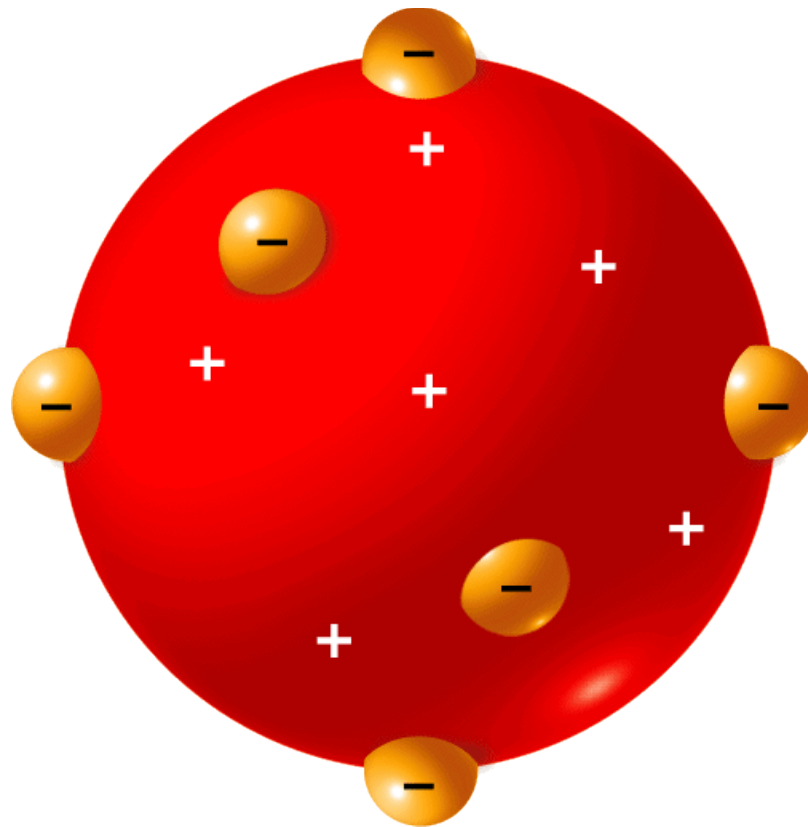


Do Now

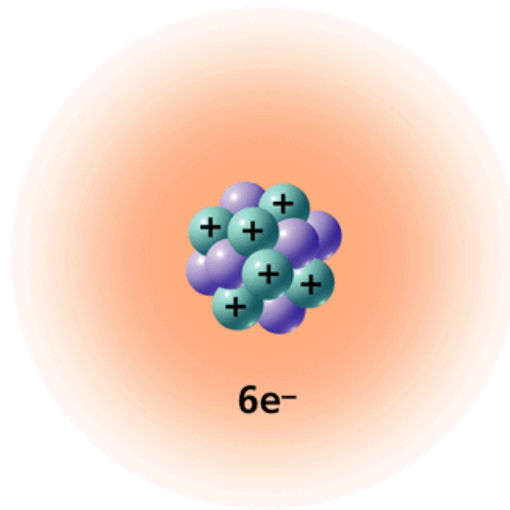
Complete the Pre-test handout. Work alone.

The Structure of an Atom



By 1920, Ernest Rutherford had already presented evidence of two subatomic particles and had predicted the existence of a third.

Modern Atomic Model ▶
The nucleus, which contains both protons and neutrons, is surrounded by a cloudlike region of electrons.



The subatomic particles are named *protons, electrons, and neutrons*.



