THE ATOM

Atoms are the basic units of matter. Matter is anything that has mass and takes up space in the universe. The idea that all matter is made up of tiny particles was first suggested in 440 B.C. by the Greek philosopher Democritus. He called these particles "atomos" which means not dividable. In the early 1800s, a chemist named John Dalton built on this idea when he wrote his atomic theory. Scientists such as Ernest Rutherford, James Chadwick, and J.J. Thompson proved that the atom was made of even smaller subatomic particles known as protons, neutrons, and electrons.

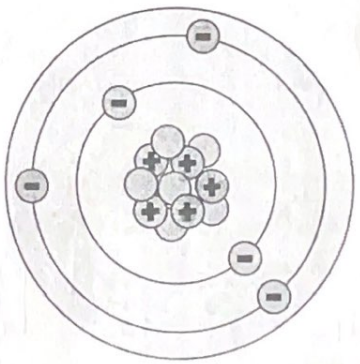
In the center of an atom is the nucleus. In the nucleus are tightly packed particles called protons and neutrons. Protons have a positive electrical charge and neutrons are neutral and have no charge. Protons and neutrons have about the same mass and are said to equal 1 atomic mass unit (AMU).

Atoms all have at least one proton in their nucleus. The number of protons in an atom determines what type of element it is. For example, all Hydrogen atoms have one proton and all Helium atoms have two protons. The number of neutrons in atoms of the same element can differ. Hydrogen is the only element that doesn't have at least one neutron.

Electrons are negatively charged particles that move around the nucleus in electron shells or levels. Electrons have a mass of about 1/1850 that of a proton. They are very small and do not add much to the mass of an atom.

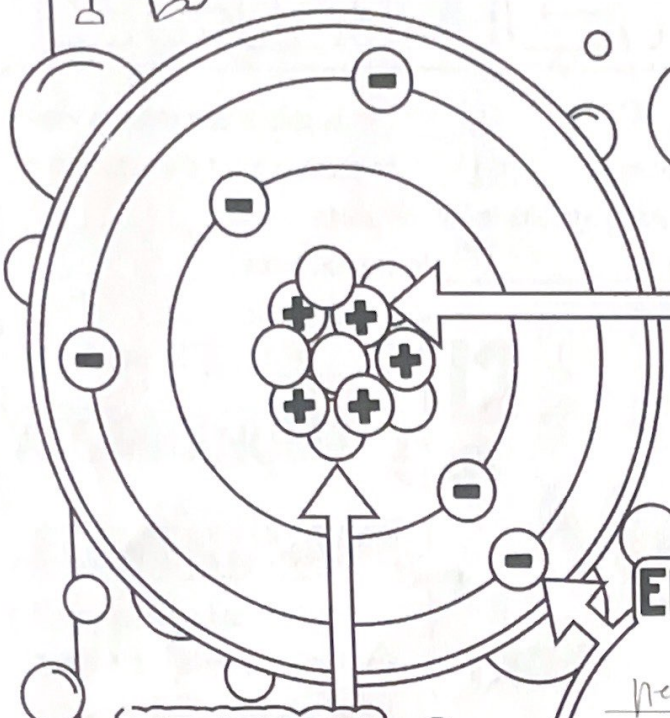
The total mass of the atom is made up of the protons and neutrons in the nucleus. However, the nucleus is very small compared to the size of the atom. Most of the volume of an atom is empty space between electron shells.

A regular atom has the same number of protons and electrons. This means that atoms are electrically neutral, the positive charges equal the negative charges. Hydrogen has one proton and one electron, Helium has two protons and two electrons, etc. Later, you will learn how atoms can lose or gain electrons and become what are known as ions.



PARTS OF AN ATOM

All matter is made of tiny particles called atoms.
Atoms are made of even smaller subatomic particles called protons, electrons and neutrons



PROTON

positively charged particles in the nucleus that have a mass of one AMU. The number of protons determines the element of an atom. For example hydrogen has one, helium has two.

AMU = ATOMIC MASS UNIT

ELECTRON

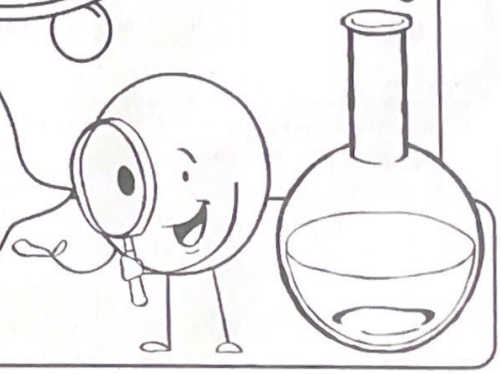
negatively charged particles in the electron shells or levels. The mass of an electron is 1/1850 than that of a proton, so it does not add significant mass to the atom.

NEUTRON

Neutral particles in the atom of the atom. They have no charge and have a mass of one AMU. Hydrogen is the only element that does NOT have at least one neutron in its nucleus.

WOW!

Atoms are so small! The dot on this i contains about 1 trillion atoms!



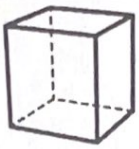
Atoms are mostly empty space. The mass comes from the protons and neutrons in the nucleus!

substance that cannot be broken down into simpler substances
Chemical means. An element is composed of atoms that have
e same number of protons in their nucleus.

ELEMENTS

Every element has a unique atomic number.
It indicates the total number of protons in the nucleus of the atom. Normal atoms are electrically neutral, same number of protons as electrons. So it is also the number of electrons.

ATOMIC NUMBER



12

Mg

Magnesium

24.305

ELEMENT NAME

Every element has a unique name. Many element names are very old and are based on other languages. Chlorine is named after "khloros," the Greek work for "yellowish green." Newly discovered elements are named by the discoverer, but must be approved by an international committee.

SYMBOL

Every elements is abbreviated using a unique symbol of one or two letters. The first letter is always capitalized and if there is a second letter, it is lower case.
Some are based on other languages, for example the symbol Fe is Iron from the Latin "ferrium."

ATOMIC MASS

Atomic mass is the mass of the protons and the neutrons in an atom. Every proton and neutron has a mass of one AMU. Electrons do Not count towards the mass because they are tiny. The mass can be shown with a decimal because it is an average mass of the isotopes of that element.

You try:

What element's neutral atom has 17 electrons?
Chlorine

How many neutrons are in a lithium atom?
4

What do you think the cube symbol in the upper right means?
natrally a solid