CHAPTER- Moving charges and magnetism

Class – XII

HOME ASSIGNMENT

1 A cyclotron is a type of particle accelerator invented by Ernest O. Lawrence in 1929–1930 at the University of California, Berkeley, and patented in 1932. A cyclotron accelerates charged particles outwards from the center of a flat cylindrical vacuum chamber along a spiral path. The particles are held to a spiral trajectory by a static magnetic field and accelerated by a rapidly varying (radio frequency) electric field. Lawrence was awarded the 1939 Nobel Prize in Physics for this invention.

Cyclotrons were the most powerful particle accelerator technology until the 1950s when they were superseded by the synchrotron, and are still used to produce particle beams in physics and nuclear medicine. The largest single-magnet cyclotron was the 4.67 m (184 in) synchrocyclotron built between 1940 and 1946 by Lawrence at the University of California, Berkeley, which could accelerate protons to 730 mega electron volts (MeV). Close to 1500 cyclotrons are used in nuclear medicine worldwide for the production of radionuclides.

Choose the correct answer for the following questions.

Cyclotron is used to accelerate

a) Some kind of charged particles,
b) Any kind of charged particle
c) both charged and neutral particles
d) none of these

The force that accelerates the particles in the cyclotron is

a) Only electrostatic force,
b) Only magnetic force
c) both electrostatic and magnetic force called Lorentz force
d) none of these

Choose the correct option

a) conductor shields any charge within it from electric fields created outside the conductor.
b) a conductor shields any charge within it from magnetic fields created outside the conductor.
c) a conductor shields any charge within it from both electric and magnetic fields created outside the conductor.
d) none of these

Inside a dee

a) The particle's speed changes
b) The particle's velocity changes
c) The particle's velocity does not change
d) The particle's kinetic energy changes

What is the formula for maximum speed attained by a charged particle in a cyclotron

a) $v_{max} = \frac{qBR}{m}$
b) $v_{max} = \frac{mBR}{q}$
c) $v_{max} = \frac{qR}{Bm}$
d) none of these

In a cyclotron

a) any speed can be obtained by a charged particle by choosing suitable dee radius.
b) maximum speed attained by a charged particle is limited by the relativistic variation of mass with speed.

c) electrons are best particles to be accelerated.
d) none of these

2 A galvanometer is an electromechanical measuring instrument for electric current. Early galvanometers were uncalibrated, but improved versions, called ammeters, were calibrated and could measure the flow of current more precisely. A galvanometer works by deflecting a pointer in response to an electric current flowing through a coil in a constant magnetic field. Galvanometers came from the observation, first noted by Hans Christian Oersted in 1820, that a magnetic compass's needle deflects when near a wire having electric current. They were the first instruments used to detect and measure small amounts of current. André-Marie Ampère, who gave mathematical expression to Oersted 's discovery, named the instrument after[1] the Italian electricity researcher Luigi Galvani. Galvanometers have been essential for the development of science and technology in many fields. For example, in the 1800s they enabled long-range communication through submarine cables, such as the earliest transatlantic telegraph cables, and were essential to discovering the electrical activity of the heart and brain, by their fine measurements of current.

Choose the correct answer for the following questions.

Galvanometer was named after
a) Italian electricity researcher Luigi Galvani
b) Italian electricity researcher Luigi Galvani who discovered galvanometer
c) Italian electricity researcher Luigi Galvani who discovered that a current carrying conductor produces magnetic field,
d) none of these

Galvanometer is used
a) to detect and measure small electric current,
b) to detect but not to measure small electric current
c) to measure any amount of electric current
d) none of these

Choose the correct option for current sensitivity of galvanometer
a) $S_i = \frac{\theta}{i} = \frac{NBA}{C}$
b) $S_i = \frac{\theta}{i} = \frac{NB}{CA}$
c) $S_i = \theta i = \frac{C}{NBA}$
d) none of these

Increasing the current sensitivity
a) surely increases the voltage sensitivity
b) may not change the voltage sensitivity
c) never changes the voltage sensitivity
d) none of these

Choose the correct option for design formula of galvanometer
a) $i = \left(\frac{C}{BNA}\right)\theta$
b) $i = \left(\frac{CA}{BN}\right)\theta$
c) $i = \left(\frac{C}{BNA\theta}\right)$
d) none of these

In the galvanometer the radial magnetic field makes the magnetic torque

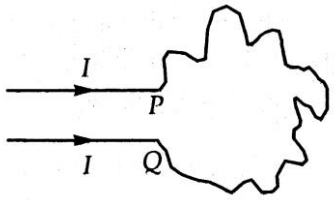
a) directly proportional to $\sin\theta$
b) independent of θ
c) zero
d) none of these

3 **DIRECTIONS**. In each of the following questions read the two statements and choose if
(A) both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.
(B) both Assertion and Reason are true but Reason is not a correct explanation of the Assertion.
(C) Assertion is true but the Reason is false.
(D) both Assertion and Reason are false.

Assertion: A steady angular deflection is produced by the spring to produce a counter torque which balances the magnetic torque.
Reason: In order to improve the strength of the magnetic field and to make the field radial a soft iron core is placed inside the coil.

Assertion: Moving Coil Galvanometer uses phosphor-bronze wire for suspension.
Reason: The Phosphor-bronze wire has a small couple per unit twist.

Assertion: A wire bent into an irregular shape with the points P and Q fixed. If a current I is passed through the wire, then the area enclosed by the irregular portion of the wire increases.
Reason: Opposite currents carrying wires repel each other.



Assertion: When a magnetic dipole is placed in a non-uniform magnetic field, only a torque acts on the dipole.
Reason: Force would also act on dipole if magnetic field were uniform.

Assertion: If the resistance of shunt of an ammeter is increased, the range of ammeter is reduced.
Reason: If the series resistance of a voltmeter is increased, the range of voltmeter is increased.

Assertion: Galvanometer cannot as such be used as an ammeter to measure the value of the current in a given circuit
Reason: Galvanometer gives a full-scale deflection for a current of the order of micro ampere.

4 ## Multiple Choice Questions (MCQ)

1. A sensitive galvanometer like a moving coil galvanometer can be converted into an ammeter or a voltmeter by connecting a proper resistance to it. Which of the following statements is true?

a) a voltmeter is connected in parallel and current through it is negligible
b) an ammeter is connected in parallel and potential difference across it is small
c) a voltmeter is connected in series and potential difference across it is small
d) an ammeter is connected in series in a circuit and the current through it is negligible

2. The resistance of an ideal voltmeter is

a) Zero
b) 100 Ω
c) Infinity
d) 500 Ω

3. Two identical galvanometers are converted into an ammeter and a milliammeter. Resistance of the shunt of milliammeter through which the current passes through will be

a) more
b) equal
c) less
d) zero

4. Choose the correct option for design formula of galvanometer

a) $i = \left(\frac{C}{BNA} \right) \theta$
b) $i = \left(\frac{CA}{BN} \right) \theta$
c) $i = \left(\frac{C}{BNA\theta} \right)$
d) none of these

5. Choose the correct option for current sensitivity of galvanometer

a) $S_i = \frac{\theta}{i} = \frac{NBA}{C}$
b) $S_i = \frac{\theta}{i} = \frac{NB}{CA}$
c) $S_i = \theta i = \frac{C}{NBA}$
d) none of these