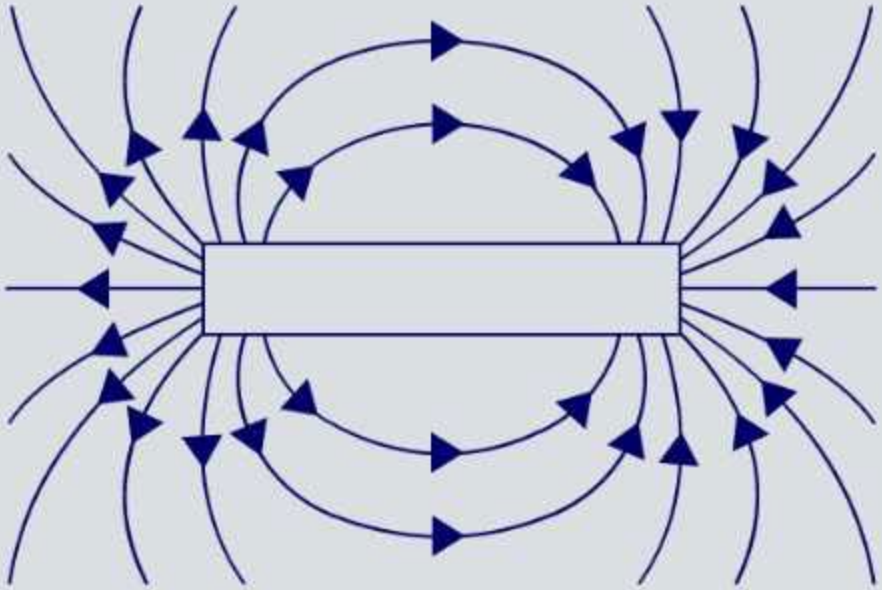
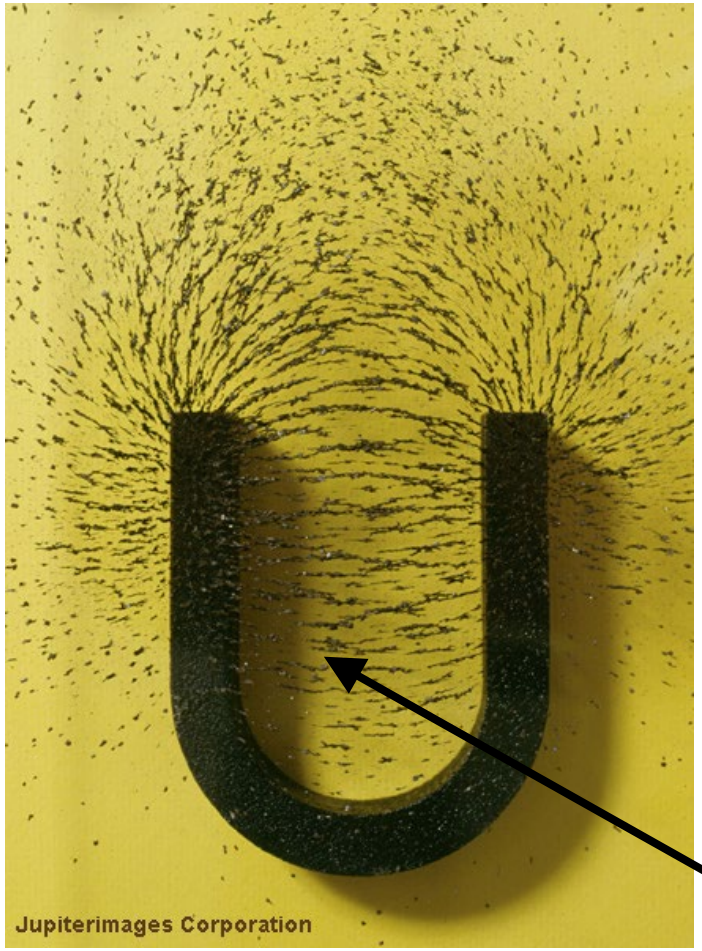
Magnetic Fields



What is a magnetic field?

The region around a magnet where it has a magnetic effect is called its **magnetic field**.



When a magnetic material is placed in a magnetic field it will experience a force.

The iron filings feel the effect of the magnetic field and line up along the direction of the forces in this region.

