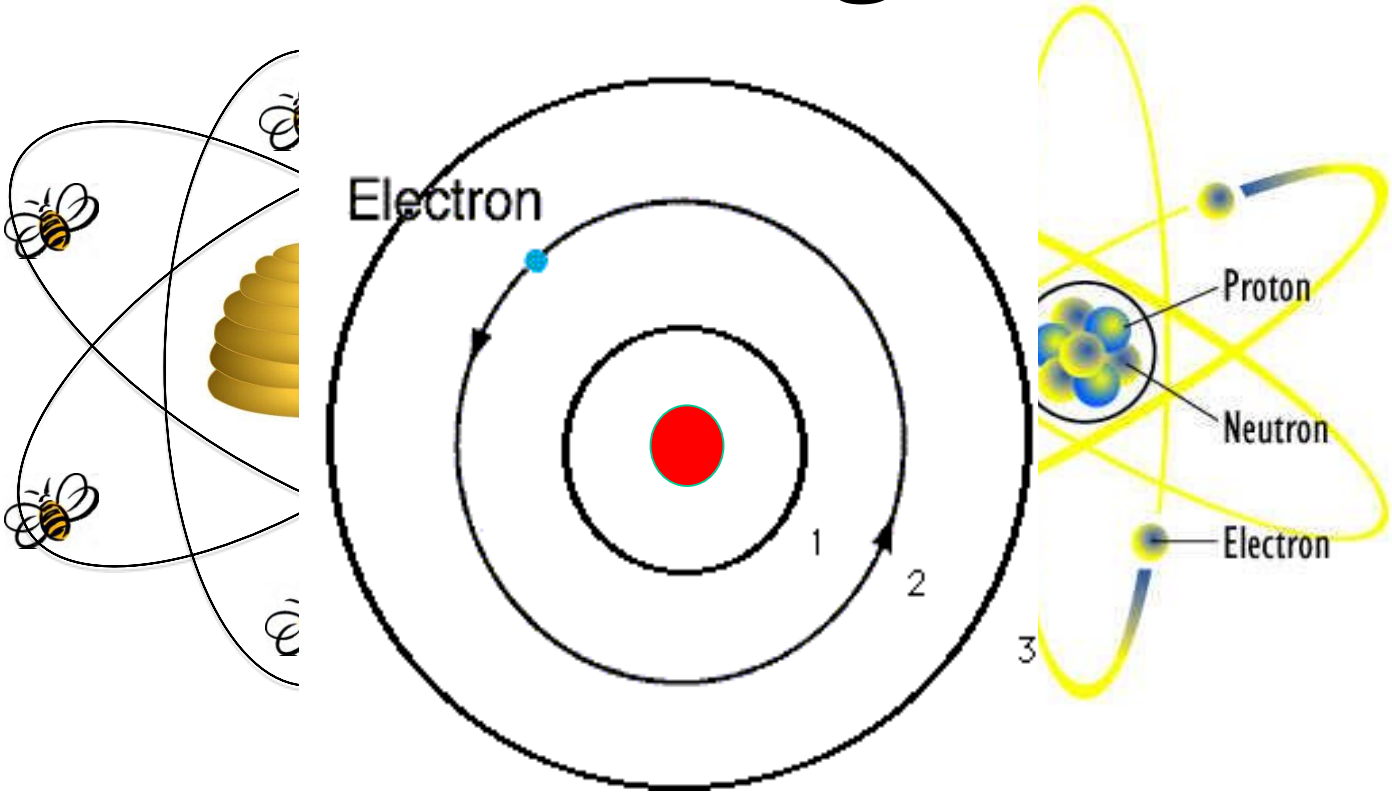
Models of Matter: Bohr Diagrams



OUTCOME QUESTION(S):

S1-2-05

How do you draw an atom using the Bohr model?

