PLUS TWO:PHYSICS - PREVIOUS YEAR QUESTIONS

CHAPTER – 1, ELECTRIC CHARGES AND FIELDS

1. In the electrostatics electric charge is a feature of particles like protons, electrons, etc that decides the force of interaction among them.

a) Write the name of the law that is used to measure the above force of interaction.

b) Express the above force law in vector form

c) Two charged spheres when placed in air attract with a force F. Keeping the distance between the charges constant, the spheres are immersed in a liquid of relative permittivity K. Then the spheres will

i) Attract with a force KF

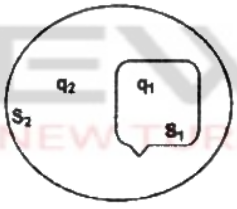
ii) Repel with a force KF

iii) Attract with a force F/K

iv) Repel with a force F/K

d) Two small aluminium spheres are separated by 80cm. How many electrons are to be transferred from one sphere to the other, so that they attract with a force of 10^4N.

2. Two closed surfaces S_1 and S_2 enclose two charges q_1 and q_2 as shown in the figure.



a) State the law in electrostatic that relates the electric flux passing through the surface with the change enclosed.

b) If $q_1 = +6\mu C$ and $q_2 = 4\mu C$. Find the ratio of the flux passing through surfaces S_1 and S_2.

c) Let the surface S_2 expands to double its area while S_1 remain as such. What will happen to the above ratio?

3. Two-point charges q_1 and q_2 are separated by a distance 'r' in space

a) What happens to the force between the charges

i) When the magnitude of the point charges increases

ii) When the distance of separation decreases

b) Three-point charges $+2\mu C$ each are placed at the corners of an equilateral triangle of side 1m. Find the magnitude of the force between charge q_1 and $q_2, [F_{12}]$ and q_1 and q_3 $[F_{13}]$

c) Draw $\overrightarrow{F_{12}}$ and $\overrightarrow{F_{13}}$ at A and find the total force acting on q_1 $[F_{13}]$

4. Two-point charges 2μC and 8μC are placed 12 cm apart. The position of point from 2μC charge, where the electric field intensity is zero is

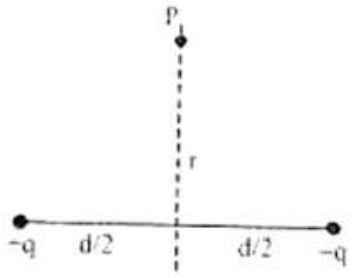
a) 8cm
b) 2cm
c) 12cm
d) 4cm

5. Write the expression for intensity of electric field near to the surface of a charged conductor with uniform charge density σ. **[MODEL 2018]**

6. Gauss's theorem is useful for finding the intensity of electric field.

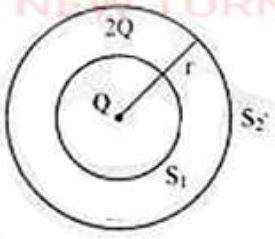
a) Write the Gauss's law in its mathematical form
b) Using the law, prove that intensity of electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it. **[MODEL 2018 & 2020]**

7. Two equal and opposite charges placed in air as shown in figure:



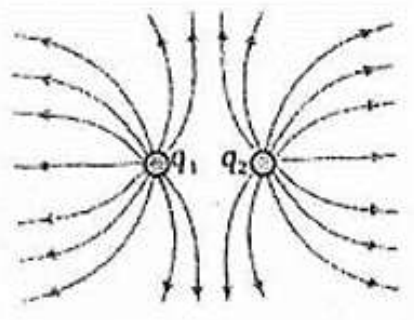
a) Redraw the figure and show the direction of dipole moment (P) direction of resultant electric field (E) at P
b) Write an equation to find out the electric field at P. **[MARCH 2018]**

8. Two spheres enclose charges as shown in figure:



a) Derive an expression for electric field intensity at any point on the surface S_2.
b) What is the ratio of electric flux through S_1 and S_2 **[MARCH 2018]**

9. The electric field lines due to a system of two charges q_1 and q_2 are shown in the figure. Referring the figure, choose the correct answer.



i. q_1 is positive and q_2 is negative
ii. q_1 and q_2 are positive
iii. q_1 is negative and q_2 is positive
iv. q_1 and q_2 are negative **[MODEL 2019]**

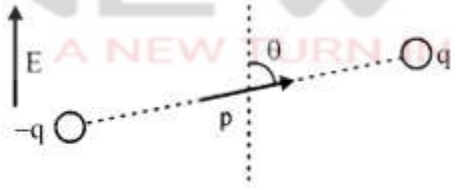
10. Gauss law relates electric flux with electric charge.
a) What is the SI unit of electric flux?
b) Using Gauss law derives an expression or the intensity of electric field at a point due to an infinitely long straight uniformly charged wire. **[MODEL 2019]**

11.
a) The ratio of electric field on the equatorial point and at the axial point at equal distance from the center of a short electric dipole is …….
b) A closed surface encloses an electric dipole. What is the electric flux through the surface? **[MARCH 2019]**

12. A spherical shell of radius R is uniformly charged with charge +q. By Gauss's theorem, find the electric field intensity at a point P.
a) Outside the spherical shell
b) Inside the spherical shell **[MARCH 2019]**

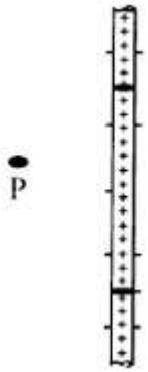
13. An electric dipole is placed in a uniform electric field.
a) Write an expression for torque acting on the dipole.
b) When is the torque maximum? **[MODEL 2020]**

14. A permanent electric dipole of dipole moment p is placed in a uniform external electric field E, as shown in Figure.



a) Redraw the figure and show the magnitude and direction of force acting on the charges.
b) Write an expression of the torque acting on this dipole in vector form. **[MARCH 2020]**

15. An infinitely long thin straight wire with uniform linear charge density is shown in figure.



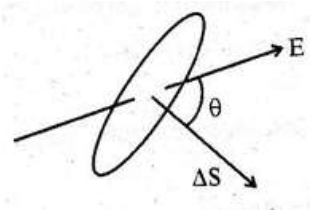
a) Draw a Gaussian surface in order to calculate the electric field at P and mark direction of electric field at this point.
b) Derive an expression to calculate electric field at this point P. **[MARCH 2020]**

16. How many electrons constitute 1 coulomb of charge ($e = 1.6 \times 10^{-19}$ C)? **[MODEL 2021]**

17.

a) State Gauss's theorem

b) Give the equation for electric flux through the given surface when the angle between electric field and area is 45^0



c) What is the flux through the surface if the surface is parallel to the lines of force?

[MODEL 2021]

18. Derive an equation for the electric field intensity due to an infinite thin sheet of charge using Gauss's law. **[MODEL 2021]**

19. What is Dipole moment? Derive the equation for the electric intensity on the axial line of a dipole **[MODEL 2021]**

20. Fill in the blanks:

"The force between two-point charges is directly proportional to the product of _____ and inversely proportional to the _____ of the distance between them." **[MARCH 2021]**

21.

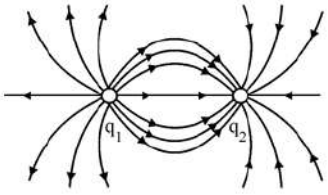
a) Define electric dipole moment.

b) A system has two charges 2.5×10^{-7} **C** and -2.5×10^{-7} **C** located at points (0, 0, –15 cm) and (0, 0, +15 cm), respectively. Determine the magnitude and direction of electric dipole moment of the system. **[MARCH 2021]**

22.

a) Write any two properties of electric field lines.

b) Observe the figure and write the signs of the charges q_1 and q_2.



[MARCH 2021]

23. Gauss law in electrostatics relates electric flux with electric charge

a) Electric flux and electric charge are scalar quantities. State whether this statement is true or false.

b) State Gauss law in electrostatics.

c) Using Gauss law derives an expression for the intensity of electric field at a point due to an infinitely long straight uniformly charged wire.

[MARCH 2021]

24. SI unit of electric charge is ……. **[MODEL 2022]**

25.

a) What is the equation for torque acting on a dipole placed in a uniform electric field?

b) What is the condition for maximum torque? **[MODEL 2022]**

26.

a) The total number of lines of force passing through a surface is called …….

b) State Gauss law in electrostatics.

c) Using Gauss law derives an expression for the electric intensity at a point distant r from a line charge having linear charge density λ **[MODEL 2022]**

27. SI unit of electric field

a) NC^{-1}

b) Vm

c) Cm

d) Nm **[MARCH 2022]**

28.

a) State Gauss's law.

b) What is meant by a Gaussian surface?

c) Using Gauss's law, find the electric field due to a uniformly charged thin spherical shell at a point outside the shell. **[MARCH 2022]**

29. Name the physical quantity whose SI unit is NC^{-1}. **[MODEL 2023]**

30. An electric dipole of dipole moment P is placed in a uniform electric field E.

a) Define dipole moment.

b) Obtain the expression for torque acting on it. **[MODEL 2023]**

31.

a) What do you understand by the term electric flux? Write its SI unit.

b) Using Gauss theorem, find the electric field intensity at a point

i. Outside the spherical shell

ii. Inside the spherical shell **[MODEL 2023]**

32. Why glass rod rubbed with silk cloth attract paper bits?

33. Explain the basic properties of basic charges? **[MARCH 2023]**

34.

a) What is electric dipole?

b) Obtain the expression for electric field intensity at a point on the axial line on an electric dipole **[MARCH 2023]**

35. An electric dipole of dipole moment P is placed on a uniform electric field E

a) Define electric dipole

b) Obtain an expression for torque acting on it **[MARCH 2023]**

36.

a) What do you understand by the term electric flux? Write the SI unit?

b) Using Gauss's theorem find the electric field intensity at a point

i. Outside the spherical shell

ii. Inside the spherical shell **[MARCH 2023]**

37. Differentiate between linear charge density and surface charge density **[MODEL 2024]**

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38. Derive the expression for the field of an

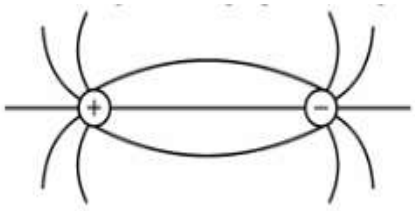
a) Electric dipole at points on the equatorial plane

b) A system has two charges
$q = 2.5 \times 10^{-7}C$ and $-2.5 \times 10^{-7}C$ located at points A (0 ,0, - 15cm) B (0,0, +15cm) respectively. What are the total charge and electric dipole moment of the system?

[MODEL 2024]

39.

a) Complete the diagram with proper marking of direction.



b) Derive the expression for electric field intensity at a point from an infinitely long straight conductor carrying charge. **[MARCH 2024]**

40. SI unit of electric flux

a) NC^{-1}

b) Nm C

c) Nm^2C^{-1}

d) Nm^2C **[MARCH 2024]**

41. State and explain the force between electric charges **[MARCH 2024]**

42. The SI unit of electric charge is …… **[MODEL 2025]**

43. Obtain the expression for the electric field at a point on the axial line of an electric dipole. **[MODEL 2025]**

44.

a) State whether the following statements are true or false.

i. Gauss's law is true for any closed surface, irrespective of its size or shape.

ii. Gauss's law is based on inverse square dependence in distance as in coulomb's law.

b) Using Gauss's law, obtain the expression for electric field due to a uniformly charged infinite plane sheet. **[MODEL 2025]**

45. The electrostatic force per unit charge is known as ……..

a) Electric current

b) Electric potential

c) Electric field **[MARCH 2025]**

46.

a) Define electric dipole moment.

b) Write an expression for torque acting on an electric dipole placed in a uniform electric field. When will it become maximum? **[MARCH 2025]**

47.

a) A spherical shell of radius 'R' is uniformly charged with charge '+q'. Using Gauss's law find the electric field intensity at a point

i) Outside the spherical shell.

ii) On the surface of the spherical shell.

