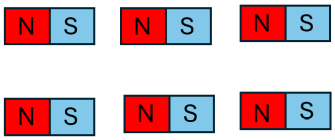
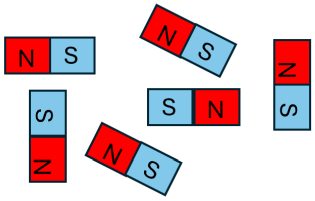
Magnetism

Magnets have a north and south pole, which are attracted to each other, while **poles of the same kind repel**. Magnets have a **magnetic field** which allows them to **act on other objects even at a distance** [1]. This is why putting magnets together will either cause them to pull together in a way that is hard to pull apart, or push each other away strongly, depending on which sides of the magnets are close to each other.

All materials are made of **atoms, each with its own magnetic field and north and south poles**. Inside most things, the atoms' magnetic fields are facing in random directions, but in a magnet, the fields face in the same direction. In **ferromagnetic materials**, like iron, atoms near a magnet will line up their magnetic fields to match the magnet. The magnet sticks to the object, as the magnet's south poles will face the object's north poles or vice versa [2].



Atom magnetic fields in a magnet



Atom magnetic fields in a non-magnetic object

Very strong magnets create a lot of force over longer distances. This can lead to cool science, like objects seeming to move on their own by putting a magnet on the object and a magnet hidden underneath it on a moving part. If the opposite poles of the magnets face each other, they will be attracted and the object will follow the moving magnet, despite not being physically connected. Magnets with the same poles facing each other can make objects float slightly if the repulsive magnetic force is stronger than gravity.

When a **magnet moves through a ring or tube that can conduct electricity**, it will create a slight electric field in the ring, which then creates a **magnetic field opposing the motion of the magnet**. This is known as **Lenz's law** [3]. For example, if we drop a magnet into a copper tube with the north pole facing down, the copper tube will have a magnetic field also facing north. This will cause the bottom of the magnet to be repelled, pushing it upward, and the top of the magnet to be attracted to the tube, slowing it down. This means that the magnet will fall much more slowly than a rubber ball dropped into the same tube.

[1] Woodford, Chris. (2008/2021) Magnetism. Retrieved from https://www.explainthatstuff.com/magnetism.html. [Accessed October 22, 2025]
[2] Britannica Editors (2025, September 15). ferromagnetism. Encyclopedia Britannica. https://www.britannica.com/science/ferromagnetism
[3] Britannica Editors (2025, October 7). Lenz's law. Encyclopedia Britannica. https://www.britannica.com/science/Lenzs-law