<u>Vocabulary & *Concepts*</u>

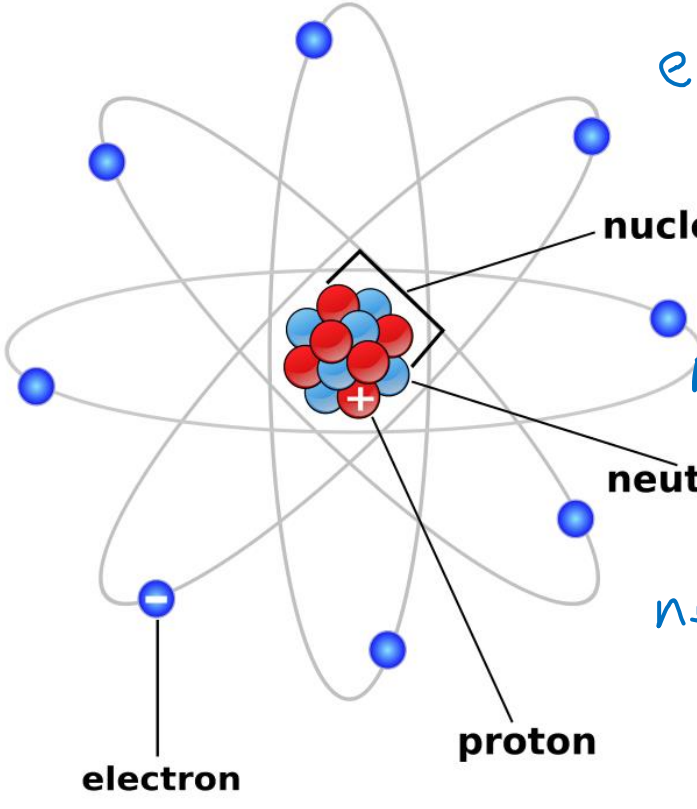
orbit *Bohr Diagram* valence

PRE-NOTE QUESTION(S):

Where is each subatomic particle placed in an atom?

protons - in nucleus
neutrons - in nucleus
electrons - around the nucleus

Refresh



electron → **e⁻**: ***negative charge, around the nucleus***

proton → **p⁺**: ***Positive charge, in nucleus***

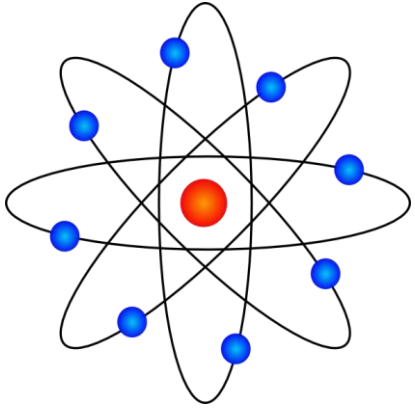
neutron → **n⁰**: ***no charge, in nucleus***

Niels Bohr (1913)

"Flame Test" ***experiments*** show **heated** elements emit a ***unique pattern of colour***.

Each element showed a **unique colour** signature that is used to identify elements in mixtures or compounds

