



# Utah Mining Association



## Earth Science Curriculum

Developed by University of Utah Mining Engineering students for the Utah Mining Association

Piloted and refined by Alpine School District teachers

### Magnetic Cereal

Topic: Particle separation	Estimated Length (minutes): 50 minutes
Standard:	Objective:

#### Description:

- Understand the relationship between properties of matter and Earth's structure. Also observe and describe the sorting of Earth's materials in a mixture based on density and particle size with different densities, sort materials of different particle size with equal densities.
- Students will learn that some minerals are essential nutrients for human health. They'll identify essential micro-minerals and macro minerals and confirm the presence of iron in breakfast cereal.

#### Required Materials/Resources:

- Ground Rules film #3 (video) <http://www.youtube.com/watch?v=xmXT1YgfoTA>
- Flaked cereal with iron (Total)
- Nutrition labels and ingredient lists from a variety of cereals
- A strong magnet
- Small Zip lock bags
- Plates and shallow bowls
- Water
- Clear plastic cups
- Plastic straws or stir sticks
- Hand lenses or magnifying glasses

### Introduction:

- Watch Chapter 3 “Mining and the Modern World” of the Ground Rules film. <http://www.youtube.com/watch?v=xmXT1YgfoTA>
- Discuss the importance of minerals in our daily lives. Minerals have specific properties that make them useful to humans. All minerals come from the Earth’s crust and must be mined.
- Ask the class whether they have ever eaten a mineral? What minerals can we eat? Why do we eat minerals?
- Have the students bring in nutrition labels and ingredient lists from several different brands of cereal. Identify the minerals.
- Minerals only represent about 0.3% of our total intake of nutrients, but they are very important. Without these mineral nutrients, we wouldn’t be able to utilize the other 99.7% of the food we consume.
- Macrominerals are minerals that we require in substantial amounts for proper nutrition. These include **calcium, chloride, magnesium, phosphorus, potassium, sodium, sulfur and zinc**. Microminerals are minerals that we require only in trace amounts. These include **chromium, cobalt, copper, fluorine, iodine, iron, manganese, molybdenum, selenium, silicon and zinc**. These minerals can be found in various foods and in supplements.

### Activity: (Length: 20 minutes)

*The objectives of this activity are to determine whether there is actually iron in breakfast cereal and observe separation of minerals.*

1. Use a magnifying glass to examine a single flake of cereal closely. Can you see any visible traces of iron? No.
2. Place a few flakes of cereal on the table. Bring your magnet near the flakes and see if they are attracted or repelled by the magnet. You likely will not get a reaction.
3. Fill a plate or shallow bowl with water and float a few flakes of cereal on the surface. Hold the magnet close to the flakes and watch closely for any movement. Any

movement that occurs will be slight, so they will need to be patient. With practice, you should be able to make the flakes rotate or move them around the bowl in a pattern.

4. Fill a zip-lock bag half full of cereal. Seal the bag and crush the cereal into a fine powder.
5. Pour enough water into the bag to make a thin cereal paste. It should be about the consistency of thick soup.
6. Pour your cereal mixture into a clear plastic cup.
7. Hold the magnet against the outside of the cup in one location. Stir the mixture gently with a straw or stir-stick (nothing magnetic). After two or three minutes, you should see an accumulation of iron particles on the side of the cup near your magnet. Use a magnifying glass to see the particles better.

#### **Discussion:** (Length: 15 minutes)

- Why did we use a magnet to test for the presence of iron? Were you able to see the iron in the cereal flake? Why not?
- Why was it easier to move the flakes around when they were floating on the water than when they were on the table?  
*Friction between the flakes and the table surface was too great to be overcome by the attraction of the iron to the magnet. By floating the flakes on the surface of water, friction was reduced.*
- What step in the mining process was simulated by crushing the cereal into a powder?  
*This process simulates the crushing process used in mining to extract minerals (such as iron) from the surrounding waste rock.*
- What is the function of iron in the human body?  
*Iron carries oxygen to the cells and is necessary for the production of energy, the synthesis of collagen, and the functioning of the immune system. Iron is found in meat, fish, beans, spinach, molasses, brewer's yeast, broccoli and seeds. It can also be added to various foods, such as cereal.*

#### **Real World Application:** (Length: 15 minutes)

- Recognition and awareness of where minerals come from. How are these minerals obtained?
- What careers, jobs, equipment, etc. are needed for these activities?