

SAIVEERA ACADEMY 8098850809
REVOLUTION FOR LEARNING -
PEELAMEDU
12TH UNIT 1 BOOK BACK FIVE
MARKS TEST

Marks :50
Time:60 min

I. Answer all the question 10×5 = 50

1. You have given a infinite long wire which is positively charged .Find the electric field due that wire .What would you infer from that while comparing with field due to infinitely charged plane sheet
2. You have given two pates with one is positively charged and other one is negatively charged separated by some distance , find their capacitance and find whether distance of plates and medium between the plates will affect the capacitance
3. Derive expression for electric potential due to a point charge and dipole .Find how distance of charge affect the potential of them
4. Explain about how electrostatic induction and corona discharge is applied in the working of Van De Graff generator
5. Derive electric field due to a dipole at a point on the equatorial line and explain why the electric field is opposite to the direction of dipole moment
6. What happens to capacitance , voltage , charge , energy of parallel plate capacitor when dielectric placed in between the plates when battery disconnected from plates with proper expression
7. What will be the potential energy when dipole placed in an uniform electric field
8. If n number of capacitors of capacitance C is connected in parallel and series , what will be their effective capacitance
9. Derive electric field due to point charge by using Coulomb's law .Find how changing the medium of charges from air affects the force between them
10. Explain how gravitational force differs by electrostatic force with clear cut explanations

SAIVEERA ACADEMY 8098850809
REVOLUTION FOR LEARNING -
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12TH UNIT 1 & 2 BOOK BACK FIVE
MARKS TEST

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Time:60 min

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UNIT – 2 CURRENT ELECTRICITY**I. One marks**

1. Resistance of a metal wire of length 10cm is $2\ \Omega$. If the wire is stretched uniformly to 50 cm ,resistance is
a) $25\ \Omega$ b) $10\ \Omega$ c) $5\ \Omega$ d) $50\ \Omega$
2. The colour code on a carbon resistor is red – red – black. The resistance of the resistor is
a) $2.2\ \Omega$ b) $22\ \Omega$ c) $220\ \Omega$ d) $2.2\ \text{k}\Omega$
3. The brown ring at one end of a carbon resistor indicates a tolerance of
a) 1% b) 2% c) 5% d) 10%
4. The unit of conductivity is
a) mho b) ohm c) ohm – m d) mho – m^{-1}
5. The material through which electric charge can flow easily is
a) quartz b) mica c) germanium d) copper
6. In the case of insulators, as the temperature decreases, the resistivity
a) decreases b) increases c) remains constant d) becomes zero
7. If the length of a copper wire has a certain resistance R , then on doubling the length its specific resistance
a) will be doubled b) will be $1/4\text{th}$
c) will become four times d) will remain the same
8. When two $2\ \Omega$ resistances are in parallel their effective resistance is
a) $2\ \Omega$ b) $4\ \Omega$ c) $1\ \Omega$ d) $0.5\ \Omega$
9. The transition temperature of mercury is
a) 4.2°C b) $4.2\ \text{K}$ c) 2.4°C d) $2.4\ \text{K}$
10. The toaster operating at 240 V has a resistance of $120\ \Omega$. The power is
a) 400 W b) 2 W c) 480 W d) 240 W
11. The relation between current and drift velocity is
a) $I = Av_d$ b) $I = nev_d$ c) $I = nv_d$ d) $I = neAv_d$
12. When the diameter of a conductor is doubled, its resistance
a) decreases twice b) decreases four times
c) decreases sixteen times d) increases four times
13. A cell of emf 2.2V sends a current of 0.2 A through a resistance of $10\ \Omega$. The internal resistance of the cell is
a) $0.1\ \Omega$ b) $1\ \Omega$ c) $2\ \Omega$ d) $1.33\ \Omega$
14. When n resistors of equal resistance (R) are connected in series the effective resistance is
a) n / R b) R / n c) $1/ nR$ d) nR
15. The electrical resistivity of a thin copper wire and a thick copper rod are respectively $p_1\ \Omega\ \text{m}$ and $p_2\ \Omega\ \text{m}$. Then :
a) $p_1 > p_2$ b) $p_2 > p_1$ c) $p_1 = p_2$ d) $p_2/p_1 = \infty$
16. The unit of electrochemical equivalent is
a) Kg. coulomb b) kg/ ampere sec c) kg/ sec. d) C/kg
17. When 'n' resistors of equal resistance (R) are connected in series and in parallel respectively, then the ratio of their effective resistance is :