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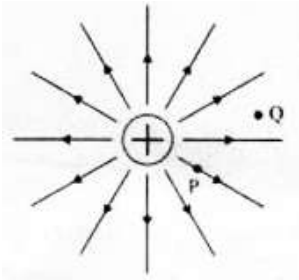
b) A point charge causes an electric flux -2 $\times 10^{14}$ Nm^2/C to pass through a spherical Gaussian surface.
($\varepsilon_0 = 8.85 \times 10^{-12}\ C^2\ N^{-1}\ m^{-2}$)

i) Calculate the value of the point charge.

ii) If the radius of the Gaussian surface is doubled, how much flux would pass through the surface? **[MARCH 2019 &MARCH 2025]**

CHAPTER – 2, ELECTROSTATIC POTENTIAL AND CAPACITANCE

1. The electric field lines of a positive charge is as shown in figure:



a) Give the sign of potential difference $V_p - V_q$

b) Give the sign of work done by the field in moving a small positive charge from 'Q' to 'P'.

c) What is the shape of equipotential surface near the charge?

[MARCH 2018]

2. Select two correct statements from the following:

i. Intensity of electric field is the negative gradient of electric potential.

ii. Electric potential is the negative gradient of intensity of electric field.

iii. Electric potential is a scalar quantity and electric potential gradient is a vector quantity.

iv. Electric potential is a vector quantity and electric potential gradient is a scalar quantity.

[MODEL 2019]

3. Two capacitors A and B of capacitances C_1 and C_2 are connected with an 18 V source as shown below.

a) Write the equation for the effective capacitance of the combination.

b) Let the capacitors have identical geometry, but the space between the plates of capacitor B is filled with a medium of dielectric constant 3. Find the potential difference across each capacitor.

[MODEL 2019]

4. The equipotential surface through a point is normal to the electric field at that point.

a) What is meant by equipotential surface?

b) What is the work done to move a charge on an equipotential surface?

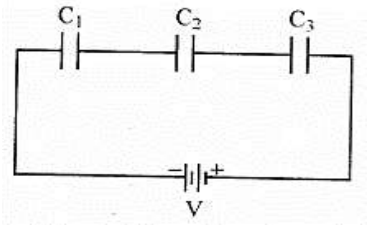
c) Draw the equipotential surfaces for a uniform electric field.

[MARCH 2019]

5. The direction of electric field is always …… (parallel / perpendicular) to an equipotential surface.

[MODEL 2020]

6. Three capacitors are connected as shown below:



a) Identify the above combination.
b) Obtain an expression for effective capacitance of the above combination.
c) If a dielectric medium is placed in between the plates of a capacitor what is the changes in its capacitance?

[MODEL 2020]

7. Derive the equation for the capacitance of a parallel plate capacitor.

[MODEL 2021]

8. Find the effective capacitance when three capacitors are connected in parallel.

[MODEL 2021]

9. Derive an expression for the energy stored in a capacitor in terms of capacitance and potential difference across the capacitor.

[MARCH 2021]

10. Write any one difference between polar and non-polar molecule. Give one example each for polar and non-polar molecule.

[MARCH 2021]

11.

a) Draw a figure of a parallel combination of three capacitors of capacitances C_1, C_2 and C_3.
b) Derive an expression for the effective capacitance of this combination.

[MARCH 2021]

12. When a dielectric is placed between the plates of a capacitor, its capacity,

a) Remains the same
b) Increases
c) Decreases **[MODEL 2022]**

13.

a) Write any two characteristics of equipotential surfaces.
b) What is the shape of equipotential surface around a point charge? **[MODEL 2022]**

14. A capacitor is a system of two conductors separated by an insulator.

a) Obtain an expression for the equivalent capacitance of two capacitors connected in series.
b) The potential across a 900 μF capacitor is 100 volts. How much energy is stored by the capacitor?

[MODEL 2022]

15. Electrostatic field at the surface of a charged conductor must be normal to the surface at every point. Is the statement true or false? **[MARCH 2022]**

16. Write down any three properties of an equipotential surfaces. **[MARCH 2022]**

17.

a) SI unit of capacitance is __

b) Two capacitors C_1 and C_2 are connected in series. Derive an expression for the capacitance of the combination. **[MARCH 2022]**

18. Two capacitors of equal capacitance when connected in series have a capacitance of C_1. When connected in parallel, they have a capacitance of C_2. What is the value of C_1 / C_2?

[MODEL 2023]

19.

a) Draw an equipotential surface due to an isolated point charge?

b) If the electric field intensity at a given point is zero, will the electric potential necessarily be zero at that point? Why? **[MODEL 2023]**

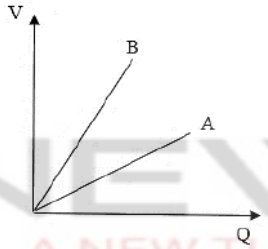
20.

a) In a parallel plate capacitor, how is the capacity affected when,

i. The distance between the plates is doubled.

ii. The area of the plate is halved.

b) Figure shows the variation of voltage V across the plates of two capacitors A and B verses increase of charge Q stored on them. Which of the two capacitors has higher capacitance? Give reason for your answer.



[MODEL 2023]

21.

a) Derive the expression for the capacitance of a parallel plate capacitor?

b) What happens to the capacitance if a medium of dielectric constant 'k' is introduced between the plates? **[MARCH 2023]**

22.

a) Give the relation between electric field and potential

b) Derive the expression for the potential due to an electric dipole?

c) Calculate the potential at a point due to a charge of 4×10^{-7} C located 9cm away.

[MARCH 2023]

23.

a) Derive the expression for the potential due to a point Charge.

b) Plot the graph showing the variation of potential 'V' with distance 'r' **[MODEL 2024]**

24.

a) Obtain the expression for the energy stored in a capacitor.

b) A 900-pF capacitor is changed by a 100V battery (fig1). If the capacitor is disconnected from the battery and connected to another 900pF capacitor (fig 2). What is the electrostatic energy stored in the system?

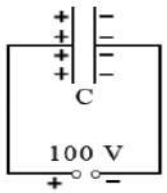


Fig. 1

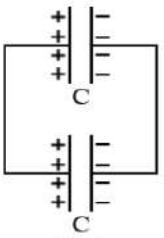


Fig. 2

[MODEL 2024]

25. The dipole moment per unit volume is called ……... **[MODEL 2024]**

26. The net electric field inside a conductor when placed in an external electric field is

a) Zero
b) Half
c) Two times
d) Four times **[MARCH 2024]**

27. What is equipotential surface? Give an example **[MARCH 2024]**

28.

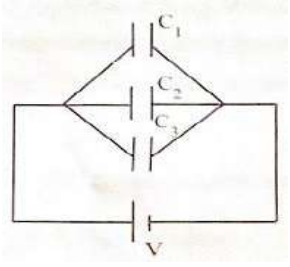
a) What is the principle of a capacitor?
b) Derive the expression for capacitance of a parallel plate capacitor?
c) A 12PF capacitor is connected to 50V battery. How much electrostatic energy is stored in the capacitor?

[MARCH 2024]

29. A hollow metal sphere of radius 1 cm is charged with a potential 10 V on its surface. Then the potential at the centre of the sphere is ……..

a) 0 V
b) 10 V
c) 20 V
d) 5 V **[MODEL 2025]**

30. Three capacitors C_1, C_2, C_3 are arranged as shown below.



a) Derive the expression for the effective capacitance of this combination.
b) If $C_1 = C_2 = C_3 = C$, in the above circuit, what is the effective capacitance?

[MODEL 2025]

31.

a) Draw the equipotential surface around a point charge.
b) Derive the expression for electric potential at any point due to an electric dipole.

[MODEL 2025]

32. A circle of radius r is drawn with a charge +q placed at the centre. The work done in moving a point charge once around the circumference of the circle is ……. **[MARCH 2025]**

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33.

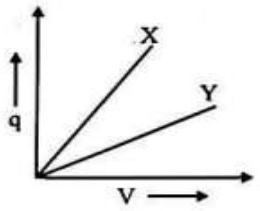
a) What is equipotential surface?

b) Write two properties of equipotential surfaces. **[MARCH 2025]**

34.

a) Obtain an expression for the equivalent capacitance when two capacitors C_1 and C_2 are connected in parallel.

b) Given graph shows variation of charge 'q' with potential difference 'V' for two capacitors C_1 and C_2. Both the capacitors have same plate separation but plate area of C_2 is greater than that of C_1. Which line (X or Y) corresponds to C_1 and why?



[MARCH 2025]

CHAPTER – 3, CURRENT ELECTRICITY

1. The unit of electrical resistivity is …… **[MODEL 2018]**

2.

a) Express Ohm's law in terms of current density, electrical resistivity and intensity of electric field.

b) Explain the variation of resistance of a semiconductor with temperature. Also draw the graph showing the variation of resistivity of silicon with temperature.

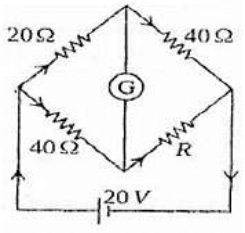
[MODEL 2018]

3.

a) What do you mean by drift velocity?

b) Write the relation between drift velocity and electric current. **[MARCH 2018]**

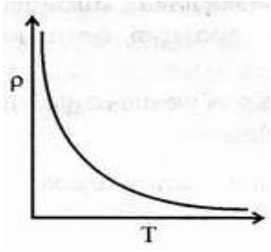
4. In the circuit shown below, assume that no current flows through the galvanometer (G).



Find the value of the resistance R. **[MODEL 2019]**

5. Write the unit of mobility. **[MARCH 2019]**

6. The temperature dependence of resistivity of a material is shown below:



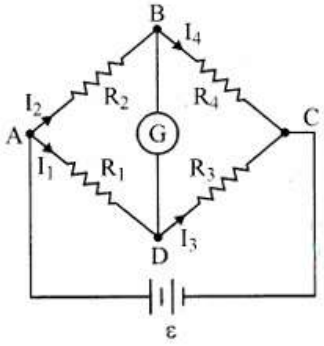
a) Identify the type of material

b) Write the relation between resistivity and average collision time for electron.

[MARCH 2019]

7. Wheatstone's bridge is an application of Kirchhoff's rules. Derive the balancing condition for Wheatstone's bridge. **[MODEL 2020]**

8. A Wheatstone bridge is shown in figure.



Derive a relation connecting the four resistors for the galvanometer to give zero or null deflection. **[MARCH 2020]**

9. Write one practical application of Wheatstone Bridge. **[MODEL 2021]**

10. Draw Wheatstone's bridge and write its balancing condition. **[MARCH 2021]**

11. Which of the following material is used to make standard resistance?

a) Carbon
b) Copper
c) Germanium
d) Manganin **[MODEL 2022]**

12. The resistance is the opposition offered by a material to the flow of current
The unit of resistance is …… **[MODEL 2022]**

13. Magnitude of the drift velocity per unit electric field is …….. **[MARCH 2022]**

14. SI unit of resistance is …….. **[MARCH 2022]**

15. write down the Wheatstone bridge principle. **[MARCH 2022]**

16. A copper wire is in the form of a cylinder and has a resistance R. It is stretched till its thickness reduced by half of its initial size. Find its new resistance in terms of R. **[MODEL 2023]**

17. What happens to the drift velocity of charge carriers of a wire if it's

a) Potential difference is doubled
b) Length is increased **[MODEL 2023]**

18.

a) Kirchhoff's second law is based on law of conservation of
   i. Charge
   ii. Energy
   iii. Momentum
   iv. Angular momentum
b) Use Kirchhoff's rule to analyse the Wheatstone's bridge and arrive at Wheatstone's condition for balancing the bridge

[MODEL 2023]

19.

a) State Kirchhoff's law

b) Obtain the balancing condition of wheat stone's bridge with the help of a diagram

[MARCH 2023]

20. Plot the graph showing the temperature dependence of resistivity for a typical semiconductor

[MODEL 2024]

21.

a) State Kirchhoff's loop rule

b) Derive the balancing condition of Wheatstone's bridge, with neat diagram

[MODEL 2024]

22. Define drift velocity? Give its equation. **[MARCH 2024]**

23.

a) State ohm's law?

b) Derive Wheatstone's network principle. **[MARCH 2024]**

24. Name a material which is used to make wire bound standard resistor. Give reason.

[MODEL 2025]

25.

a) State Kirchhoff's junction rule.

b) Obtain the balancing condition of Wheatstone's bridge with the help of a diagram.

