

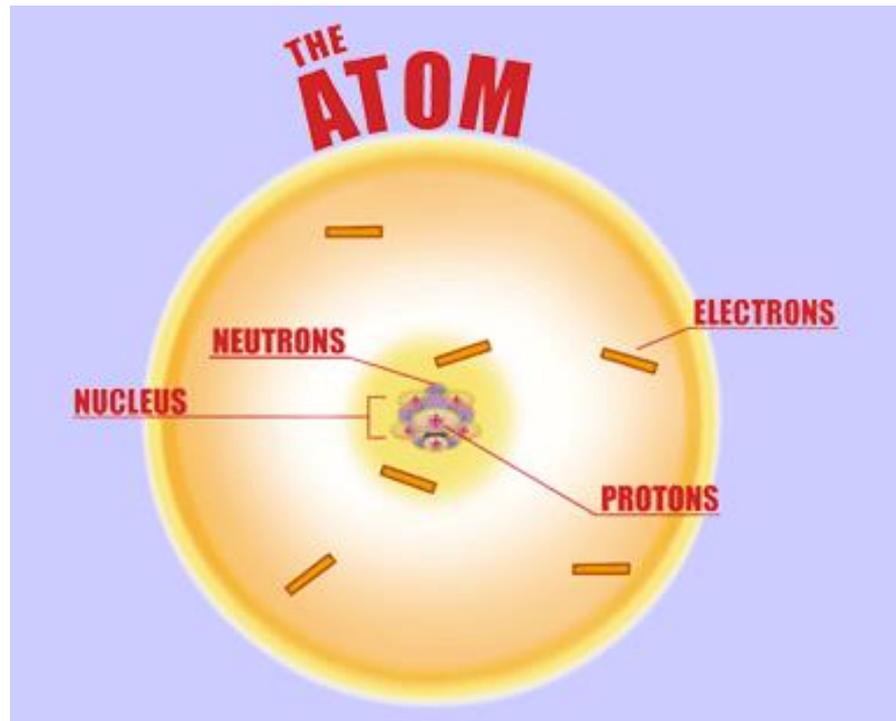
5.2 - The Structure of the Atom

SNC1D

Recap . . .

An **atom** is the smallest particle of an element that still has the property of that element.

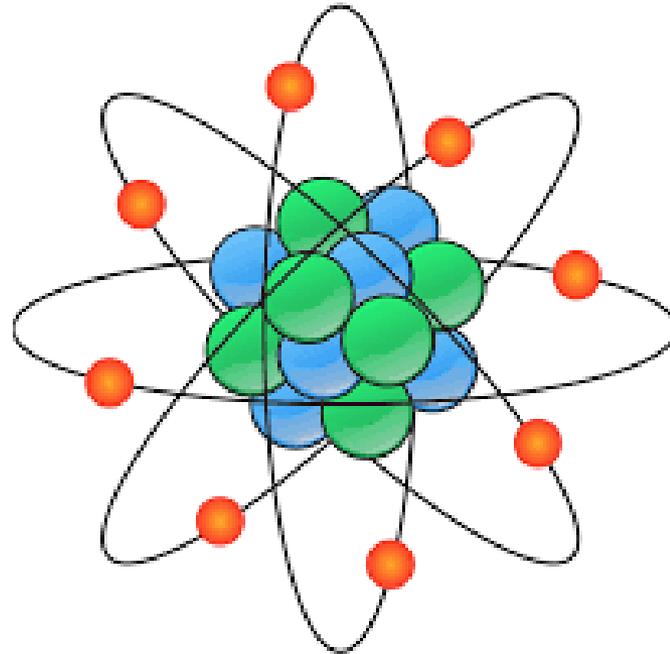
How big is an atom?



Recap . . .

<https://www.youtube.com/watch?v=o-3I1JGW-Ck>

What is an atom?



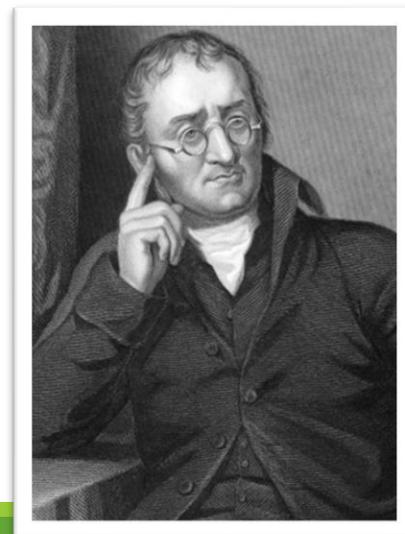
Recap . . . Dalton's Atomic Theory

All matter is made of small particles called **atoms**.

