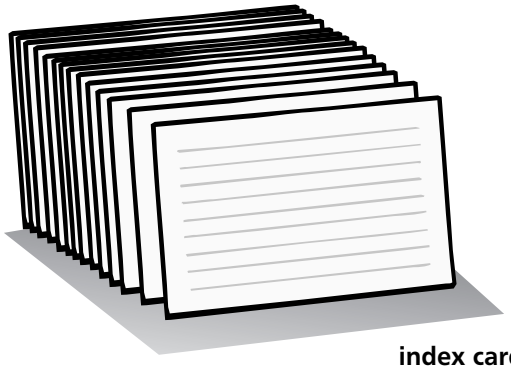
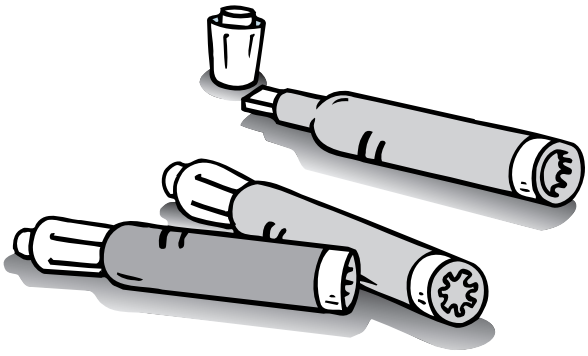
Chapter Science Investigation Name _____

Investigating Elements

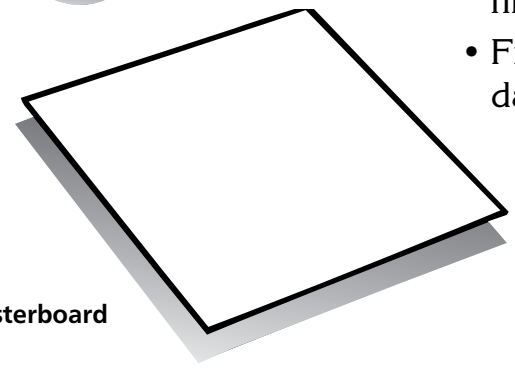
What You Need



index cards



markers



posterboard

Find Out

Do this activity to see how an element in the periodic table compares to other elements.

Process Skills

- Constructing Models
- Predicting
- Communicating
- Using Numbers
- Classifying
- Interpreting Data

Time

- One hour on the first day
- Five minutes each day for two weeks

What to Do

1. On the index cards, write the names of the elements with the atomic numbers 1 through 35. Have your teacher shuffle the cards and pass one card out to everyone in the class.

2. When you receive your card, look up the element on the periodic table. This will be your element for the next two weeks.

3. **Predict** which elements might have similar chemical properties to your element and which will have similar numbers of protons, neutrons, and electrons. **Record** your predictions.

4. **Draw** the atom that makes up your element on posterboard.

5. Use the atomic number that is listed on the periodic table to help you include the correct number of protons, neutrons, and electrons.

6. **Classify** your element as a metal, nonmetal, or metalloid. On the posterboard, describe what properties your element might have, based on its being a metal, nonmetal, or metalloid.

7. Hang up your posterboard in the classroom.

8. For the next two weeks, look around for your element. Check the labels on the foods you eat and the liquids you drink. Look in books at the library and ask other people. Find out in what places or in what products your element can be found. **Write** or **draw** on your posterboard all of the information you find during the next two weeks.

Predictions: _____

Predictions will vary.

Conclusions

1. What element did you have? How many protons, neutrons, and electrons did it have?
Answer will depend on the element. The number of protons and electrons in an atom equals the atomic number of that element, and the number of neutrons in an atom equals the number of protons (except its isotopes).

2. In what family and period is your element? Were there other elements in the same family on other posterboards?
Answer will depend on element and position on table.

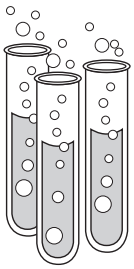
3. How did your element compare to other elements in the same family? In the same period?
Elements in same family may have similar chemical properties; elements in the same period, particularly those with one higher and one lower atomic number, will have similar numbers of protons, neutrons, and electrons.

New Questions

1. How are elements different from compounds? Did you find a compound that had your element in it?
A compound is made up of more than one kind of atom. Answer will depend on element chosen.

2. How does your model compare to a real atom?
The model is like a real atom because it has the same number of protons, neutrons, and electrons. The model is unlike the real model because it is far bigger in size; the relative sizes of the protons, neutrons, and electrons are not to scale; the distance between the nucleus and the electrons is not to scale; and a real atom is three-dimensional and in constant motion.

