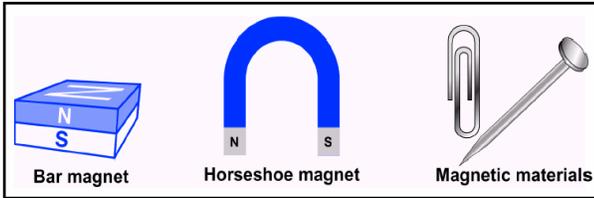


## Magnetism

### What is a Magnet?

A magnet is something that can attract metal or another magnet. A magnet can also repel another magnet.



### Properties of magnets:

- Magnets have two opposite poles: north and south.
- If divided, each part of a magnet will also have a north and south pole (you can never make an unpaired pole)
- Magnets exert forces on other magnets, called "Magnetic forces"
- Opposite poles attract (North attracts South)  
Like poles repel (North repels North, etc)

### Permanent and Temporary Magnets

*Iron makes the best temporary magnets.*

*Only lodestone and magnetite are permanent magnets.*

**Permanent magnet** – a magnet that retains its magnetism and does not need to be "recharged." *Lodestone* and *magnetite* are the only two permanent magnetic substances.

**Temporary magnet** – a magnet that occurs when near a permanent magnet, but loses its magnetism away from the permanent magnet; many metals can be temporary magnets.

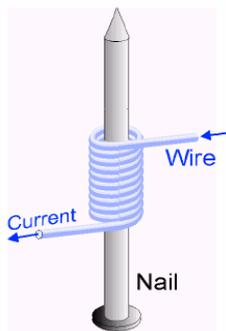
### Electromagnets

**Electromagnet**—a magnet made from electricity. When electricity moves it causes magnetism.

**Best use of an electromagnet**—we can turn it on and off.

Toasters, doorbells: any job needing a force on command needs an electromagnet.

### A simple electromagnet



### Strengthening an electromagnet –

*Increase electricity*

– more batteries or stronger battery;

*Increase number of coils*

– actually adds electricity, too.

*Add iron to the core* (center of electromagnet)

- the iron amplifies the electromagnetic field.

### Second best use of an electromagnet

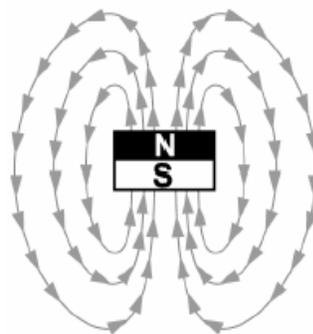
—we can control how much force we need by increasing or decreasing the electricity.

### How do Magnets Work?

*Spinning electrons cause magnetism.*

**Permanent magnets**—all of the electrons in an atom are spinning the same way and the little electromagnets add up.

**Temporary magnets**— the electrons can switch to spin in the same way when near a magnet, but will fall back after the magnet leaves.



Any magnet will reach inside the magnetic field (the arrows)

The arrows show the direction a North pole would move in the magnetic field.

### Magnetic Fields

**Magnetic Field**—the area in which a magnet or piece of metal feels the force of another magnet.

**Rules for magnetic fields**—

- drawn from North pole to South pole;
- closer or more arrows = stronger field.
- any magnet will react in a magnetic field.
- every magnet creates a magnetic field.



The magnet of a compass reacts to the Earth's magnetic field to point to **magnetic north** (in Canada), not **true north** (the North Pole).

1. Magnet	A. Where a compass points to (in Hudson Bay, Canada).	1. Compass	A. The center of an electromagnet.
2. Permanent magnet	B. Becomes a magnet near a magnet, then loses its magnetism when moved away.	2. Electromagnet	B. A magnetic navigational device that point toward magnetic north.
3. Temporary magnet	C. Anything that attracts or repels another magnet or magnetic material.	3. Magnetic field	C. The area in which magnets will feel magnetic force. More arrows show a stronger one.
4. True north	D. The North Pole; where maps point to as north.	4. Core	D. Best magnetic substance; more of this in an electromagnetic core makes it stronger.
5. Magnetic north	E. Does not lose its magnetism: lodestone and magnetite are only types.	5. Iron	E. A magnet made from electricity.

Two magnetic north poles: attract or repel?  A magnetic north and south pole: attract or repel?	Draw a simple electromagnet:
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<p>1) Label the north and south poles of the nail magnet.</p> <p>2) Draw the magnetic field lines. (don't forget arrows).</p>		Name three ways you could increase the strength of an electromagnet:
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<p>You move a 25 N object 4 meters. Find the work you did.</p> <p>_____</p>	An 5 kg object is 6 meters up a hill. Find potential energy.
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<p>You move a 3N object 15 meters. Find work.</p> <p>_____</p>	A 10 kg boat is moving 3 m/s. Find kinetic energy.
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<p>You push on a 35 N object for 3 seconds. Find work.</p> <p>_____</p>	A rock is thrown 0.8 meters into the air. Find how fast it was thrown.
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<p>You move a 4 N object 10 meters. Find work.</p> <p>_____</p>	You do 25 J of work to move a 4 N object 5 meters. Find your efficiency.
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<p>Then find power if it is done in 5 seconds.</p> <p>_____</p>	
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