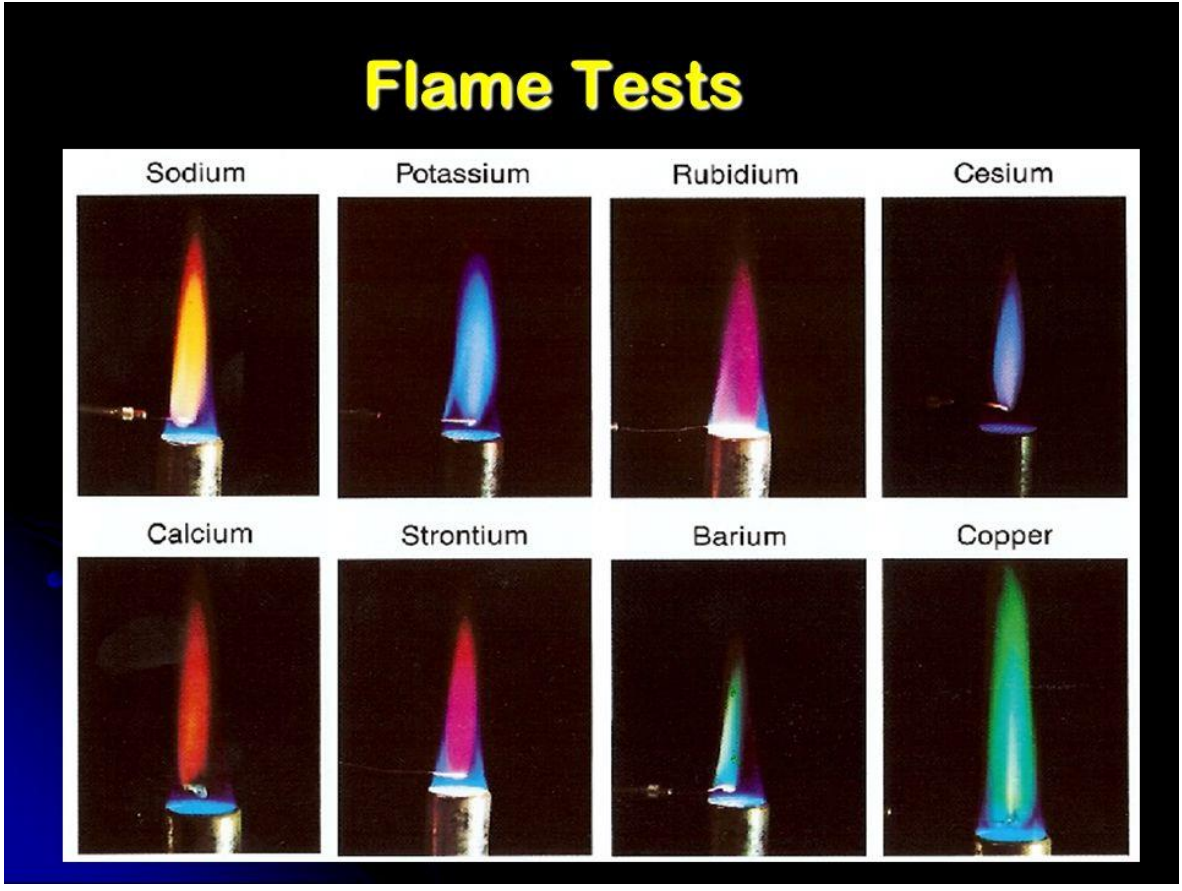
- This **emitted** light was ***from excited electrons!***



Colour	Element
green	copper
red	strontium
purple	potassium
lavender	Lithium
yellow	sodium

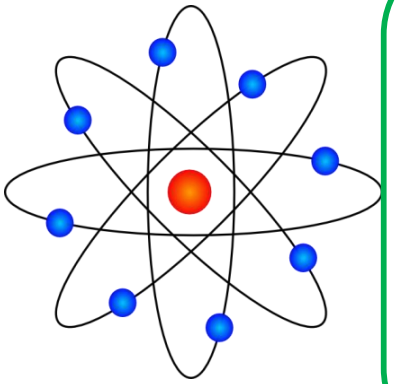
Hypothesis:

Electrons move in *organized circular paths* of different *distances* around a nucleus.

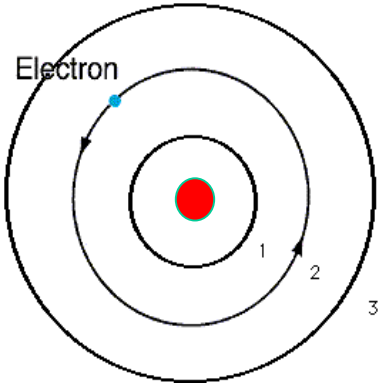


Orbit: **location of electron motion around a nucleus.**

*Only a specific number of electrons **fill** each orbit!*



Bohr reasoned that ***random*** electron movement **cannot** produce the **same** unique colour pattern EVERY TIME



