ROYAL OBSERVATORY GREENWICH

Compasses and Magnetism on Earth

Key Stage 2

Topics covered: Magnetic force, magnetic poles, magnetic materials, attraction and repulsion

Before you get started make sure you have watched our video 'Seeing The Invisible', https://vimeo.com/163255189

Magnetism is an invisible force. We can't see it but we can detect its effects. Magnetic materials experience a force from other magnetic materials even if they aren't touching. But, not all materials are magnetic – can you think of some that are?

Teacher notes:

Activity 1: Magnetic Materials

You will need: tray of magnetic and non-magnetic objects, bar magnets
E.g. Scissors, cutlery, iron nail, metal keyrings, different coins.

- Instruct students to identify some magnetic and non-magnetic materials by bringing the bar magnet close to an object and seeing if they are attracted / repelled.

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Questions to ask the students:

1. Which materials were magnetic? Were all parts of the object magnetic?

   A: Not all materials are magnetic. For example, classroom scissors may be made of steel which is magnetic but the plastic handles are not.

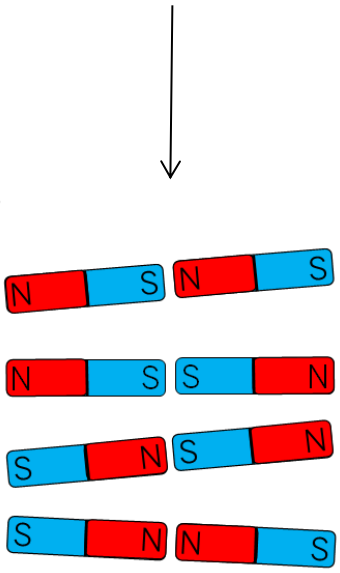
2. Are all metals magnetic?

   A: Not all metals are magnetic. Iron, nickel and cobalt are magnetic as well as alloys of these metals e.g. steel (alloy of iron). Some metals which are not magnetic include aluminium, copper and gold.

Activity 2: Attraction and Repulsion

You will need: a pair of bar magnets for each pair or group of students

- Instruct students to place the magnets in the following positions and look at what happens in each case.



Questions to ask the students

1. What happens in each case shown in the images?
   Introduce/ use the words attract and repel.
   You can display the larger image on the following page on the board.

   A: Attract, repel, attract, repel.
   Opposite poles attract and similar poles repel.

2. What do we call the two ends of the magnet?

   A: Magnetic poles.

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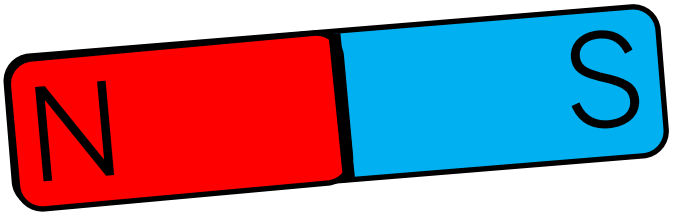