Based on concepts

1. Nichrome is used as heating element because it has
 - a) very low resistance
 - b) low melting point
 - c) **high specific resistance**
 - d) high conductivity
2. Peltier effect is the converse of
 - a) Joule effect
 - b) Raman effect
 - c) Thomson effect
 - d) **Seebeck effect**
3. In which of the following pairs of metals of a thermocouple the e.m.f. is maximum?
 - a) Fe – Cu
 - b) Cu – Zn
 - c) Pt - Ag
 - d) **Sb – Bi**
4. Joule's law of heating is
 - a) $H = I^2 t/R$
 - b) $H = V^2 R t$
 - c) $H = I R^2 t$
 - d) **$H = V I t$**
- 5.. Fuse wire is an alloy of
 - a) **Lead and Tin**
 - b) Tin and Copper
 - c) Lead and Copper
 - d) Lead and Iron
6. Fuse wire
 - a) is an alloy of lead and copper
 - b) has low resistance
 - c) **has high resistance**
 - d) has high melting point
7. In the case of insulators, as the temperature increases, the resistivity **decreases**
8. The drift velocity acquired per unit electric field is called **mobility**
9. Kirchoff's first law is a consequence of conservation of **charges**
10. Kirchoff's second law is a consequence of conservation of **energy**
11. 1 kWh is equal to **36×10^5 J.**
12. The quantity of charge passing per unit time through unit area is called as **current density**
13. Germanium and silicon are called as **semiconductors**
14. The electric iron works on the principle of **Joule's heating** effect of current.
15. The melting point of tungsten is **3380°C.**
16. Fuse wire has high resistance and **low** melting point.
17. The alloy of nickel and chromium is called **nichrome**
18. Sn, Au, Ag, Zn, Cd, Sb show **Positive Thomson** effect.
19. Bi, Ni, Pt, Co, Fe, Hg show **Negative Thomson** effect.
20. Seebeck effect is a **Reversible** process.
21. Which of the following has negative temperature coefficient of resistance?
 - (a) copper
 - (b) tungsten
 - (c) **carbon**
 - (d) silver
22. The temperature co-efficient of resistance for alloys is
 - (a) low
 - (b) **very low**
 - (c) high
 - (d) very high
23. Joule heating effect is desirable in
 - (a) AC dynamo
 - (b) DC dynamo
 - (c) **water heater**
 - (d) Transformer
24. The resistivity of a wire depends on
 - (a) Length
 - (b) material
 - (c) area of cross section
 - (d) **all the above**

25. Ohm's law is applicable for

- (a) Complicated circuit (b) **simple circuit** (c) Primary circuit (d) secondary circuit

Notes

1. **Instaneous Current** $I = dq/dt$

2. **Current** $I = Q/t$ Unit : A

3. **Drift velocity** $v_d = a \tau$ Unit: m/s

4. **Mobility** $\mu = \frac{v_d}{E}$ Unit : m^2/Vs

5. **Current density** $J = \frac{I}{A}$ Unit : A/m^2 Quantity : Vector

6. **Ohm's law** $V \propto I$ $V = IR$

V-potential difference I - current

R - resistance

7. **Resistance** $R = \frac{V}{I}$ Unit : ohm or Ω

8. **Electrical resistivity** $\rho = \frac{RA}{L}$ Unit : Ωm or ohm-meter

9. **Resistors in series** $R_s = R_1 + R_2 + R_3$

10. **Resistors in parallel** $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

11. **Temperature coefficient of resistance** $\alpha = \frac{\Delta \rho}{\Delta T \rho_0}$ Unit : per $^{\circ}C$

12. **Joule's law of heating.** $H = I^2 R t$

13. **Conductivity** $\sigma = 1/\rho$ Unit : $\Omega^{-1} m^{-1}$

14. **Internal resistance of the cell** $r = \left(\frac{\xi - V}{V} \right) R$

15. **Condition for bridge balance** $\frac{P}{Q} = \frac{R}{S}$

16. **In metre bridge ; Unknown resistance** $P = Q \frac{l_1}{l_2}$

17. **Electric power** $P = VI = I^2 R$

Two marks (Book back & Book inside)**1. Define electric current**

The electric current in a conductor is defined as the rate of flow of charges through a given cross-sectional area A.

$$I = \frac{Q}{t} \quad \text{Unit : Ampere} \quad \text{Quantity : scalar}$$

2. Define 1 ampere current

1A of current is equivalent to 1 Coulomb of charge passing through a perpendicular cross section in 1 second

$$I = \frac{1C}{1s}$$

3. Define Drift velocity

The drift velocity is the average velocity acquired by the electrons inside the conductor when it is subjected to an electric field

$$v_d = a \tau \quad \text{Unit: m/s} \quad \text{quantity : vector}$$

4. Define mean free time

The average time between successive collisions is called the mean free time denoted by τ .

$$\tau = \frac{v_d}{a} \quad \text{Unit : s}$$

5. Define mobility

It is defined as the magnitude of the drift velocity per unit electric field.

$$\mu = \frac{v_d}{E} \quad \text{Unit : m}^2/\text{Vs} \quad \text{Quantity : scalar}$$

6. Define Current density (BB-10)

The current density (J) is defined as the current per unit area of cross section of the conductor.

$$J = \frac{I}{A} \quad \text{Unit : A/m}^2 \quad \text{Quantity : Vector}$$

7. Write down microscopic model of ohm's law (BB-3)

$$\vec{J} = \sigma \vec{E}$$

J- Current density **σ** – conductivity

E – Electric field

8. Why current is a scalar? (BB-1)

Current I is defined as the scalar product of the current density and area vector in which the charges cross.