[MODEL 2025]

26. Show that the resistance of a conductor can be expressed by R= $\frac{ml}{ne^2\tau A}$ where symbols have their usual meanings. **[MARCH 2025]**

27.

a) Kirchhoff's voltage law is in accordance with the conservation of

(i) mass

(ii) energy

(iii) momentum

(iv) charge

b) With the help of diagram, arrive at the Wheatstone's principle. **[MARCH 2025]**

NEW 10'S
A NEW TURN IN EDIFICATION

CHAPTER – 4, MOVING CHARGES AND MAGNETISM

1. A galvanometer with a coil of resistance 12Ω shows a full-scale deflection for a current of 2.5 mA. How can it be converted into an ammeter of range 7.5A?

[MODEL 2018]

2. The relation between magnetic field and current is given by Biot-Savart's law.

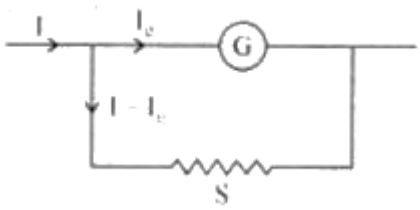
a) Write the expression for the magnetic field at point along the axis of a circular loop of radius 'R' carrying a current 'I'.

b) From the above expression. Find the value of magnetic field at the centre of the loop.

c) Sketch the magnetic field lines for current carrying circular loop

[MODEL 2018]

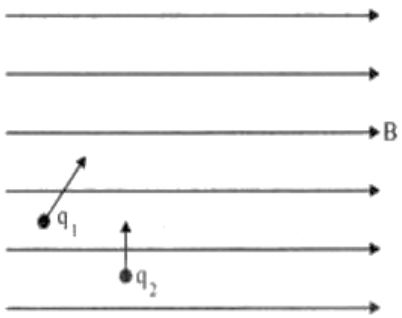
3. A galvanometer is connected as shown in the figure:



a) This combination can be used as ……(voltmeter/rheostat/ammeter)
b) Derive an expression to find the value of resistance S.

[MARCH – 2018]

4. Two charged particles $q_1$and q_2 are moving through a uniform magnetic field (B) as shown in figure:



a) What is the shape of path of $q_1$and q_2
b) Derive an expression for cyclotron frequency with the help of a neat diagram

[MARCH – 2018]

5.

a) Write the equation for the force acting on a charged particle moving through a uniform magnetic field
b) Using the above equation define the SI unit of intensity of magnetic field.

[MODEL 2019]

6. A famous law in physics is expressed mathematically as $\int \vec{B}.\vec{d}l = \mu_0 I$
a) Write the name of the law.
b) Using this law derive and expression for the intensity of magnetic field at the interior midpoint of a current carrying long solenoid.

[MODEL 2019]

7. A charged particle enters a uniform magnetic field at an angle of 40^o. Its path becomes…… **[MARCH – 2019]**

8. To convert a galvanometer into ammeter, you have to connect a

a) Low resistance in series
b) High resistance in series
c) Low resistance in parallel
d) High resistance in parallel

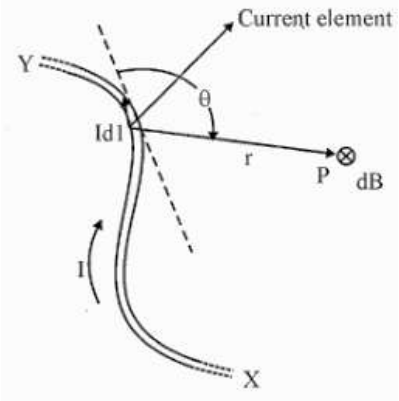
[MODEL 2020]

NEW 10'S
A NEW TURN IN EDIFICATION

9. When a charged particle moves in a combined electric and magnetic field, it experiences Lorentz force.
Write equation for Lorentz force.

[MODEL 2020]

10. Biot-Savart law can b used to find out the magnetic field at a point P, in the following figure



a) Write the mathematical expression for Biot-Savart law.
b) Derive an expression for magnetic field due to a current carrying circular loop at a point on its axis. **[MODEL 2020]**

11. The path of a charged particle entering parallel to uniform magnetic field will be
a) Circular
b) Helical
c) Straight line
d) None of these **[MARCH – 2020]**

12. Ampere's theorem helps to find the magnetic field in a region around a current carrying conductor.
a) Write the expression of Ampere's theorem.
b) Draw a graph showing the variation of intensity of magnetic field with the distance from the axis of a current carrying conductor. **[MARCH – 2020]**

13. A rectangular loop of area A and carrying a steady current I is placed in a uniform magnetic field
a) Derive the expression of torque, $\tau = \vec{m} \times \vec{B}$, acting on the loop.
b) Increasing the current sensitivity may not necessarily increase the voltage sensitivity of a galvanometer. Justify. **[MARCH – 2020]**

14.
a) A stationary charge can produce magnetic field' (True/false)
b) Write down the equation for magnetic Lorentz force.

[MODEL 2021]

15. A solenoid of length of 0.5 m has radius 1cm and is made up 500 turns. It carries a current of 5 A. what is the magnitude of the magnetic field inside the solenoid?

[MODEL 2021]

16.
a) State Ampere's circuital law.
b) Find the magnetic field along the axis of a solenoid, at its centre, carrying current.

[MODEL 2021]

17. Derive an equation for the magnetic field due to a circular loop carrying current, at any point on the axis using Biot-Savart's law.

[MODEL 2021]

18. State Biot - Savart law and express it mathematically. **[MARCH – 2021]**

19. Using Ampere's circuital law shows that the intensity of magnetic field at an axial point near the centre of a current carrying solenoid is $B = \mu_0 nI$.

[MARCH – 2021]

20. With a circuit diagram explain how a moving coil galvanometer can be converted to an ammeter. **[MARCH – 2021]**

21. A circular coil of radius R and N turns carries a current I. Show that the intensity of magnetic field at an axial point distant x from the centre is,

$B = \frac{\mu_0 NIR^2}{2(R^2+X^2)^{3/2}}$ **[MARCH – 2021]**

22. What is the value of magnetic field at the centre of a circular coil having n turns carrying current? **[MODEL 2022]**

23. A charged particle is moving perpendicular to a uniform magnetic field.

a) What is the shape of the path followed by the particle?

b) If the field is non-uniform, what is its new trajectory?

[MODEL 2022]

24. A moving coil galvanometer is used as a current detector in a circuit.

a) What is the working principle of a moving coil galvanometer?

b) How can you convert a moving coil galvanometer into

(i) an ammeter

(ii) a voltmeter **[MODEL 2022]**

25. Name the force experienced by a charge q moving through a uniform magnetic field with a velocity V. **[MARCH – 2022]**

26.

a) What is a solenoid?

b) Write down the equation for magnetic field inside a solenoid. **[MARCH – 2022]**

27. A galvanometer is used to detect current in a circuit.

a) State the working principle of a moving coil galvanometer.

b) How will you convert a galvanometer into

i) An ammeter and

ii) A voltmeter?

c) A galvanometer coil has a resistance of 12Ω. It shows a full-scale deflection for a current of 3mA. How will you convert this into a voltmeter of range 0 – 18V?

[MODEL 2023]

28.

a) State Biot – Savart law

b) Obtain the expression for magnetic field on the axis of a circular current loop

[MARCH – 2023]

29.

a) Derive the expression for torque acting on a rectangular current loop in a uniform magnetic field with the help of a diagram

b) A 100 turn closely wound circular coil of radius 10cm carries a current of 3.2A. What is the magnetic moment of this coil?

[MARCH – 2023]

30.

a) State Ampere's circuital law

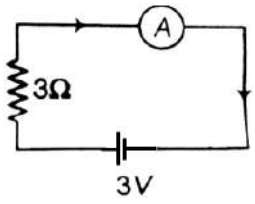
b) Obtain the expression for the magnetic field at a distance 'r' from a long straight wire carrying a current I? **[MODEL 2024]**

31.

a) Define current Sensitivity?

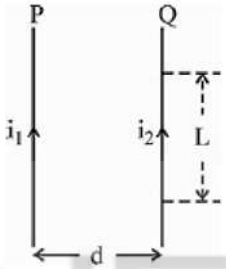
b) How will you convert a galvanometer into a voltmeter?

c) In the circuit given below. What is the value of the current of the ammeter shown is having a resistance of 60Ω



[MODEL 2024

32. Figure shows the two current carrying conductors. Derive the expression for force between the conductors.



[MARCH – 2024]

33. Using Ampere's circuital theorem, find out the magnetic field at a point due to an infinite long straight conductor. **[MODEL 2025]**

34.

a) Explain the theory and working of a moving coil galvanometer.

b) How can you convert a galvanometer into a voltmeter?

c) Write the equation of current sensitivity of a moving coil galvanometer. **[MODEL 2025]**

35.

a) What is the working principle of a moving coil galvanometer?

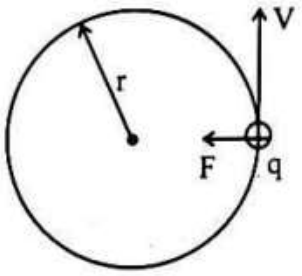
b) How will you convert a galvanometer into an ammeter?

c) An ammeter is always connected in series with a circuit. Why? **[MARCH 2025]**

36.

a) What is Lorentz force?

b) The figure shows the path of motion of a charged particle (+q) in a uniform magnetic field:



i) What will be the direction of magnetic field with respect to the velocity of the charged particle?
ii) Show that the frequency of revolution of charged particle is independent of the radius of the path.
iii) Is there any change in kinetic energy of the charged particle? Explain.

[MARCH 2025]

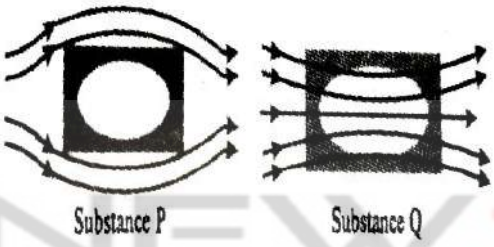
CHAPTER – 5, MAGNETISM AND MATTER

1. A magnetizing field of 1200 A/m produces a magnetic flux 1.8×10^{-5} Wb in a bar of area of cross section $0.15 cm^2$. Estimate permeability and susceptibility of the material of the bar?

2. The phenomenon of perfect diamagnetism in super conductors is called …….

3. The temperature at which a ferromagnetic material become paramagnetic is ……

4. The behaviour of magnetic field lines near two magnetic substances P and Q are shown below.



a) From the figure, identify paramagnetic substances.
b) Susceptibility of substance P is ……

5. Materials are classified into ferromagnetic, paramagnetic and diamagnetic according to their magnetic properties.

a) Which one of the following is not ferromagnetic?
   i. Cobalt
   ii. Iron
   iii. Nickel
   iv. Bismuth

b) Define the term magnetic susceptibility. What is its value for a perfect diamagnet?
c) State the reason why soft iron is used in making electromagnets.

[MARCH 2012]

6. Classify the following materials into diamagnetic and paramagnetic
a) Lead
b) Magnesium
c) Tungsten
d) Copper **[MARCH 2013]**

7. The value of relative permeability of a diamagnetic material is;

a) $\mu_r > 1$
b) $\mu_r = 0$
c) $\mu_r < 1$
d) $\mu_r = 1$ **[MODEL 2018]**

8. A solenoid has a core of a material with relative permeability 400. The windings of the solenoid are insulated from the core and carry a current of 2A. If the number of turns is 1000 per metre. Calculate magnetic intensity (H) and magnetic field (B).

[MARCH 2018]

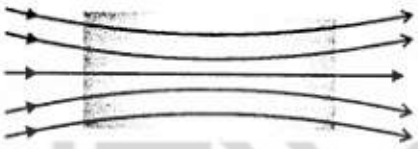
9. Based on the magnetic property, materials are classified into diamagnetic, paramagnetic and ferromagnetic

a) Compare paramagnetic and ferromagnetic materials in view of magnetic susceptibility.
b) State the law explaining the variation of magnetic susceptibility with temperature in the case of ferromagnetic material. What happens to its magnetic property when the temperature is increases?

[JUNE 2019]

10. State Gauss's law for magnetism. **[MODEL 2019 & 2022]**

11. The magnetic field lines through a substance are shown below:



a) Identify the substance.
b) Write two characteristics of the substance.

