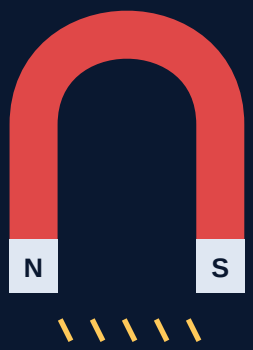
YOUR SCIENCE ONLINE
yourscienceonline.com

YEAR 9 • PHYSICS

Magnetism and Electromagnets

Poles, fields and electromagnets
Homework Worksheet • KS3 • GCSE foundations



Name: _____

Class: _____

Date: _____

Time: about 40 minutes

Total: 45 marks

Score: _____ / 45

Key notes – read these first

- Every magnet has a **north (N)** and a **south (S)** pole. **Like** poles repel; **unlike** poles attract.
- The **magnetic materials** are iron, nickel, cobalt and steel. Most other metals (copper, aluminium, gold) are not magnetic.
- A **magnetic field** is the area around a magnet where it has an effect. Field lines go from **N to S**; the field is strongest where the lines are closest, at the poles.
- An **electromagnet** is a coil of wire with a current flowing through it, usually wrapped around an **iron core**. It can be switched on and off.
- To make an electromagnet stronger: add **more turns** of wire, increase the **current**, or use an **iron core**.

Instructions

- Answer **all** questions in the spaces provided.
- Use a pencil and ruler for any diagrams.
- The marks for each question are shown in brackets, e.g. [2].
- Read the key notes above if you get stuck.
- Questions marked CHALLENGE stretch you towards GCSE.

Section	Topic	Marks
A	Magnets and magnetic fields	14
B	Electromagnets	14
C	Using magnetism	11
D	Challenge: fields around wires	6
	Total	**45**

Section A – Magnets and magnetic fields 14 marks

1 Complete the sentences using words from the box. Each word is used once. Two words are not needed. [5]

attract • repel • north • south • steel • copper • push

Like poles _____ and unlike poles _____ each other. Magnetic field lines go from the _____ pole to the _____ pole. Iron, nickel, cobalt and _____ are magnetic materials.

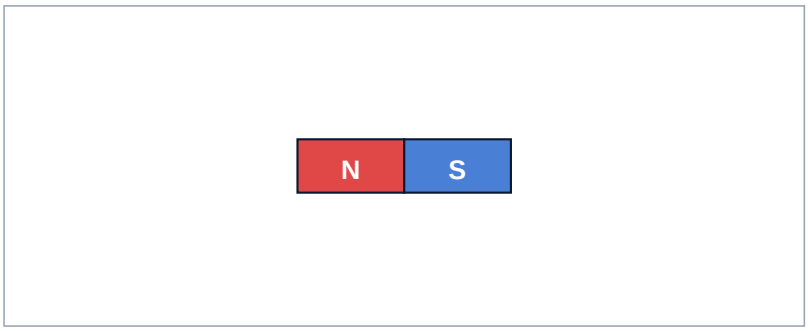
2 Three pairs of bar magnets are placed end to end. For each pair, write **attract** or **repel** on the dotted line. [3]

(a) S N S N .....

(b) N S S N .....

(c) S N N S .....

3 The diagram shows a bar magnet.



(a) Draw the magnetic field pattern around the magnet. Add arrows to show the direction of the field. [3]

(b) Where is the magnetic field strongest? [1]

.....

(c) Name the piece of equipment used to find the direction of a magnetic field. [1]

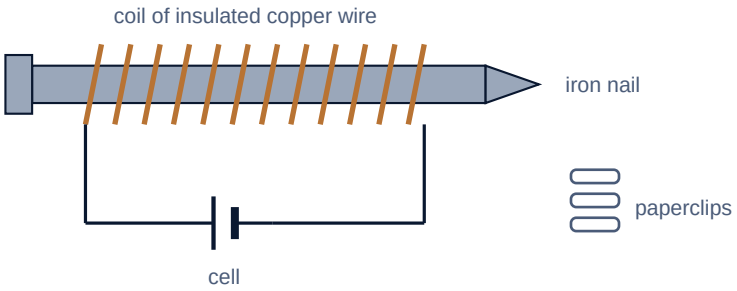
.....

(d) Which **two** of these objects would be attracted to a magnet? aluminium can • steel paperclip • copper coin • nickel coin [1]

.....

Section B – Electromagnets 14 marks

4 A student makes an electromagnet by wrapping wire around an iron nail and connecting it to a cell.



(a) Name the material used for the core of the electromagnet. [1]

.....

(b) Give **two** ways the student could make the electromagnet stronger. [2]

.....

.....

(c) Scrapyard cranes use an electromagnet, not a permanent magnet, to move old cars. Explain why. [2]

.....

.....

5 The student changed the number of turns of wire and counted how many paperclips the electromagnet picked up.

Number of turns	10	20	30	40	50
Paperclips picked up	3	6	9	7	15

(a) What is the **independent** variable? [1]

.....

(b) What is the **dependent** variable? [1]

.....

(c) Give **two** control variables the student should keep the same. [2]

.....

.....

(d) Which result is anomalous (does not fit the pattern)? [1]

.....

(e) Describe the pattern in the results. [1]

.....

(f) Predict how many paperclips 60 turns would pick up. [1]

.....

6 Compare a permanent magnet with an electromagnet.

(a) Give **one** similarity. [1]

.....

(b) Give **one** difference. [1]

.....

Section C – Using magnetism 11 marks

7 A compass needle is a tiny magnet.

(a) Explain why a compass needle always points north. [1]

.....

(b) The Earth's core is mostly made of one magnetic metal. Name it. [1]

.....

8 Put a tick in one box in each row to show which type of magnet is used. [2]

Use	Permanent magnet	Electromagnet
Crane in a scrapyard		
Fridge magnet		
Electric door bell		
Compass needle		

9 **Maglev** trains float above the track. Electromagnets in the train and the track push against each other.

(a) Explain how magnets can lift the train off the track. [2]

.....

.....

(b) Suggest **one** advantage of a train that does not touch the track. [1]

.....

10 In an electric bell, pressing the switch makes a current flow through an electromagnet. An iron arm (the armature) is pulled towards the electromagnet and the hammer hits the gong.

(a) Explain why the hammer moves when the current flows. [2]

.....

.....

(b) Explain why the armature must be made of iron and not copper. [1]

.....

(c) What happens to the armature when the current stops? [1]

.....

Section D – CHALLENGE: fields around wires 6 marks

11 A current flows through a long, straight wire.

(a) Describe the shape of the magnetic field around the wire. [1]

.....

(b) What happens to the field if the current is reversed? [1]

.....

(c) Suggest why winding the wire into a coil makes the field stronger. [1]

.....

(d) With 2 cells, an electromagnet picks up 12 paperclips. The student uses 4 cells. Predict what happens and explain why. [2]

.....

.....

(e) Suggest why using far too many cells is a bad idea. [1]

.....

End of worksheet. Check your answers, then ask your teacher for the mark scheme. Total: 45 marks.