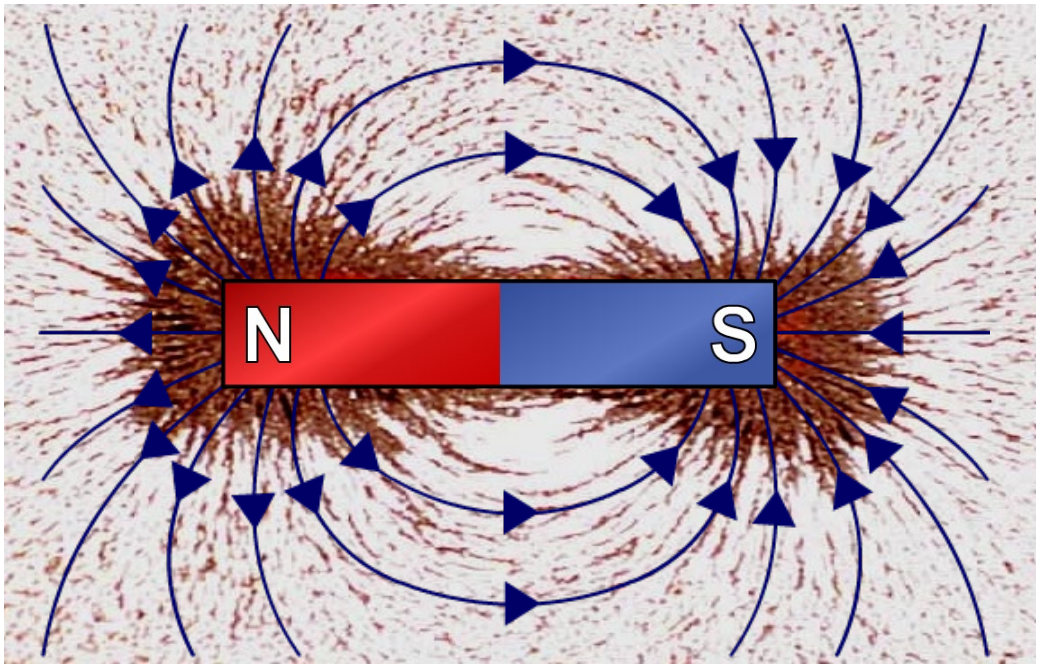
magnetic field

Shape of a magnetic field

Magnetic field lines

The shape of a magnetic field can be shown by drawing **magnetic field lines**. These always point from the north pole of a magnet to the south pole, along the direction of the magnetic forces in each region. Where is the magnetic field strongest?

strongest field at poles

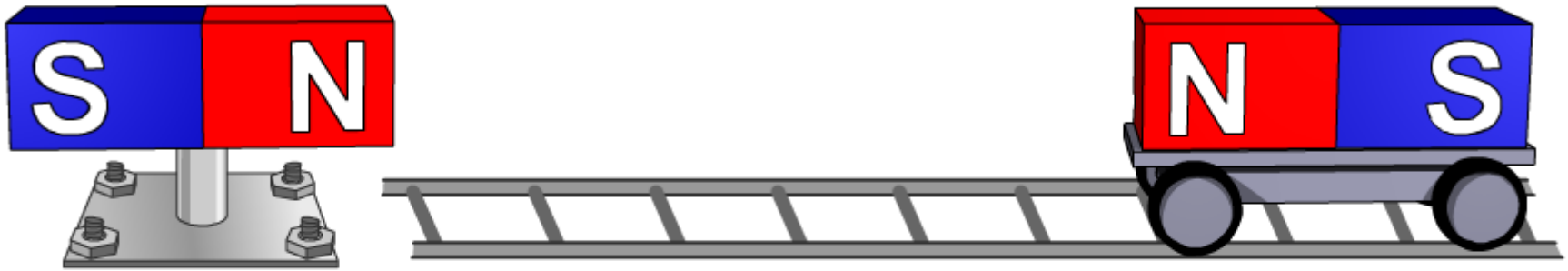


The closer together the magnetic field lines, **the stronger the magnetic field**.

weakest field further away from poles

Forces between magnets experiment

Is the force between two magnets always the same?