[MODEL 2020]

12. What is the magnitude of the equatorial and axial fields due to a bar magnet of length 5.0 cm at a distance of 50 cm from its mid-point? The magnetic moment of the bar magnet is 0.40 Am^2

[MARCH 2020]

13. Infrared spectrum lies between

a) Radio and microwave
b) Visible and UV
c) Microwave and visible
d) UV and X rays

[MODEL 2021]

14.

a) what is the intensity of magnetisation for magnetic materials?
b) Give the relation between B and H **[MODEL 2021]**

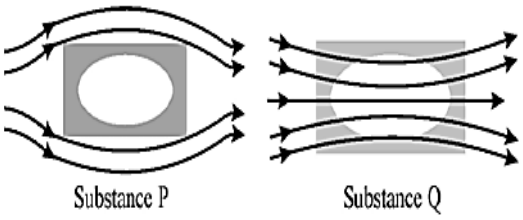
15. The expression $\sum \vec{B}.\Delta\vec{S} = 0$ is

(i) Gauss Law in Electrostatics
(ii) Gauss Law in Magnetism
(iii) Ampere's circuital law
(iv) Lenz's law **[MARCH 2021]**

NEW 10'S
A NEW TURN IN EDIFICATION

16. An air cored solenoid has 1000 turns per metre and carries a current of 2A. Calculate the magnetic intensity (H). **[MARCH 2021]**

17. The behaviour of magnetic field lines near two magnetic substances P and Q are shown below.



a) From the figure identify paramagnetic substance.

b) Susceptibility of substance P is _____. (positive/negative)

[MARCH 2021]

18. The susceptibility of a diamagnetic material is ……. (negative/ positive/zero)

[MODEL 2022]

19. The temperature at which a ferromagnetic material become paramagnetic is ……..

a) Cut-off temperature

b) Absolute temperature

c) Curie temperature **[MARCH 2022]**

20. A magnetic needle made of iron is suspended in a uniform external magnetic field. It experiences a torque and the needle starts oscillating.

Write down the frequency of oscillation of the magnetic needle.

21. Differentiate between paramagnetic, diamagnetic and ferromagnetic substances

22.

a) SI unit of magnetic moment of a dipole is

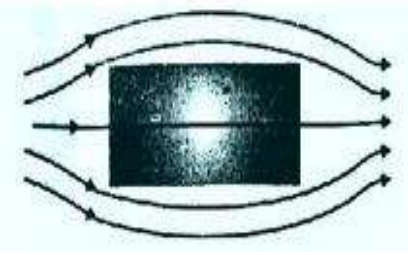
i. Am

ii. Am^2

iii. JT

iv. JT^{-2}

b) Figure shows a magnetic substance placed in an external magnetic field. Identify the substance.



[MODEL 2023]

23.

a) Define magnetisation?

b) Give its dimension? **[MARCH 2023]**

24.

a) Explain Gauss's law in magnetism

b) If magnetic monopoles existed, how the Gauss's law of magnetism be modified

[MODEL 2024]

NEW10'S
A NEW TURN IN EDIFICATION

25. Compare diamagnetic substances, paramagnetic substances and ferromagnetic substances with suitable examples.

[MARCH 2024]

26. State Gauss's law in magnetism. **[MODEL 2025]**

27. Compare the magnetic susceptibility and magnetic permeability of diamagnetic, paramagnetic and ferromagnetic substances.

[MODEL 2025]

28. Relative permeability of a material $\mu_r < 1$, identify the magnetic material. Write the relation between relative permeability and magnetic susceptibility.

[MARCH 2025]

29.

a) State Gauss's law in magnetism.

b) A short bar magnet placed with its axis at 30° with a uniform external magnetic field of 0.3 T experiences a torque of magnitude equal to 5 x 10^{-2} J. What is the magnitude of the magnetic moment of the magnet?

[MARCH 2025]

CHAPTER – 6, ELECTROMAGNETIC INDUCTION

1. Current in a circuit falls from 5.0A to 1.0A in 0.1s. If an average emf of 200V induced, give an estimate of the self – inductance of the coil.

2. A pair of adjacent coils has a mutual inductance of 1.5H. If the current in one coil changes from 0 to 20A in 0.5s

a) What is the change of flux linkage with the other coil?

b) What is the emf induced in the other.

3. An emf of 16V is induced in a coil of self – inductance 4H. The rate of chance of current must be

a) 64 A/s

b) 32 A/s

c) 16 A/s

d) 4 A/s

4. A steady current 1 ampere is passed through a long solenoid of length ℓ and number of turns N.

a) Obtain a relation for the self – inductance of the solenoid.

b) The self – inductance of a coil is 2mH. If a current of 1A is switched off in a time of one millisecond, what is the induced emf in it?

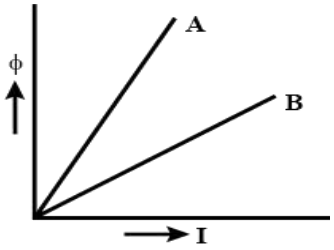
c) When an alternating current is applied to an electrical element, the current in it lag the voltage by $\frac{\pi}{2}$. Identify the element.

5. Self- inductance of a coil plays the role of inertia in a circuit.
The S.I unit of self - inductance is …….

6. A solenoid of length 1m has self – inductance L henry. If number of turns are doubled without any change in its length? What is its new self -inductance?

NEW 10'S
A NEW TURN IN EDIFICATION

7. A plot of magnetic flux ($\boldsymbol{\phi}$) versus (I) is shown in the figure for the two inductors A and B, which of the two has larger value of self – inductance?



8. The generation of emf when the magnetic flux associated with a coil change is known as electromagnetic induction.

a) Mention the factors on which the self – inductance of a solenoid depends

b) Calculate the energy stored in an inductor of inductance 50mH when a current 0f 2A is passing through it.

c) Two identical loops one of copper and other of aluminium are rotated with same speed in the same magnetic field. In which case the

i) Induced emf will be more?

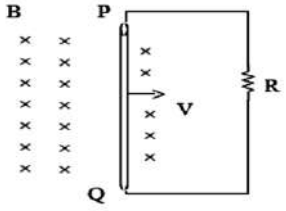
ii) Induced current will be more and why?

[MARCH 2013]

9. A jet plane is travelling towards west at a speed of 1800 km/h. What is the voltage difference developed between the ends of the wing 25m long if the earth's magnetic field at the location has a magnitude of 5.0×10^{-4} and the dip angle is 30.

[SAY 2013]

10. A conducting rod PQ of length 'ℓ' connected to a resistance 'r' is moved at a uniform speed 'V', normal to a uniform magnetic field 'B'

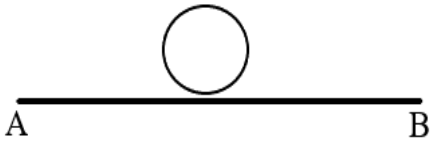


a) Deduce the expression for emf induced in the conductor.

b) Find the magnitude and direction of current through the conductor.

[MODEL 2018]

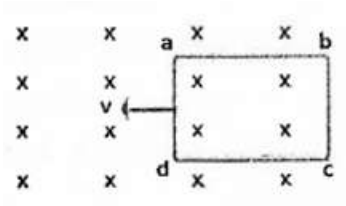
11. A circular metallic loop and a current carrying conductor are placed as shown in the figure.



If the current through the conductor is increasing from A to B, find the direction of induced current in the loop.

[SAY 2018]

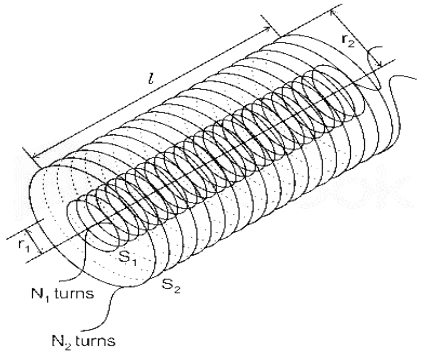
12. A rectangular loop, abcd, is moving into a region of a magnetic field which is directed normal to the plane of the loop as shown in the figure.



Determine the direction of induced current in the loop using Lenz's law.

[MODEL 2019]

13. Two long coaxial solenoids of same length are shown below:



a) Define mutual inductance of the pair of coils

b) Derive an expression for mutual inductance of two co- axial solenoids.

c) Write the dimension of mutual inductance. **[MARCH 2019]**

14. The polarity of induced emf in electro-magnetic induction is given by …….
(Ohm's law, Lenz's law, Gauss law) **[MODEL 2020]**

15. Write the help of diagram, explain the working principle of AC generator. **[MODEL 2020]**

16. Coefficient of mutual inductance of two coils is 1 H. Current in one of the coils is increased from 4 to 5 A in 1 ms. What average emf will be induced in the other coil?

a) 1000 V

b) 2000 V

c) 100 V

d) 200 V **[MARCH 2020]**

17.

a) State Faraday's law of electromagnetic induction.

b) How does the magnetic energy stored in an inductor and electrostatic energy stored in a capacitor related to their respective field strengths?

[MARCH 2020 & 2021]

18.

a) Name the principle of AC Generator

b) Derive the equation for instantaneous e.m.f in an AC Generator. **[MODEL 2021]**

19.

a) What is motional emf?

b) Derive the equation for the induced emf between the ends of a straight conductor moving perpendicular to a uniform magnetic field. **[MODEL 2021]**

20. A jet plane is travelling towards west at a speed of 1800 km/h. What is the voltage difference developed between the ends of the wing having a span of 25m, if the vertical component of Earth's magnetic field at the location is 2.9×10^{-4}T.

[MARCH 2021]

21. An emf is induced in a coil due to the change of flux in the same coil.

a) This phenomenon is called ……

b) Derive an expression for the energy stored in an inductor.

[MODEL 2022]

22.

a) Which is the working principle of an AC generator.

b) With the help of a diagram, explain the working of AC generator.

[MARCH 2022]

23. Which of the following can produce max induced emf:

a) 50A, DC

b) 50A, 50Hz AC

c) 50A, 500Hz AC

d) 100A, DC

24. An air cored solenoid having a diameter of 4cm and length 60cm is wound with 4000 turns. Find the inductance of solenoid. What will be the inductance if an iron core of relative permeability 4000 is introduced?

25. How does this magnetic energy compare with the electrostatic energy stored in a capacitor?

26.

a) Define self-inductance

b) Derive an expression for self-inductance of a coil. **[MODEL 2023]**

27. Lenz law is in accordance with the law of conservation ……. **[MODEL 2023]**

28. State laws of electromagnetic induction? **[MARCH 2023]**

29.

a) State the principle of a generator

b) Obtain the expression for the emf generated by an AC generator. **[MARCH 2023]**

30. Obtain the expression for the magnetic energy stored in a solenoid in terms of magnetic field B, area A and length ℓ of the solenoid. m. **[MODEL 2024]**

31. State Faraday's law of electromagnetic induction. **[MARCH 2024]**

32. Obtain the expression for magnetic energy stored in a solenoid in terms of magnetic field B, area A and length 'ℓ' of a solenoid. **[MARCH 2024]**

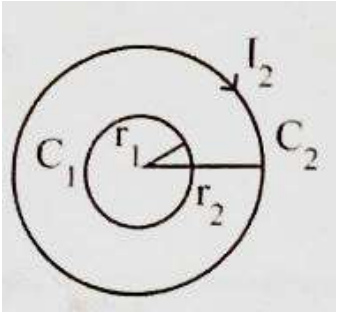
33. Give the equation of motional emf induced in a conductor of length ℓ, moving with velocity V in a uniform magnetic field B. **[MODEL 2025]**

34.

a) What is self-induction?

b) Two concentric circular coils C_1 and C_2. Radius r_1 and r_2 ($r_1 << r_2$) respectively are kept coaxially as shown in the figure.

NEW10'S
A NEW TURN IN EDIFICATION



If the current I_2 is passed through C_2, then find the expression for mutual inductance between the two coils. **[MODEL 2025]**

35. Which of the following gives the polarity of the induced emf?

(i) Biot-Savart Law

(ii) Ampere's circuital Law

(iii) Lenz's Law

(iv) Fleming's right-hand Rule **[MARCH 2025]**

36.

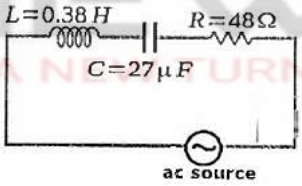
a) What is the working principle of an AC generator?

b) With the help of a diagram, explain theory and working of an AC generator.

[MARCH 2025]

CHAPTER – 7, ALTERNATING CURRENT

1. 110V variable frequency ac source is applied to a circuit as shown in figure. The circuit is in resonance.



