Class-XII Subject-Physics

Time : 3 hours **Maximum Mark : 70**

General Instructions :

(a.) All questions are compulsory.

(b.) The figures in the margin indicate full marks for the questions.

(c.) Question Number A (i) to A (viii) carry 1 mark each.

Question Number B (i) to B (x) carry 2 marks each.

Question Number C (i) to C (ix) carry 3 marks each.

Question Number D (i) to D (iii) carry 5 marks each

A. Answer the following questions very shortly: **(1×8=8)**

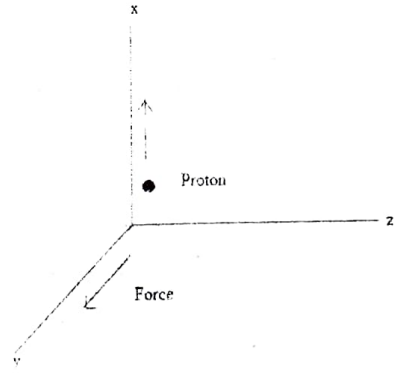
i. A closed loop is held stationary in the magnetic field between the north and south poles of two permanent magnets held fixed. Can we hope to generate current in the loop by using very strong magnets?

ii. In Bohr's theory of model of a Hydrogen atom, name the physical quantity which equal to an integral multiple of $\frac{h}{2\pi}$.

iii. Write the dimension formula of magnetic field induction.

iv. Under what condition the velocity of a charged particle moving in a region where both magnetic and electric fields exist is $v=\frac{E}{B}$.

v. A beam of protons is projected along +x-axis experiences a force due to a magnetic field along the +y-axis as shown in the figure. What is the direction of magnetic field?



vi. Write the dimension formula of permittivity?

vii. Dielectric constant of water is 80. What is its permittivity?

viii. State Lenz's Law of Electromagnetic Induction.

B. Answer the following questions: **(2×10=20)**

i. If $\vec{F}$ is the force acting on a charge carrier q moving with a velocity $\vec{v}$ through a magnetic field $\vec{B}$ then under what conditions the magnitude of $\vec{F}$ –
(a) maximum (b) minimum

ii. Draw the ray diagram for the formation of image, indicate the position, nature and size when object is placed between focus and pole in a concave mirror.

iii. A ray of light falls normally on a mirror. What are the values of angle of incidence and angle of reflection.

iv. Can we obtain image of an object formed by Convex mirror on a screen? If not why?

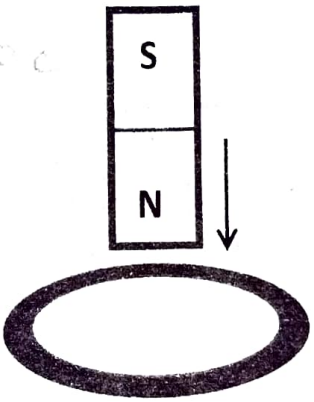
v. Can a body have a charge of 0.8×10^{-19}? Justify.

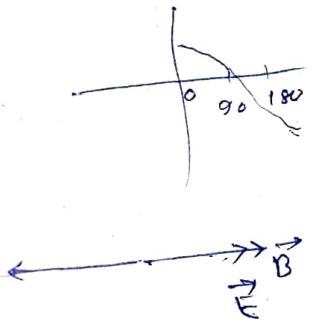
vi. A uniform magnetic field and a uniform electric field are produced pointing in the same direction. An electron is projected with its velocity pointed in the same direction. What will be the effect on velocity of the electron?

vii. Write two ways to produce magnetic field.

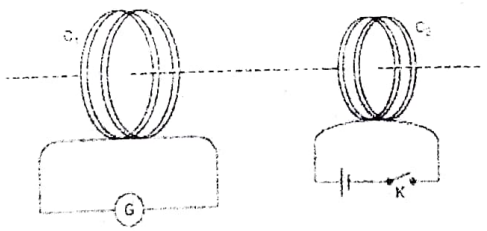
viii. If a body gives out 10^9 electron every second. How much time is required to get a total charge of 1C from it?

ix. A bar magnet falls from a height h through a metal ring as shown in the figure. Will there be any change of acceleration of the magnet? Justify your answer.





x. A current is induced in coil C_1 due to the motion of current carrying coil C_2.
Write any two ways by which a large deflection can be obtained in the galvanometer G.



C. Answer the following questions: **(3×9=27)**

i. A circular coil of radius 10cm, 500 turns and resistance 2Ω is placed with its plane perpendicular to the horizontal component of earth's magnetic field. It is rotated through 180° in 0.25s. Estimate the magnitude of emf and current induced in the coil. Horizontal component of earth's magnetic field at the place is 3.0×10^{-5}T.

ii. Establish the mirror equation in case of Concave mirror producing virtual image.

iii. Two bodies A and B carry charges -3.00μC and -0.44μC. How many electrons should be transferred from A to B so that they acquire equal charges.

iv. Establish the relation between distance of closest approach and Kinetic Energy of an incoming alpha particle.

v. Find the number of images formed by two plane mirror inclined at an angle
(a) 40° (b) 45° (c) when the two mirrors are parallel.

vi. Write the observations from Rutherford's alpha particle scattering experiment.

vii. What would be the distance of closest approach when an alpha particle of kinetic energy 5.5 MeV is bombarded in a gold nucleus?

viii. What do you understand by impact parameter? Write its relation with scattering angle. Mention the condition in which the impact parameter will be maximum, zero and minimum.

ix. Suppose the charge on a proton and an electron differ slightly. One of them is -e and the other is (e+Δe). If the net of electrostatic force and gravitational force between two Hydrogen atoms placed at a distance d (much greater than atomic size) apart is zero, then Δe is of the order of?

D. Answer the following questions: **(5×3=15)**

i. Which experiment established the fact that electric charge is quantized? Write two difference between mass and charge. Name the device used to detect charge on a body. Write one basic property of charge.

ii. What is Lorentz Force? Write the expression for Lorentz Force in vector form. Define SI unit of Magnetic Field Induction. What is its CGS unit? State the relation between its SI unit and CGS unit.

iii. In a closed loop an emf can be induced by changing magnetic flux linked with the loop.
(i) Name the factors which will be changed to produce emf in the loop.
(ii) What is motional emf? Derive an expression for it.