Atoms cannot be **created, destroyed, or divided**.

All atoms of the same element are identical in **mass** and **size**. The atoms of one element are different from the atoms of other elements.

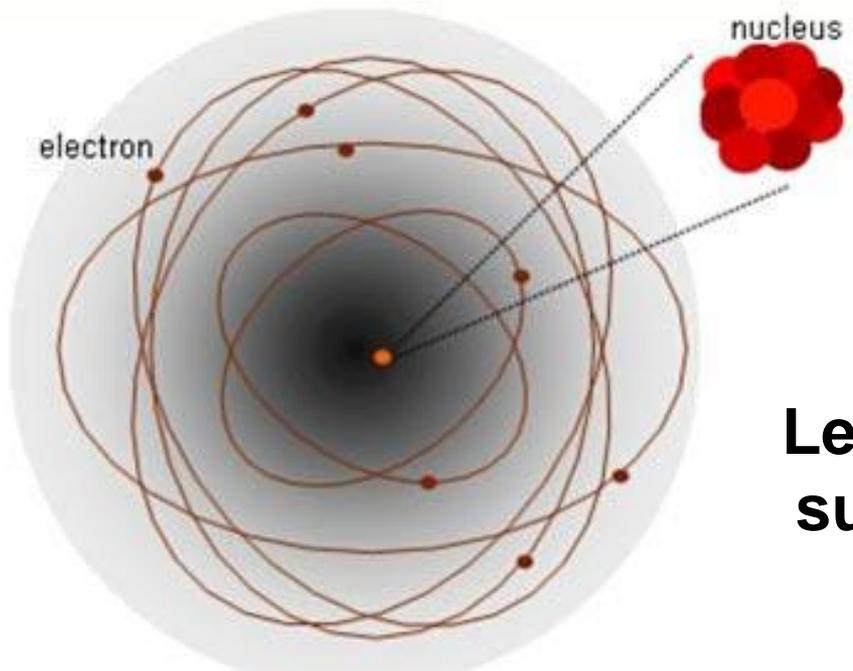
Compounds are created when atoms of different elements link together in fixed proportions.



Structure of an Atom

**Dense core:
the nucleus**

Contains
**protons and
neutrons**

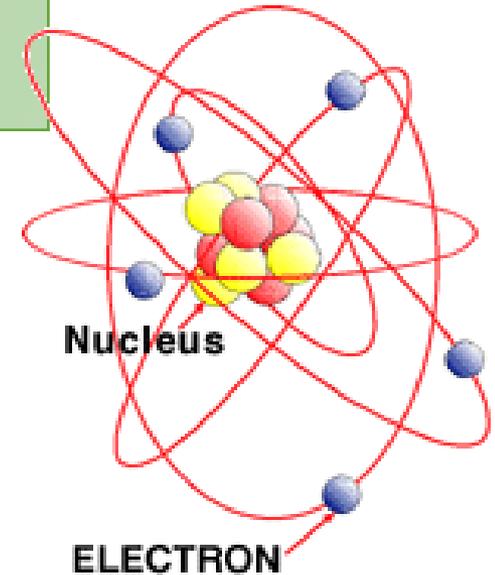


**Less dense area,
surrounding the
nucleus**

Contains
electrons

Expressed in
atomic mass units
(a.m.u)

| Particle | Mass | Charge | Location in the atom |
|----------|---------|--------|--|
| proton | 1 | 1+ | nucleus |
| neutron | 1 | 0 | nucleus |
| electron | ~1/2000 | 1- | orbiting the nucleus, contained within shells |



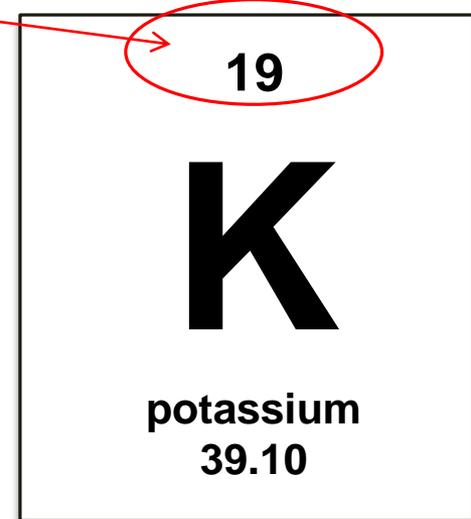
Comparing Atoms of Different Elements

- equal to the number of _____ * in the nucleus
- all of the elements have their own unique **atomic number**

*Potassium (K) has an atomic number of 19.
There are **19 protons** in its nucleus.*

No two elements have the same atomic number!