Bohr's model is called the **"planetary" model**

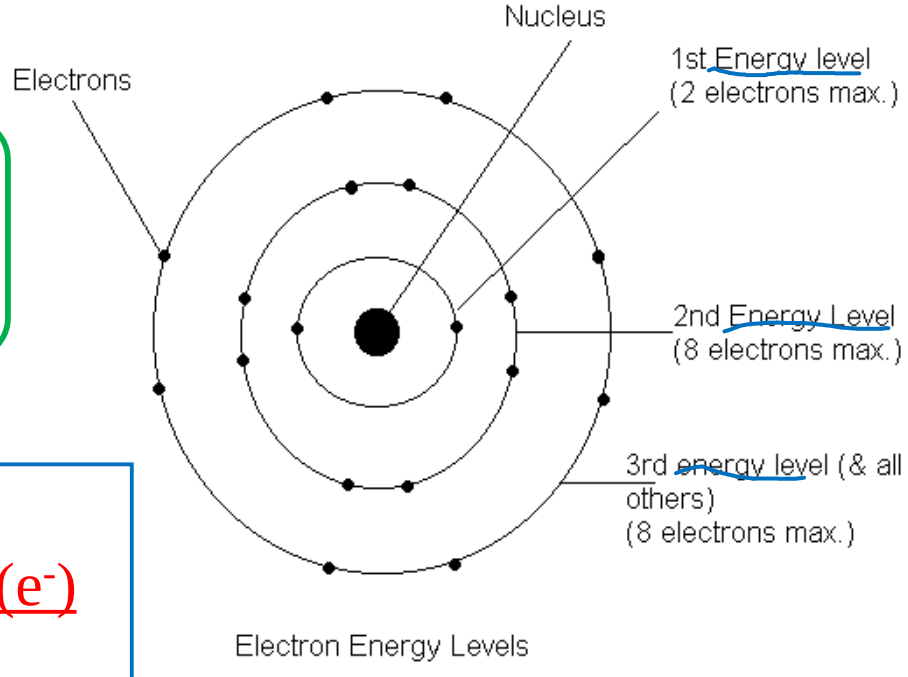
energy level

ORBITS:

1st : holds **two** electrons (e^-)