It does not obey vector law of addition and multiplication .& it cannot be resolved into components unlike other vector quantities

18. Why temperature coefficient of resistance (α) is positive for conductor and negative for semiconductor

If the temperature of a conductor increases, the average kinetic energy of electrons in the conductor increases. This results in more frequent collisions and hence the resistivity increases.

As the temperature increases, more electrons will be liberated from their atoms. Hence the current increases and therefore the resistivity decreases.

19. Define thermistor

A semiconductor with a negative temperature coefficient of resistance is called a thermistor.

Ex: Germanium, silicon

20. Define transition or critical temperature

The resistance of certain materials become zero below certain temperature T_c . This temperature is known as critical temperature or transition temperature.

21. What are superconductor

The resistance of certain materials become zero below certain temperature. The materials which exhibit this property are known as superconductors

22. When the car engine is started with headlights turned on, they sometimes become dim.

This is due to the internal resistance of the car battery.

23. Define Kirchhoff's first rule (Current rule or Junction rule) (BB-13)

It states that the algebraic sum of the currents at any junction of a circuit is zero. It is a statement of conservation of electric charge. Current entering the junction is taken as positive and current leaving the junction is taken as negative

24. Define Kirchhoff's Second rule (Voltage rule or Loop rule) (BB-14)

It states that in a closed circuit the algebraic sum of the products of the current and resistance of each part of the circuit is equal to the total emf included in the circuit. This rule follows from the law of conservation of energy for an isolated system.

25. Define Joule's heating effect.

When current flows through a resistor, some of the electrical energy delivered to the resistor is converted into heat energy and it is dissipated.

26. Define Joule's law of heating. (BB-17)

$$H = I^2 R t$$

It states that the heat developed in an electrical circuit due to the flow of current varies directly as

- (i) the square of the current
- (ii) the resistance of the circuit and
- (iii) the time of flow.

27. Define thermoelectric effect

Just as current produces thermal energy, thermal energy may also be suitably used to produce an electromotive force.

$$P = \frac{dW}{dt} = \frac{d}{dt}(V \cdot dQ) = V \frac{dQ}{dt}$$

$$\text{Since } I = \frac{dQ}{dt}$$

$$P = VI$$

38.State principle of potentiometer (BB-15)

When a constant current flows through a wire of uniform area of cross section, The emf of the cell is directly proportional to the balancing length of wire between two points

$$E \propto l$$

39.What do you meant by internal resistance of a cell (BB-16)

The resistance offered by electrolyte of a cell to the flow of current between its electrodes is called internal resistance of a cell

40.Distinguish between drift velocity and mobility (BB-2)

Drift velocity	Mobility
It is defined as velocity with which electrons get drifted towards positive terminal when electric field is applied	It is defined as the magnitude of the drift velocity per unit electric field
$v_d = a \tau$	$\mu = \frac{v_d}{E}$
Unit : m/s	Unit : $m^2V^{-1}s^{-1}$

41.Define instantaneous current

It is defined as limit of average current, $\Delta t \rightarrow 0$ $I = \lim_{\Delta t \rightarrow 0} \frac{\Delta Q}{\Delta t} = \frac{dQ}{dt}$

42.Why nickel is used as heating element

It has high specific resistance and can be heated to very high temperature without oxidation

43.What are factors on which resistivity of material depend

- (i) Inversely proportional to number density of electrons
- (ii) inversely proportional to average time between collisions

See all graphs, table, note, do you know and all derivations in book

Five marks (Book back)**1. Describe the microscopic model of current and obtain general form of Ohm's law**

Consider a conductor with area of cross section A and an electric field applied from right to left. Suppose there are n electrons per unit volume in the conductor and assume that all the electrons move with the same drift velocity v_d

The electrons move through a distance dx within a small interval of dt

$$v_d = \frac{dx}{dt} \quad dx = v_d dt \dots\dots\dots(1)$$

A – area of cross section of the conductor

$$\begin{aligned} \text{The electrons available in the volume of length } dx &= \text{volume} \times n/V \\ &= A dx \times n \dots\dots\dots(2) \end{aligned}$$

