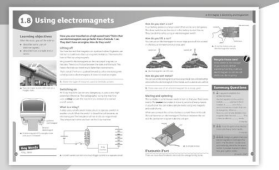
1.8 Using electromagnets



Physics KS3 NC link:
- the magnetic effect of a current, electromagnets, D.C. motors (principles only).

Working Scientifically NC link:
- identify further questions arising from their results.

Band	Outcome	Checkpoint	
		Question	Activity
Developing	State some uses of electromagnets (Level 4).	A, B, 1	Starter 2, Lit, Plenary 2
↓	State the main parts of a motor (Level 4).	2	Main
	Ask simple questions about motors (Level 4).		Main
Secure	Describe some uses of electromagnets (Level 5).	2, 3	Lit, Starter 2, Plenary 2
↓	Describe how a simple motor works (Level 5).	2	Main, Homework
	From your experiment, pose scientific questions to be investigated (Level 6).		Main
Extending	Apply existing knowledge about electromagnets to design a circuit (Level 7).	3	Lit
↓	Suggest ways to make a motor turn faster (Level 7).		Main, Homework
	Suggest investigations about electromagnets used in different applications (Level 7).		Main

Literacy
Students use scientific terms correctly when explaining observations in their experiment, when explaining the uses of motors for their homework, and when writing a letter in the student-book activity to persuade the use of electromagnets to sort soft-drinks cans for recycling.

APP
Students make further predictions on electromagnets and motors, based on experimental results (AF5).

Key Words
relay, motor

Answers from the student book

In-text questions	**A** electromagnets **B** To lift cars/sort metals.
Activity	**Recycle those cans!** The letter should explain the basic construction of an electromagnet, and that the electromagnet will attract steel cans but not aluminium.
Summary Questions	**1** trains, relay, current, spins, motor (5 marks) **2** A simple motor contains a coil of wire and two permanent magnets. A current flows in the coil of wire. The coil becomes an electromagnet. The forces between the coil and the permanent magnets make it spin. (4 marks)

	3 6 mark question. Example answers: Electromagnet is on the two walls. A magnetic material is on the doors. When a current flows in the electromagnet there is a magnetic field around it. The magnetic material on the doors is attracted to it. The doors stay open while a current flows. When the fire alarm sounds, the current to the electromagnet is cut. There is no longer a magnetic field around the electromagnet. The magnetic material on the doors is no longer attracted to it. The doors close.

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Starter	Support/Extension	Resources
Introducing motors (10 min) Explain that a motor uses electricity to make something spin. Students list as many pieces of equipment that use motors in the home as possible. This can be done as a competition in small groups.	**Extension**: Students rank their list of equipment by their prediction of the strength of the motor they use.	
Uses of electromagnets (10 min) Students sort uses of electromagnets into three categories (electromagnets that turn on and off, those that vibrate, and those that are very strong) using the interactive resources.	**Support**: Allow students to work in groups to discuss possible answers before a class discussion.	**Interactive**: Uses of electromagnets
Main	**Support/Extension**	**Resources**
Using electromagnets (35 min) Compare properties of permanent magnets and electromagnets, and introduce the different uses of electromagnets, leading to motors. Demonstrate equipment that uses a motor, and explain that motors need magnets and an electric current to spin. Students should be able to spot that both a permanent magnet and an electromagnet are required in a motor. Students then carry out a simple practical to make a motor of their own, answering questions that follow on the practical sheet. Students may choose to use different thicknesses of wire, different batteries, or different magnets if time permits. Students should explain their observations and try to relate their results to their work from previous lesson on electromagnets.	**Support**: The support sheet contains hints for students when writing further questions they can investigate in this practical. **Extension**: Students may be able to repeat the experiment, changing one variable in a methodical way, in the same time it takes the rest of the class to carry out the practical once.	**Practical**: Using electromagnets
Plenary	**Support/Extension**	**Resources**
Your questions (10 min) Students share their questions from the practical sheet with a partner, and decide in groups/pairs if they can suggest answers to these questions. If there is time, demonstrate the effect of some of their changes and see if they were right.	**Extension**: Students share their hypothesis for each change suggested.	
Uses of electromagnets revisited (10 min) Students should work independently to name as many uses of electromagnets as possible. They then join up in small groups to add to their existing ideas. Groups can then compete with each other in a competition for the longest list.	**Extension**: Students may earn bonus points if they list uses of electromagnets by category (e.g., transport: car engine and levitating train; kitchen: microwave turntable and electric whisk).	
Homework		
Students find out about one application of motors in detail. They write a paragraph explaining how the motor works, explaining the roles of the permanent and electromagnet in the motor, and how to make the motor stronger. Students can decorate their work using an image of a motor. An alternative WebQuest homework activity is also available on Kerboodle where students research the use of electromagnets in metal-recycling.		**WebQuest**: Metal-recycling and electromagnets