CHEMISTRY REVIEW

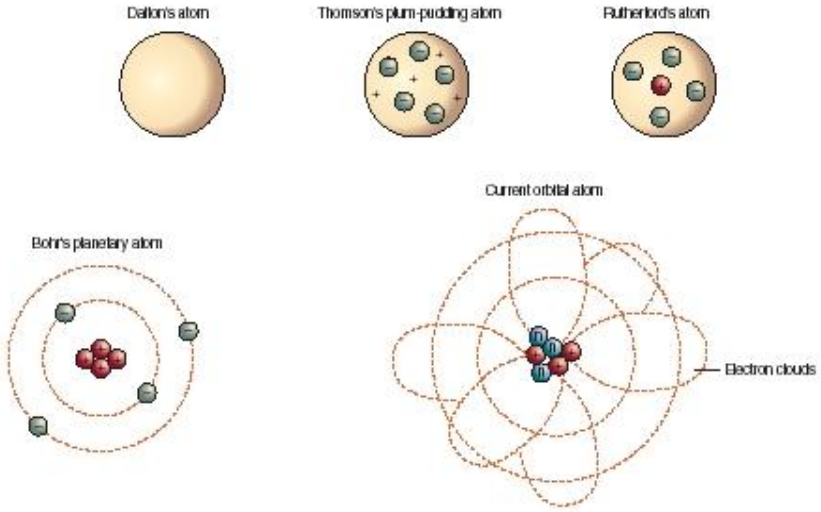
The Atomic Theory

The particle theory was good at explaining physical changes but a new theory was needed to explain chemical changes.

The Atomic Theory

- The atomic theory states that matter is composed of discrete units called atoms.
- It is used to explain what happens during a chemical change.

The Development of the Atomic Theory



1803 John Dalton – the atom is an indivisible particle

1897 JJ Thompson – discovered the electron through his work with a cathode ray tube

1911 Ernest Rutherford – discovered the planetary model of the atom through his gold foil experiments

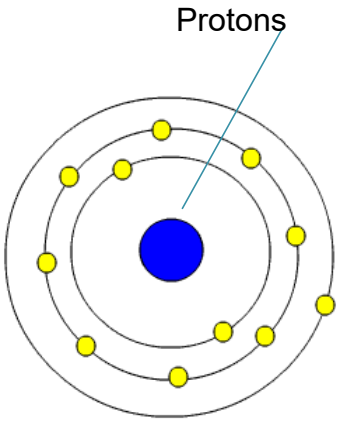
1919 – the proton was discovered over many years although Rutherford was given credit for it's discovery

1932 James Chadwick – discovered the neutron.

Subatomic Particles

Protons

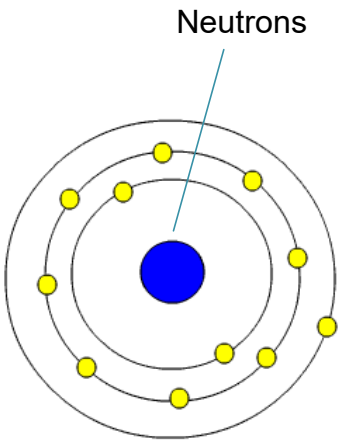
- Located in the nucleus
- Positively charged
- Not directly involved in chemical reactions
- Heavy (relative mass of 1)
- The number of protons is also equal to the atoms atomic number (Z)



Subatomic Particles

Neutrons

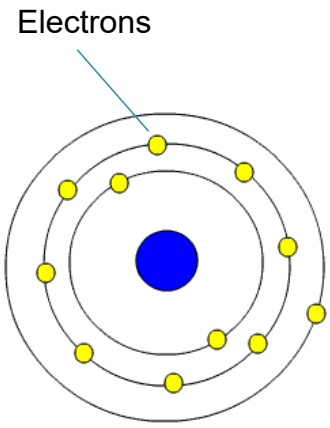
- Located in the nucleus
- No charge
- Not involved in chemical reactions
- Heavy (relative mass of 1)
- Obtained by subtracting the atomic number (Z) from the mass number (A)
- The proton and neutron make up most of the mass of the atom.



Subatomic Particles

Electrons

- Located in the orbitals/shells that surround the nucleus
- Negatively charged
- Involved in chemical reactions
- Virtually no mass (relative mass of 1/2000)
- The number of electrons is equal to the number of protons in a neutral atom.



Valence Electrons

Electrons in the outermost energy level/ orbital. Valence electrons have the greatest influence on chemical behaviour

Orbital Shell
1st – 2 electrons
2nd – 8 electrons
3rd – 8 electrons

(limited model)

Try These:

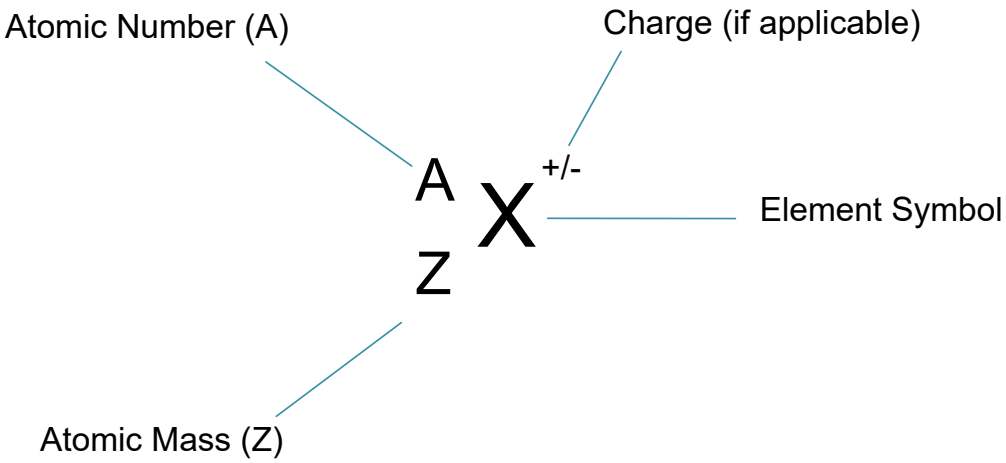
Calculate the number of protons, neutrons, and electrons for the following **neutral** atoms (need a periodic table):

A. Oxygen

B. Lithium

C. Magnesium

Standard Atomic Notation



Try These:

Draw the Standard Atomic Notation for the following neutral atoms:

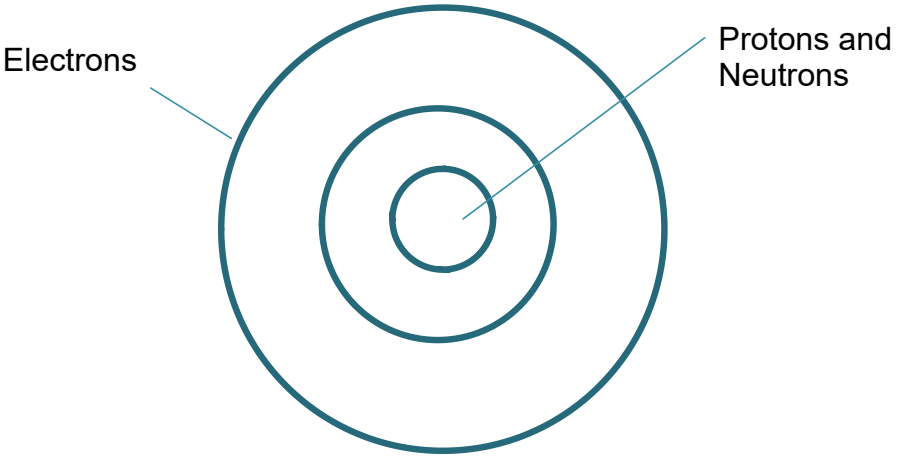
A. Lithium

B. Magnesium

C. Iron

Bohr Rutherford Diagrams

Bohr-Rutherford diagrams are an excellent way of visually representing atoms (but aren't actually accurate).



Try These:

Draw the Bohr-Rutherford diagrams for the following atoms:

A. Sodium

B. Aluminum

C. Hydrogen

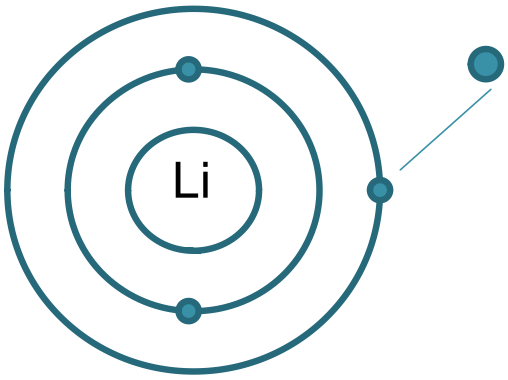
The Formation of Ions

An ion is a positively or negatively charged atom or group of atoms. Neutral atoms (found on the periodic table) have the same number of protons and electrons but these atoms, although neutral, are unstable as they do not have a full outer shell (are not following the octet rule). In order to become stable, these atoms must gain or lose electrons.

For example: The Lithium atom

Lithium is unstable because it has only one valence electron. In order to become stable, lithium will have to lose 1 electron or gain 7. What do you think would be easier?

Lithium is now a positive ion because it has become **less negative**

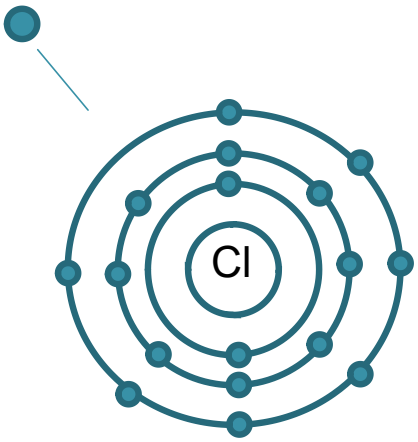


Li^+

For example: The Chlorine atom

Chlorine has seven valence electrons. It will gain one in order to have a stable octet.

Chlorine is now a **negative** ion because it has become **more negative.**



Cl^-

Try These:

Draw the (i) standard atomic notation and (ii) Bohr Rutherford diagrams for the following ions.

A. Beryllium ion

B. Phosphorous ion

Key Terms

Anion – negatively charged atom
(a negative)

Cation – positively charged atom

So where do these electrons come from and where do they go?

The Formation of Compounds – to be discussed

Task - Handout