

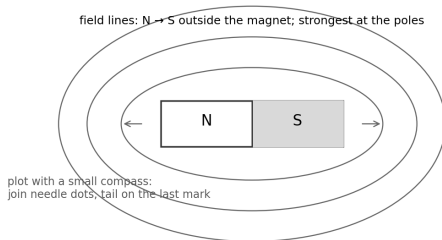
Topic 7: Magnetism and electromagnetism

AQA GCSE Physics 8463 · spec 4.7 · sheets 7.1–7.3

Movement from current

- A moving magnet induces current; current makes movement.
- Motor effect and everything after it are HT; 4.7.3 is physics only.
- Field-pattern drawing is a required skill.

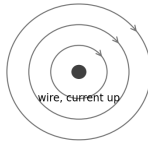
Poles and fields



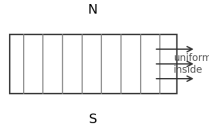
- Like poles repel; unlike poles attract (non-contact).
- Permanent makes its own field; induced attracts only, temporarily.
- Field lines N to S; strongest at the poles; compass plots them.

Coils make fields stronger

Straight wire: concentric circles

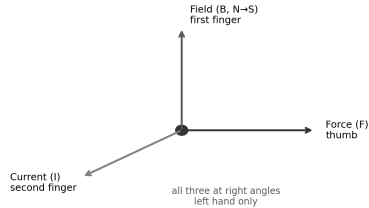


Solenoid: strong and uniform inside



- Wire: concentric field; more current, less distance-dependence.
- Solenoid: strong and uniform inside; bar-magnet shape outside.
- Iron core makes an electromagnet: switchable, adjustable.

Left hand: F, B, I (HT)



- Force, field, current at right angles: left hand rule.
- $F = BIl$ for a conductor at right angles.
- Bigger B , bigger I , longer l : bigger force.

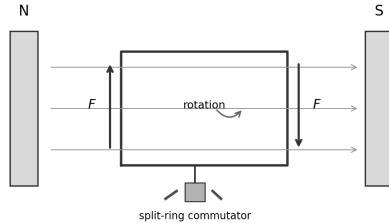
Your turn: force on a rod

- A 4.0 cm rod carries 2.5 A at right angles to a 0.15 T field.
- Calculate the force.

Force worked

- 1 **Convert** $l = 4.0 \text{ cm} = 0.040 \text{ m}$.
- 2 **Equation** $F = BIl = 0.15 \times 2.5 \times 0.040$.
- 3 **Answer** $F = 1.5 \times 10^{-2} \text{ N}$.

The motor turns

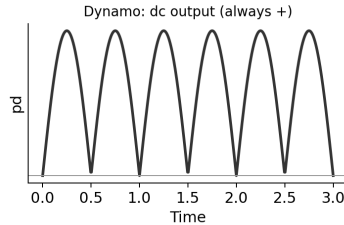
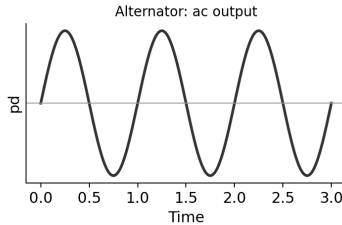


- Coil sides feel opposite forces: rotation.
- Split-ring commutator reverses current each half-turn.
- Loudspeaker: current variations become sound pressure.

Moving magnet, induced current

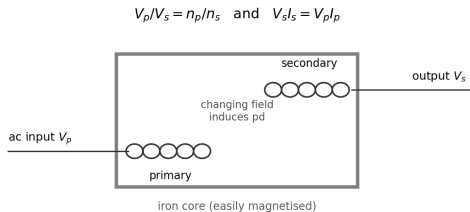
- Move a conductor in a field — or change the field: pd induced.
- The induced current opposes the change.
- Faster, stronger, more turns: bigger induced pd.

Alternator and dynamo



- Alternator: ac, the graph crosses zero.
- Dynamo: commutator, output always positive.
- Microphone: sound in, induced current out.

Transformers trade pd for current



- Two coils on an iron core; ac in, induced ac out.
- $V_p/V_s = n_p/n_s$; and $V_s I_s = V_p I_p$.
- Step-up for the Grid; step-down for homes.

Check yourself

- Checklist before you call this topic done.
- Pole rules; the three field patterns; left hand and $F = BIl$.
- Generator conditions; alternator vs dynamo; both transformer equations.