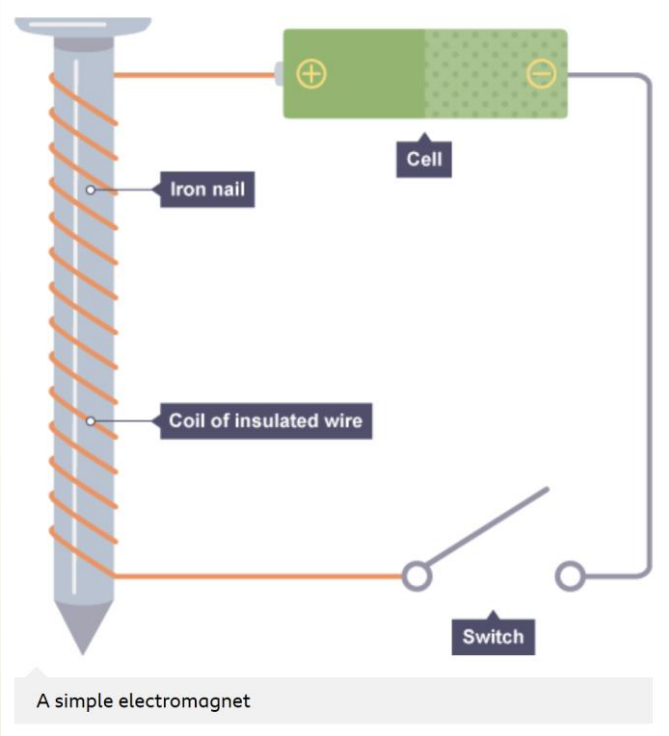
Subject: Science/Physics
Level: Form 1
Topic: Magnetic Effect of Current

Electromagnets

- When an electric current flows in a wire, it creates a magnetic field around the wire.
- This effect can be used to make an **electromagnet.**
- A simple electromagnet comprises a length of wire turned into a coil and connected to a battery or power supply.



A simple electromagnet

Electromagnets have some **advantages over permanent** magnets. For example:

- **the magnetism can be easily turned on and off**
- **the strength of the magnetic field can be varied**

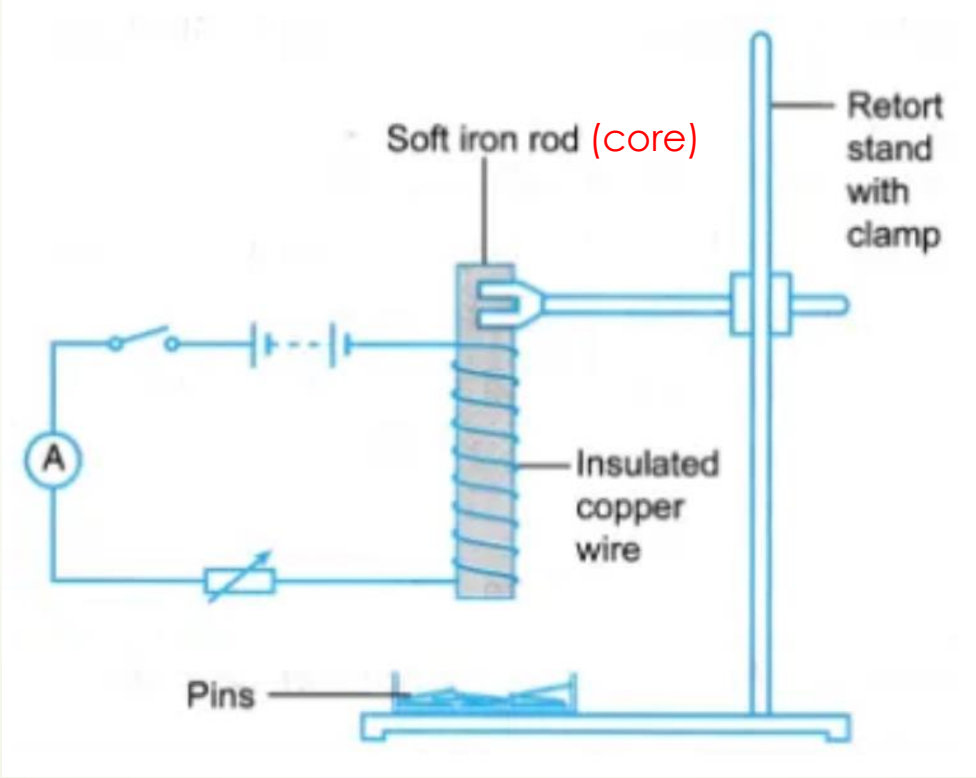
These properties make electromagnets useful for picking up scrap iron and steel in scrapyards.

They can let go of the car/scrap iron/steel by turning off the current.

Activity:

Barry wants to investigate whether the **strength of an electromagnet** depends on the **current** in the coil, the **number of turns** in the coil and the **material used** as the core of the coil.

He sets up the following apparatus and materials as shown in the diagram below.



And recorded the following results in tables 1, 2 and 3 shown below.

Table 1:

Number of turns	Number of pins attracted
20	8
30	15
40	19
50	24
60	30

Complete the following sentence based on the results he recorded in Table 1.

(i) The strength of the electromagnet _____ when the number of turns in the coil _____.

Table 2:

Current in A	Number of pins attracted
0	0
0.1	5
0.3	18
0.5	23
1.0	30

Complete the following sentence based on the results he recorded in Table 2.

(ii) The strength of the electromagnet _____ when the current _____.

Table 3:

Type of core	Number of pins attracted
Wood	1
plastic	2
Aluminum	3
Soft Iron	25

Complete the following sentence based on the results he recorded in Table 3.

(iii) The strength of the electromagnet depends on the _____ of the _____ of the core.

Assessment:

1. To build an electromagnet, you will need

   (a) a battery, wire, and nail
   (b) a battery, nail and paper clip
   (c) a battery, wire, and pencil
   (d) a battery, wire and paper clip

2. What is the main difference in an electromagnet and bar magnet?

   (a) An electromagnet can be turned on and off
   (b) An electromagnet is just a large bar magnet
   (c) A bar magnet is not permanent
   (d) A bar magnet is stronger than an electromagnet

3. If you wrap a wire around a nail 15 times and attach a battery, you can pick up 3 paper clips. What do you need to do in order to pick up more paper clips?

   (a) add more paper clips
   (b) wrap the wire around more times
   (c) use a core made of wood
   (d) use less cells

Assessment:

4. What material would be the best to use as the core of the electromagnet?

(a) wood (b) plastic

(c) iron (d) steel

5. For which of the following, an electromagnet would be best?

(a) to hold notes in place on a fridge

(b) the needle of a compass

(c) clasp for wallets and purses

(d) a device to pick up metals and place them elsewhere

3. For which of the following an electromagnet is not best to use?

(a) clasp for jewelry (b) magnetic separator of materials

(c) an electric bell (d) industrial lifting magnet

Answer Key:

Activity:

(i) The strength of the electromagnet **increases** when the number of turns in the coil **increases**.

(ii) The strength o the electromagnet **increases** when the current **increases**

(iii) The strength of the electromagnet depends on the **type** of the **material** of the core.

Assessment:

1. (a)
2. (a)
3. (b)
4. (c)
5. (d)
6. (a)

References

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- https://www.aplustopper.com/factors-affect-strength-electromagnet/
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