Sub (2) in (1)

$$= A v_d dt \times n$$

Total charge in volume element $dQ = \text{charge} \times \text{number of electrons in the volume element}$

$$dQ = e A v_d dt \times n$$

$$I = \frac{dQ}{dt} \dots\dots\dots(3)$$

Sub (2) in (3)

$$I = \frac{neA dt v_d}{dt}$$

$$I = neA v_d$$

Since current density

$$J = I/A$$

$$J = nev_d \dots\dots\dots(4)$$

Sub v_d in (4)

$$J = -\frac{n\tau e^2}{m} E$$

$$J = -\sigma E$$

But conventionally, we take the direction of (conventional) current density as the direction of electric field. So the above equation becomes

$$J = \sigma E \dots\dots\dots(\text{microscopic form's of ohm's law})$$

$$\sigma = \frac{n\tau e^2}{m} \text{ is called conductivity}$$

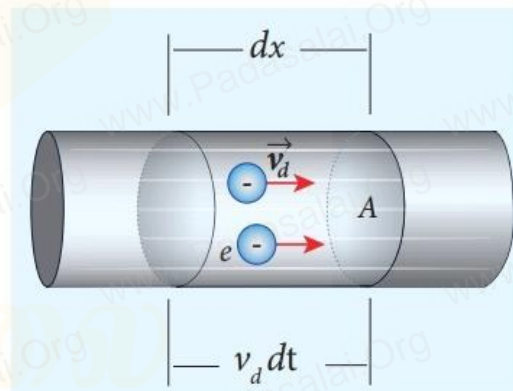
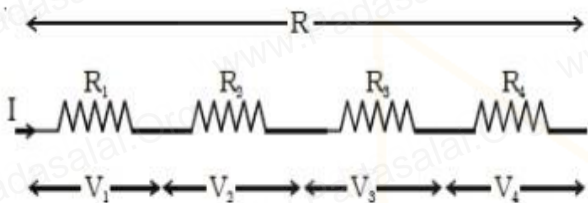
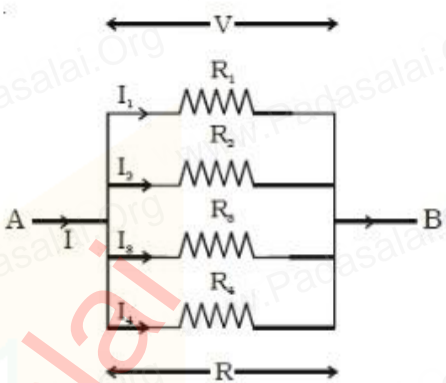


Figure 2.5 Microscopic model of current

3.Explain the equivalent resistance of a series and parallel resistor network

Resisters in series	Resisters in parallel
1. R_1, R_2, R_3, R_4 Resisters are connected in series. R_s is the effective resistance.	1. R_1, R_2, R_3, R_4 are Resisters connected in parallel. R_p is the effective resistance.
2. 	2. 
3. Current flowing through each resistor is the same.	3. Potential difference (V) across each resistor is same.
4. $V = V_1 + V_2 + V_3 + V_4$	4. $I = I_1 + I_2 + I_3 + I_4$.
5. $V_1 = IR_1, V_2 = IR_2, V_3 = IR_3, V_4 = IR_4$ and $V = IR_s$ $IR_s = IR_1 + IR_2 + IR_3 + IR_4$ (Or) $R_s = R_1 + R_2 + R_3 + R_4$	5. $I_1 = \frac{V}{R_1}, I_2 = \frac{V}{R_2}, I_3 = \frac{V}{R_3}, I_4 = \frac{V}{R_4}$ $I = \frac{V}{R_p}$ $\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3} + \frac{V}{R_4}$ $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$
6. The equivalent resistance of a number of resistors in series connection is equal to the sum of the resistance of individual resistors.	6. The sum of the reciprocal of the resistance of the individual resistors is equal to the reciprocal of the effective resistance of the combination.

This rule follows from the law of conservation of energy for an isolated system.

6. Obtain the condition for bridge balance in Wheatstone's bridge.

An important application of Kirchhoff's rules is the Wheatstone's bridge. It is used to compare resistances and also helps in determining the unknown resistance in electrical network.

The bridge consists of four resistances P, Q, R and S connected .

A galvanometer G is connected between the points B and D.

The battery is connected between the points A and C. The current through the galvanometer is I_G and its resistance is G.

Applying Kirchhoff's current rule to junction B

$$I_1 - I_G - I_3 = 0 \quad \text{.....(1)}$$

Applying Kirchhoff's current rule to junction D,

$$I_2 - I_G - I_4 = 0 \quad \text{.....(2)}$$

Applying Kirchhoff's voltage rule to loop ABDA,

$$I_1 P + I_G G - I_2 R = 0 \quad \text{.....(3)}$$

Applying Kirchhoff's voltage rule to loop ABCDA,

$$I_1 P + I_3 Q - I_2 R - I_4 S = 0 \quad \text{.....(4)}$$

When the points B and D are at the same potential, the bridge is said to be balanced , no current flows through galvanometer ($I_G = 0$).

