

Name: \_\_\_\_\_

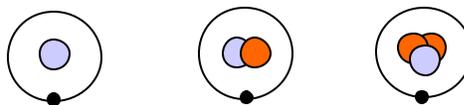
Period: \_\_\_\_\_

# Isotopes; Molecular Notation; Electron Orbits

## Isotopes

An isotope is an element that has a different number of neutrons. As long as the number of protons is the same, it is still the same element.

The isotopes of Hydrogen—each has unique properties, but each is hydrogen, with only 1 proton.



Protium—  
1 proton

Deuterium—  
1 proton  
1 neutrons

Tritium—  
1 proton  
2 neutrons

## Mass Number

Remember that the mass number is the total number of masses (protons and neutrons) in the nucleus.

Mass Number: number of *protons and neutrons*

- Atomic Number: number of *protons*

Number of *Neutrons*

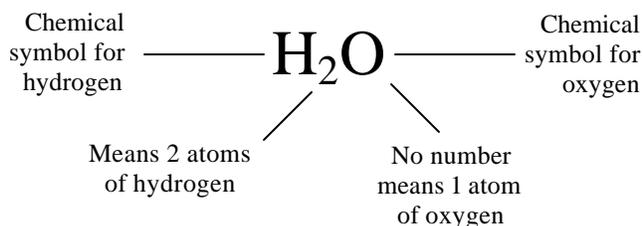
Ex. Tritium is Hydrogen with a mass number of 3.  
Find the number of neutrons.

(Mass #) - (Atomic #) = (# of neutrons)  
3 - 1 = 2 neutrons in Tritium

Find the number of neutrons in Lithium 7.  
(Mass #) - (Atomic #) = (# of neutrons)

Find the number of neutrons in Oxygen 18.

## Molecular Notation



How many atoms of each element are there in CH<sub>4</sub>?

C—carbon—1 atom  
H<sub>4</sub>—hydrogen—4 atoms  
Total—5 atoms

How many atoms of each element are there in CO<sub>2</sub>?

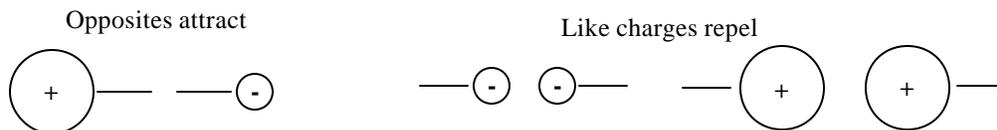
| Element                       | # of atoms |
|-------------------------------|------------|
| C: Carbon _____               | _____      |
| O <sub>2</sub> : Oxygen _____ | _____      |
| Total: _____                  | _____      |

How many atoms of each element are there in NaOH?

| Element           | # of atoms |
|-------------------|------------|
| Na: Sodium _____  | _____      |
| O: Oxygen _____   | _____      |
| H: Hydrogen _____ | _____      |
| Total: _____      | _____      |

### Electric Attraction

Electric charges work just like magnets: opposites attract and like charges repel. Since protons are positive and electrons are negative, protons attract electrons. Protons repel protons; electrons repel electrons.

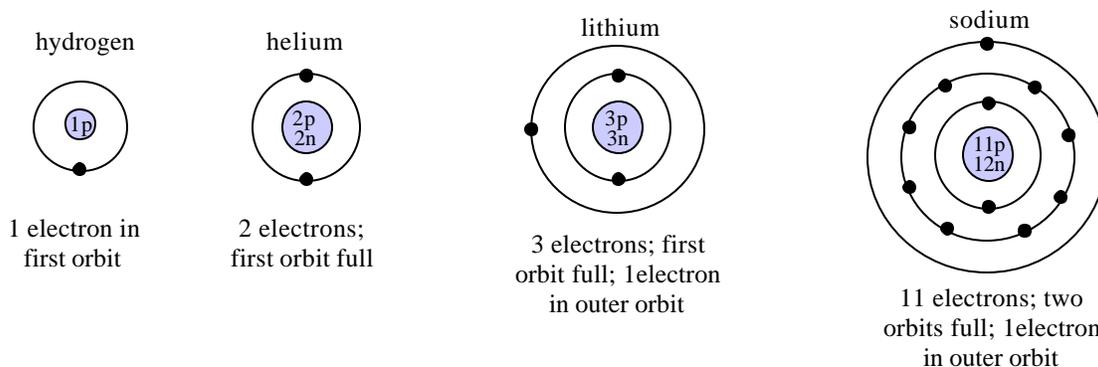


Though this may seem too simple, much of chemistry can be explained by electric attraction and repulsion.

Q: If protons repel each other, how can a nucleus (made up of multiple protons) stay together?

### Electron Orbits

Because of electron-to-electron repulsion, electrons don't crowd around the nucleus as their number increase. Instead, they fill up orbits. Each orbit can hold a certain number of electrons, then that orbit is full. This is because even though as the number of protons increases (attraction), the number of electrons also increases (repulsion).



**BIG HINT:** Each completed orbit (electron level) is one complete row on the periodic table.

|               |  |   |
|---------------|--|---|
| 1. Dalton     | a. Did gold foil experiment which proved, in early 20th century, that atoms had a nucleus. | Magnesium has how many full electron levels (orbits)? |
| 2. Bohr       | b. Late 1800's scientist found the electron and other smaller particles.                   | Calcium has how many full electron levels?            |
| 3. Democritus | c. Greek philosopher that realized said called the smallest part of matter atoms.          | Neon has how many full electron levels:?              |
| 4. Rutherford | d. Mid-1900s scientist that hypothesized that electrons are in distinct orbits.            | Aluminum has how many full electron levels?           |
| 5. Thompson   | e. Scientist that said that atoms can be changed chemically.                               | Gold has how many full electron levels?               |
|               | f. Worked with gases in 1808 and published theory that atoms were hard spheres.            |   |