Objective Questions

(For Complete Chapter)

Multiple Choice Questions (MCQs)

1. A coil of area 100 cm^2 is kept at an angle of 30° with a magnetic field of 10^{-1}T. The magnetic field is reduced to zero in 10^{-4}s. The induced emf in the coil is **CBSE 2021 Term-I**

(a) $5\sqrt{3}$ V (b) $50\sqrt{3}$ V (c) 5.0 V (d) 50.0 V

2. The self-inductance of a solenoid of 600 turns is 108 mH. The self-inductance of a coil having 500 turns with the same length, the same radius and the same medium will be **CBSE 2021 (Term-I)**

(a) 95 mH (b) 90 mH
(c) 85 mH (d) 75 mH

3. According to Lenz's law of electromagnetic induction

(a) the induced emf is not in the direction opposing the change in magnetic flux
(b) the relative motion between the coil and magnet produces change in magnetic flux
(c) only the magnet should be moved towards coil
(d) only the coil should be moved towards magnet

4. Induced emf in the coil depends upon

(a) conductivity of coil
(b) amount of flux
(c) rate of change of linked flux
(d) resistance of coil

5. A bar magnet is dropped between a current carrying coil. What would be its acceleration?

(a) g downwards
(b) Greater than g downwards
(c) Less than g downwards
(d) Bar will be stationary

6. A wire of length 50 cm moves with a velocity of 300 m/min, perpendicular to a magnetic field. If the emf induced in the wire is 2 V, then the magnitude of the field (in tesla) is

(a) 2 (b) 5 (c) 0.4 (d) 0.8

7. If coil is open, then L and R become

(a) $\infty, 0$ (b) $0, \infty$
(c) ∞, ∞ (d) $0, 0$

8. When the current changes from +2 A to − 2 A in 0.05 s, an emf of 8V is induced in a coil. The coefficient of self-induction of the coil is

(a) 0.2 H (b) 0.4 H
(c) 0.8 H (d) 0.1 H

9. The inductance of a coil is proportional to

(a) its length
(b) the number of turns
(c) the resistance of coil
(d) the square of the number of turns

10. In a solenoid, if number of turns is doubled, then self-inductance will become

(a) half
(b) double
(c) $\frac{1}{4}$ times
(d) quadruple

11. A dynamo converts

(a) mechanical energy into thermal energy
(b) electrical energy into thermal energy
(c) thermal energy into electrical energy
(d) mechanical energy into electrical energy

Assertion-Reason Questions

Directions (Q. Nos. 12-18) *In the following questions, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below*

(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
(b) If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
(c) If Assertion is correct but Reason is incorrect.
(d) If both Assertion and Reason are incorrect.

12. **Assertion** Magnetic flux of a magnetic field **B** passing through an area **A** is given by the relation $\phi = \mathbf{B} \cdot \mathbf{A}$.

Reason Quantity obtained by product of two vectors is always scalar.

13. **Assertion** Faraday's laws are consequence of conservation of energy.

Reason Earth's magnetic field can induce emf.

14. **Assertion** If a magnet is brought closer to a current carrying loop along its axis, then current always decreases in the loop.

Reason Magnet is repelled by the loop.

15. **Assertion** If a loop is placed in a non-uniform (with respect to position) magnetic field, then induced emf is produced in the loop.

Reason In a non-uniform magnetic field, magnetic flux passing through the loop will change. Therefore, induced emf is produced.

16. **Assertion** If the inner solenoid is much shorter than (and placed well inside) the outer solenoid, then the flux linkage $N_1\phi_1$ can still be calculated.

Reason The inner solenoid is effectively immersed in a uniform magnetic field due to the outer solenoid.

17. **Assertion** The self-induced emf is also called the back emf.

Reason The self-induced emf opposes any change in the current in a circuit.

18. **Assertion** If current shown in the figure is increasing, then $V_A > V_B$.

Reason If current passing through an inductor is constant, then both ends of the inductor are at same potential.

