Electromagnetic Induction

Standard difficulty · 20 questions · 40 marks · Time: 40 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. A loop of area 210 cm^2 is in a field of 2 × 10^{-1} T. If the normal to the loop makes 90° with the field, the flux through it is:

(a) 2.1 × 10^{-3} Wb **(b)** 4.2 × 10^{-3} Wb **(c)** 1 Wb **(d)** 0 Wb

2. The flux through each turn of a 402-turn coil changes by 37 mWb in 10 × 10^{-2} s. The average induced emf is:

(a) 148.74 V **(b)** 0.37 V **(c)** 1.4874 V **(d)** 1.4874 × 10^{4} V

3. A rod 5 cm long moves at 20 m/s at right angles to a field of 4 × 10^{-1} T. The emf across its ends is:

(a) 1 × 10^{-3} V **(b)** 40 V **(c)** 0.8 V **(d)** 0.4 V

4. The current in a 419 mH coil changes by 2 A in 5 × 10^{-2} s. The self-induced emf is:

(a) 1,676 V **(b)** 0.1676 V **(c)** 0.0419 V **(d)** 16.76 V

5. The SI unit of magnetic flux is the:

(a) gauss **(b)** tesla **(c)** weber **(d)** henry

6. The energy stored in a 129 mH inductor carrying 6 A is:

(a) 2.322 × 10^{-3} J **(b)** 2.322 J **(c)** 4.644 J **(d)** 0.387 J

7. Two coils have mutual inductance 371 mH. If the current in one changes by 6 A in 1 × 10^{-2} s, the emf in the other is:

(a) 222.6 V **(b)** 445.2 V **(c)** 2.226 V **(d)** 0.02226 V

8. Assertion (A): A rod 87 cm long moving at 19 m/s at right angles to a 3 × 10^{-1} T field has an emf of 4.959 V across it.
Reason (R): The emf across a rod moving at right angles to a field is e = Blv.

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. A metal rod 60 cm long spins at 120 rad/s about one end, in a plane at right angles to a field of 1 × 10^{-1} T. Find the emf between its ends.

10. A coil of 128 turns and area 60 cm^2 rotates at 260 rad/s in a field of 7×10^{-1} T. Find the peak emf.

11. The flux through each turn of a 466-turn coil of resistance 36 Ω falls by 38 mWb. Find the charge that flows round the coil.

12. A rod 19 cm long slides at 14 m/s on rails joined by a 17 Ω resistor, at right angles to a field of 8×10^{-1} T. Find the emf and the current.

13. A long solenoid has 1743 turns, cross-section 49 cm^2 and length 86 cm. Find its self-inductance. ($\mu_0 = 4\pi \times 10^{-7}$ T m/A)

14. An emf of 32 V is induced in a coil when the current in a nearby coil changes by 7 A in 5×10^{-2} s. Find their mutual inductance.

15. A coil of 442 turns and area 370 cm^2 lies at right angles to a field of 7×10^{-1} T. It is pulled out of the field in 5×10^{-1} s. Find the average emf.

16. The south pole of a magnet is moved away from one face of a coil, changing the flux by 4×10^{-3} Wb in 2×10^{-1} s. What polarity does that face of the coil take, and what is the average emf in one turn?

Section C — Word problems — 4 × 4 = 16 marks

17. A rod 100 cm long slides at a steady 17 m/s along rails joined by a 4 Ω resistor, at right angles to a field of 1×10^{-1} T. Find the emf, the current, the force needed to keep it moving, and the power supplied.

18. A generator coil of 193 turns and area 310 cm^2 turns at 100 rad/s in a field of 7×10^{-1} T and is joined to a 31 Ω load. Find the peak emf, the peak current and the rms emf.

19. A coil of 462 turns, area 80 cm^2 and resistance 44 Ω lies at right angles to a field of 4×10^{-1} T. The field is reversed in 5×10^{-1} s. Find the change in flux linkage, the average emf, the average current and the charge that flows.

20. The current in a 241 mH inductor rises from 9 A to 14 A in 10×10^{-2} s. Find the emf induced and the extra energy stored.

Want another sheet on this chapter? In the Ambiful Worksheets app every sheet is new, with its answer key, and your child never gets the same question twice.

Scan the code to get the free app, or open **worksheets.ambiful.com/get**

Answer key

Electromagnetic Induction · AW-12P-EMI-2026-V1 · For parents — fold back or tear off before handing the sheet to your child.

Q	Answer	Working
1	**(d) 0 Wb**	$\Phi = BA\cos\theta$
2	**(a) 148.74 V**	$e = N\Delta\Phi/\Delta t$
3	**(d) 0.4 V**	$e = Blv$
4	**(d) 16.76 V**	$e = L\,\Delta I/\Delta t$
5	**(c) weber**	—
6	**(b) 2.322 J**	$U = \frac{1}{2}LI^2$
7	**(a) 222.6 V**	$e = M\,\Delta I/\Delta t$
8	**(c) A is true, but R is false.**	A is true: $Blv = 3 \times 10^{-1} \times 87 \times 10^{-2} \times 19 = 4.959$ V. R is false.
9	**2.16 V**	$e = \frac{1}{2}B\omega l^2$
10	**139.776 V**	$e_0 = NBA\omega$
11	**0.492 C**	$q = N\Delta\Phi/R$ (it does not depend on how fast the flux changes)
12	**2.128 V; 0.125 A**	$e = Blv$; $I = e/R$
13	**$6.92\pi \times 10^{-3}$ H**	$L = \mu_0 N^2 A/l = 4\pi \times 10^{-7} \times 1743^2 \times 49 \times 10^{-4} \div (86 \times 10^{-2})$
14	**0.229 H**	$M = e/(\Delta I/\Delta t)$
15	**22.8956 V**	$\Delta\Phi = NBA$, $e = NBA/t$
16	**the face becomes a north pole; 0.02 V**	Lenz's law: the induced current opposes the change, so it attracts the receding pole
17	**1.7 V; 0.425 A; 0.0425 N; 0.7225 W**	$e = Blv$; $I = e/R$; $F = BIl$; $P = Fv = e^2/R$
18	**418.81 V; 13.51 A; 418.81/√2 V**	$e_0 = NBA\omega$; $I_0 = e_0/R$; e_rms = $e_0/\sqrt{2}$
19	**2.9568 Wb; 5.9136 V; 0.1344 A; 0.0672 C**	$\Delta\Phi = 2NBA$
20	**12.05 V; 13.8575 J**	$e = L\,\Delta I/\Delta t$; $\Delta U = \frac{1}{2}L(I_2^2 - I_1^2)$

Ambiful Worksheets · worksheets.ambiful.com · Not affiliated with CBSE / NCERT