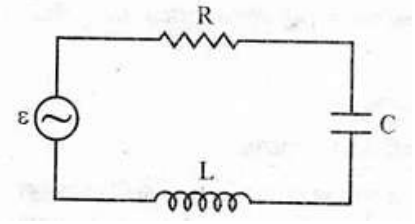
a) Write a practical application of the circuit shown.

b) Calculate the current through the circuit and frequency of the applied source.

c) How does the current change if the plates of the capacitor are brought closer?

[MODEL 2019]

2. A series LCR circuit connected to an ac source is shown below:



a) write an expression for impedance offered by this circuit.

b) Under what condition this circuit is used for tuning radio? **[MARCH 2019]**

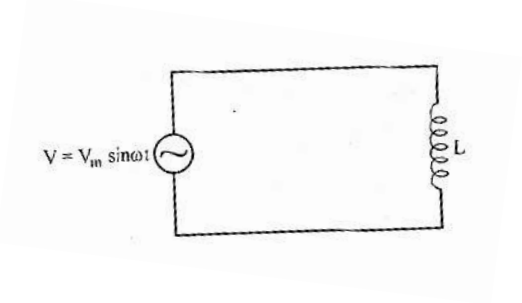
3. A transformer is used to change the alternating voltage to a high or low value.

a) What is the principle of a transformer?

b) A power transmission line feeds input power of 2300V to a stepdown transformer with its primary windings having 4000 turns. What should be the number of turns in the secondary in order to get output power at 230 V?

[MARCH 2019 &2022]

4. An ac voltage V = $V_m \sin\omega t$ is given to an inductor as shown below:



a) Obtain an expression for current through the inductor.

b) Draw the phasor diagram for the inductor.

c) Calculate the resonant frequency of a series LCR circuit with L = 5H, C = 80 μF and R = 40Ω. **[MODEL 2020]**

5. The current through an AC circuit depends on the magnitude of the applied voltage and impedance of the circuit.

a) Write any two factors on which the impedance of a series LCR circuit depends.

b) Draw and impedance diagram of a series LCR circuit and write the expression for the power factor from the diagram.

c) A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which R = 3 Ω, L = 25.48 mH, and C = 796 μF. Find the impedance of the circuit. **[MARCH 2020]**

6.

a) Give the principle of a transformer.

b) Give the two energy losses in transformer **[MODEL 2021]**

7.

a) Draw the phasor diagram with V and I for an inductive circuit.

b) What is the phase difference between V and I in an inductive circuit? **[MODEL 2021]**

8.

a) How rms value of AC is related to its maximum value?

b) With the help of phasor diagram, explain how current leads the e.m.f. in a capacitive circuit **[MODEL 2021]**

NEW10S
A NEW TURN IN EDIFICATION

9. Prove that when an alternating voltage is applied to an inductor, the current through it lags behind voltage by an angle $\frac{\pi}{2}$. **[MARCH 2021]**

10.

a) Working principle of transformer is

i. mutual induction

ii. resonance

iii. motional emf

iv. LC oscillations

b) Write any one difference between step-up and step-down transformer.

c) A power transmission line feeds input power at 3300 V to a step-down transformer with its primary windings having 6000 turns. What should be the number of turns in the secondary in order to get output power at 220 V? **[MARCH 2021]**

11. Draw the phasor diagram for an A.C voltage applied to a series LCR circuit. **[MODEL 2022]**

12. In purely inductive or capacitive circuit, power factor (cos ϕ) is

a) 0

b) 1

c) -1 **[MARCH 2022]**

13.

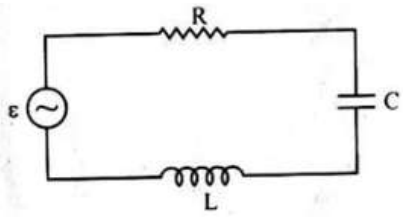
a) Can a transformer be used to step up or step down a DC voltage? Justify your answer.

b) Why do we use soft iron core in a transformer? **[MODEL 2023]**

14.

a) The equation of a.c. is given by V= $200\sqrt{2}$ sin $(100\pi t)$. Find the r.m.s. value and frequency.

b) Figure shows a series LCR circuit connected to a variable frequency. Obtain the impedance of the circuit using phasor diagram.



c) What is the value of power factor in the circuit at resonance? **[MODEL 2023]**

15. Obtain the expression for the current flowing through a resistor when an ac voltage is applied to it. **[MARCH 2023]**

16.

a) State the principle of a transformer.

b) Explain the working of a transformer.

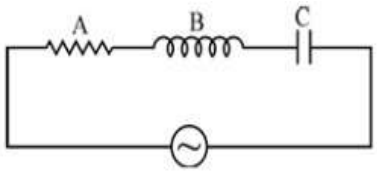
c) Differentiate between step up & step-down transformer. **[MARCH 2023]**

17. A light bulb is rated at 100w for 220V. Supply find the resistance of the bulb **[MODEL 2024]**

18.

a) Write the expression for instantaneous emf of a.c.

b) Identify A, B and C in figure.

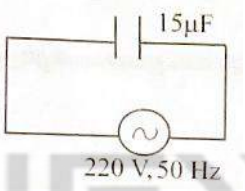


c) Draw the phasor diagram of the above circuit and write the expression for impedance in the circuit, then mention the terms.

[MARCH 2024]

19. A power transmission line feeds power at 2200 V with a current of 5A to stepdown transformer with its primary winding having 4000 turns. Calculate the number of turns and current in the secondary in order to get output power at 220 V. **[MODEL 2025]**

20. A 15μF capacitor is connected to a 220 V, 50Hz source as shown in the figure.



a) Determine the capacitive reactance.

b) Calculate the rms and peak value of current in the circuit.

c) Show that when AC is applied to a capacitive circuit, the current leads the emf by $\frac{\pi}{2}$.

[MODEL 2025]

21. The instantaneous current and voltage of an a.c. circuit are given by i = 10 sin 314t Ampere and v = 50 sin (314t + π/2) Volt. What is the

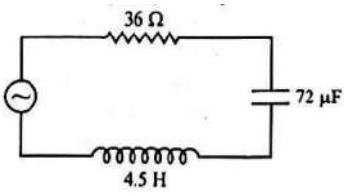
a) phase difference between voltage and current?

b) power dissipation in the circuit? **[MARCH 2025]**

22.

a) With the help of a phasor diagram, find the impedance of a series LCR circuit.

b) A series LCR circuit is connected to an AC source of variable frequency as shown in figure below. At what frequency the impedance of this circuit will be minimum?



[MARCH 2025]

NEW10'S
A NEW TURN IN EDIFICATION

CHAPTER – 8, ELECTROMAGNETIC WAVES

1. What physical quantity is the same for X- rays of wavelength 10^{-10}, red light of wavelength $6800A^0$ and radio waves of wavelength 500m

2. A plane electromagnetic wave travels in vacuum along z-direction. What can you say about the directions of its electric and magnetic field vectors? If the frequency of the wave is 30 MHz, what is its wavelength?

3. A radio can tune into any station in the 7.5 MHz to 12 MHz band. What is the corresponding wavelength band?

4. Suppose that the electric field part of an electromagnetic wave in vacuum is

E = {(3.1N/C)

Cos [(1.8 rad/m) y + (5.4×10^6rad s^{-1}t] *i*

a) What is the direction of propagation?
b) What is the wavelength?
c) What is the frequency?
d) What is the amplitude of the magnetic field part of the wave?
e) Write an expression for the magnetic field part of the wave?

5. Match the following

A	B	C
Radio waves	Nuclear reactions	Destroy cancer cells
Ultraviolet rays	Inner shell electron transition	Detect fake currency notes
	Acceleration of charges in conducting wires	Physical Therapy
		Cellular phones

6. Match the following

A	B
X -rays	Water purifier
Infrared	Cancer treatment
Microwave	Remote switch
Ultraviolet	Radar

7. An important result of Maxwell`s theory is that accelerated charges radiate electromagnetic waves.

a) Which of the following is not an electromagnetic wave?
   i. X-rays
   ii. Γ -rays
   iii. β- rays
   iv. Microwaves

b) An electromagnetic wave propagates through a medium of permittivity `$\varepsilon$` and permeability `$\mu$`. What is the speed of this wave through the medium? Also write the dimensional formula of `$\mu\varepsilon$`.

8. Sun is a natural source of electro- magnetic.

a) Which part of the electromagnetic spectrum is termed as `heat waves`?

b) Different animals are sensitive to different ranges of electromagnetic spectrum. Human eyes are sensitive to which part of the electromagnetic spectrum.

c) Ozone layer in the atmosphere acts as a protective layer for living organisms. Which radiation is prevented by ozone layer reaching earth.

d) Ozone layer depletion is caused by which gas.

9. Match the following

A	B	C
Microwave	Fracture bones	Melanin
Infra – red	Nuclear reaction	Cancer treatment
Ultraviolet	Klystron	Cellular phones
X – rays	Hot bodies and molecules	Radar
	Ozone layer	Greenhouse effect

10. Periodic variation in electric and magnetic fields that propagates through space is called electromagnetic radiation.

a) The direction of propagation of an electromagnetic wave is that of

i. $\vec{B} \cdot \vec{E}$

ii. $(\vec{B} \times \vec{E}) \cdot \vec{E}$

iii. $\vec{E} \times \vec{B}$

iv. $(\vec{E} \cdot \vec{B}) \times \vec{B}$

b) An electromagnetic wave is entering from one medium to another. Then the property which remains unaltered is

i. Wavelength

ii. Frequency

iii. Velocity

iv. None of these

11. In an electromagnetic wave electric and magnetic field vectors are given by

$E = 120 \sin(\omega t + k z)\, i$,

$B = 40 \times 10^{-8} \sin(\omega t + k z)\, j$

a) What is the direction of propagation of electromagnetic wave?

b) Determine the ratio of amplitude of electric field to magnetic field in the case of the above em wave?

c) How can you relate the above ratio with μ_0 and ε_0

NEW 10'S
A NEW TURN IN EDIFICATION

12. Match the following.

A	B	C
γ - ray	Sunburn	Photon emission by fast moving electron
X -ray	Remote sensing	Electronic de excitation
uv - ray	Diagnosis	Oscillating current
Microwave	Radio activity	Nucleus

13. The magnetic field of a plane electromagnetic wave is given by

$$B = 2 \times 10^{-7} \sin(0.5 \times 10^{3} x + 1.5 \times 10^{11} t)$$

a) What is the maximum amplitude of this magnetic field?
b) What is wavelength and frequency?
c) If this electromagnetic wave move in z - direction. Write the equation of its electric field.

14.

a) Sun is a very powerful source of ultraviolet rays. But we do not receive much ultraviolet rays on the surface of the earth. Why?
b) The electric field of an ultra violet ray is given by E = 60 sin (0.5×10^{3}z -1.5×10^{11}t) What is the amplitude of the magnetic field vector in the ultraviolet ray?

15. An accelerating charge produce ….. waves.
a) electric
b) magnetic
c) electromagnetic
d) None of these

NEW10'S
A NEW TURN IN EDIFICATION

16. How maxwell modified Ampere's Law.

17. The electric field amplitude of an electromagnetic wave is 15V/m. Find the magnetic field amplitude of the wave. **[MODEL 2018]**

18. James Clerk Maxwell modified Ampere's circuital theorem by introducing the concept of displacement current.
a) What do you mean by displacement current?
b) Write down the equation for displacement current **[MODEL 2018]**

19.

a) Name the part of electromagnetic spectrum
   i. Used in radar systems.
   ii. Produced by bombarding a metal target by a high-speed electron.
b) Electromagnetic waves are produced by ……...
c) Why only microwaves are used in microwave ovens? **[MARCH 2018]**

20.

a) If μ and ϵ are the permeability and permittivity of a medium, velocity of an electromagnetic wave through that medium is given by ……

b) Match the following

Gamma rays	**Bombarding metal target by high energy electrons.**
Visible light	Radar systems used in aircraft navigation
X rays	Emitted by radioactive nuclei
Micro waves	Wavelength range about 700nm – 400nm
	LASIK eye surgery

[MODEL 2019]

21. Which electromagnetic waves are used for the following purposes?

a) Diagnostic tool in medicine.

b) Kill germs in water purifiers.

c) Cellular phones.

d) In remote switches of household electronic systems **[MARCH 2019 & MODEL 2025]**

22.