3. How could you change the model to make it more realistic?
Answers will vary but may include: making the parts of the atom smaller, making the distance between nucleus and electrons greater, making a three-dimensional model.



Name _____

ACTIVITY

Investigating Matter

What is the shape of your container? **Describe** it or **draw** a picture.

Note: Answers to these questions will depend on the shape of the container and what is in it.

What are the **measurements** of your container?

What do you **observe** when you:

Tilt the box?

Shake the box?

Pass the magnet over the box?

Predict what is inside the box on the basis of the data you collected.

Predictions will vary.

Draw a picture of what you think is inside the box.

Drawings will vary.

Name _____

Conclusions

1. What information did you use to **infer** what was in the box?
Answers will vary depending on the contents of the box.

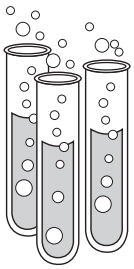
2. Did any articles in the box roll or slide about? Did anything inside the box respond to the magnet?
Answers will vary.

3. How did your prediction compare to those of the other members in your group? How can you explain any differences?
Answers will vary.

Asking New Questions

1. How do you think that this activity might resemble the way scientists developed the idea that all matter is made up of atoms?
Students may say that, like scientists who use indirect evidence to explain events or concepts, they had to infer what was inside the box on the basis of indirect evidence gathered through experimentation.

2. Do you think the theory that all matter is made up of atoms will ever be changed? Why or why not?
Answers will vary. Students may say that if better or more direct observations of atoms can be made, the theory might change.



Name _____

ACTIVITY

Making a Model of a Molecule

How do the water molecule and salt molecule look different from one another?

Answers will vary and may include that the water molecule has a two-to-one ratio of hydrogen to oxygen atoms. The salt compound has a one-to-one ratio of sodium to chloride atoms.

Draw your compound model. Drawings will vary.

Name _____

Conclusions

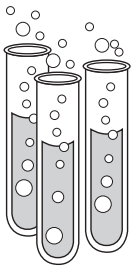
1. **Infer** how your models of water and salt molecules are different from the real water and salt molecules.
Answers will vary and may include that actual molecules would be too small to see, would be made up of smaller particles, and would be in constant motion.

2. **Infer** how your models are like the actual molecules.
Answers will vary and may include that the ratio of atoms would be the same in actual molecules.

Asking New Questions

1. What structures of hydrogen, oxygen, sodium, and chlorine atoms were not shown in your model?
protons, neutrons, and electrons

2. Do you think that any two elements could combine to form a compound? Why?
Answers will vary. Not just any two elements will join together to form a compound; the arrangement of atomic particles will determine how elements will react.



Name _____

ACTIVITY

Investigating Metals and Nonmetals

Use the chart to **record** your observations.

Elements	Observations	Conducts Electricity?
Aluminum (Al)	Answers will vary.	yes
Carbon (C)	Answers will vary.	no
Lead (Pb)	Answers will vary.	yes
Sulfur (S)	Answers will vary.	no
Iron (Fe)	Answers will vary.	yes
Tin (Sn)	Answers will vary.	yes
Copper (Cu)	Answers will vary.	yes
Zinc (Zn)	Answers will vary.	yes

Name _____

Conclusions

1. Which samples conducted electricity?
aluminum (Al), copper (Cu), zinc (Zn), tin (Sn), iron (Fe), and lead (Pb)

2. By looking at the periodic table, which elements that you tested are metals and which are nonmetals?
metals: aluminum (Al), copper (Cu), zinc (Zn), tin (Sb), iron (Fe), and lead (Pb); nonmetals: carbon (C) and sulfur (S)

3. On the basis of the data you collected, what characteristics do most metals have and most nonmetals have?
Most metals conduct electricity and are shiny. Most nonmetals are dull in appearance and do not conduct electricity.

Asking New Questions

1. Which elements that you tested are in the same families? Periods?
Depending on elements used, carbon (C), lead (Pb), and tin (Sn) are in the same family (family or group 14). Both aluminum (Al) and sulfur (S) are in period 3. Iron (Fe), copper (Cu), and zinc (Zu) are in period 4.

2. What are some other properties of metals and nonmetals?
Most metals exist as solids at room temperature, are shiny, and are good conductors of heat and electricity. Most nonmetals are gases at room temperature, are hard and brittle when solid, and do not conduct heat or electricity well.