Substituting $I_G = 0$ in (1) , (2) , (3) , (4)

$$I_1 = I_3 \quad \text{.....(5)} \quad I_2 = I_4$$

.....(6)

$$I_1 P = I_2 R \quad \text{.....(7)}$$

Substituting (5) & (6) in (4)

$$I_1 P + I_1 Q - I_2 R - I_2 S = 0$$

$$I_1 (P + Q) = I_2 (R + S) \quad \text{.....(8)}$$

Dividing (8) by (7)

$$\frac{P+Q}{P} = \frac{R+S}{R}$$

$$1 + \frac{Q}{P} = 1 + \frac{S}{R}$$

$$\frac{Q}{P} = \frac{S}{R}$$

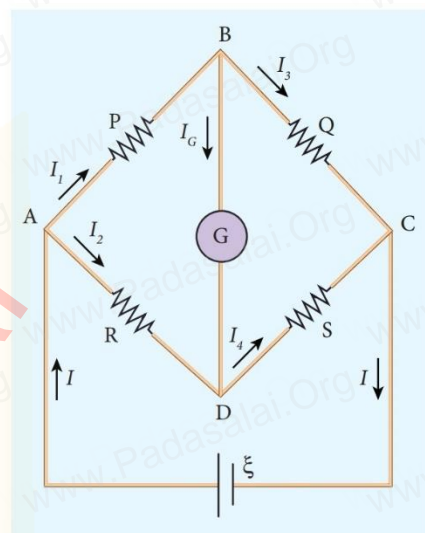


Figure 2.25 Wheatstone's bridge

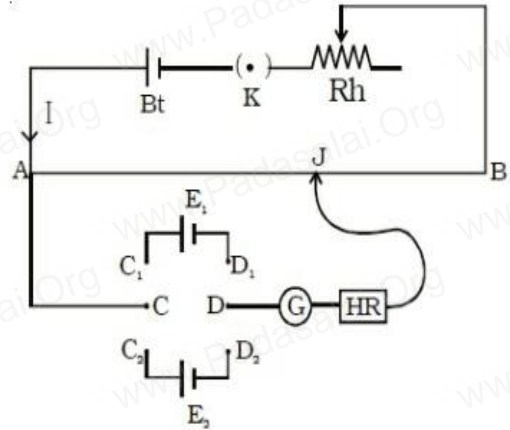
7. Explain the determination of unknown resistance using meter bridge

8. How the emf of two cells are compared using potentiometer?

- The end A of potentiometer is connected to the terminal C of a DPDT switch.
- Battery, key and rheostat are connected in series with B. terminal D is connected to the jockey (J) through a galvanometer and high resistance.
- Let I be the current flowing through the primary circuit and r be the resistance of the potentiometer wire per metre length.
- The jockey is moved on the wire and adjusted for zero deflection in galvanometer.
- $E_1 = Irl_1 \rightarrow (1)$
- $E_2 = Irl_2 \rightarrow (2)$

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

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



Book inside

1. Explain about cells in series and parallel

In series connection, the negative terminal of one cell is connected to the positive terminal of the second cell, the negative terminal of second cell is connected to the positive terminal of the third cell and so on.

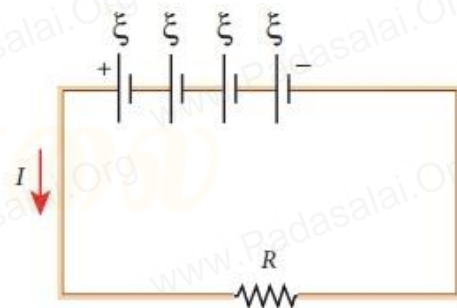
The free positive terminal of the first cell and the free negative terminal of the last cell become the terminals of the battery.

Suppose n cells, each of emf ξ volts and internal resistance r ohms are connected in series with an external resistance R

The total emf of the battery = $n\xi$

The total resistance in the circuit = $nr + R$

By Ohm's law, the current in the circuit is



Cells in series (circuit diagram)

Figure 2.21 cells in series

Potentiometer is used for the accurate measurement of potential differences, current and resistances.

It consists of ten meter long uniform wire of manganin or constantan stretched in parallel rows each of 1 meter length, on a wooden board.

The two free ends A and B are brought to the same side and fixed to copper strips with binding screws. A meter scale is fixed parallel to the wire. A jockey is provided for making contact.

Principle

A steady current is maintained across the wire CD by a battery Bt .

The battery, key and the potentiometer wire are connected in series forms the primary circuit. The positive terminal of a primary cell of emf ξ is connected to the point C and negative terminal is connected to the jockey through a galvanometer G and a high resistance HR . This forms the secondary circuit. Let contact be made at any point J on the wire by jockey. If the potential difference across CJ is equal to the emf of the cell ξ then no current will flow through the galvanometer and it will show zero deflection. CJ is the balancing length l . The potential difference across CJ is equal to Irl where I is the current flowing through the wire and r is the resistance per unit length of the wire. $\xi = Irl$

Since I and r are constants

The emf of the cell is directly proportional to the balancing length.

