5.2 Magnetism and electromagnetism

Name: _____ Class: _____ Date: _____ **Total: 19 marks**

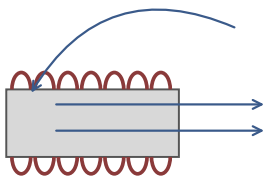
Objective

Cover magnetism and electromagnetism (3.5.2): poles and fields, induced magnetism, the Earth's field, the field around a current, solenoids and electromagnets with the required practical. Original OxfordAQA practice.

1 Key knowledge and worked examples

■ From lodestone to electromagnet

Like poles repel, unlike attract; field lines N→S outside; opposite poles facing give a uniform field. A current makes circular fields; a solenoid makes a bar-magnet field; add a soft-iron core for an electromagnet.



field runs S to N inside the core (arrows right); outside it loops back to the S end

Stronger electromagnet: more turns, larger current, soft-iron core.

2 Practice

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

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

2.3 What is an induced magnet? [2]

2.4 How does a plotting compass detect the Earth's field? [2]

2.5 State three ways to strengthen an electromagnet. [3]

3 Exam-style questions

3.1 Describe the magnetic field pattern around a straight current-carrying wire, and two factors that change it. [3]

3.2 Explain why a solenoid's field is stronger than a single wire's, and what the iron core adds. [3]

3.3 Describe an investigation into the factors affecting an electromagnet's strength, identifying the variable to control. [4]

Solutions

2.1 Like poles repel; unlike poles attract.

2.2 From N to S.

2.3 A magnetic material that becomes a magnet while in another magnet's field, losing most of its magnetism on removal – it is always attracted.

2.4 The compass needle is a small magnet that aligns with the local field; away from other magnets it settles along the Earth's field, pointing north–south.

2.5 More turns; larger current; soft-iron core.

3.1 Concentric circles centred on the wire, in a plane perpendicular to it; increasing the current strengthens the field; reversing the current reverses the field direction.

3.2 Each turn's circular field overlaps the next, adding to a strong, nearly uniform field along the core; the soft-iron core becomes an induced magnet, multiplying the total field.

3.3 Wind a coil around a soft-iron core and count paper clips lifted; change one factor at a time – turns, current, core presence; keep the others constant and repeat readings; e.g. vary the current with an ammeter in series, recording clips lifted at each value.