Atomic number



Atoms are *electrically neutral*.

- They have no charge.

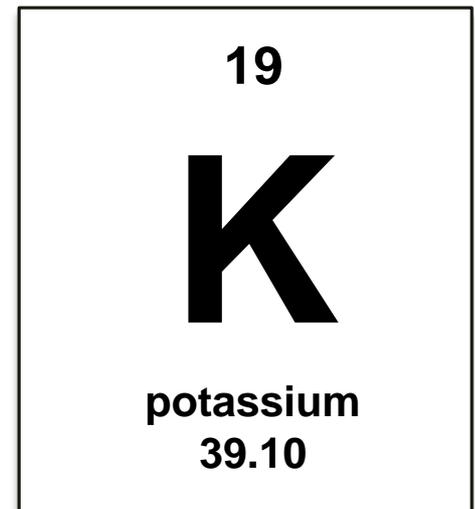
All positive charges are balanced by an equal number of negative charges.

of protons = # of electrons

Potassium (K) has an atomic number of 19.

There are 19 protons in its nucleus.

*There are also **19 electrons** orbiting the nucleus.*



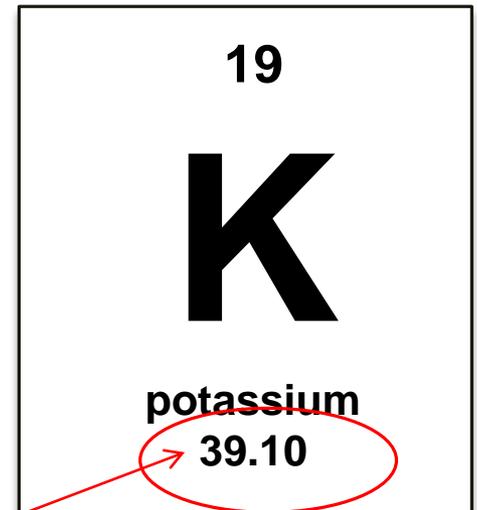
Atomic Mass and Mass Number

- All atoms have a mass, called the _____*.
 - only the protons and neutrons are heavy
 - electrons barely weigh anything; their mass is *negligible*

Round the atomic mass to the nearest whole number, to find the **mass number**.

Potassium (K) has an atomic mass of 39.10 amu. Its mass number is _____.

**Atomic
mass**



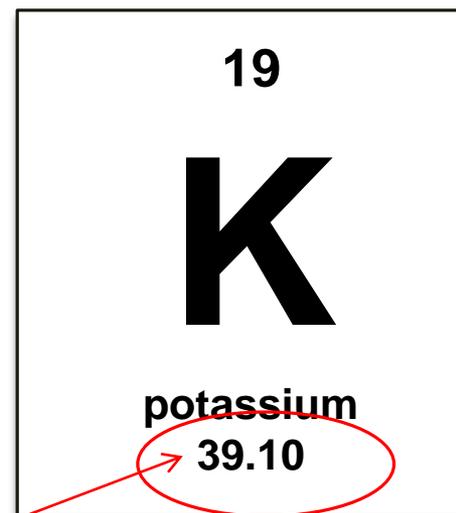
Potassium (K) has an atomic mass of 39.10 amu.
Its mass number is 39.

Mass number = # protons + # neutrons

heavy

heavy

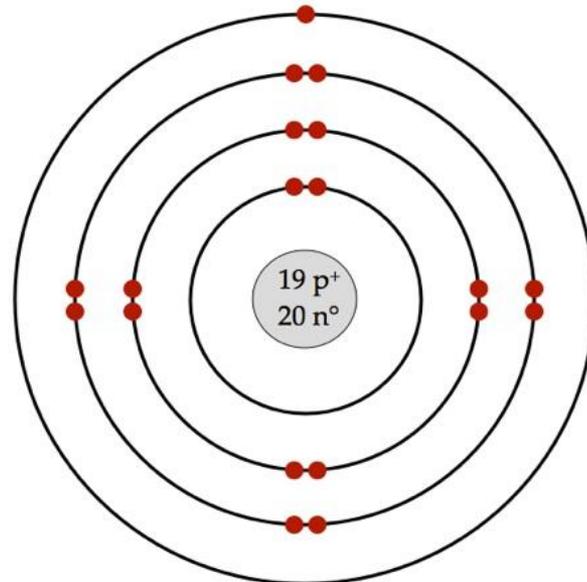
Potassium has _____ neutrons in its nucleus.