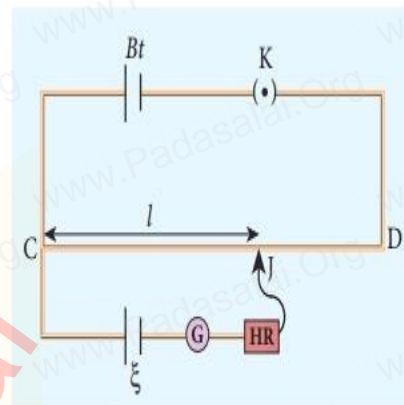


Figure 2.27 Potentiometer

3. Explain determination of internal resistance of a cell by potentiometer

To measure the internal resistance of a cell, the circuit connections are made

The end C of the potentiometer wire is connected to the positive terminal of the battery Bt and the negative terminal of the battery is connected to the end D through a key K_1 . This forms the primary circuit.

The positive terminal of the cell ξ whose internal resistance is to be determined is also connected to the end C of the wire. The negative terminal of the cell ξ is connected to a jockey through a galvanometer and a high resistance. A resistance box R and key K_2 are connected across the cell ξ . With K_2 open, the balancing point J is obtained and the balancing length $CJ = l_2$ is measured. Since the cell is in open circuit, its emf is

$$\xi \propto l_1$$

A suitable resistance (say, $10\ \Omega$) is included in the resistance box and key K_2 is closed. Let r be the internal resistance of the cell. The current passing through the cell and the resistance R is given by

$$I = \frac{\xi}{R+r} \dots\dots\dots(1)$$

The potential difference across R is

$$V = \frac{\xi R}{R+r}$$

When this potential difference is balanced on the potentiometer wire, let l_2 be the balancing length. $\frac{\xi R}{R+r} \propto l_2 \dots\dots\dots(2)$

From (1) & (2)

$$\frac{R+r}{R} = \frac{l_1}{l_2}$$

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

4. Explain application of Joule's heating effect

1. Electric heaters

Electric iron, electric heater, electric toaster are some of the home appliances that utilize the heating effect of current.

In these appliances, the heating elements are made of nichrome, an alloy of nickel and chromium.

2. Electric fuses

Fuses are connected in series in a circuit to protect the electric devices from the heat developed by the passage of excessive current. It is a short length of a wire made of a low melting point material. It melts and breaks the circuit if current exceeds a certain value.

Whenever there is an excessive current produced due to faulty wire connection, the circuit breaker switch opens. After repairing the faulty connection, we can close the circuit breaker switch

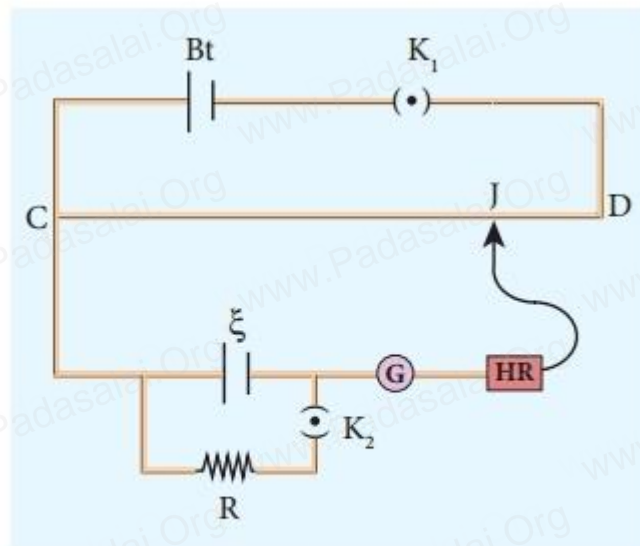


Figure 2.29 measurement of internal resistance

5.Explain seeback effect and its application

Seebeck discovered that in a closed circuit consisting of two dissimilar metals, when the junctions are maintained at different temperatures an emf (potential difference) is developed. The current that flows due to the emf developed is called thermoelectric current. The two dissimilar metals connected to form two junctions is known as thermocouple

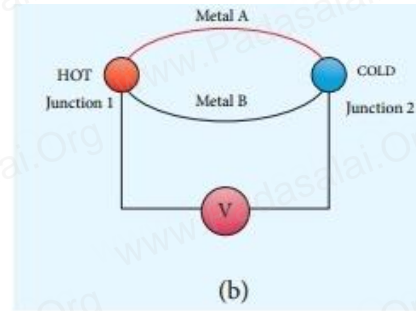


Figure 2.35 Seebeck effect (Thermocouple)

If the hot and cold junctions are interchanged, the direction of current also reverses. Hence the effect is reversible.

