

Exercise walk-through

6.1

Magnetism and the motor effect

Pearson Edexcel · International GCSE · Physics

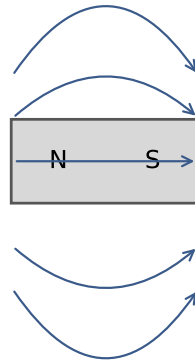
1

The method

Method — Fields first

Hard materials keep magnetism (permanent); soft materials (iron) magnetise and lose it easily. Current in a wire makes circular field lines around it; a solenoid's field is like a bar magnet's.

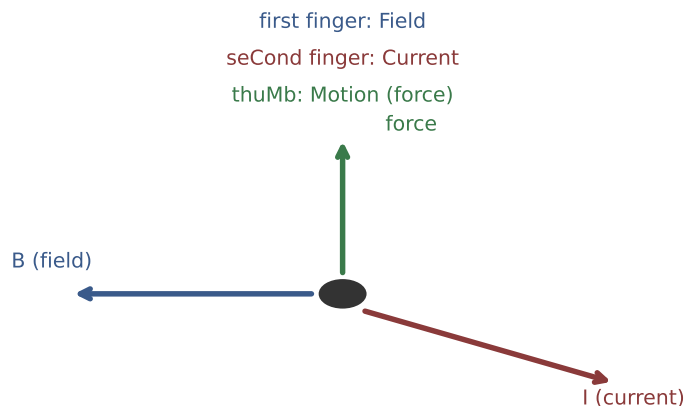
field lines point from N to S outside the magnet



A bar magnet's field lines run N to S outside.

Method — The motor effect and its rule

Force grows with field strength and current; it reverses when either reverses; no force when the wire is parallel to the field.



hold the three mutually at right angles

The left-hand rule: field, current and force at right angles.

Exercises 2.1·2.3

2.1 State the rule for attraction and repulsion of poles. [1]

2.2 Name one magnetically hard and one magnetically soft material. [2]

2.3 In which direction do magnetic field lines point outside a magnet? [1]

Exercises 2.1·2.3

2.1 State the rule for attraction and repulsion of poles. [1]

2.1 Like poles repel; unlike poles attract.

2.2 Name one magnetically hard and one magnetically soft material. [2]

2.2 Hard – steel; soft – iron.

2.3 In which direction do magnetic field lines point outside a magnet? [1]

2.3 From N to S.

Exercises 2.4·3.1

2.4 Describe how two bar magnets can produce a uniform field. [1]

2.5 State the left-hand rule. [3]

3.1 Explain how an electric motor keeps rotating, naming the key component. [3]

Exercises 2.4·3.1

2.4 Describe how two bar magnets can produce a uniform field. [1]

2.4 Place opposite poles facing each other with a small gap – parallel, evenly spaced lines fill the gap.

2.5 State the left-hand rule. [3]

2.5 First finger – Field; second finger – Current; thumb – Motion/force, held mutually at right angles.

3.1 Explain how an electric motor keeps rotating, naming the key component. [3]

3.1 The current-carrying coil in the field feels opposite forces on its two sides, turning it; as it turns, the **commutator** reverses the current every half-turn, so the force pair keeps turning the coil in the same direction.

Exercises 3.2·3.3

3.2 A wire carrying current upwards sits in a field pointing into the page. Use the left-hand rule to state the force's direction on the wire. [2]

3.3 (P) Describe the construction of an electromagnet and one way to make it stronger without changing the core. [3]

Exercises 3.2-3.3

3.2 A wire carrying current upwards sits in a field pointing into the page. Use the left-hand rule to state the force's direction on the wire. [2]

3.2 Field into the page (first finger), current up (second finger): force on the wire is to the **left**.

3.3 (P) Describe the construction of an electromagnet and one way to make it stronger without changing the core. [3]

3.3 (P) A coil of insulated wire wound around a soft-iron core; stronger by increasing the current or adding more turns.