magnet 1

magnet 2

test poles		result	
magnet 1	magnet 2	attract	repel
N	N		
N	S		
S	S		
S	N		

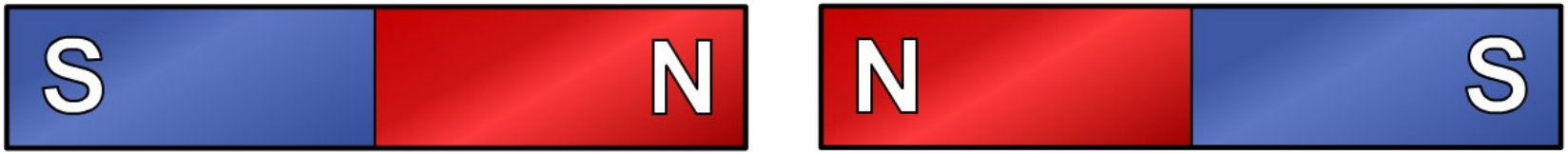
Investigating magnetic fields

Investigate the magnetic field around two bar magnets

field lines

Viewing magnetic fields: N poles together

Bring the north poles of two bar magnets together.



What happens to the magnets?

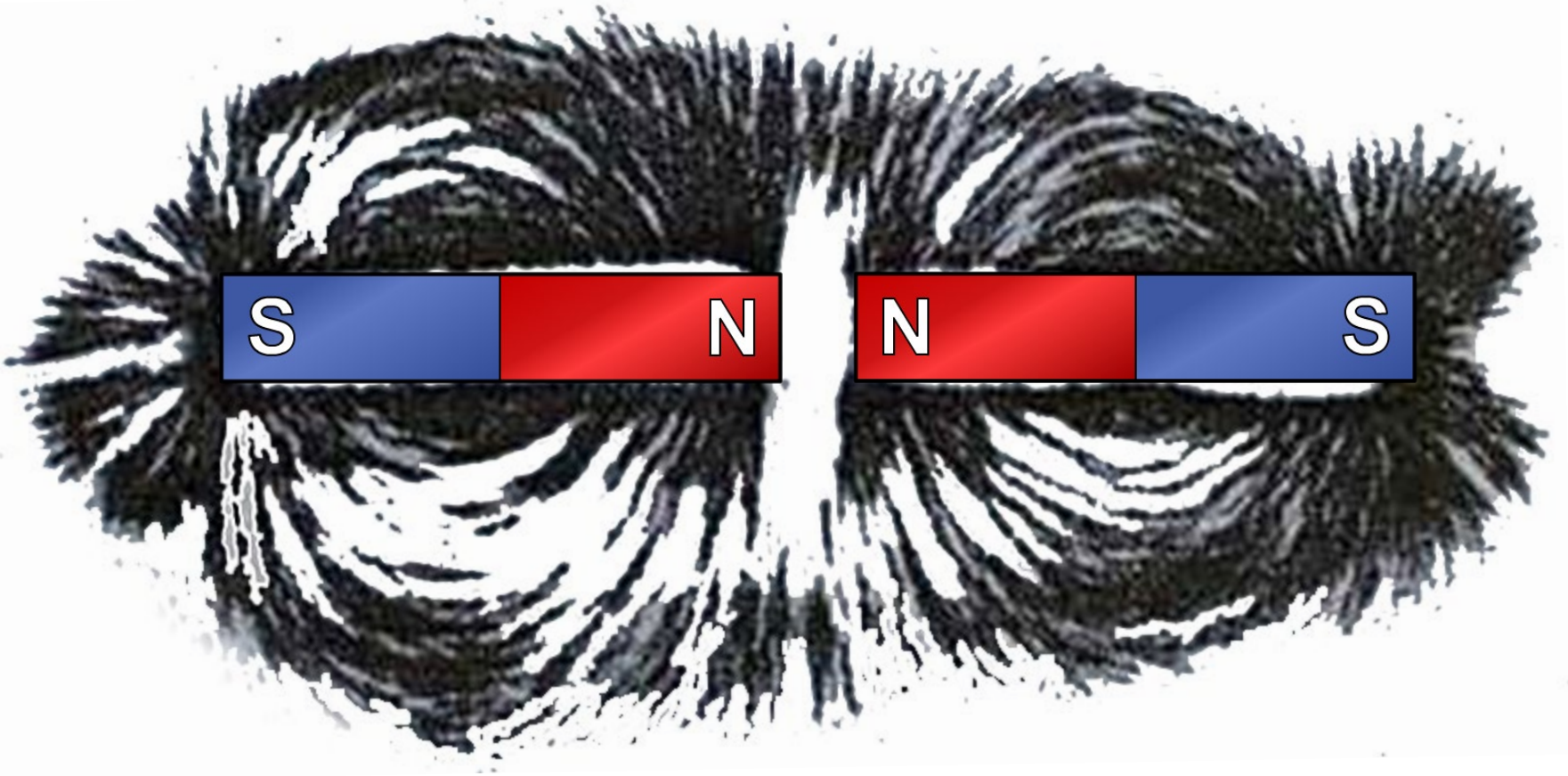
Next, bring the two north poles as close to each other as possible and place a piece of paper on top of the magnets.