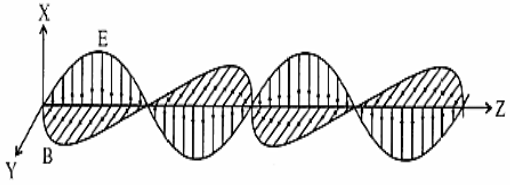
a) What do you mean by displacement current?

b) Match the following

A	B
Microwave	Srterilization
Infrared	Diagnosis
Ultraviolet	Greenhouse effect
X – ray	Radar communication

[MODEL 2020]

23. A typical plane electromagnetic wave propagating along the Z direction is shown in figure



a) Write the equation for electric and magnetic fields.

b) Write the methods of production of radio waves and microwaves. Write any one use of these waves **[MARCH 2020]**

24.

a) Give two properties of electromagnetic waves

b) Give one use of radio waves **[MODEL 2021]**

25. The electromagnetic waves used in LASIK eye surgery is

a) Micro waves

b) Ultraviolet rays

c) Infra-red waves

d) Gamma rays **[MARCH 2021]**

26.

a) The current due to time varying electric field is called ……

b) An electromagnetic wave travels in free space with a velocity of 3×10^8 m/s. At a particular point in space and time, magnitude of intensity of electric field is 6.3 V/m. What is magnitude of magnetic field at this point? **[MARCH 2021]**

27. A stationary charge can produce electromagnetic waves. State true or false. **[MODEL 2022]**

28. Write any two uses of X – rays. **[MODEL 2022]**

29. Relation between velocity of light (c), permeability of free space (μ_0), permittivity of free space (ε_0) is ……

a) $C = \frac{1}{\mu_0 \varepsilon_0}$

b) $C = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$

c) $C = \mu_0 \varepsilon_0$

d) $C = \sqrt{\mu_0 \varepsilon_0}$ **[MARCH 2022]**

30. Infra-red waves are also referred to as heat waves. Why? **[MARCH 2022]**

31. Name the physical quantity which can be expressed by the ratio of the amplitude of electric field to the magnetic field in an electromagnetic wave. **[MODEL 2023]**

32. Match the following

A	B
Radio waves	Night vision camera
Ultraviolet	**Cellular phone**
Microwave	Water purifier
Infrared	**Radar communication**

[MODEL 2023]

33. How Maxwell modified Ampere's law **[MARCH 2023]**

34. Electromagnetic radiation belonging to the region with wavelength of about 400 nm to 700nm is called …… **[MARCH 2023]**

35.

a) How electromagnetic waves are produced

b) Why infrared waves are called heat waves? **[MODEL 2024]**

36. Briefly explain the electromagnetic spectrum. **[MARCH 2024]**

37. The frequencies of gamma-rays, ultraviolet rays, and X-rays are ν_1, ν_2 and ν_3 respectively. Then

a) $\nu_1 = \nu_2 = \nu_3$

b) $\nu_1 > \nu_3 > \nu_2$

c) $\nu_1 > \nu_2 > \nu_3$

d) $\nu_3 > \nu_2 > \nu_1$ **[MARCH 2025]**

38.

a) Which electromagnetic wave is used in cellular phones to transmit voice communication?

b) In the process of charging of a parallel plate capacitor, the current produced between the plates of the capacitor is

(i) $\mu_0 \frac{d\phi_E}{dt}$ (ii) $\frac{1}{\mu_0} \frac{d\phi_E}{dt}$

(iii) $\varepsilon_0 \frac{d\phi_E}{dt}$ (iv) $\frac{1}{\varepsilon_0} \frac{d\phi_E}{dt}$

where symbols have their usual meanings. **[MARCH 2025]**

CHAPTER – 9, RAY OPTICS AND OPTICAL INSTRUMENTS

1. An object is placed at (i)10cm (ii)5cm in front of a concave mirror of radius of curvature 15cm. Find the position, nature, and magnification of the image in each case.

2. Light from a point source in air falls on a spherical glass surface (n=1.5 and radius of curvature = 20cm). The distance of light source from the glass surface is 100cm. At what position the image is formed?

3. If the refractive index of the material of prism is 1.5, find the critical angle of the prism

4.

a) With a neat ray diagram, the relation $\frac{n_2}{v} - \frac{n_1}{u} = \frac{n_2 - n_1}{R}$. For the refraction at a spherical surface.

b) Light from a point source in air falls on a spherical glass surface (n = 1.5 and radius of curvature = 20cm). The image is formed at a distance of 100cm from the glass surface, in the direction of incident light. What is the distance of the light source from the glass surface?

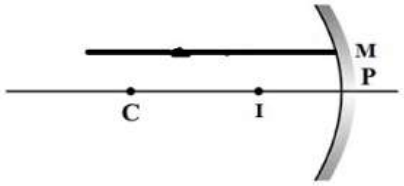
[MODEL 2019]

5. A ray of light parallel to the principal axis of a spherical mirror falls at a point M as shown in the figure below.

a) Identify the type of mirror used in this figure

b) By drawing a suitable diagram obtain mirror equation

c) If the mirror is immersed in water, its focal length …...



[MARCH 2019]

6. When placed inside water the focal length of a spherical mirror
   a) Increases
   b) Decreases
   c) Becomes zero
   d) Remains unchanged **[MODEL 2020]**

7. Explain total internal reflection. Write any two applications of total internal reflection. **[MODEL 2020]**

8.
   a) Derive an expression for angle of deviation for a ray of light when it passes through a prism.
   b) A thin prism is having an angle of the prism 4^0 and refractive index 1.5. find the angle of minimum deviation of the thin prism.

[MODEL 2020]

9. Total internal reflection may be observed if
   a) Light ray is travelling from denser medium to rarer medium.
   b) Light ray is travelling from rarer medium to denser medium.
   c) Light ray is travelling from any medium to another medium. **[MARCH 2020]**

10. What happens to the ray of light when it travels from rarer to denser medium.
   a) Bends towards the normal
   b) Bends away from the normal
   c) No change. **[MODEL 2021]**

11. When a ray of light enters a glass slab from air:
   a) Its wavelength decreases.
   b) Its wavelength increases.
   c) Its frequency increases
   d) Its frequency decreases **[MODEL 2021]**

NEW10'S
A NEW TURN IN EDIFICATION

12. Using a suitable ray diagram derive the relation $\frac{n_2}{v} - \frac{n_1}{u} = \frac{n_2 - n_1}{R}$ for refraction at a spherical surface.

[MARCH 2021]

13. A magician during a show makes a glass lens with n= 1.47 disappear in a liquid.
   a) What is the refractive index of the liquid.
   b) Could the liquid be water?

14. Using a suitable ray diagram derive the relation $\frac{n_2}{v} - \frac{n_1}{u} = \frac{n_2 - n_1}{R}$ for refraction at a spherical surface. **[MARCH 2021]**

15. Draw a ray diagram showing the image formation in a refracting telescope when the final image is formed at infinity. Write an equation for the length of the telescope tube in terms of focal length of the objective and eyepiece.

[MARCH 2021]

16. Using a suitable ray diagram prove that the radius of curvature of a spherical mirror is twice its focal length. **[MARCH 2021]**

17.

a) State Snell's law of refraction.

b) Refraction at a spherical surface can be explained using the relation. $\frac{n_2}{v} - \frac{n_1}{u} = \frac{n_2 - n_1}{R}$ using this derive lens Marker's formula.

c) A concave lens always produces …… (real/ virtual) image.

18. Draw the ray diagram of a convex lens producing virtual image

19. Optical fibres make use the phenomenon of …… **[MARCH 2022]**

20.

a) If f = 0.5m, for a glass lens. What is the power of the lens?

b) The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm. Its focal length is 12cm What is the refractive index of glass.?

[MARCH 2022]

21. A spherical mirror is a mirror with a curved reflecting surface.

a) What is the relation between focal length and radius of curvature of a spherical mirror?

b) Prove that for a concave mirror forming real image. **[MARCH 2022]**

22.

a) State laws of refraction.

b) Obtain a relation for the total deviation produced for a ray incident on a prism with the help of a ray diagram.

23.

a) Draw a labelled diagram of a compound microscope forming an image at the near point of the eye.

b) Obtain an expression for the magnification produced by a compound microscope

[MODEL 2023]

NEW 10'S
A NEW TURN IN EDIFICATION

24.

a) Draw a ray diagram to show refraction of light through a glass prism. Hence, obtain the prism formula to determine the refractive index of the material of the prism.

b) Show graphically the variation of angle of deviation with angle of incidence for a ray of light entering prism.

c) If the refractive index of the material of the prism is 1.49. find the critical angle of the prism. **[MODEL 2023]**

25.

a) With a neat diagram, derive lens makers formula.

b) The radii of curvature of the faces of a double convex lens are 10cm and 15cm. Its focal length is 12cm. What is the refractive index of glass? **[MARCH 2023]**

26. Derive the expression for the refractive index of a prism with the help of a diagram.

[MARCH 2023]

27.

a) State law of refraction

b) Explain total internal refractions. **[MODEL 2024]**

28.

a) Derive the expression for refractive index of prism with a neat diagram.

b) Obtain the expression for the angle of minimum deviation for small angled prism.

[MODEL 2024]

29. (a) Derive lens maker's formula
(b) Draw the image formation in a simple microscope
(c) Write the value of least distance of distinct vision **[MARCH 2024]**

30.
(a) State Snell's law of refraction.
(b) Explain critical angle and total internal reflection **[MARCH 2024]**

31. Two lenses of powers +7D and -3D are combined. The focal length of the combination would be ……..
a) -50 cm
b) +50 cm+
c) -25 cm
d) +25 cm **[MODEL 2025]**

32.
a) Represent the image formation in a compound microscope diagrammatically.
b) A small telescope has an objective of focal length 144 cm and an eye piece of focal length 6.0 cm. what is the magnifying power of the telescope? What is the separation between the objective and eye piece? **[MODEL 2025]**

33.
a) With the help of a neat diagram obtain the expression for the refractive index of the material of the prism.
b) Plot the graph showing angle of deviation versus angle of incidence for a triangular prism.
[MODEL 2025]

34. Two thin lenses of power +4D and -2D are in contact. The focal length of the combination is ……….. **[MARCH 2025]**

35.
a) Draw a ray diagram of simple microscope showing image formation at the least distance of distinct vision (D).
b) The magnification of a compound microscope is 20. The focal length of the eyepiece is 5 cm and the image is formed at the near point (25 cm). find the magnification of objective lens.
[MARCH 2025]

36.
a) Draw the path of a light ray, through the prism, which suffers minimum deviation. Mark the angle of deviation, angle of incidence and angle of emergence in the figure.
b) Using the above diagram, show that sum of the angle of deviation and the angle of the prism is equal to the sum of the angle of incidence and angle of emergence.
c) What do you mean by angle of minimum deviation? **[MARCH 2025]**

CHAPTER – 10, WAVE OPTICS

1. What is the relation between phase difference and path difference?

2. When a low-flying aircraft passes over head, we sometimes notice a slight shaking of pictures in the TV screen. Why?

3.
a) A Soap bubbles exhibit different colours in sunlight. Why?
b) Why beautiful colours appear in thin films?

4. State the principle of super position of light waves?

5. What happens to the fringe width when Young's double slit experiment is immersed in water?

6. Distinguish between ordinary light, (unpolarized light) and polarized light.

7. What is the importance of polarization?

8. Explain the diffraction pattern obtained due to a single slit and represent graphically the variation of intensity with angle of diffraction.

[MARCH 2018]

9. The shape of the portion of the wave front of light from a distant star intercepted by the earth is

a) Plane
b) Spherical
c) Cylindrical
d) Converging **[MODEL 2019]**

10. Describe young's double slit experiment and derive an expression for the bandwidth of interference band

[MODEL 2019]

11. Prove Snell's law based on Huygen's principle. **[MODEL 2019]**

12. Using Huygen's wave theory derive Snell's law. **[MARCH 2019]**

13. Using Huygen's wave theory prove that angle of incidence is equal to angle of reflection.

[MARCH 2020]

14.

a) State Huygen's principle?
b) Based on Huygen's wave theory of light show that angle of incidence is equal to angle of reflection. **[MODEL 2021]**

15. Using Huygen's principle, explain refraction of a plane wave, with the help of a diagram?

[MARCH 2021]

16. Name the property of light that proves its transverse nature. **[MARCH 2021]**

17. According to Huygen's principle, each point of the wavefront is the source of secondary wavelets.

a) Using Huygen's principle, prove the law of refraction.
b) Light can be bend around the corners of an obstacle in its path and can deviate from its path if the size of the obstacle is very small. What is this phenomenon called?

