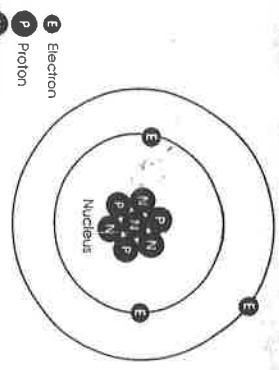




What Are Atoms?

Matter is made of **atoms**. Atoms are sort of like building blocks or bricks in a building. Like blocks and bricks, some atoms fit together well to make something larger and some don't.

To understand chemical changes, we need to understand what atoms are. Atoms are the smallest bits of matter that get changed around during a chemical change. But, like building blocks, atoms don't change so they will fit better. Think of a child playing with building blocks. She wouldn't saw a block in half to make it fit better.



Atomic Model

About 200 years ago, scientists agreed that matter is made of atoms. It took another 100 years to learn what the main parts of atoms are and how they are arranged. This picture shows the three main parts of an atom. They are electrons, protons, and neutrons.

This is called an **atomic model**. A model is not a true picture of a thing. Scientists use models like this to help explain things that are hard to picture exactly. These are some ideas that the atomic model helps us understand:

1. Atoms are mostly empty space.
2. The three main parts of an atom are **electrons**, **protons**, and **neutrons**.
3. Most of the mass of an atom is in the small center area called the **nucleus**. The nucleus is where all the neutrons and protons are found.
4. Electrons circle the nucleus at different distances.
5. Neutrons and protons have about the same mass. Electrons have much less mass than neutrons or protons.
6. The number of electrons in an atom equals the number of protons. The number of neutrons is about the same but can be a little different.
7. Electrons have a minus (or **negative**) electrical charge. Protons have a plus (or **positive**) electrical charge. Neutrons have no charge.

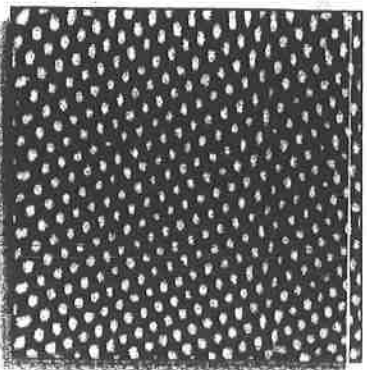


What Are Atoms?

Now let's put all these ideas together: In an atom, small, negative electrons circle the nucleus. The nucleus is made of larger, positive protons and uncharged neutrons. Atoms are mostly empty space. Most of an atom's mass is in the middle. The number of electrons equals number of protons.

Scientists have learned a lot more than this, but these are the most important things to remember about atoms.

The model on page 8 shows one kind of atom, called a lithium atom. There are about 100 other kinds of atoms, each with its own numbers of electrons, protons, and neutrons.



Actual atoms

STOP

Suppose the atomic model shown did not have the electrons, protons, and neutrons named. How could you tell which were the **PROTONS**?

All of these things about atoms were figured out before anyone ever saw an atom. People just thought hard about how matter behaved in experiments. They got ideas, which led to more experiments. After many years, they came up with this model of the atom.



What Are Atoms?

Put a check mark (✓) next to the answer that is most correct.

1) Which is true about an atom?

- A Atoms have no mass.
- B Atoms are mostly empty space
- C Most of the space in an atom is taken up by the nucleus.
- D Electrons have much more mass than protons or neutrons.

2) Which two things have about the same mass?

- A protons and atoms
- B atoms and electrons
- C neutrons and protons
- D electrons and protons

3) Which did scientists understand first?

- A Matter is made of atoms.
- B Electrons circle the nucleus.
- C Atoms are mostly empty space.
- D Atoms are made of electrons, protons, and neutrons.

Fill in each blank with a word from the list. Some words will be used more than once.

electron nucleus neutron proton

1) _____s circle the nucleus.

2) The _____ is made up of neutrons and protons.

3) _____s have a plus charge.

4) Most of the mass of an atom is in the _____.

5) Atoms have the same number of _____s and _____s.

6) _____s have no charge.



What Are Atoms?

3. Tell what kind of electrical charge electrons, protons, and neutrons have.

4. Where are electrons, protons, and neutrons found in an atom?

Extensions & Applications

5. On the next page are a table and a diagram about atoms for you to complete.

a) Show what you have learned about electrons, protons, and neutrons by filling in the table on the next page.

A. In each box under Mass, write a lot of a little.

B. In each box under Charge, write plus, minus or zero.

C. In each box under Position, write inside or outside.

D. In the last boxes on the right, put a check mark in the two boxes for the parts of an atom that have equal mass.

b) Show what you have learned about electrons, protons, and neutrons by labeling the diagram of the atom on the next page.

6. a) After scientists decided matter is made of atoms, it took about 100 years to figure out the parts of an atom. Why do you think it took so long?

b) Is an atomic model the same as a real atom?

c) How is an atomic model useful?



What Are Atoms?

a) Complete the table with information from the reading passage.

Atom Part	A. How much mass? A lot or a little?	B. Electrical Charge plus, minus, or zero?	C. Position inside or outside the nucleus?	D. Which two have about equal mass?
Electron				
Proton				
Neutron				

b) Label the parts of the atom in the diagram below. Write **E** in the circle if it is an ELECTRON. Write **P** in the circle if it is a PROTON. Write **N** in the circle if it is a NEUTRON.

Atomic Model

