

Exploring the Electrical Nature of Matter

PROBLEM

What evidence is there that atoms are composed of smaller, electrical particles?

INTRODUCTION

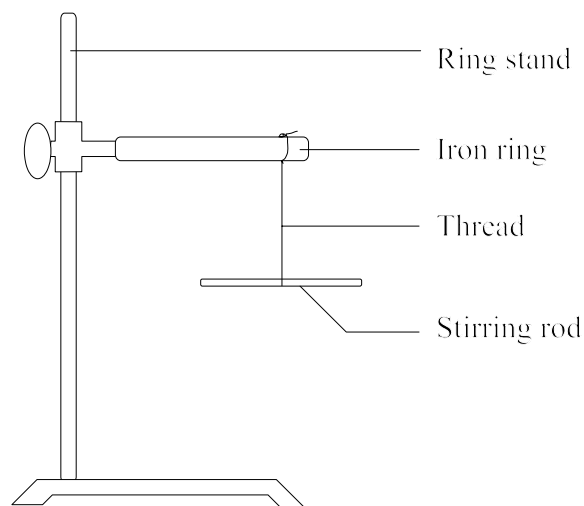
Dalton's model of the atom maintained that the atom was indivisible. More recent models of the atom suggest that the atom is composed of an equal number of oppositely charged electrical particles. If this newer model is correct, it should be possible to separate these oppositely charged particles and see some evidence of the electrical charges. In this laboratory investigation you will use uncharged matter and show that it is composed of moveable electrical charges. You will do this using the **Law of Electrical Charges**, namely, that opposite charges attract while like charges repel.

MATERIALS (per group)

Paper towel; paper (sheet); ring stand and iron ring; scissors or hole punch; stirring rods (2); tap water; thread

PROCEDURE

1. Cut a handful of paper bits from a sheet of paper using scissors or a hole punch. Bring one end of a clean, dry glass stirring rod next to the pieces of paper and note if anything happens. Record your observations on the next page. Indicate if the paper and the stirring rod attract, repel, or nothing happens.
2. Rub one end of the stirring vigorously against your hair. (*NOTE: For best results, hair should be dry.*) Bring the rubbed end of the stirring rod next to the pieces of paper and note if anything happens. Record your observations on the next page.
3. Wait about 2 minutes. Bring the rubbed end of the stirring rod next to the pieces of paper and note if anything happens. Record your observations on the next page.
4. Turn on the tap so a thin stream of water is flowing. Rub one end of the stirring vigorously against your hair. Bring the rubbed end of the stirring rod next to the thin stream of water and note if anything happens. Record your observations on the next page.
5. Wait about 2 minutes. Bring the rubbed end of the stirring rod next to the thin stream of water and note if anything happens. Record your observations on the next page.
6. Set up a ring stand and iron ring as shown in the diagram to the right. Tie one end of a thread tightly around the center of a glass stirring rod. Tie the other end of the thread around the iron ring. Adjust the position of the stirring rod so it is perfectly balanced.
7. Rub the stirring rod vigorously with a paper towel, making sure it stays balanced. Rub a second stirring rod vigorously with a paper towel and quickly bring it to the stirring rod suspended from the iron ring. Note if anything happens. Record your observations below.



8. Repeat step 7, but wait 2 minutes before bringing the rods together. Note if anything happens. Record your observations below.
9. Rub the suspended stirring rod vigorously with a paper towel, making sure it stays balanced. Then bring the paper towel close to the part of the stirring rod you rubbed. Record your observations below.
10. Repeat step 9, but wait 2 minutes before bringing the rod and the paper towel together. Record your observations below.

~~OBSERVATIONS~~ **OBSERVATIONS**

For each of the observations you made indicate if there was ATTRACTION, REPULSION, or NOTHING.

- [a] Paper and rod before rubbing (Step 1) _____
- [b] Paper and rod after rubbing (Step 2) _____
- [c] Paper and rod after rubbing and waiting (Step 3) _____
- [d] Water and rod after rubbing (Step 4) _____
- [e] Water and rod after rubbing and waiting (Step 5) _____
- [f] Two rods after rubbing (Step 7) _____
- [g] Two rods after rubbing and waiting (Step 8) _____
- [h] Paper towel and rod after rubbing (Step 9) _____
- [i] Paper towel and rod after rubbing and waiting (Step 10) _____

~~CONCLUSIONS~~ **CONCLUSIONS**

1. Explain what causes attraction, repulsion, or no response. _____

2. Explain why the observations in step 1 and step 2 were different. In your explanation describe how the difference was caused by rubbing. _____

3. What effect does waiting have on your observations. Why? _____

4. Compare your observations in step 7 and step 9. Explain why these observations make sense. _____

5. What evidence is there that atoms are composed of electrical particles? _____

