

Activate Physics Kerboodle Teacher Handbook

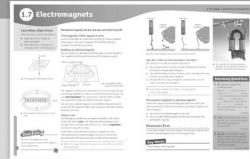
1.7 Electromagnets

Physics KS3 NC link:

- the magnetic effect of a current, electromagnets, D.C. motors (principles only).

Working Scientifically NC link:

- make predictions using scientific knowledge and understanding.



Band	Outcome	Checkpoint	
		Question	Activity
Developing	State the main features of an electromagnet (Level 4).	1	Starter 1
	State one difference between permanent magnets and electromagnets (Level 4).	1	Starter 1
	Test the effect of changing an electromagnet (Level 4).		Starter 2, Main
Secure	Describe how to make an electromagnet (Level 5).	1, 2	Starter 2
	Describe how to change the strength of an electromagnet (Level 6).	B, 3	Starter 2, Main
	Predict and test the effect of changes to an electromagnet (Level 6).		Main, Plenary 1
Extending	Explain how an electromagnet works (Level 7).	3	Homework
	Predict the effect of changes on the strength of different electromagnets (Level 7).		Main, Plenary 1, Homework
	Predict the effect of changes made to an electromagnet, using scientific knowledge to justify the claim (Level 8).		Main, Plenary 1

Maths

Students calculate the quantitative relationship between changes made to an electromagnet and the increase in its strength, demonstrating an understanding of simple ratios.



Literacy

Students use scientific terminology correctly when discussing observations and conclusions from their experiment.



APP

Students identify quantitative relationships between variables in an experiment (AF5).

Key Words

electromagnet, core, magnetise

Answers from the student book

In-text questions	A magnetic B type of core, number of turns, current
Summary Questions	1 current, magnetic field, coil, current, magnetic field (5 marks) 2 Wind a wire around the nail. Attach the ends of the wires to the battery using the leads and crocodile clips. (2 marks) 3 6 mark question. Example answers: There is a magnetic field around a wire carrying a current. The field is stronger if there are more loops of wire. This is because the fields add together. A bigger current produces a stronger magnetic field. The magnetic material inside the coil becomes magnetised when you put it in a magnetic field. This increases the strength of the electromagnet.



Starter	Support/Extension	Resources
An alternative question-led lesson is also available.		Question-led lesson: Electromagnets
What is an electromagnet? (10 min) Demonstrate an electromagnet in the laboratory or using a video clip. Show that it can be switched on and off, and that it can be adjusted in strength. Students prepare a list that compares features of an electromagnet with a magnet.	Support: Provide a list of statements for students to match to magnets or electromagnets.	
Changing the strength (10 min) Introduce the idea of an electromagnet using a diagram. Discuss as a class the factors affecting the strength of an electromagnet, encouraging students' ideas in the meantime. Students then recap what they have learnt using a gap-fill summary on the interactive resource.	Support: Prepare a list of variables from the interactive resource. Students can decide if any of these variables apply to a permanent magnet. Extension: Students evaluate the factors given, stating those that will cause the biggest change in strength.	Interactive: Changing the strength
Main	Support/Extension	Resources
Changing the strength of electromagnets (35 min) Students carry out a practical to investigate the effects on the strength of electromagnets of changing different variables, by taking part in a circus activity. Students will change the current, the number of turns on the coil, and the material used as the core of the electromagnet in their experiments. Students form their own predictions before carrying out the experiment, compare results to their predictions, and answer questions that follow on the practical sheet.	Support: A support sheet is available that includes partially filled results tables. Extension: Students should be encouraged to suggest quantitative predictions based on scientific understanding.	Practical: Changing the strength of electromagnets Skill sheet: Recording results
Plenary	Support/Extension	Resources
Testing predictions (10 min) Students compare their original prediction with what actually happened during their experiment. They identify the factors that had the biggest effect on the strength of an electromagnet and list features of a really strong electromagnet on a mini-whiteboard.	Support: Students focus on general trends. Extension: Students should offer quantitative examples when explaining the trends observed.	
What have I learned? (10 min) Students list three things they learnt in this lesson, including the three factors that affect the strength of an electromagnet. Use this as a chance to check and correct misconceptions.		
Homework		
Provide students with information regarding costs of materials to make an electromagnet (e.g., copper costs 10p per metre; 1 m = 20 turns in the coil). Ask students to make the strongest but cheapest electromagnet possible based on prices provided.		

Resources