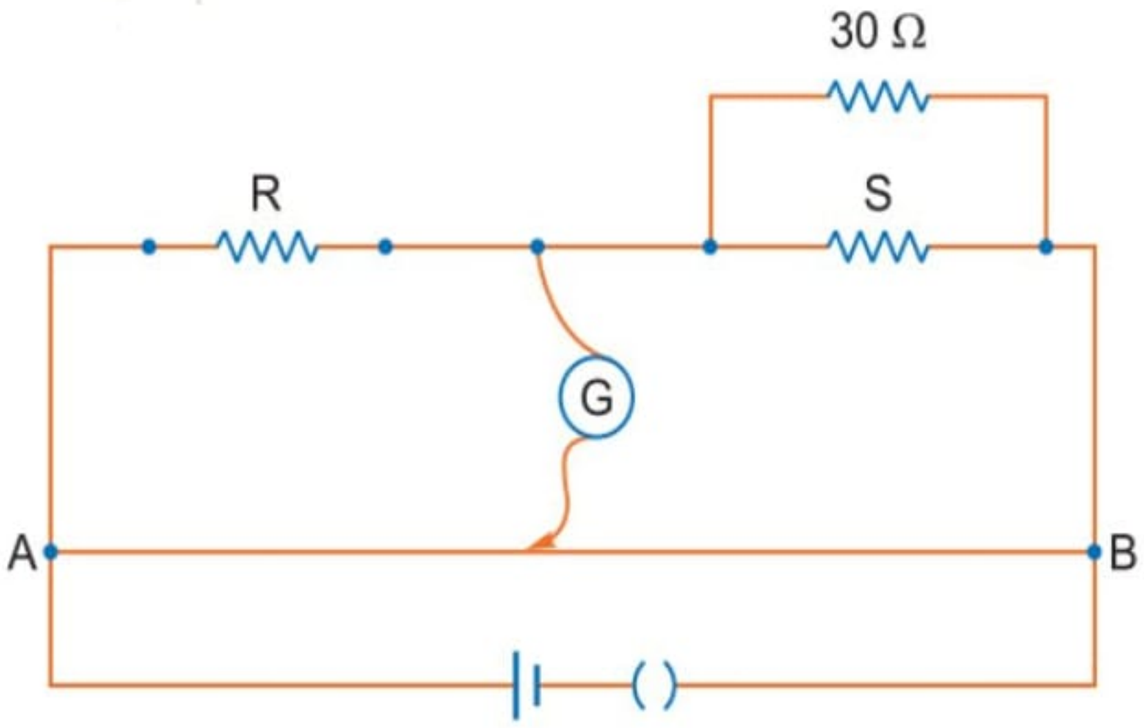
Q7. Define relaxation time of the free electrons drifting in a conductor. How is it related to the drift velocity of free electrons? Use this relation to deduce the expression for the electrical resistivity of the material.

Q8. Draw a circuit diagram showing balancing of Wheatstone bridge. Use Kirchhoff's rules to obtain the balance condition in terms of the resistances of four arms of Wheatstone Bridge.

Q9. Draw a circuit diagram of a Metre Bridge and write the mathematical relation used to determine the value of an unknown resistance. Why cannot such an arrangement be used for measuring very low resistance?

Q10. Draw the circuit diagram of a potentiometer which can be used to determine the internal resistance of a given cell of emf (E). Describe a method to find the internal resistance of a primary cell.

Q11. In a meter bridge with R and S in the gaps, the null point is found at 40 cm from A. If a resistance of 30Ω is connected in parallel with S, the null point occurs at 50 cm from A. Determine the values of R and S.



REVISION PAPER
(CURRENT ELECTRICITY)

Time :1hrs **M.M:20 marks**

Note:

Q. No. 1-4 is of 01 mark each, Q. 5-6 is of 02 marks each, Q.No.7 is of 03 marks, Q. No. 8 is a case study based and is of 04 marks, Q. No. 9 is of 5 marks.

Q1.State the two Kirchhoff 's rules used in electric networks. How are these rules justified?

Q2. Show variation of resistivity of copper as a function of temperature in a graph.

Q3. Kirchhoff 's first and second laws of electrical circuits are consequences of

(a) conservation of energy and electric charge respectively. (b) conservation of energy.

(c) conservation of electric charge and energy respectively. (d) conservation of electric charge.

Q4. A battery of emf 2 volt and internal resistance 0.1 Ω is being charged with a current of 5 ampere. The p.d. between the two terminals of the battery is _____ .....volt.

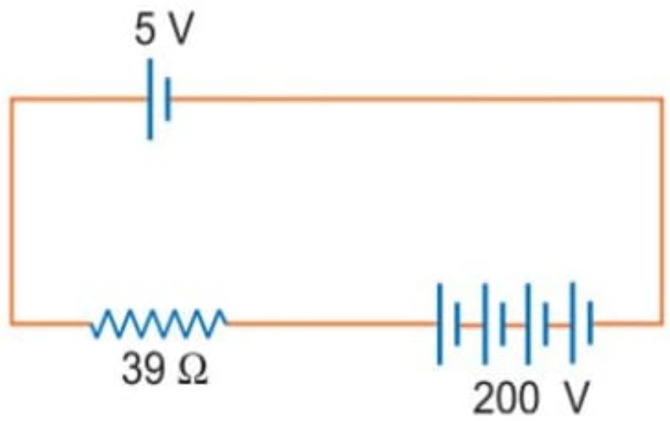
Q5. It is found that when R = 4 Ω, the current is 1 A and when R is increased to 9 Ω , the current reduces to 0.5 A. Find the values of the emf E and internal resistance r.

Q6. A cell of emf 'E' and internal resistance 'r' is connected across a variable resistor 'R'. Plot a graph showing variation of terminal voltage 'V' of the cell versus the current 'I'. Using the plot, show how the emf of the cell and its internal resistance can be determined.

Q7. Estimate the average drift speed of conduction electrons in a copper wire of cross-sectional area

$2.5 \times 10^{-7} m^2$ carrying a current of 1.8A. Assume the density of conduction electrons to be $9 \times 10^{28} m^{-3}$.

Q8. A 5 V battery of negligible internal resistance is connected across a 200 V battery and a resistance of 39 Ω as shown in the figure. Find the value of the current flowing in the circuit. State the two Kirchhoff 's rules used in electric networks. How are these rules justified?



Q9. (i) State the principle of working of a meter bridge. (ii) In a meter bridge balance point is found at a distance L_1 with resistance R and S as shown in the figure. When an unknown resistance X is connected in parallel with the resistance S, the balance point shifts to a distance L . Find the expression for X in terms of L_1, L_2 and S.