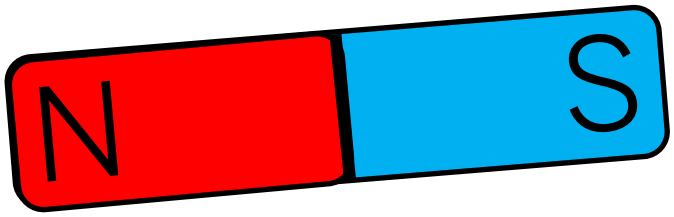

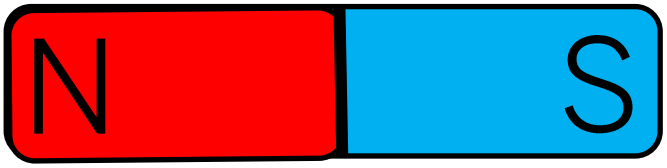

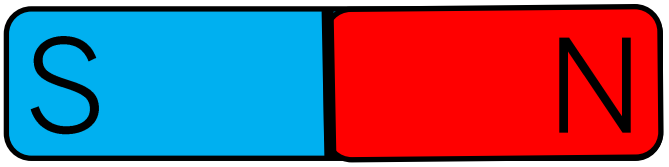

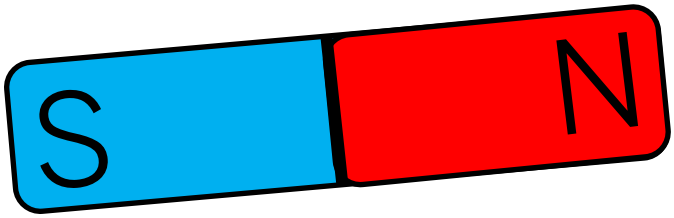

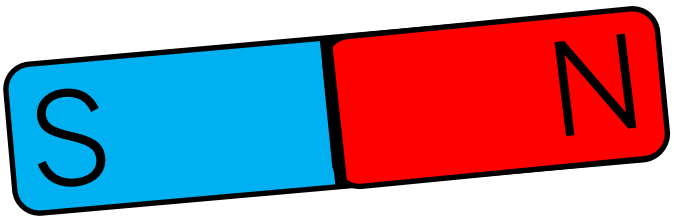

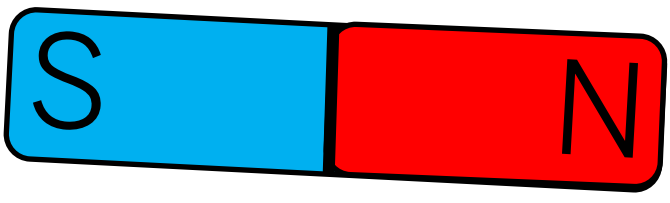

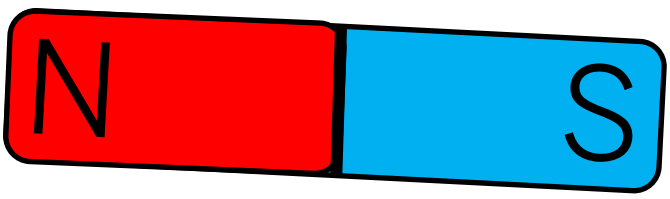

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Activity 3: Making a Magnetic Compass

You will need:
Method 1: Large dish/ bowl filled will water, large needle, cork, bar magnet or rare earth metal magnet e.g. neodymium (stronger magnets work better).
Method 2: Large clear plastic cup or glass jar, pencil, needle, thread, bar magnet or rare earth metal magnet e.g. neodymium (stronger magnets work better).

- Construct a floating compass or Chinese magnetic compass as shown on the following pages.
  You can display the larger images on the following pages on the board.
- Magnetise the needle by rubbing a bar magnet a dozen times along its length in one direction **only**. (A bit like the motion of brushing your hair).
- Explain to students that this rubbing action makes the needle magnetic.
- Bring the bar magnet close to (but not touching) the end of the needle and watch what happens to the needle.
- Then allow the needle to spin and come to rest on its own – note the direction in which the needle is pointing.

Questions to ask the students:

1. What is a compass and what does it do?

   A: A compass is a device which has a magnetised needle. The needle acts like a magnet and lines up in the direction of magnetic North.

2. Why does the needle follow or move away from the bar magnet when it is brought closer?

   A: The magnetised needle is either attracted by the bar magnet and moves towards it or it is repelled by the bar magnet and moves away from it.

3. When there is no magnet nearby, why does the needle point in a particular direction (North)?

   A: The needle is affected by the Earth's magnetic field and points North unless a magnet is brought closer to the needle. When a magnet is brought closer, the force from the magnet is stronger than the force from the Earth's magnetic field.

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Chinese magnetic compass

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Floating compass