1. Carefully scatter iron filings onto the paper.

2. Draw the pattern created by the iron filings.

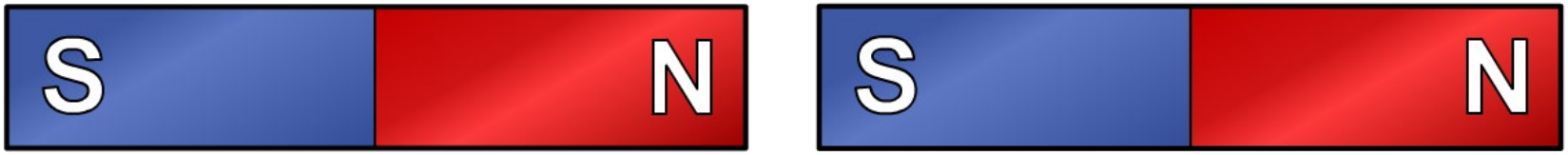
Magnetic field pattern: N poles together

What do you notice about the pattern of the lines of force in the region between the two north poles?



Viewing magnetic fields: N and S poles together

Bring the north and south poles of two bar magnets together.



What happens to the magnets?

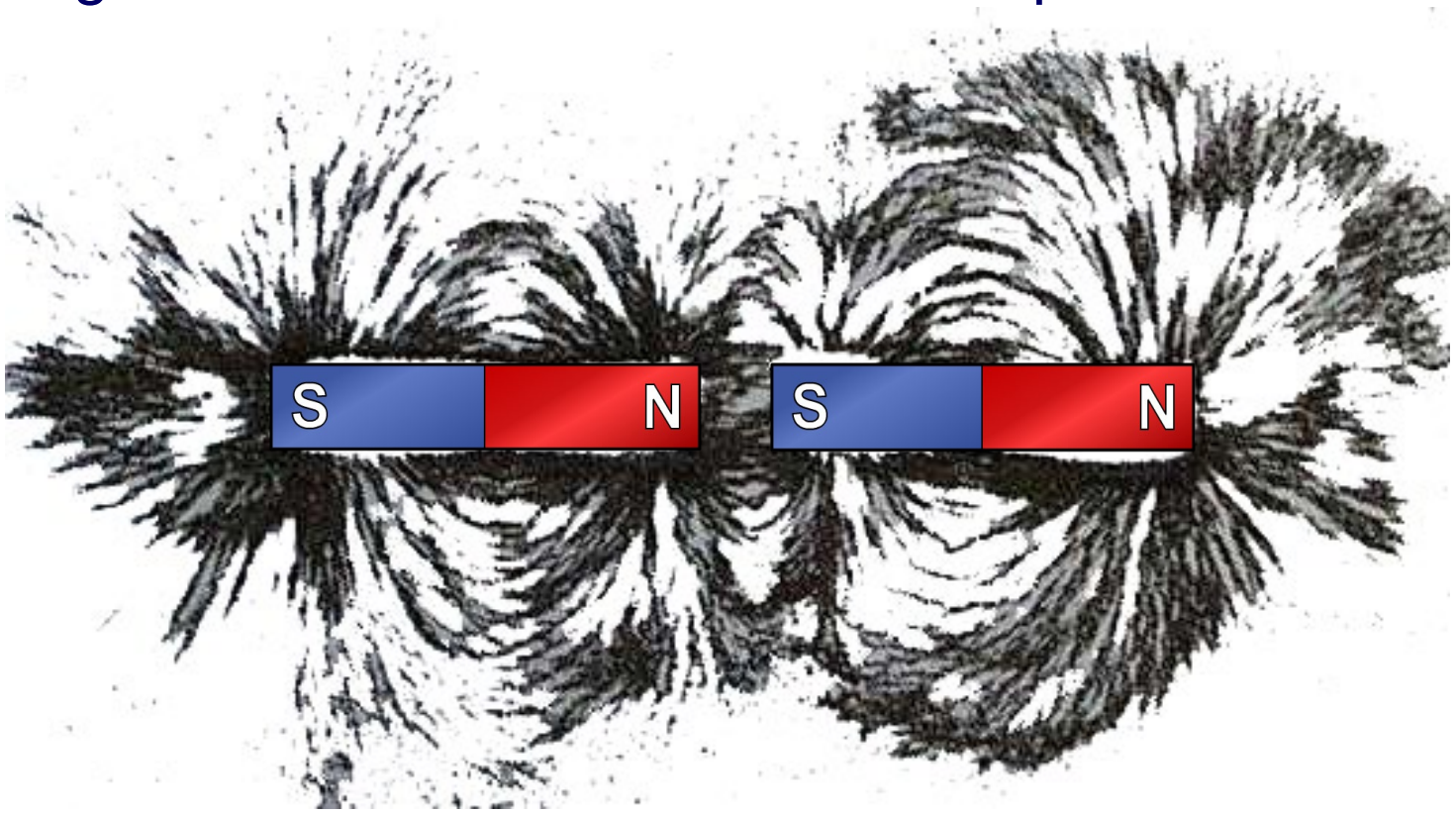
Next, put the north and south poles close to each other, without letting them touch, and place a piece of paper on top.