[MODEL 2022]

18. Light waves are ..... in nature (transverse/longitude). **[MARCH 2022]**

19. State Malu's law **[MARCH 2022]**

20.

a) State Huygen's principle.
b) Using Huygen's wave theory, verify the law of reflection. **[MODEL 2023]**

21. Sketch the wavefront corresponding to light from the following sources:

a) A point source
b) A distant source **[MODEL 2023]**

22. When the speed of light is independent of direction, the secondary waves are .....

i. Spherical
ii. Cylindrical

iii. Plane

iv. Rectangular **[MARCH 2023]**

23. a) State Huygen's principle?

b) Explain refraction of plane wave using Huygen's principle. **[MARCH 2023]**

24. Sound waves cannot be polarized. Why?

25. Explain Coherent sources. **[MODEL 2024]**

26. Explain the refraction of a plane wave using Huygen's principle. **[MODEL 2024]**

27. "The locus of points which have the same phase is called a wave front", the statement is ..... (True/False). **[MARCH 2024]**

28. a) What are coherent sources?

b) In young's double slit experiment interference pattern is observed at 5cm from the slits with a fringe width 1mm. Calculate the separation between the slits ($\lambda = 5000$ Å)

[MARCH 2024]

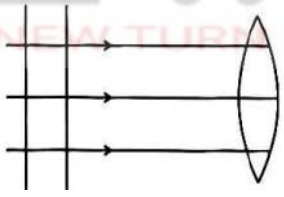
29. Write the condition for constructive and destructive interference. **[MODEL 2025]**

30. With the help of neat diagram explain reflection of plane wave using Huygen's principle. **[MODEL 2025]**

31.

a) Define wavefront.

b) Figure shows a plane wavefront incident on a convex lens, draw the corresponding refracted wave front.



[MARCH 2025]

32. Using Huygens concept of wavefront, derive Snell's law of refraction. **[MARCH 2025]**

CHAPTER – 11, DUAL NATURE OF RADIATION AND MATTER

1.

a) Work function of a metal is the

(i) Energy required by an electron to get absorbed in the metal surface.

(ii) Minimum energy required by an electron to escape from the metal surface.

(iii) Energy required by an electron to be retained in the metal surface.

(iv) Maximum energy required by an electron to escape from metal surface.

b) Write Einstein's Photo – Electric Equation and explain the terms in it.

c) All photo electrons are not emitted with the same energy as the incident photons. Why?

[MARCH 2015]

2.

a) What is Broglie hypothesis?

b) Write the formula for de Broglie wavelength.

c) Calculate the de – Broglie wavelength associated with an electron accelerated by a Potential difference of 100 Volts. (Given mass of electron = 9.1×10^{-31})
($h = 6.634 \times 10^{-34}$ JS, 1 eV = 1.6×10^{-19} J)

[MARCH – 2015]

3.

a) The work function of the metal is 6 eV. If two photons each having energy 4 eV strike with the metal surface.

a) Will the emission possible?

b) Why?

b) The waves associated with matter is called matter waves. Let λ_e and λ_p be the de- Broglie wavelengths associated with electron and proton respectively. If they are accelerated by the same potential, then

a) $\lambda_e > \lambda_p$

b) $\lambda_p > \lambda_e$

c) $\lambda_p = \lambda_e$

d) $\lambda_e = \frac{1}{\lambda p}$ **[MARCH 2016]**

4. A) The wavelength of matter waves is
called de Broglie Wavelength.

a) An $\propto$ – particle, a proton and an electron having de - Broglie wavelengths λ_a, λ_p and λ_e respectively are moving with the same momentum. Then

(i) $\lambda_a > \lambda_p > \lambda_e$

(ii) $\lambda_p > \lambda_e > \lambda_a$

(iii) $\lambda_a = \lambda_p = \lambda_e$

(iv) $\lambda_p = \lambda_e \neq \lambda_a$

b) The de Broglie wavelength of a ball of mass 0.12 kg is 2.76×10^{-34} m. Calculate the speed of the ball. ($h=6.625 \times 10^{-34}$)

OR

B) Photo electric current depends on the
intensity of incident light.

a) The maximum current emitted by a photoelectric material is called

(i) Emitter current

(ii) Collector current

(iii) Saturation current

(iv) Peak current

b) Work function of caesium and platinum are 2.14 eV and 5.65 eV respectively. Which one of the two metals has higher threshold wavelength? Justify **[SAY – 2016]**

5. Momentum of a photon with wavelength λ is ……

i) hλ ii) $\frac{h}{\lambda}$ iii)) $\frac{h}{\lambda}$ $iv) h + \lambda$ **[MARCH 2017 & MODEL 2022]**

NEW 10'S
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6. Pick the correct material suited for exhibiting photoelectric effect from the following. Arsenic, Copper, Zinc, Gold, Argon. **[SAY – 2017]**

7. The mass of an electron is $\frac{1}{1840}$ part of mass of a proton. When they are subjected to a uniform electric field, they start accelerating.

a) Which of them will have large acceleration?

b) If they start from rest and have the same De Broglie wavelength of 1 angstrom unit, then determine the ratio of the kinetic energies.

[SAY – 2017]

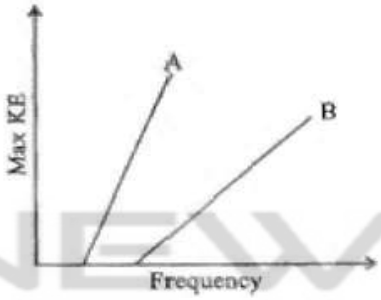
8.

a) Write the expression for the de Broglie wavelength associated with a charged particle having charge 'q' and mass 'm', When it is accelerated by a potential of 'V' volts.

b) A proton and an electron have same kinetic energy. Which one has greater value of de Broglie wave length and why?

[MODEL 2018]

9. The given graph shows the variation of KE with frequency of incident radiations for two surfaces A and B.

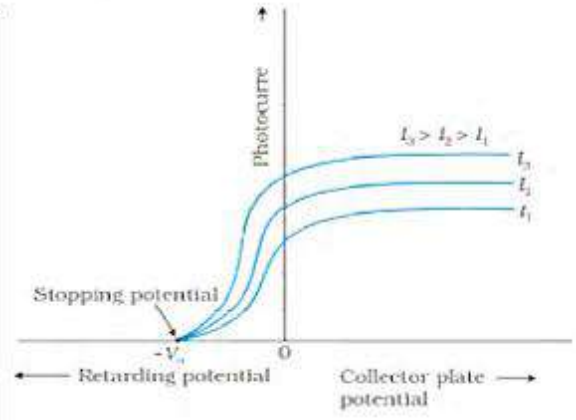


a) Which of the two metals has greater work function? For which of the metals will stopping potential be more for the same frequency of incident radiation?

b) The work function of caesium metal is 2.14eV, when light of frequency $6\times10^{14}H_z$ incident on the metal surface, what is the maximum KE of the photoelectrons and stopping potential?

[MARCH 2018]

10. Variation of photo current with collector plate potential for different intensities I_1, I_2, I_3 of incident radiation is shown below.



Arrange these intensities in the ascending order. **[SAY 2018]**

11. when light of suitable frequency illuminates a metal surface, electrons are emitted from the surface.

a) Write einstein's photoelectric equation.

b) Draw a graph showing the variation of photo current with collector plate potential for two different intensity I_1 and I_2 of incident radiation such that $I_1 < I_2$. Mark stopping potential in the graph.

c) Radiations of frequency 1.5 times the threshold frequency falls on a photosensitive material and a photo current of I is obtained. if the intensity of incident radiation is doubled and frequency is reduced of half, the photo current becomes

i. I
ii. 2I
iii. 0.5 I
iv. Zero **[MODEL 2019]**

12. If 'h' is Planck's constant, the momentum of a photon of wave length $1A^0$ is

i) h ii) 10^{10}h iii) 10^{-10} iv) 10h **[MARCH 2019]**

13.

a) Draw a graph showing the variation of de- Broglie's wave length (λ) with accelerating potential (V)

b) Express de- Broglie's wave length in terms of accelerating voltage **[JUNE 2019]**

14.

a) Obtain Einstein's photoelectric equation.

b) A particle is moving three times as fast as an electron. The ratio of the de Broglie wavelength of the particle to that of the electron is 1.813×10^{-4}. Calculate the mass of the particle. (Mass of electron is 9.11×10^{-31} kg)

[MODEL 2020]

15. The work function of Caesium metal is 2.14eV. When light of frequency $6\times10^{14} H_z$ is incident on the metal surface, photoemission of electrons occurs. (h = $6.6 \times 10^{-34}\ js$).

a) Define work function

b) Calculate the maximum kinetic energy of the emitted electrons.

c) Calculate the stopping potential. **[MODEL 2020 & 2021]**

16. Calculate the work function in electron volt for a metal, given that the photoelectric threshold wave length is 6800Å. **[MODEL 2021]**

17.

a) Write Einstein's photoelectric equation.

b) Using this equation show that, "Photoelectric emission is not possible if the frequency of incident radiation is less than threshold frequency"

[MARCH 2021]

18. Photoelectric effect is the emission of electrons from certain metal surfaces when they are exposed to light.

a) State any two laws of photo electric emission.

b) What is meant by stopping potential?

[MODEL 2022]

19. Photo electric effect is the emission of electrons from certain metal surfaces when they are exposed to light.

a) State any two laws of photo electric emission.

b) What is meant by stopping potential?

[MARCH 2022]

20. Photons are electrically ..... a) neutral

b) positive

c) negative

d) unpredictable **[MARCH 2022]**

21.

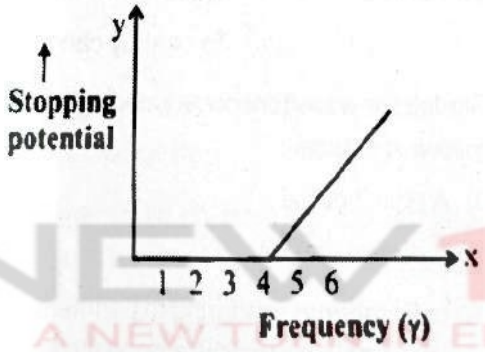
a) What is meant by the threshold frequency of photosensitive metal?

b) Draw the graph showing the variation of stopping potential with frequency.

[MARCH 2022]

22.

a) The variation of stopping potential with frequency of sodium is given below. Calculate its work function.



b) The work function for two metals is in the ratio 1:2. Find the ratio of threshold wavelength of those metals. **[MODEL 2023]**

23. Explain work function. [**MARCH 2023]**

24. Explains Einstein's photoelectric equation. [**MARCH 2023]**

25. The phenomenon of photoelectric emission was discovered by ..... **[MODEL 2024]**

26. Electron revolves around the nucleus only in those orbits for which the angular momentum is some integral multiple of ..... **[MODEL 2024]**

27. Explain Einstein's photoelectric equation. **[MODEL 2024]**

28. What is stopping potential? **[MARCH 2024]**

29. The expression for de Broglie wavelength associated with a particle is .....

[MARCH 2024]

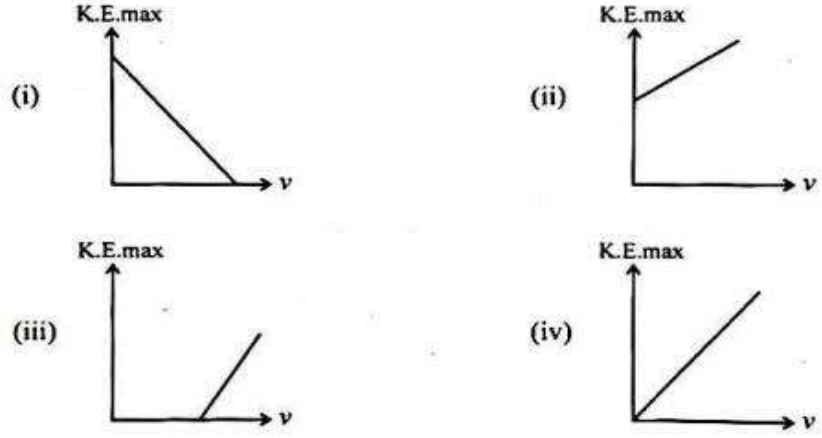
30.

a) Draw the graph showing the variation of photoelectric current with intensity of light.

b) The work function is 2.14 eV. Find the threshold frequency for caesium. ($h = 6.63 \times 10^{-34}$ Js). **[MODEL 2025]**

31.

a) Which one of the following is the correct graph showing the variation between the maximum kinetic energy (K.E.max) of the emitted photoelectrons and the frequency of incident radiation (v) for a given photosensitive surface?



b) A photosensitive surface has a work function of 2.00 eV. Find the maximum kinetic energy of electrons ejected from this surface by radiation of wavelength 300 nm. (Planck's constant, $h = 6.63 \times 10^{-34}$ J s)

[MARCH 2025]

CHAPTER – 12, ATOMS

1. The atomic hydrogen emits lines spectrum consisting of various series.

a) Name the series observed first.

b) Draw the energy level diagram of hydrogen atom. **[2016]**

2.

a) Unit of wave number is

(i) Hz

(ii) eV

(iii) m

(iv) m^{-1}

b) Energy of ground state of hydrogen atom is 13,6eV. What is its ionization potential?