The magnitude of the emf developed in a thermocouple depends on (i) the nature of the metals forming the couple and (ii) the temperature difference between the junctions.

Applications of Seebeck effect

1. Seebeck effect is used in thermoelectric generators (Seebeck generators). These thermoelectric generators are used in power plants to convert waste heat into electricity.
2. This effect is utilized in automobiles as automotive thermoelectric generators for increasing fuel efficiency.
3. Seebeck effect is used in thermocouples and thermopiles to measure the temperature difference between the two objects.



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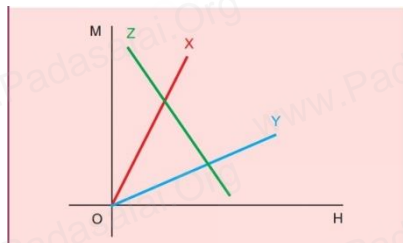
12th Physics Unit – 3 (First Quarter) Cognizance Test

Marks ; 120

Time : 1 hr 45 min

15×1 = 15

i. Choose the best answers



1. The following figure shows the variation of intensity of magnetisation with the applied magnetic field intensity for three magnetic materials X, Y and Z. What will be the materials X, Y and Z

a) para, dia, ferro

b) Dia, para, ferro

c) Ferro, para, dia

d) Ferro, dia, para

2. The vertical component of Earth's magnetic field at a place is equal to the horizontal component. What is the value of angle of dip at this place?

(a) 30°

(b) 45°

(c) 60°

(d) 90°

3. The most suitable metal for permanent magnet is

a) copper

b) Aluminium

c) Steel

d) Iron

4. In T.G the magnetic needle is small so that

a) the circular scale is small

b) The compass box is small

c) It remains in uniform magnetic field

d) It can be easily detected

5. In T.G experiment for two different values of current, the deflection are 45° and 30°, then ratio of the current is

a) 2:3

b) 3:2

c) $\sqrt{3} : 1$

d) $1 : \sqrt{3}$

6. The magnetic declination for Chennai is

a) -1° 5'

b) 1° 5'

c) -1° 8'

d) 14° 16'

7. Find the odd one out pole strength, magnetic flux, magnetic dipole moment

8. For which angle, intensity of vertical component of earth's magnetic field will be maximum at poles

a) (a) 30°

(b) 45°

(c) 60°

(d) 90°

9. What will be the angle of dip if B_H and B_V are 0.15 G, 0.26 G

(a) 30°

(b) 45°

(c) 60°

(d) 90°

10. What will be the unit of flux density

a) Wb m²

b) Wb

c) Wb m³

d) Tesla

11. H m⁻¹ is the unit for

a) permittivity

b) flux

c) pole strength

d) permeability

12. What will be the magnitude of magnetic field produced by bar magnet having magnetic moment 0.5 J T^{-1} and at a distance of 0.1 m from its center along normal bisector of bar magnet

- a) 10^{-4} b) 10^{-4} c) 0.5×10^{-4} d) 0.5

13. What will be the reduction factor of TG if current of 5 A produces a deflection of 45°

- a) 0.5 b) 0.25 c) 2.5 d) 5

14. Which of the following material will have relative permeability of 1.6×10^{-5}

- a) paramagnetic b) dia magnetic c) ferro magnetic d) both a & c

15. What will be the value of vertical component of earth's magnetic field at equator if its horizontal component at a place is B and angle of dip is 60°

- a) B b) $2B$ c) $\sqrt{3}B$ d) $1/\sqrt{3} B$

ii. Knowledge Based Questions

15×1= 15

1. Where on the surface of the earth, the vertical component of earth's magnetic field is zero

2. How does a diamagnetic material behave when it is cooled to very low temperature

3. Why core of a transformer made up of ferromagnetic material

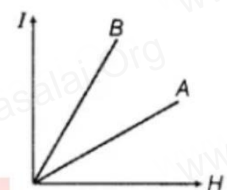
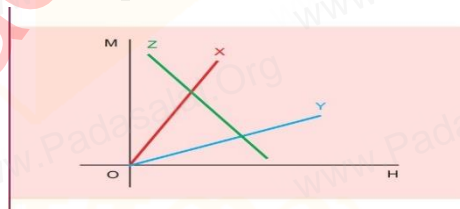
4. Draw magnetic field lines when a i) diamagnetic, ii) paramagnetic substance is placed in an external field

5. Out of the following, identify the material which can be classified as i) paramagnetic ii) diamagnetic

- a) Aluminium b) Bismuth c) Copper d) Sodium

6. Identify materials A & B. Why does a material B have larger susceptibility than A for given field at constant temperature

7. Draw the variation of susceptibility with temperature for Material Z



8. Why do magnetic lines of force form continuous closed loops

9. A bar magnet of magnetic moment M is aligned parallel to direction of a uniform magnetic field B . What is work done to turn the magnet, so as align its magnetic moment opposite to the field direction

10. The earth's core known to contain iron. Yet geologists do not regard this as source of earth's magnetism?

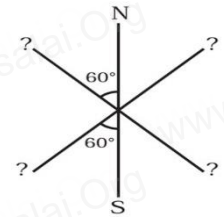
11. A vector needs three quantities for its specifications. Name the three independent quantities conventionally used to specify the earth's magnetic field.

