Chapter 16. Magnetism

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New word list:

Permanent magnet bar magnet compass horseshoe magnet relay ferrous material cobalt nickel steel solenoid electromagnets induce magnetize demagnetize arial

4.1 Simple phenomena of magnetism

Core

1 Describe the forces between magnetic poles and between magnets and magnetic materials, including the use of the terms north pole (N pole), south pole (S pole), attraction and repulsion, magnetised and unmagnetised

2 Describe induced magnetism

3 State the differences between the properties of temporary magnets (made of soft iron) and the properties of permanent magnets (made of steel)

4 State the difference between magnetic and non-magnetic materials

5 Describe a magnetic field as a region in which a magnetic pole experiences a force

6 Draw the pattern and direction of magnetic field lines around a bar magnet

7 State that the direction of a magnetic field at a point is the direction of the force on the N pole of a magnet at that point

8 Describe the plotting of magnetic field lines with a compass or iron filings and the use of a compass to determine the direction of the magnetic field

9 Describe the uses of permanent magnets and electromagnets

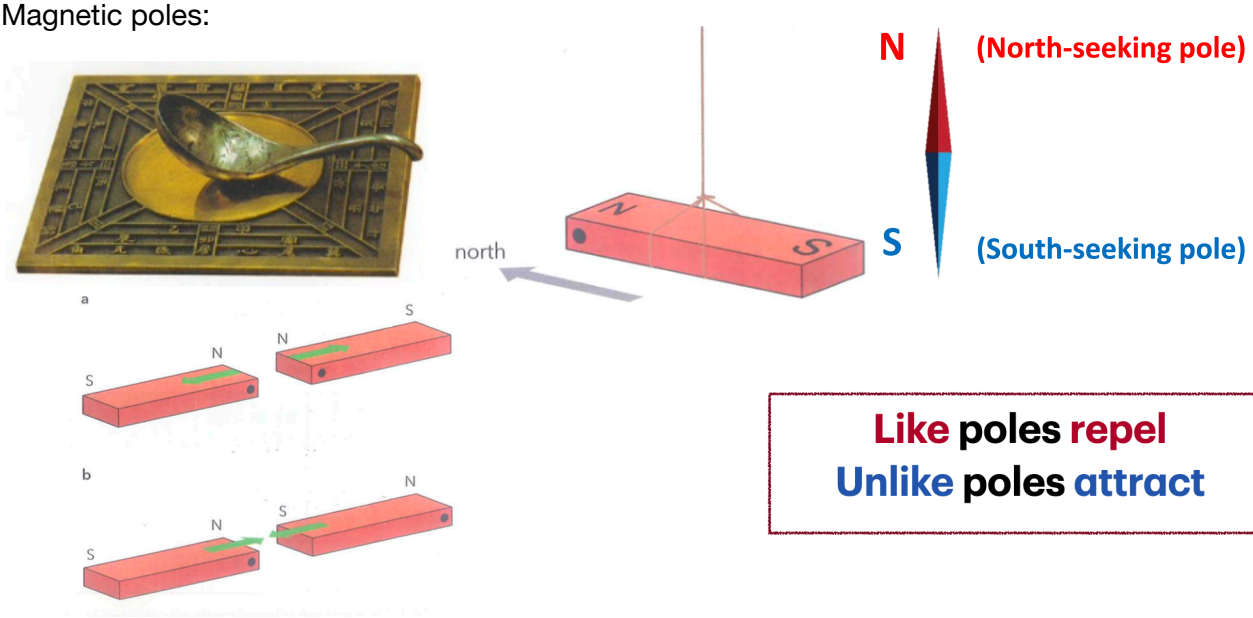
Supplement

10 Explain that magnetic forces are due to interactions between magnetic fields

11 Know that the relative strength of a magnetic field is represented by the spacing of the magnetic field lines

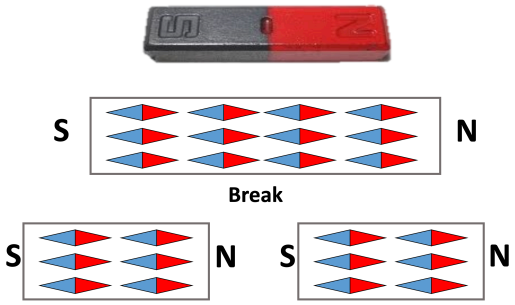
16.1 Permanent magnets

Magnetic poles:

