

6.3 Electromagnetic Induction

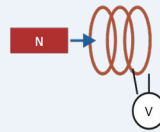
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1. KEY VOCABULARY

TERM	MEANING
Electromagnetic induction	Generating a voltage by moving a magnet and a coil relative to each other.
Generator	A machine that induces electricity by spinning a coil in a field.
Transformer	A device that changes the size of an a.c. voltage.
Primary / secondary	The input and output coils of a transformer.

2. INDUCING A VOLTAGE

INDUCING A VOLTAGE



Moving a magnet near a coil INDUCES a voltage (and a current if the circuit is complete).
Move faster, use a stronger magnet or more turns – bigger voltage.

GENERATORS & TRANSFORMERS

Generator:
a coil spinning in a magnetic field induces a voltage — this is how power stations make electricity.

Transformer:
changes the size of an a.c. voltage using two coils on an iron core.

$$V_p \div V_s = (\text{turns on primary}) \div (\text{turns on secondary})$$

Step-up transformers raise voltage for transmission; step-down transformers lower it for use in homes.
High voltage – lower current – less energy wasted.

3. ELECTROMAGNETIC INDUCTION

Moving a magnet near a coil (or a wire through a field) INDUCES a voltage across it.

Bigger induced voltage: move faster, use a stronger magnet, or use more turns on the coil.

If the magnet stops moving, the voltage stops.

4. THE GENERATOR

A generator spins a coil inside a magnetic field (or a magnet inside a coil).

This continuously induces a voltage — it is how power stations generate electricity.

5. THE TRANSFORMER

Two coils on an iron core. An a.c. voltage in the primary induces an a.c. voltage in the secondary.

$$V_p \div V_s = (\text{primary turns}) \div (\text{secondary turns})$$

Step-up raises voltage; step-down lowers it.

6. THE WHY

Why power is sent at high voltage: high voltage means low current, and low current wastes far less energy as heat in the cables.

Why transformers only work with a.c.: they need a constantly CHANGING magnetic field — steady d.c. would not induce anything.

7. COMMON EXAM MISTAKES

- ✗ "A stationary magnet in a coil induces a voltage."
- ✓ There must be relative MOVEMENT (a changing field).
- ✗ "Transformers work on d.c."
- ✓ Transformers need a.c. — a changing field.
- ✗ "Electricity is sent at high current to save energy."
- ✓ It is sent at high VOLTAGE (low current) to cut losses.

8. SELF-CHECK · cover & quiz

Can you...

1. Describe how to induce a voltage in a coil?
2. State three ways to increase the induced voltage?
3. Explain how a generator works?
4. Use the transformer turns equation?
5. Explain why electricity is transmitted at high voltage?
6. Explain why transformers need a.c.?