12. Why does paramagnetic's sample display greater magnetisation when cooled for the same magnetising field

13. The hysteresis loop of soft iron piece has a much smaller area than that of carbon steel plate. If the material is go through repeated cycles of magnetisation, which piece will dissipate greater heat energy?

14. A ball of super conducting material is dipped in liquid nitrogen and place near a bar magnet. In which direction will it move

15. Three identical magnets are rivetted together at centre in the same plane as shown in figure. This system is placed at rest in a slowly varying magnetic field. It is found that system of magnet does not show any motion. The north – south poles of one magnet is shown. Determine the poles of remaining two



iii. Conceptual problems

$$5 \times 3 = 15$$

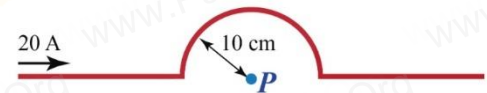
1. A short bar magnet placed with axis at 30° with a uniform external magnetic field of 0.25 experiences a torque of magnitude equal to 4.5×10^{-2} . What is the magnitude of magnetic moment of magnet?

2. A short bar magnet of magnetic moment 0.32 is placed in a uniform magnetic field of 0.15. If the bar magnet is free to rotate in the field, which orientation would correspond to its stable equilibrium. What is the potential energy in this case

3. The horizontal component of the earth's magnetic field at a place is $\sqrt{3}$ times its vertical component. Find the value of angle of dip at that place. What is the ratio of horizontal component to the total magnetic field of the earth at that place?

4. The magnetic field strength at a distance of 5 cm from a thin, straight wire is 0.00005 T. What is the current in the wire?

5. Find the strength of magnetic field at a point P



iv. Very short answers

$$16 \times 2 = 32$$

1. What is meant by magnetic induction?

2. Define magnetic flux & its unit

3. Define magnetic dipole moment

4. State Coulomb's inverse law

5. What is magnetic susceptibility?

6. What is magnetic permeability?

7. What is meant by hysteresis?

8. State the elements of Earth's magnetic field

9. Distinguish between Uniform and non uniform magnetic field

10. What are the properties required to make permanent magnets & electro magnets

11. Why declination is greater in poles & inclination is smaller in poles

12. Compute the geometric length of a uniform bar magnet if the magnetic length is 10 cm

.Mark the positions of magnetic pole points

13. The repulsive force between two magnetic poles in air is 9×10^{-3} N. If the two poles are having equal pole strength of 30 NT^{-1} , find their distance of separation.
14. What are precautions to be taken up before starting the experiment in TG
15. Define Curie's law
16. Define Curie – Weiss law

v. Short Answers

$6 \times 3 = 18$

1. Difference between Hard & soft ferro magnetic materials
2. Compare Dia, Para, Ferromagnetism
3. Explain about properties of magnet & magnetic lines of forces
4. Derive Torque & Potential energy experienced by Magnetic needle in a uniform magnetic field
5. Define i) Magnetising field ii) Intensity of magnetisation for bar magnet iii) Relative permeability
6. Define i) Dip ii) Magnetic declination iii) Horizontal component of earth's magnetic field

vi. Long Answer

$4 \times 5 = 20$

1. Calculate the magnetic induction at a point on the axial line of a bar magnet.
2. Obtain the magnetic induction at a point on the equatorial line of a bar magnet.
3. Explain principle, working of TG
4. Explain about Hysteresis loop with neat diagram

vii. Give reasons

$10 \times 1 = 10$

1. Why superconductors repel the magnetic materials. What is the effect behind that
2. Why unit of magnetic field at a point is $\text{N A}^{-1} \text{ m}^{-1}$
3. Why there is no magnetic flux when field is parallel to surface
4. Why dimensional formula for magnetic flux is $[\text{ML}^2\text{T}^{-2}\text{A}^{-1}]$
5. Why a freely suspended bar magnet in your laboratory experiences only torque even though earth has non uniform magnetic field
6. Why potential energy of bar magnet is maximum when aligned anti parallel to field
7. Why mirror is placed below the aluminium pointer in magnetometer
8. Why Magnetic susceptibility is a dimensional quantity
9. Why diamagnetic material is repelled by field
10. Why there is strong magnetisation of ferro magnets in the direction of applied field

*If you study to remember, you will forget
But, if you study to understand, you will remember*