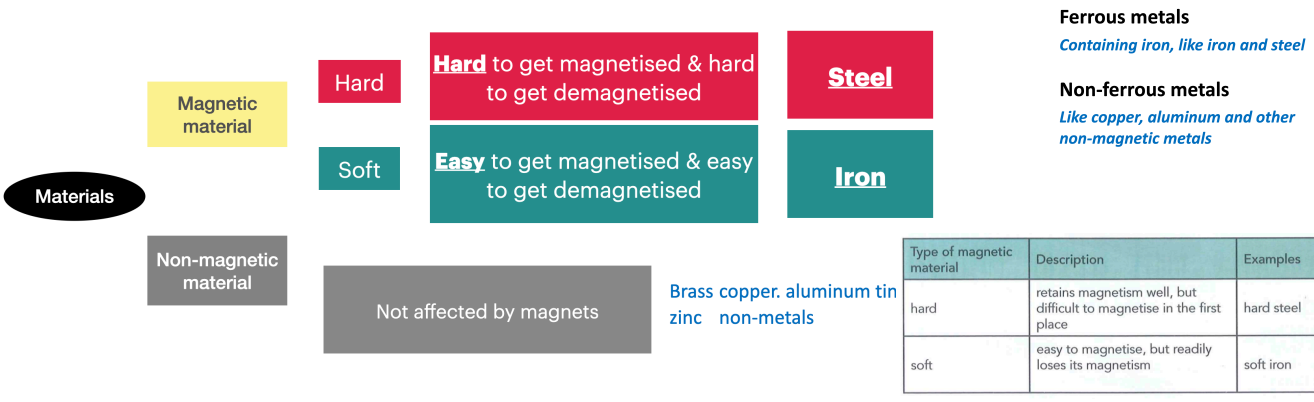


Like poles repel
Unlike poles attract

What would happen if you cut a bar magnet in half?



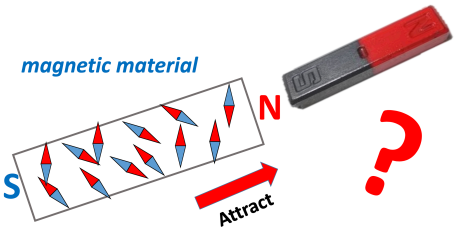
Magnetic material: Can be magnetized and be attracted to magnets (containing iron, nickel, cobalt)



Type of magnetic material	Description	Examples	Uses
hard	retains magnetism well, but difficult to magnetise in the first place	hard steel	permanent magnets, c needles, loudspeaker r
soft	easy to magnetise, but readily loses its magnetism	soft iron	cores for electromagne later in the chapter), tra and radio aerials

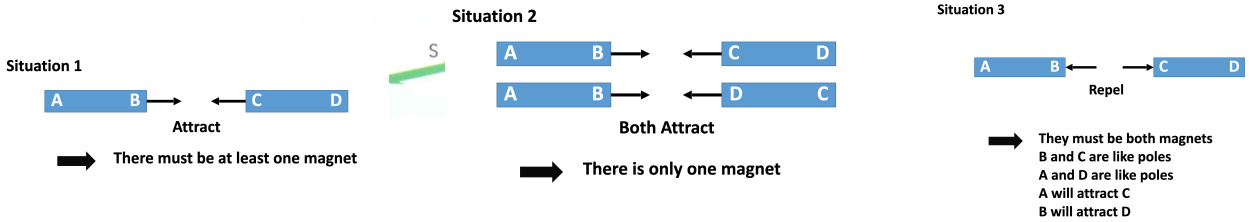
Induced magnetism

Why magnets can attract magnetic material?



Exercise

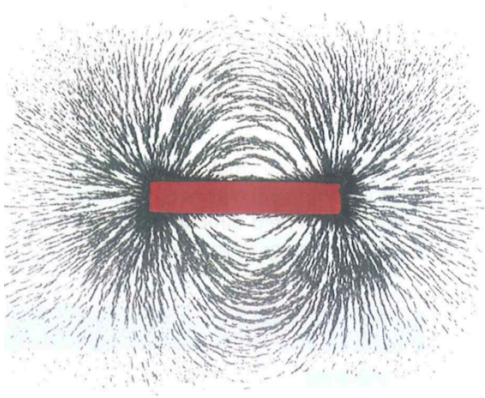
Which object is magnet in the following situations respectively?

