SNC1D/1P Atoms, Elements and Compounds/Exploring Matter

Teacher Demo/Student Activity: There's Iron in Your Cereal?

Topics	Timing
elements physical properties and changes homogenous and heterogenous mixtures	preparation: 20 min demonstration: 15 min

Specific Expectations

SNC1D

A1.5 conduct inquiries, controlling some variables, adapting or extending procedures as required, and using standard equipment and materials safely, accurately, and effectively, to collect observations and data

A1.10 draw conclusions based on inquiry results and research findings, and justify their conclusions

C1.1 assess the usefulness of and/or the hazards associated with common elements or compounds in terms of their physical and chemical properties [AI, C]

C2.2 conduct an inquiry to identify the physical and chemical properties of common elements and compounds (e.g. magnesium sulfate, water, carbon, copper II) [PR]

C3.4 describe the characteristic physical and chemical properties of common elements and compounds (e.g., aluminum is a good conductor of heat; copper reacts to moist air by developing a greenish surface of copper carbonate; sodium carbonate is a white, odourless powder that dissolves in water; water has unique physical properties that allow it to support life)

SNC1P

A1.5 conduct inquiries, controlling some variables, adapting or extending procedures as required, and using standard equipment and materials safely, accurately, and effectively, to collect observations and data

A1.10 draw conclusions based on inquiry results and research findings, and justify their conclusions

C1.1 analyze how the chemical and physical properties of common elements and/or simple compounds affect the use of everyday materials that contain those elements and/or compounds [AI, C]

C2.2 use an inquiry process to identify the physical and chemical properties of common elements and simple common compounds, including gaseous substances (e.g., sulfur is a yellow solid; sodium chloride is water soluble; nitrogen gas is colourless, odourless, and very unreactive) [PR, AI]

C3.7 identify the elements and compounds in common household products (e.g. hydrogen peroxide, lye, salt)

Introduction

This demo shows how flakes of iron can be extracted from iron-fortified cereals with the use of a strong magnet. The demo shows a physical separation process and provides students with a good example of how one component (the iron) can be separated from a heterogenous mixture (the cereal). The demonstration can lead to discussions about the need of, and uses for, iron in biological systems.

Materials

chemical safety goggles
iron-fortified cereal (about 1 cup)
re-sealable plastic bag or a 250 mL beaker
strong magnet
mortar and pestle (or rolling pin)
water

Safety Considerations

None

Procedure

Wear appropriate PPE: safety goggles.

1. Pour the dry cereal into a re-sealable plastic bag or beaker.

Part One - Whole Flakes

2. **Predict/Explain**
   Ask students to predict what will happen if you pass a strong magnet over the flakes of cereal. Invite an explanation for their prediction.
3. **Observe**
   Pass a strong magnet, outside of the bag, over the flakes of cereal. Note any movement of the flakes. Have students revisit their prediction and make any adjustments necessary.

Part Two - Crushed Flakes

4. Crush the cereal flakes using a mortar and pestle until it becomes a fine powder.
5. **Predict/Explain**
   Once again, ask students to predict what will happen if you pass a strong magnet over the powdered cereal. Have students provide an explanation for their prediction.
6. **Observe**
   Pass the magnet closely over the cereal powder, again on the outside of the bag.

Part Three - Crushed Flakes in Water

7. Half fill the bag (containing crushed cereal) with water, seal it, and mix well.
8. **Predict/Explain**
   Ask students to predict what will happen if the magnet is inserted into the bag. Have students provide an explanation for their prediction.
9. **Observe**
   Insert the magnet into the bag and gently mix. Remove the magnet from the bag and inspect the magnet. Note any iron particles that have been removed.
10. **Explain**
    Have students revisit their prediction and make any adjustments necessary.

Disposal

The crushed flakes and water can be disposed of down the sink. Follow disposal procedures that are consistent with school board protocol and appropriate for your municipality.

What happens?

In Part One, the magnet will not have a noticeable effect on the cereal flakes and no iron particles will be found on the magnet. Once the cereal is in powder form (Part Two), the magnet will attract small iron particles. After mixing with water (Part Three) the magnet will extract even more iron particles.

How does it work?

Iron-fortified cereals are heterogenous mixtures that contain particles of iron. These particles can be removed with a magnet. The separate components of the original mixture conserve their physical properties.

Teaching Suggestions/Hints

1. This demonstration dramatically shows the presence of iron in iron-fortified cereals.
2. It is important that the cereal flakes are crushed into a very fine powder. The finer the powder, the easier it will be to separate the iron particles. If a mortar and pestle are not available, leave the cereal in the plastic bag and use a rolling pin to crush the flakes to a powder.
3. It is important that the magnet is strong. A magnetic stir bar works well. The stronger the magnet, the easier it will be to separate the iron particles.

Next Steps

Repeat the demo using different kinds of cereal. From which one can you collect the most iron? Do the findings relate to the information on the nutrition labels?

Additional Resources

1. A more detailed explanation of this demonstration - http://www.scientificamerican.com/article.cfm?id=get-the-iron-out-of-your-breakfast-cereal-bring-science-home
2. A video of this demonstration - http://www.youtube.com/watch?v=XodLfNHg010