Class 12 Physics · Chapter 6: Electromagnetic Induction

Worksheet · 20 marks · about 40 minutes · based on NCERT

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1. The current in a coil is being decreased steadily. The self-induced emf in the coil [1]

(a) acts opposite to the current, helping it to fall

(b) is zero, because the current is decreasing and not increasing

(c) is equal to the emf of the source driving the current

(d) acts in the same direction as the current, opposing its decrease

2. A closed metal ring is pulled away, along the axis, from the north pole of a bar magnet that is held fixed. As seen from the magnet's side, the induced current in the ring is [1]

(a) anticlockwise

(b) zero, because the magnet is at rest

(c) clockwise

(d) clockwise at first and then anticlockwise

3. A long solenoid with an air core has a self-inductance of 2.0 mH. It is filled completely with a material of relative permeability 400, everything else unchanged. Its self-inductance becomes [1]

(a) 0.0050 H

(b) 0.80 H

(c) 0.040 H

(d) 320 H

4. The flux through each turn of a 200-turn coil falls steadily from 5.0 mWb to 1.0 mWb in 0.20 s. The magnitude of the emf induced in the coil is [1]

(a) 4.0 V

(b) 6.0 V

(c) 0.020 V

(d) 0.80 V

5. The weber, the SI unit of magnetic flux, is the same as [1]

(a) V s^{-1}

(b) V s

(c) T m^{-2}

(d) A m^{2}

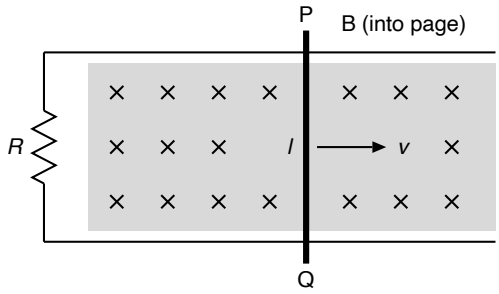
6. In a simple ac generator, what is the role of the slip rings and brushes? What energy conversion takes place in the generator? [2]

7. The current through an inductor of 0.50 H is raised from 2.0 A to 6.0 A. Find the increase in the energy stored in it. Where does this energy come from? [2]

8. Why is self-inductance called the electrical inertia of a coil? Which quantities in $\tfrac{1}{2}LI^2$ play the parts of mass and velocity in $\tfrac{1}{2}mv^2$? [2]

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9. In the arrangement shown, the rod PQ, 0.60 m long, moves to the right at 4.0 m s^{-1} on the rails through a uniform field of 0.25 T directed into the page. (a) Find the Lorentz force on a free electron in the rod and its direction. (b) Using the work done per unit charge, find the emf of the rod. (c) Which end of the rod is at the higher potential? [3]



10. An aluminium ring rests on the top of a vertical coil wound on a soft-iron core. When the switch in the coil's circuit is closed, the ring jumps up. (a) Explain why. (b) Why does it fall back while the switch is kept closed? (c) What would happen if the ring had a narrow cut in it? [3]

11. A coil of N turns, each of area A, rotates at a constant angular speed ω about an axis perpendicular to a uniform field B. (a) Show that the emf induced is $\varepsilon = NBA\omega \sin \omega t$, taking the plane of the coil perpendicular to B at t = 0. (b) State the positions of the coil in which the emf is maximum and zero, with a reason. [3]