Protons

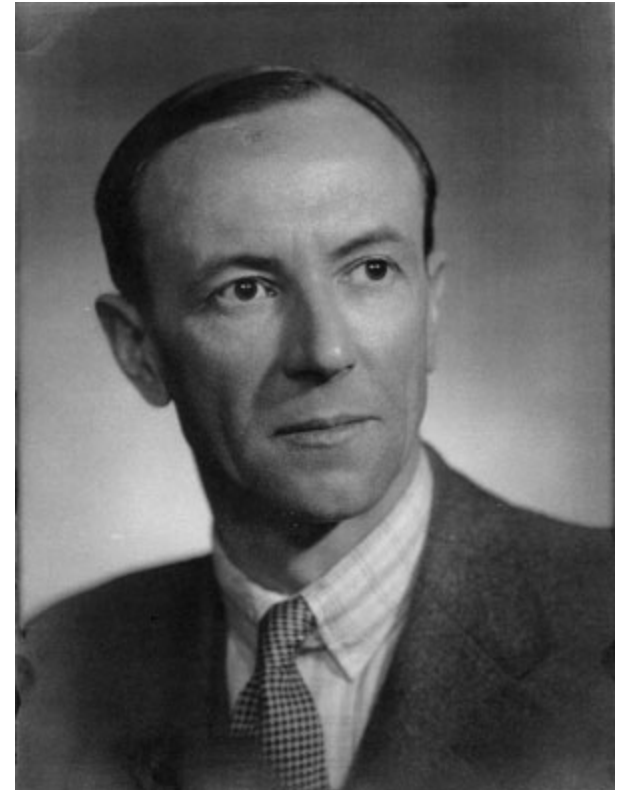
- A **proton** is a positively charged particle found in the nucleus of an atom.
- Each nucleus must contain at least one proton.
- Protons are given a charge of $1+$, and is expressed as “ p^+ ”.

Electrons

- An **electron** is a negatively charged particle found in the space outside of the nucleus.
- Each electron has a charge of 1^- , and is expressed as “ e^- ”.

Neutrons

- James Chadwick was the first to name a neutron.
- A **neutron** is a neutral particle found in the nucleus of an atom.
- Neutrons have almost the same mass as protons and are expressed as “n”.



Comparing Subatomic Particles

Particle	Symbol	Relative Charge	Relative Mass
Proton	p ⁺	+1	1
Neutron	n	neutral	1
Electron	e ⁻	-1	1/1836

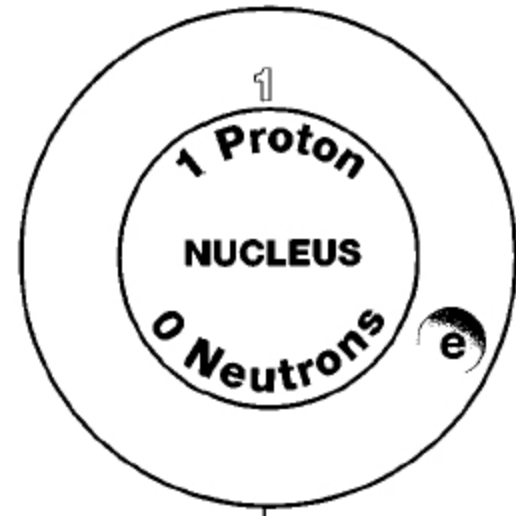
Atomic Number

- The **atomic number** of an element is equal to the **number of protons** in that element.

Example: HYDROGEN

Hydrogen is assigned atomic number 1 because it has only 1 proton.

- Neutral elements must also have equal number of electrons to balance the + charge of the protons.



Hydrogen gas is extremely flammable



Answer these questions on your notes:

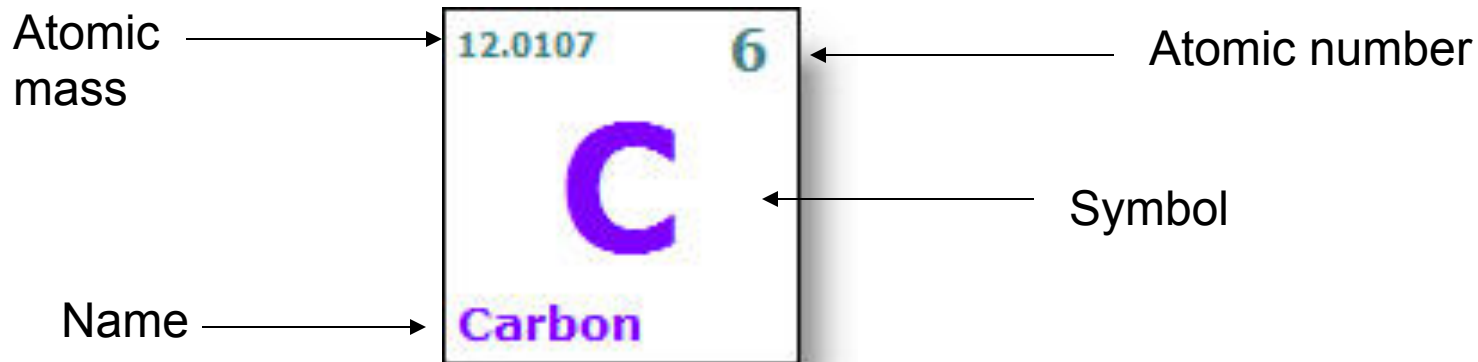
1. If sulfur has an atomic number of 16, how many protons does it have?
2. If iron has 26 protons, how many electrons does it have?
3. If silver has 47 protons, what is its atomic number?

Atomic Mass Number

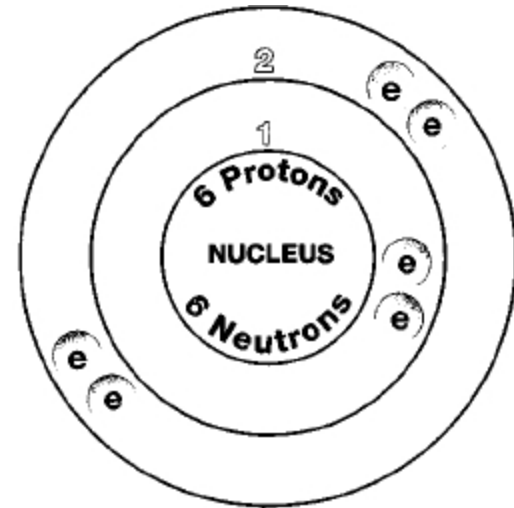
- The **atomic mass number** of an atom is the total of the protons and neutrons in the nucleus.
- If you know the atomic number (the # of protons) as well as the atomic mass number of an atom, you can find the number of neutrons by subtracting.

Ex: Aluminum has mass # of 27 and atomic # of 13. How many neutrons are in the nucleus?

How are elements written?



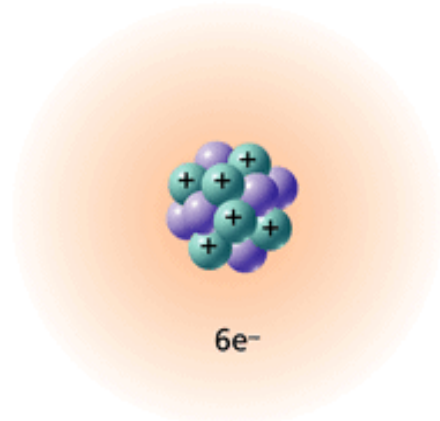
Carbon has 6 protons (atomic number), balanced by 6 electrons. It has a mass number of 12 (6 protons + 6 neutrons). **Atomic mass** is the mass of the protons + neutrons in the nucleus.



Isotopes

- As Dalton said, “Every atom of a given element has the same number of protons and electrons”.
- However, every atom of a given element does not have the same number of neutrons.
- Isotopes of an element have a different number of neutrons.

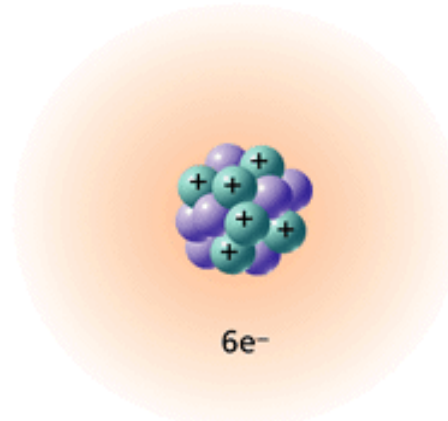
The atomic number (number of protons) for each Carbon isotope is 6. But notice how the mass number changes as the number of neutrons increases. Because each isotope is neutral in charge, the number of electrons remains equal to the number of protons.