**Atomic
mass**

Summarize the important information for potassium:

| Symbol | Element | Atomic Number | Mass number | Protons | Electrons | Neutrons |
|--------|-----------|---------------|-------------|---------|-----------|----------|
| K | Potassium | | | | | |



Bohr-Rutherford diagram of a potassium atom

Potassium

Summary:

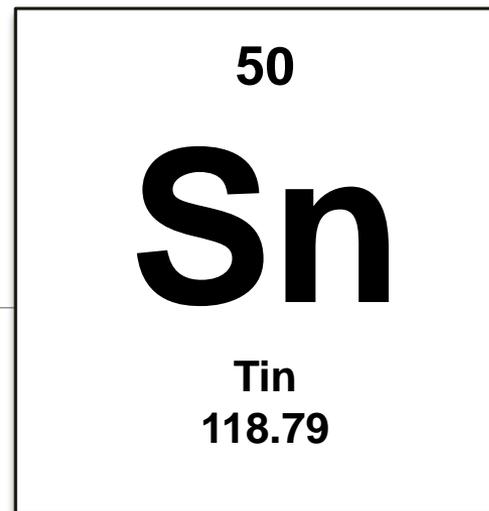
Calculating the Number of Subatomic Particles

- atomic number = number of protons
- number of protons = number of electrons
- mass number = number of protons + number of neutrons
 - number of neutrons = mass number - atomic number



Practice:

1. What is the **atomic number** of tin?
2. What is tin's **mass number**?
3. How many of each particle is in one atom of tin?
 - i. protons
 - ii. electrons
 - iii. neutrons



| Symbol | Element | Atomic Number | Mass number | Protons | Electrons | Neutrons |
|--------|---------|---------------|-------------|---------|-----------|----------|
| (a) Sn | | | | | | |



Practice:

1. What is the **atomic number** of mercury?
2. What is mercury's **mass number**?
3. How many of each particle is in one atom of tin?
 - i. protons
 - ii. electrons
 - iii. neutrons

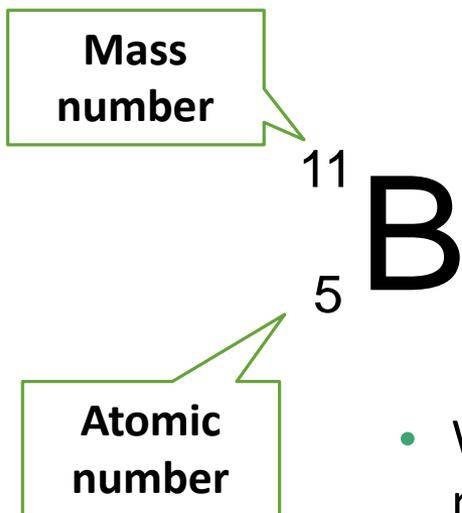
| |
|-------------------|
| 80 |
| Hg |
| Mercury 200.59 |



| Symbol | Element | Atomic Number | Mass number | Protons | Electrons | Neutrons |
|--------|---------|---------------|-------------|---------|-----------|----------|
| (a) Hg | | | | | | |

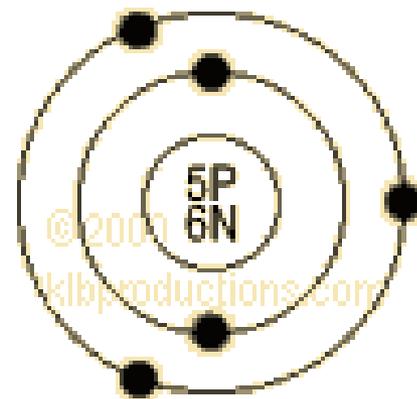
Representing Atoms

Standard atomic notation



- What element is being represented in the example?
- Determine the number of:
 - protons _____
 - electrons _____
 - neutrons _____

Bohr-Rutherford diagram



Practice:

Represent each atom using standard atomic notation:



1. hydrogen

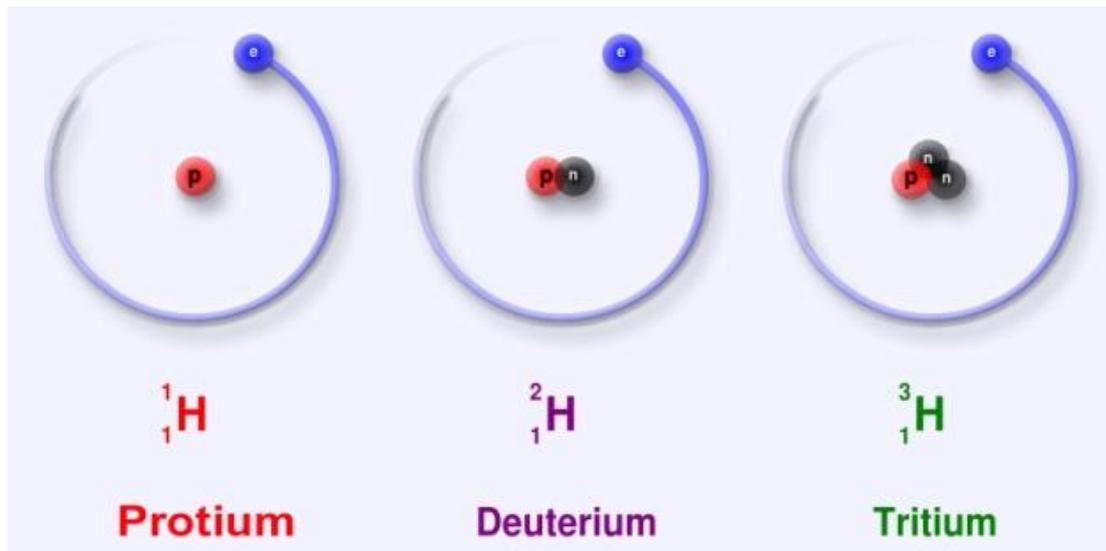
4. magnesium

2. oxygen

5. calcium

3. phosphorus

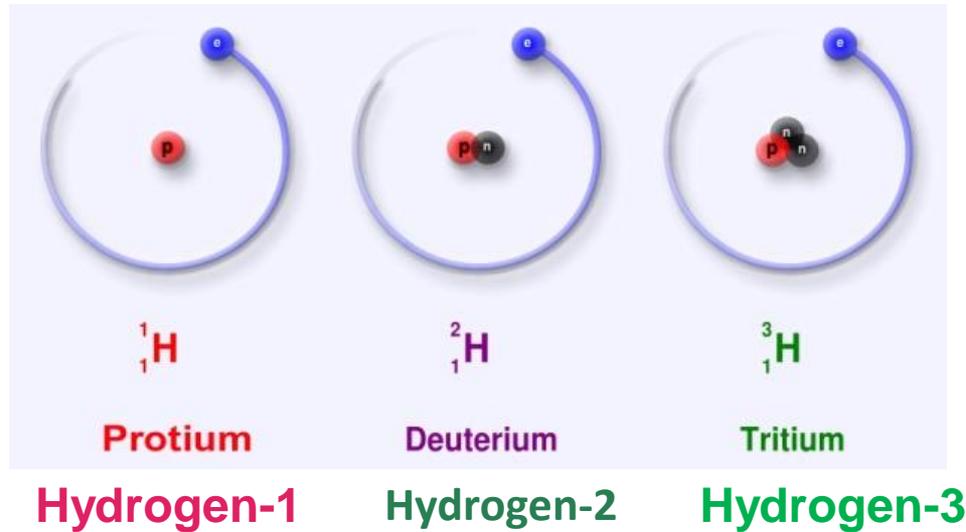
6. potassium



- f) What is the atomic number for each of these atoms?
- g) What is the chemical identity (element) of each of these atoms?
- h) Describe how these atoms are different from each other.

Isotopes

Isotopes: Atoms of the same element that have the same number of protons, but different number of neutrons.



Isotopes can be identified by their mass numbers.

Homework

1. Copy the following table & fill it in for the first 20 elements:

| Atomic number | Element | Standard atomic notation | # of protons | # of electrons | # of neutrons |
|---------------|---------|--------------------------|--------------|----------------|---------------|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |

2. Fill in sheet: Getting to Know the Elements