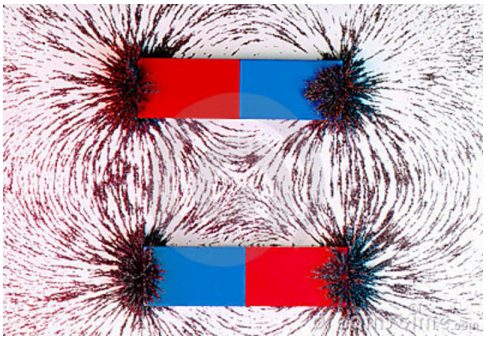


- What can be **attracted** by magnetic magnets: magnets and magnetic material
- What can be **repel** by magnetic magnets: only magnets
- Why can magnet attract magnetic material: induced magnetism

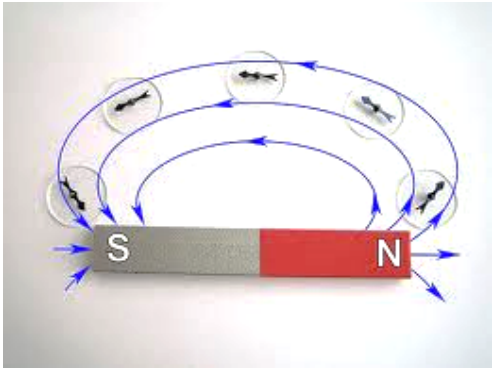
16.2 Magnetic field

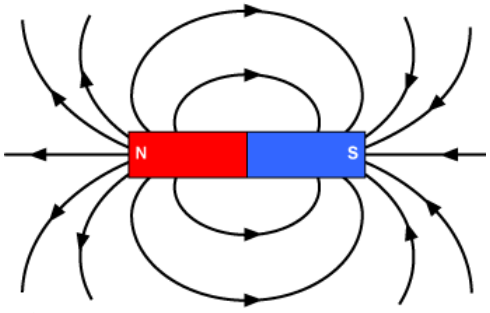
Region around the magnet where magnetic materials experience forces



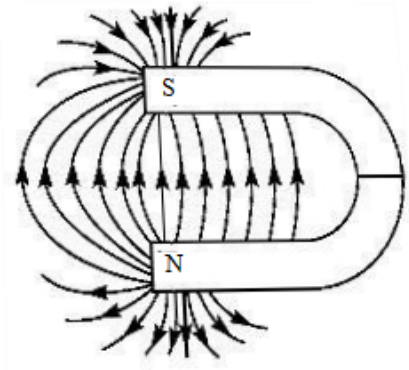


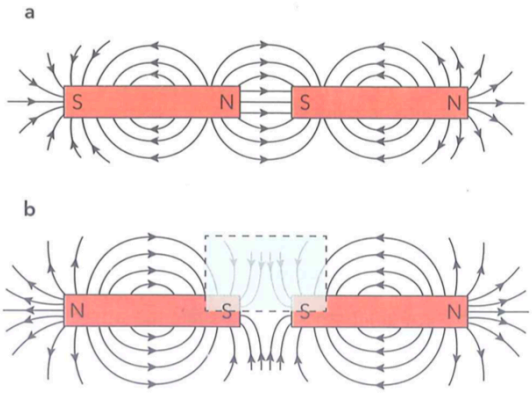
Magnetic field lines

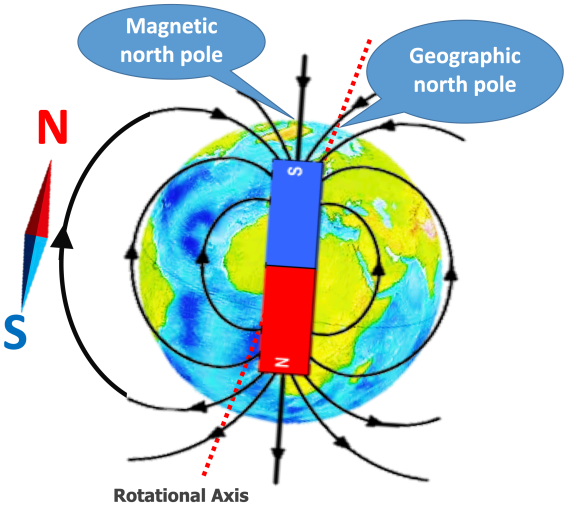




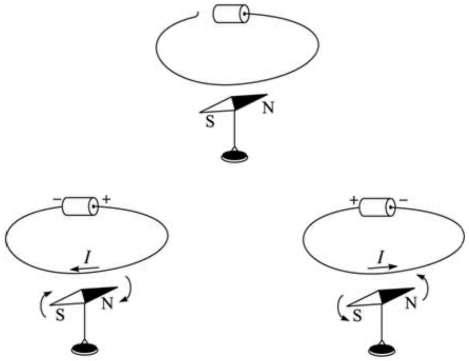
- Magnetic field lines start from N, ends at S (**N -> S**)
- Compass (N pole) points to the direction of field lines
- The closer the field lines, the stronger the field



