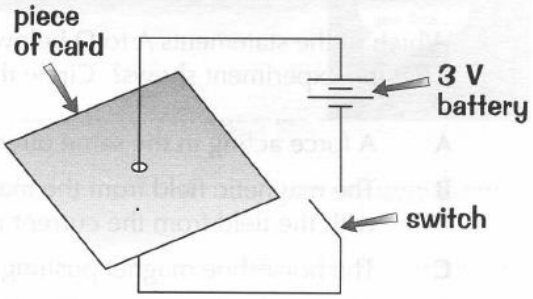
Magnetic Fields 1

1.

The diagram below shows a wire carrying a current passing through a piece of flat card.

Some iron filings are sprinkled onto the card. When the current is switched on, a pattern develops in the iron filings because of the magnetic field around the wire.

On the diagram, sketch the pattern that the iron filings make when the current is switched on.



2.

Electromagnets are often found in cranes used for lifting iron and steel.
Explain why electromagnets are **more useful** than ordinary magnets for this purpose.

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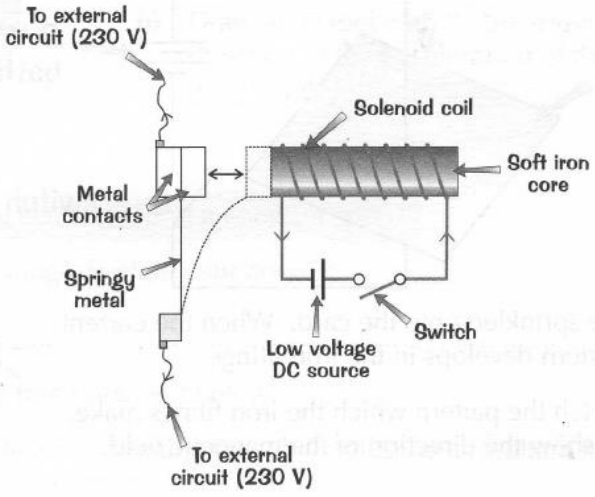
3.

The diagram shows how a solenoid can be used as a relay to switch an external circuit on and off.



a) Describe what happens when the switch is closed and then opened again.

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b) Give two reasons why a **soft iron** core is used in the solenoid.

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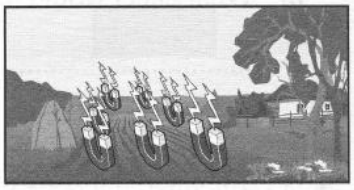


4.

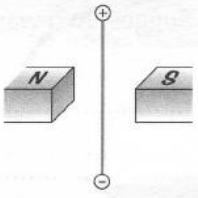
Complete the passage below using the words supplied.

force	angle	stronger	current	magnetic field	motor	permanent magnets

A wire carrying an electric current has a .... around it. This can interact with the magnetic fields of other wires or of .... to produce a ..... and sometimes movement. A bigger ..... or a ..... magnet will produce a bigger force. The size of the force will also depend on the ..... at which the two magnetic fields meet each other. A force is experienced by a current-carrying wire in a magnetic field — this is known as the ..... effect.

5.

The diagram shows an electrical wire between two magnetic poles. When the current is switched on, the wire moves at right angles to the magnetic field.



a) Using Fleming's Left-Hand Rule, state which way the wire will move.

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b) How could the wire be made to move in the opposite direction?

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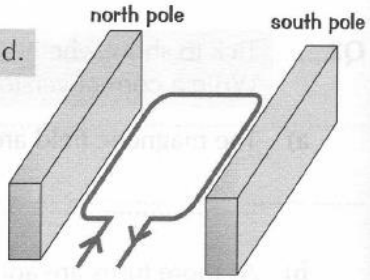
6.

Read the three statements below. Tick the box next to each statement that you think is **true**.

- ☐ A current-carrying wire will not experience a force if it is parallel to the magnetic field of a permanent magnet.
- ☐ A current-carrying wire will not experience a force if it is at right-angles to the magnetic field of a permanent magnet.
- ☐ A current-carrying wire will not experience a force if it is at an angle of 45° to the magnetic field of a permanent magnet.

7.

The diagram shows a current-carrying coil in a uniform magnetic field.



a) Draw an arrow on the diagram to show the direction of the uniform magnetic field.

b) Describe the direction of the force on the **left-hand arm** of the coil.

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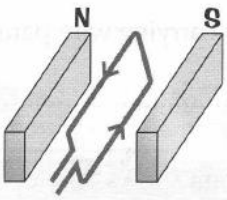
c) In which direction will the coil move — clockwise or anticlockwise? .....

d) **i)** This diagram shows the coil just after it has turned through 90°. Draw arrows to show the direction of the forces on each arm of the coil at this stage and describe how you would expect the coil to move.



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ii) In a motor, the coil keeps rotating in the same direction. Explain how this is achieved.

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8.

Read the three statements below. Tick the box next to each statement that you think is **true**.

- ☐ The split-ring commutator increases the size of the electric current.
- ☐ The split-ring commutator reverses the direction of the current every half turn by swapping the contacts to the DC supply.
- ☐ The split-ring commutator makes the motor rotate in a different direction.

9.

Suggest two ways in which the direction of spin of a simple DC motor can be reversed.

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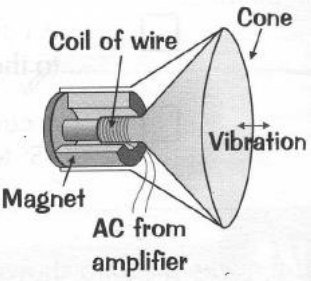
10.

Fill in the blanks, using the words below, to explain how a **loudspeaker** works. Use the **diagram** of a loudspeaker to the right to help you.

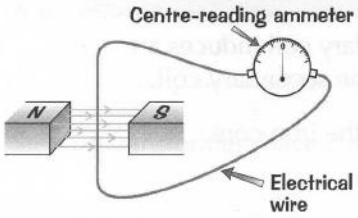


move	amplifier	force	field	
sound	magnetic	frequency	current	

The loudspeaker relies on the fact that a wire carrying a ..... in a .... can experience a ..... . A coil is attached to a cardboard or plastic cone. An AC signal is then sent to the coil from an ..... . This makes the coil ..... and causes the cone to vibrate. The cone vibrates at the same ..... as the signal from the amplifier and produces ..... .

11.

The apparatus in the diagram below can be used to demonstrate electromagnetic induction.



a) What is electromagnetic induction?

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b) Describe how you could use the apparatus to demonstrate electromagnetic induction.

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c) What would you see on the ammeter?

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d) What effect would swapping the magnets have?

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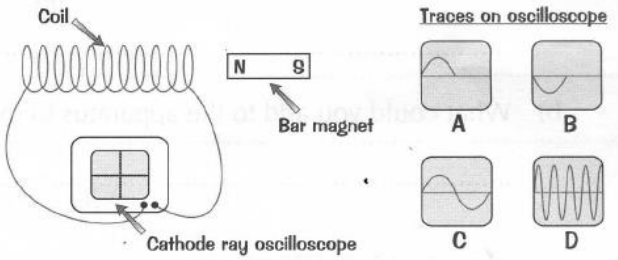
12.

Moving a magnet inside an electric coil produces a trace on a cathode ray oscilloscope.

When the magnet was pushed **inside** the coil, **trace A** was produced on the screen.



a) Explain how trace B could be produced.

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b) Explain how trace C could be produced.

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c) Explain how trace D could be produced.

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13.

To the right is a diagram of a **dynamo** used to power lights on a bicycle. Use the diagram to help you explain **how** a dynamo works.

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