Case Based Questions

Directions (Q.Nos. 19-20) *These questions are case study based questions. Attempt any 4 sub-parts from each question. Each question carries 1 mark.*

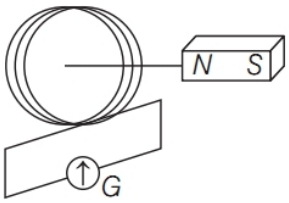
19. **Faraday's Laws**

According the Faraday's first law, whenever the amount of magnetic flux linked with a circuit changes, an emf is induced in it. Induced current is determined by the rate at which the magnetic flux changes.

Mathematically, the magnitude of the induced emf in a circuit is equal to the rate of change of magnetic flux through the circuit.

Induced emf $\propto$ Rate of change of magnetic flux

(i) On the basis of Faraday's law, current in the coil is smaller



(a) when the magnet is pushed towards the coil faster
(b) when the magnet is pulled away the coil faster
(c) Both (a) and (b)
(d) Neither (a) nor (b)

(ii) The flux linked with a circuit is given by $\phi = t^3 + 3t - 5$. The graph between time (X-axis) and induced emf (Y-axis) will be a
(a) straight line through the origin
(b) straight line with positive intercept
(c) straight line with negative intercept
(d) parabola not through the origin

(iii) Wire loop is rotated in a magnetic field. The frequency of change of direction of the induced emf is
(a) once per half revolution
(b) twice per revolution
(c) four times per revolution
(d) Both (a) and (b)

(iv) The instantaneous magnetic flux linked with a coil is given by $\phi = (5t^3 - 100t + 20)$ Wb. The emf induced in the coil at time $t = 2$ s is
(a) – 40 V (b) 40 V
(c) 140 V (d) 300 V

(v) A copper disc of radius 0.1 m is rotated about its centre with 20 rev/s in a uniform magnetic field of 0.2 T with its plane perpendicular to the

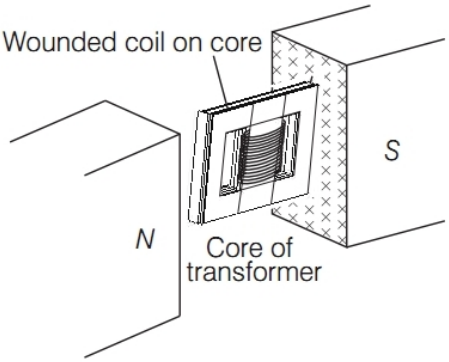
field. The emf induced across the radius of the disc is

(a) $(\pi/20)$ V (b) $(\pi/120)$

(c) 20π mV (d) 40π mV

20. Eddy Current

Coil is wound over metallic core is helpful in reducing eddy currents in the metallic cores of transformers, electric motors, induction furnaces and other such devices (as shown below). Eddy currents are undesirable, since they heat up the core and dissipate electrical energy in the form of heat. These currents are minimised by using laminations of metal to make a metal core.



(i) How are eddy currents minimised to make a metal core of transformer on which coils are wound?

(a) By using laminations of metal

(b) By using soft iron core

(c) Both (a) and (b)

(d) Neither (a) nor (b)

(ii) Which of the following is application of eddy current?

(a) Induction meter

(b) Electromagnetic shielding

(c) Energy meter

(d) All of the above

(iii) Induction furnace is used to produce

(a) low temperature to melt the metal

(b) high temperature to melt the metal

(c) constant low temperature 80°C

(d) constant high temperature of 190°C

(iv) Induction furnace can be utilised to prepare

(a) alloys, by melting the constituent metals

(b) metal, by mixing electrons, protons and neutrons

(c) Both (a) and (b)

(d) Neither (a) nor (b)

(v) When a high frequency alternating current is passed through a coil which surrounds the metal to be melted, then

(a) the metal freezes

(b) coil rotates with frequency ω

(c) the metal melts

(d) metal becomes brittle