

Magnetic Chemistry

All chemicals are affected by magnets. The most strongly attracted are ferromagnetic substances containing the elements iron, cobalt, or nickel.

A magnetic water compass will detect ferromagnetism and find the north (N) and south (S) poles of magnets.

Stroke a large sewing needle several times in one direction with a permanent magnet, then push the needle half way through a 2 cm lump of foam plastic. Float the magnetized needle on a bowl of water and it will point to the North Magnetic Pole in Arctic Canada. This kind of compass was said to have been invented in China 17 centuries ago.

A ferromagnetic object will attract both ends of the compass needle, while a magnet will attract one end (N to S) and repel the other (N to N or S to S).

Coins and cutlery are often ferromagnetic or permanent magnets and are fun to test with the compass. Magnetically Canadian and U.S. coins are different, and, since a certain date (which you can discover with your compass), Canadian five-cent pieces have been minted from 75% copper and 25% nickel and are not ferromagnetic. They are not really "nickels", while dimes and quarters are 100% nickel.

A small (5 gauss) magnet held 2 cm from the centre of a colour TV screen will turn the faces green. Electrons, tiny pieces of negative electricity, are magnets, and the picture they make on the TV screen gets smudged from yellow and blue to green by the attraction of the magnet in front.

Pairs of electrons glue atoms together and are not magnetic. In ferro-magnets there are extra, unpaired electrons that attract the compass needle.

Steel is magnetized when rubbed on a magnet because the electrons are forced to line up N to S to make a new magnet. This happens during recording in the metal coating on an audio or videotape.

A flow of electrons in a wire is electricity and the wire becomes an electromagnet. Very powerful electromagnets, when correctly tuned, line up the magnetic nuclei of hydrogen atoms (protons). This nuclear magnetic resonance (NMR) can be used, without harm, to scan the hydrogen-containing compounds in the living human body.

Soviet chemists have recently made a plastic magnet containing only C, H, N, O, and unpaired electrons. A compound of yttrium - barium - copper -oxygen when cooled to -196 degrees C, with liquid nitrogen, is very strongly repelled by magnets.

This new substance is a superconductor and carries electricity without resistance. Superconductors should provide very cheap electricity and more powerful computers and electromagnets.

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