

Exercise walk-through

7.1

Permanent and induced magnetism, magnetic fields (4.7.1)

AQA · GCSE · Physics

Exercises 2.1·2.3

2.1 Complete: like poles _____; unlike poles _____. [2]

2.2 Give the four magnetic materials. [2]

2.3 Describe how a compass needle behaves near a bar magnet, and what this shows about the Earth. [2]

Exercises 2.1·2.3

2.1 Complete: like poles _____; unlike poles _____. [2]

2.1 Like poles repel; unlike poles attract.

2.2 Give the four magnetic materials. [2]

2.2 Iron, steel, cobalt, nickel.

2.3 Describe how a compass needle behaves near a bar magnet, and what this shows about the Earth. [2]

2.3 Near a magnet the needle aligns with the magnet's field lines; the compass works anywhere on Earth because the Earth itself has a magnetic field.

Exercise 3.1

3.1 A teacher demonstrates with two bar magnets.

- (a) Describe what happens when the N pole of one is brought near the S pole of the other, and name the force type. [2]
- (b) State two differences between a permanent magnet and an induced magnet. [2]
- (c) A steel paperclip hangs from a bar magnet. Explain why the paperclip can then pick up a second paperclip. [2]

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3.1 (a) They attract; a non-contact force. **3.1** (b) Any two: a permanent magnet produces its own field while an induced magnet is magnetic only inside one; induced magnetism always causes attraction while permanent poles repel or attract; an induced magnet loses its magnetism when removed from the field. **3.1** (c) The first clip becomes an induced magnet by the bar magnet's field; its near end is an induced opposite pole, which induces the second clip in turn and attracts it.

Exercises 3.2·3.3

3.2 A student plots the field of a bar magnet with a plotting compass.

- (a) Describe the method step by step. [3]
- (b) State where the field is strongest and how the diagram shows it. [2]
- (c) The student scatters iron filings instead. State one advantage and one limitation. [2]

3.3 Explain why a compass points north, and why it fails to give an accurate bearing near a large iron structure. [4]

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3.2 (a) Place the compass at a point near the pole; mark the needle ends with dots; move the compass so the tail dot sits on the previous tip dot; repeat along the whole field line; join the dots smoothly. **3.2** (b) At the poles; the field lines are closest together there.

3.2 (c) Advantage: shows the whole two-dimensional pattern instantly; limitation: no direction (the needle gives it) / only coarse detail.

3.3 Explain why a compass points north, and why it fails to give an accurate bearing near a large iron structure. [4]

3.3 The Earth has a magnetic field, as if a huge bar magnet were inside it; the compass needle, itself a small magnet, experiences a force aligning it with the field lines, pointing approximately geographic north. Near a large iron structure, the iron becomes an induced magnet whose stronger local field deflects the needle away from north.