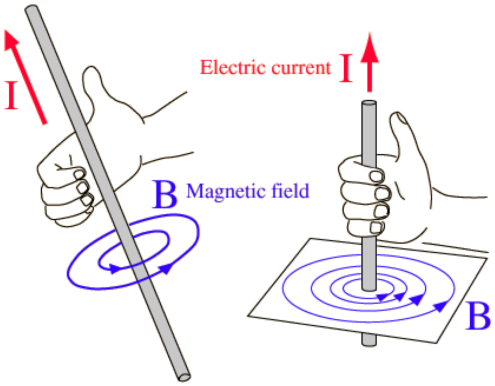




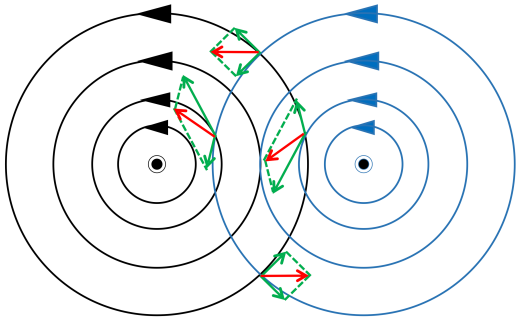
Magnetic field around a current

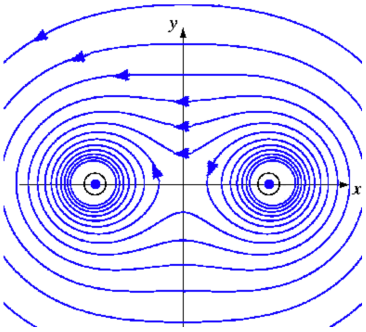


The Right-hand Grip Rule



Two metal wire contains same/opposite direction of current, will they attract to each or repel?





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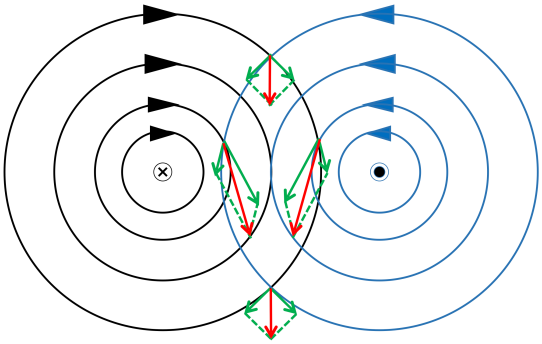
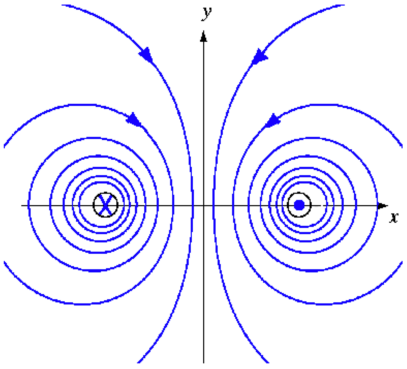
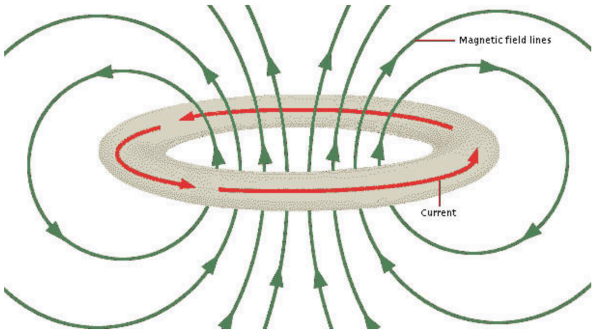
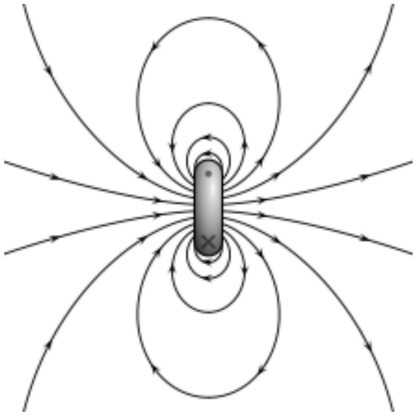


