



## 10. Magnetite (ferrous ferric iron oxide or Fe<sub>3</sub>O<sub>4</sub>)



Magnetite occurs in all types of depositional environments in the Earth, from igneous to metamorphic to sedimentary. Its distinguishing characteristic is its attraction to a magnet. Magnetite itself is used as an abrasive, pigment in paints, and heavy media in specific gravity operations used in mining and other industries to separate less dense materials, which rise to the top. It is a primary ore of iron. Iron is one of the most common elements on the Earth's

surface, but must be found in high concentrations such as large deposits of magnetite ore to make it economically favorable to mine. Iron is an important industrial metal used to make wrought iron and steel, as mentioned previously for the other common ore of iron, hematite. Iron is used to make and build everything from the nails and screws that hold buildings together, to cars, to major appliances in your home. Iron is almost always mixed with other elements to make it into the alloy steel. The other added elements, such as vanadium, chrome, and molybdenum, give the steel higher strength and help reduce corrosion.

### Activities:

**K-2:** Magnets attract metals that have iron in them. Take a refrigerator magnet and find some things around your home that the magnet is attracted to. Things made of metal or with metal parts that you can test include paper clips, aluminum foil, nails, pots and pans, different parts of a car, and cans with food and drinks in them. Draw or write the things the magnet was and was not attracted to:



\_\_\_\_\_ Attracted to the magnet \_\_\_\_\_



\_\_\_\_\_ Not attracted to the magnet \_\_\_\_\_

**3-5:** Some metals can be turned into magnets. Take a screwdriver or a metal nail file and touch it to some small pieces of steel, such as paperclips or staples. If the screwdriver magnetically picks up these things, it is because it was already magnetized to prevent the annoyance of dropping a screw. If your screwdriver is not magnetized, rub a strong magnet (a refrigerator magnetic will not work for this) several times on the screwdriver in the same direction. Now try to pick up the same small pieces of steel. Did the screwdriver behave magnetically: Yes No



## 10. Magnetite continued

Rubbing the magnet along the screwdriver in one direction aligned the magnetic elements in it to behave as magnets. This effect will last about three months. If you were able to magnetize the screwdriver, try demagnetizing it by rubbing with the strong magnet in the opposite direction from before. Is the screwdriver demagnetized now: Yes No

**6+:** Some foods are naturally rich in iron and others are enriched or fortified with iron, which is used by the body to produce red blood cells. You carry enough iron in your body to make two small nails! To find evidence of this added iron take a few pieces of Cheerios (12.6 mg/serving) or Total breakfast cereal—or some other cereal that has a high iron content as listed on the nutrition label, typically providing 100% of the recommended daily intake of iron—and float them in a bowl of water. Get a strong magnet and move it close to the floating piece of cereal. What is the effect on the cereal:

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If you don't have a strong enough magnet, search for "magnetic Cheerios" on [YouTube](#) and watch what happens to answer.

**8+:** Take a bowl of Cheerios or Total or another iron-fortified dry breakfast cereal and crunch the cereal up with a potato masher or rolling pin until it is a fine, even powder. Put the powdered cereal into a gallon-sized self-sealing plastic food storage bag, and add some water to make it the consistency of soup. Lay the bag flat on the table and push a strong magnet around on top of the bag, without lifting it at all. Finally, move the magnet to one corner of the plastic bag and then lift the magnet. If you are using a sufficiently strong magnet, describe anything unusual that you see where the magnet was:

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Any dark eyelash-like objects that you see attracted to the magnet are iron filings!

**8+:** Lodestone is a type of magnetite with a distinct north-south polarity. The Chinese were the first to make a magnetic compass using lodestone, not for determining the cardinal directions of north, south, east, and west for navigation but initially for harmonizing the organization of their buildings and objects by using the principles of feng shui. Research how you could construct a simple compass using a lodestone, a piece of wood, water, and bowl: Sketch and briefly describe your answer:

Is the lodestone aligning with the north geographic pole or the north magnetic pole. What is the difference between the two? \_\_\_\_\_

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