1. Carefully scatter iron filings onto the paper.

2. Draw the pattern created by the iron filings.

Magnetic field pattern: N and S poles together

What do you notice about the pattern of the lines of force in the region between the north and south poles?

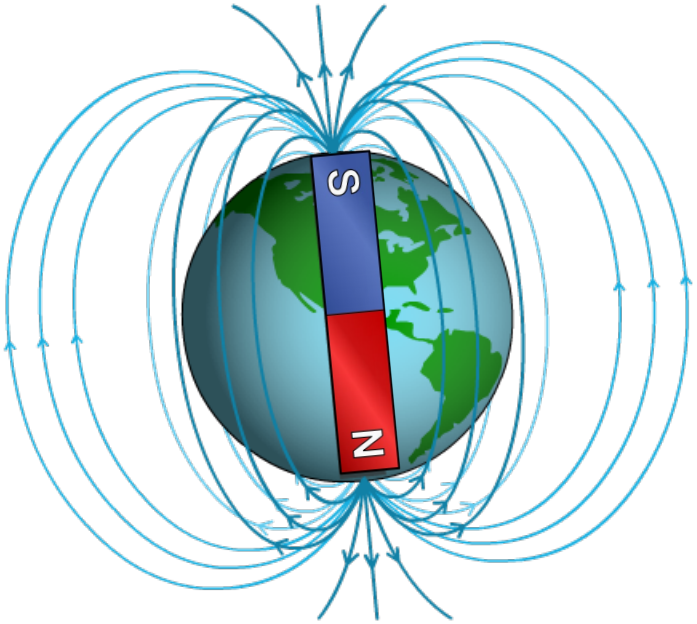


How does this pattern compare with the pattern between the two north poles?

The Earth's magnetic field

People have used magnetism to navigate for hundreds of years. The Earth's iron core creates a magnetic field. The north poles of magnets, such as compass needles, are attracted to the North Pole of the Earth.

But if like poles repel, why is the north pole of a magnet attracted to the North Pole of the Earth?



These poles were named before magnetism was properly understood. The 'Magnetic North Pole' of the Earth is really a magnetic south pole.

Do you think that you would be able to use a compass to navigate on other planets, or on the moon?

Magnetic fields: summary

What are the missing words about magnetic fields?

1. When two ? poles (e.g. a north and a south pole) are put together, they attract each other.

2. When two like poles (e.g. two north poles or two south poles) are put together, they ? each other.

3. Scattering ? filings around a bar magnet makes it possible to see the lines of force of the magnetic field.

solve

Making a magnet

A magnet can be made by magnetizing a material that is attracted to a magnet, e.g. a paper clip.

There are three methods that can be used to make a magnet:

1. Stroke a magnet along the paper clip from one end to the other and then, starting from the same place, repeat the movement. The more times this is done, the more magnetic the paper clip becomes.

2. Hold a nail in a magnetic field and hit it with a hammer.

3. Put a magnetic material in a strong magnetic field.