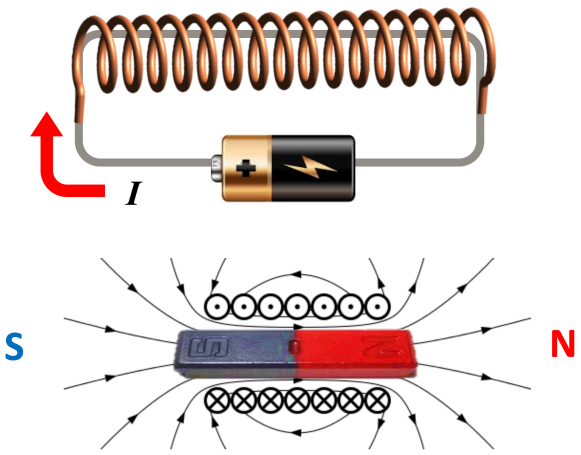


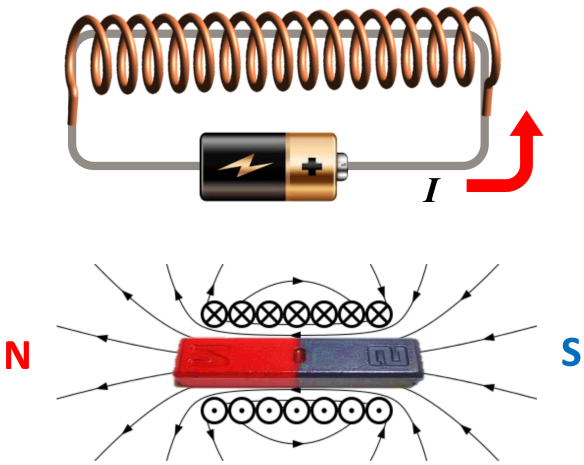
Can you use what you just learned(magnetic field around a straight current) to determine the magnetic field around a circle current?

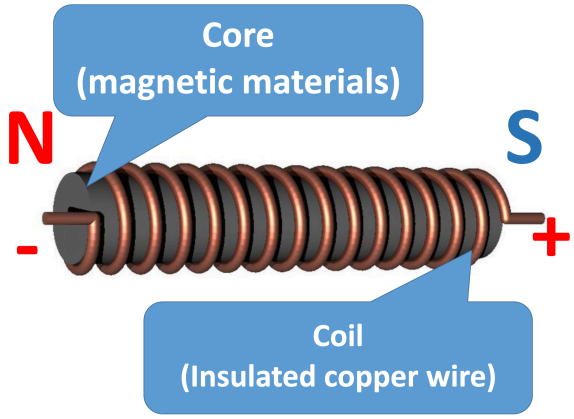




Electromagnet





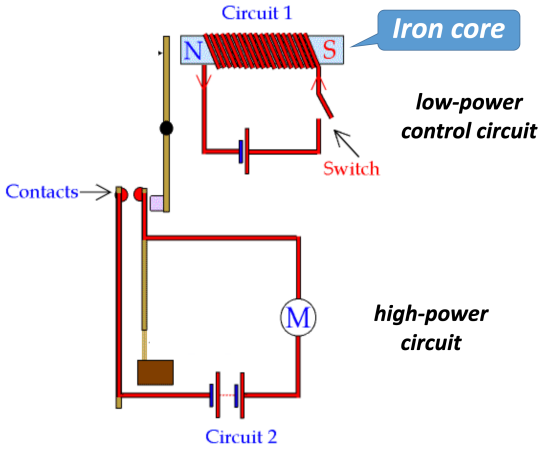


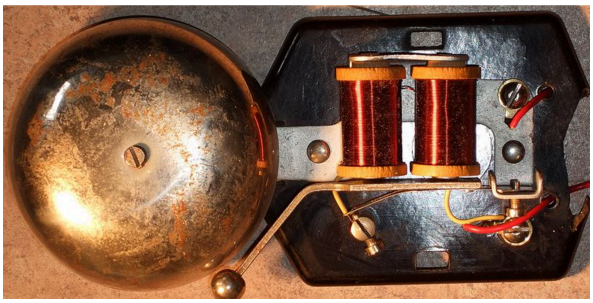
Ways to increase the strength of the magnetic field in a solenoid:

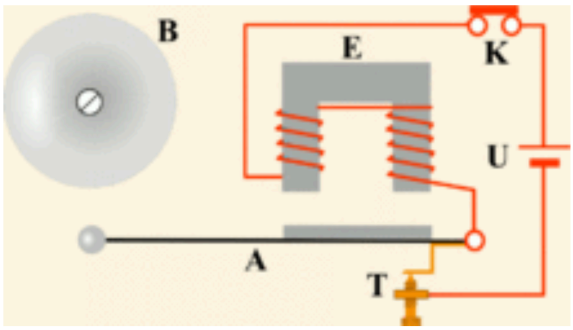
1. Increase the current
2. Increase the number of turns on the coil
3. Using a magnetic core

The magnetic field produced by the current in the coil magnetizes the core and the strength of the magnetic field is greatly increased.

Application of electromagnets:



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