[MARCH 2017]

3.

a) Name different series of lines observed in hydrogen spectrum.

b) Draw energy level of diagram of hydrogen atom.

4.

a) The radius of n^{th} stationary orbit of hydrogen atom is

$$r_n = \frac{n^2 h^2 \varepsilon_o}{\pi m e^2}$$

Using Bohr postulates, obtain an expression for the energy of electron in the stationary states of H-atom.

b) Draw the energy level diagram showing how the spectral lines corresponding to Balmer series occur due to transition between the energy levels. **[MODEL 2018]**

5. An electron is revolving around the nucleus of a hydrogen atom in an orbit of radius nine times the radius of the first orbit. Angular momentum of the electron in this orbit is.

i) $\frac{h}{2\pi}$ ii) $\frac{9h}{2\pi}$ iii) $\frac{3h}{\pi}$ iv) $\frac{3h}{2\pi}$ **[MARCH 2018]**

6. The energy of an electron in the n^{th} orbit of hydrogen atom is

i) $E_n = -\frac{13.6}{n^2}$ J

ii) $E_n = \frac{13.6}{n^2}$ eV

iii) $E_n = -\frac{13.6}{n^2}$ eV

iv) $E_n = -\frac{13.6}{n}$ eV

[MODEL 2019]

7. Niels Bohr made certain modification in Rutherford's model by adding the ideas of quantum hypothesis.

a) State Bohr's second postulate of quantisation of angular momentum.

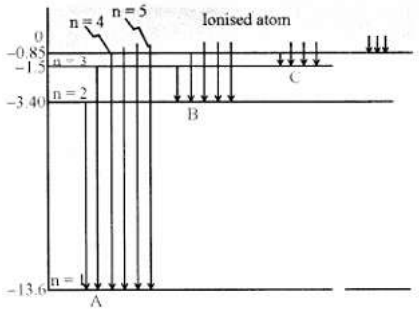
b) Derive an expression for the radius and energy of the electron in the n^{th} orbit of hydrogen atom. **[MARCH 2019]**

8.

a) Draw the Lyman series and Balmer series of emission line spectra of hydrogen atom.

b) The ground state energy of hydrogen atom is -13.6 eV. What are the Kinetic and potential energies of electron in this state? **[MODEL 2020]**

9. The atomic line spectra of hydrogen atom is shown in figure.



Write the names of the series A, B and C **[MARCH 2020]**

10. Which physical quantity is quantised in Bohr's second postulate? **[MODEL 2021]**

11. State any two postulates of Bohr atom model. **[MODEL 2021]**

12. Energy of electron in the nth orbit of hydrogen atom is $E_n = \frac{-13.6}{n^2}$ eV. What is the energy required to make electron free from first orbit of hydrogen atom? **[MARCH 2021]**

13. If radius of first electron orbit of hydrogen is a_0, radius of second electron orbit of hydrogen is ..... **[MARCH 2021]**

14. Write any two postulates of Bohr model of hydrogen atom **[MARCH 2021]**

15.

a) Define ionisation energy.

b) Mention any two drawbacks of Rutherford model of atom. **[MODEL 2022]**

16. According to Bohr, the electron can revolve around the nucleus only in those orbits where angular momentum is an integral multiple of ……...? **[MODEL 2022]**

17. The minimum energy required to free an electron from the ground. State of hydrogen atom is ……?

a) + 13.6 J

b) – 13.6 J

c) + 13.6ev

d) – 13.6ev **[MARCH 2022]**

18.

a) Draw the energy level diagram for hydrogen atom and mark the transition corresponding to Balmer series.

b) Name the spectral series which lies in the ultraviolet region of the spectrum.

[MARCH 2022]

19.

a) In Rutherford scattering experiment, most of the $\propto$ particle go un scattered while some of them are scattered through large angles. What can be concluded from this?

b) What will be the angle of scattering when impact parameter is 0? **[MODEL 2023]**

20. Explain Rutherford's alpha particle scattering experiment. **[MARCH 2023]**

21. Draw the energy level diagram for the hydrogen atom. **[MODEL 2024]**

22. Write the postulates of Bohr's atom model. **[MARCH 2024]**

23. Ionisation energy of hydrogen atom is …… **[MODEL 2025]**

24. From Bohr's second postulate of quantisation, how can we obtain the de Broglie wavelength of electron orbiting around the nucleus? **[MODEL 2025]**

25. If radius of first electron orbit of hydrogen is r_0, radius of second electron orbit of hydrogen is ……. **[MARCH 2025]**

26. What is meant by ionisation energy? Write its value for hydrogen atom. **[MARCH 2025]**

CHAPTER – 13, NUCLEI

1. Obtain the binding energy (in MeV) of a Nitrogen nucleus ($^{14}_{7}$N) given

m ($^{14}_{7}$N) = 14.00307u.

2. Obtain the Binding energy of nuclei $^{56}_{26}$Fe and $^{209}_{83}$Bi in units of MeV from the following data.

m ($^{56}_{26}$Fe) = 55.934939u

m = ($^{209}_{83}$Bi) = 208.980388u

3. Obtain the binding energy:
Given $m_{20}^{40}Ca$ = 39.962589
Mp = 1.00783u, Mn = 1.00867u
Tale 1 amu = 931MeV **[MODEL –2018]**

4.

a) Write the expression for binding energy in terms of mass defect?

b) Draw the graph showing the variation of binding energy per nucleon as a function of mass number?

c) Which nucleus possess maximum binding energy per nucleon? **[MARCH 2019]**

5.

a) Two nuclei have mass numbers in the ratio 1:27. What is the ratio of their nuclear radii?

b) Write any two characteristics of nuclear force.

[MODEL 2020]

6. Match the following

A	B
Nuclear fission	β −decay
Nuclear fusion	Hydrogen spectrum
Transition between atomic energy levels	Nuclei with low atomic numbers
Electron emission from nucleus	Generally possible for nuclei with high atomic number
	Photo electric emission

[MARCH 2020]

7. Give two differences between nuclear fission and fusion. **[MODEL 2020]**

8. Write any two properties of nuclear force. **[MARCH 2021]**

9. Write any two properties of nuclear force **[MARCH 2022]**

10. What will be the ratio of radii of two nuclei if their mass numbers are in the ratio 8:27?
[JULY SAY 2022]

11. Calculate binding energy of $_{20}Ca^{40}$ from the following data:

mass of proton : 1.007825 a.m.u

mass of neutron : 1.008665 a.m.u

mass of $_{20}Ca^{40}$: 39.962589 a.m.u.

[MODEL 2023]

12. Atoms of same element differing in mass are called …….

a) Isotones

b) Isobars

c) Isotopes

d) Isomers **[MARCH 2023 & MODEL 2024]**

13. Differentiate between nuclear fission and nuclear fusion. **[MARCH 2023]**

14. Differentiate between nuclear fission and nuclear fusion **[MODEL 2024]**

15. Which element in the periodic table shows maximum binding energy per nucleon?
[MARCH 2024]

16. What is nuclear fission? Give example? **[MARCH 2024]**

17. Ratio of the radii of two nuclei of mass numbers A_1 and A_2 is …… **[MODEL 2025]**

18.

a) What is mass defect?

b) How is it related to binding energy? **[MODEL 2025]**

19. ……. process is responsible for the production of energy in sun. (Nuclear fission / Nuclear fusion). **[MARCH 2025]**

20. The carbon isotope $_6C^{12}$ has a nuclear mass of 12 u. Calculate the binding energy of its nucleus. Given $m_p = 1.007825$ u; $m_n = 1.008665$ u, 1 a.m.u. (u) = 931 M eV. **[MARCH 2025]**

CHAPTER – 14, SEMICONDUCTOR

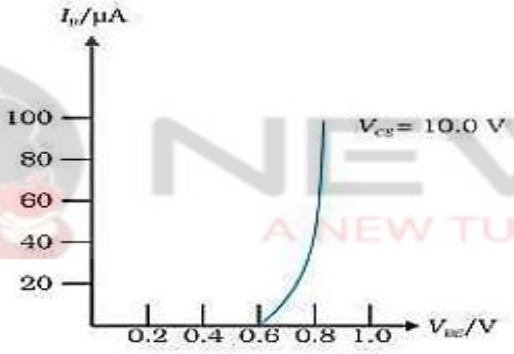
1.

a) What do you mean by barrier potential of a diode?

b) With the help of a diagram explain the working of a full wave rectifier.

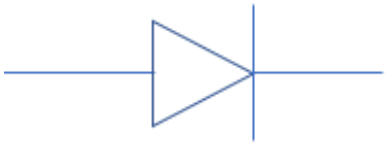
[MARCH 2015]

2. A graph showing the variation of current (I) flowing through a p-n junction with the voltage (V) applied across it is called the V-I characteristic of a p-n junction.
V-I characteristic of a forward biased diode is shown in the figure.



Write any two important features of the graph. **[MARCH 2016]**

3. The symbol of a diode is shown in the figure:



a) The diode is a ..... (rectifier diode/ photodiode/ Zener diode)

b) Draw the VI characteristics of above diode. **[MARCH 2018]**

4. With a neat circuit diagram explain the working of a full wave rectifier. **[MODEL 2019]**

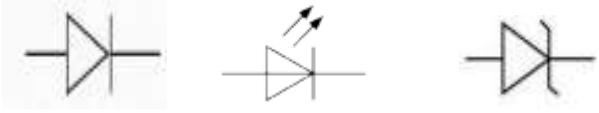
5. The circuit used to change alternating voltage to direct voltage is called rectifier with a neat diagram, explain the working of a full wave rectifier having two diodes. **[MARCH 2019]**

6. Draw the reverse bias characteristics of the diode

7. Draw the energy band diagram of n-type semiconductor. **[MODEL 2020]**

8. Diodes are cone of the building elements of electronic circuits. Some types of diodes are shown in the figure.

i) ii) iii)



a) Identify rectifier diode from the figure.

b) Draw the circuit diagram of a forward biased rectifier diodes by using a battery.

[MARCH 2020]

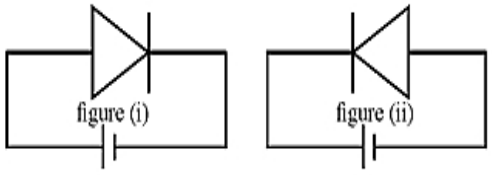
9.

a) What is the use of rectifier?

b) With the help of a neat diagram explain how diode acts as a rectifier. **[MODEL 2021]**

10.

a) In which figure the diode is under forward biased condition?



b) Draw the circuit diagram of a full wave rectifier and explain its working. **[MARCH 2021]**

11. A diode is used to rectify alternating voltages

a) Which property of diode is used here?

b) Explain a full wave rectifier using necessary circuit diagram.

[MODEL 2022]

12. Draw the input and output wave form of half wave rectifier. **[MARCH 2022]**

13. Draw the input and output wave form of a halt wave rectifier. **[MARCH 2023]**

14. What is an intrinsic semiconductor? **[MARCH 2024]**

15. What is a rectifier? Draw the circuit diagram and input, output wave forms of a full wave rectifier? **[MARCH 2024]**

16.

a) Give classification of materials based on energy band diagram

b) Differentiate between intrinsic and extrinsic semiconductors **[MARCH 2024]**

17. Explain the working of a full wave rectifier having two diodes by drawing the circuit diagram. **[MODEL 2025]**

18. With the help of a circuit diagram, explain the working of a half wave rectifier. Draw the input and output waveforms.

[MARCH 2025]