6e⁻

Carbon-12

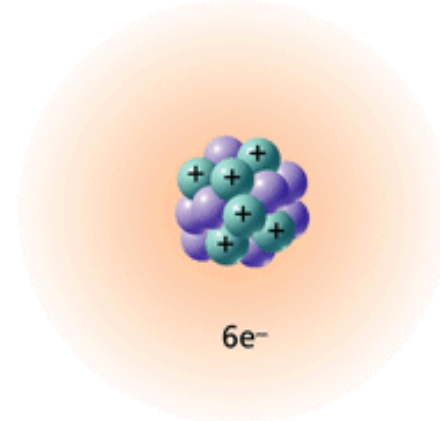
6 Protons
6 Neutrons
6 Electrons



6e⁻

Carbon-13

6 Protons
7 Neutrons
6 Electrons



6e⁻

Carbon-14

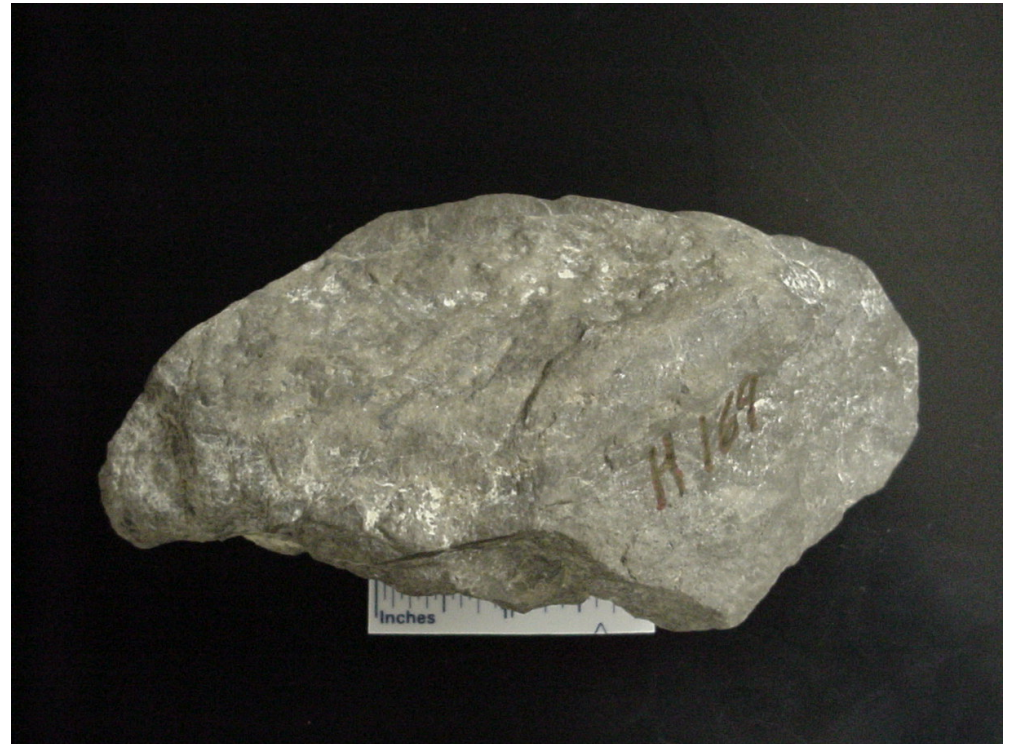
6 Protons
8 Neutrons
6 Electrons



Isotopes of an element have the same atomic number but different mass numbers because they have different number of neutrons.

Problem: Uranium-238 has a mass number of 238 with 146 neutrons in the nucleus. An isotope, Uranium-235 has 143 neutrons in the nucleus.

What is the atomic number of Uranium?



Closure:

How do you calculate the atomic mass of an atom?