2nd : holds **eight** e^-

3rd : holds **eight** e^-

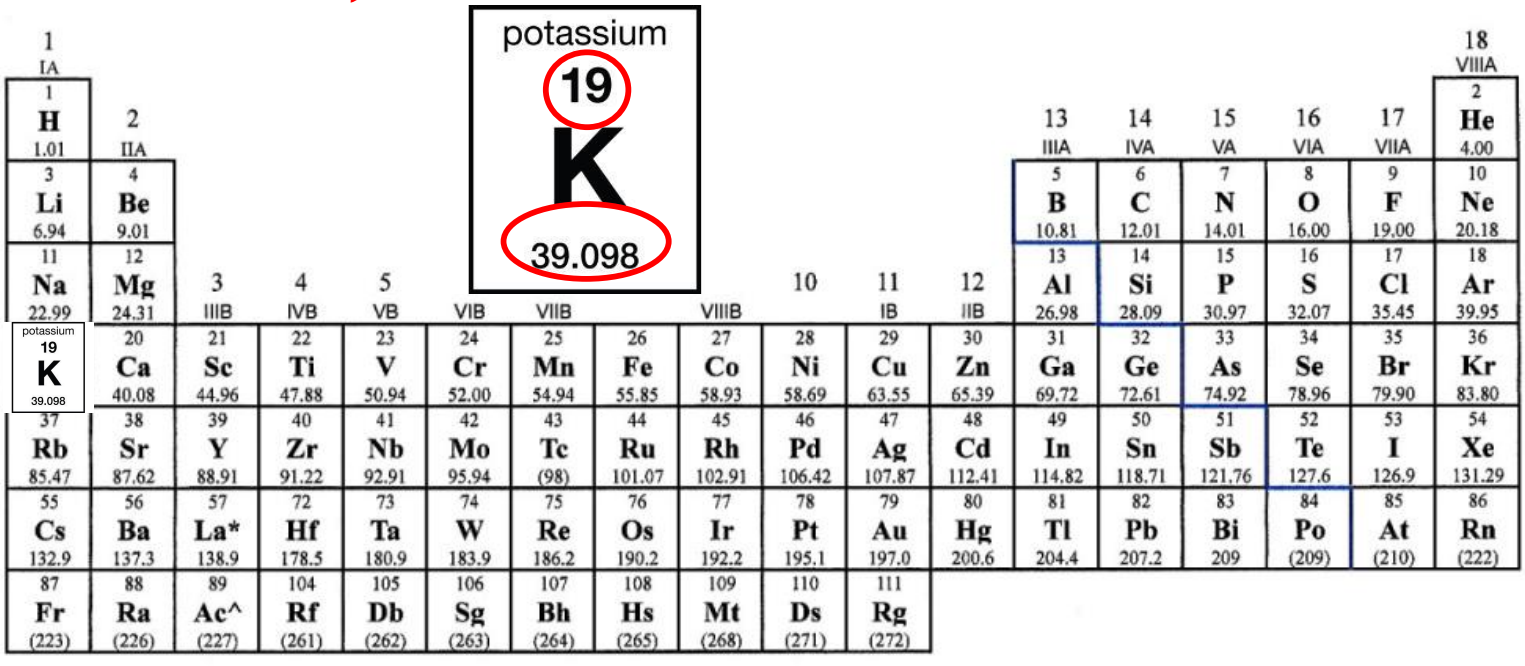


Electron Energy Levels

energy level

- Electrons occupy the ***closest orbital first***
- *Each element have a **different** number of electron*

HOW DO WE KNOW HOW MANY PROTONS, NEUTRONS, AND ELECTRONS AN ATOM HAS?



Use the atomic mass and atomic number to find the information (p^+, n^o, e^-) to build **Bohr** atomic models

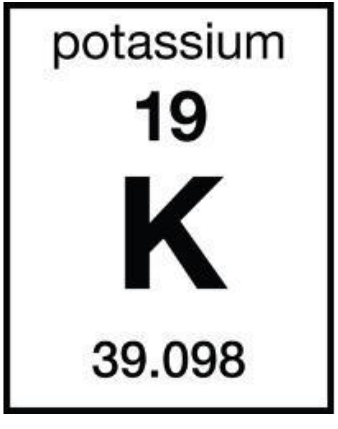
HOW DO WE KNOW HOW MANY PROTONS, NEUTRONS AND ELECTRONS AN ATOM HAS?

We use the atomic number and atomic mass!

Protons = <u>atomic number</u>

Neutrons = <u>atomic mass – atomic number</u>

Electrons = <u>atomic number</u>



Protons = 19

Neutrons = 39 -19=20

Electrons = 19

Drawing a Complete Bohr Diagram:

1. Determine **the *number* of** **n^o, p^+, e^-** in the atom.
2. Draw the *nucleus*.
3. Label the #of **protons** and **neutrons**. in the nucleus
4. Add orbits and fill with the ***appropriate*** *# of* e^-.

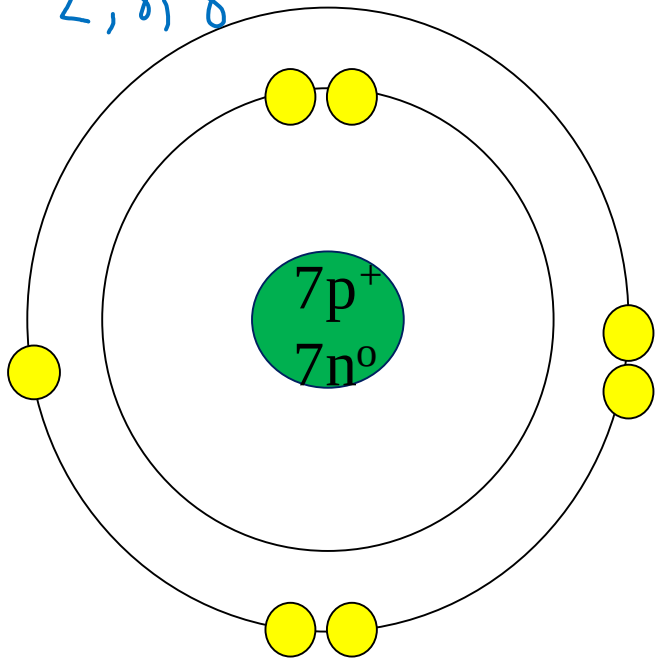
2, 8, 8

Nitrogen (N)

p^+ : **7**

n^o : **14 – 7 = 7**

e^- : **7**



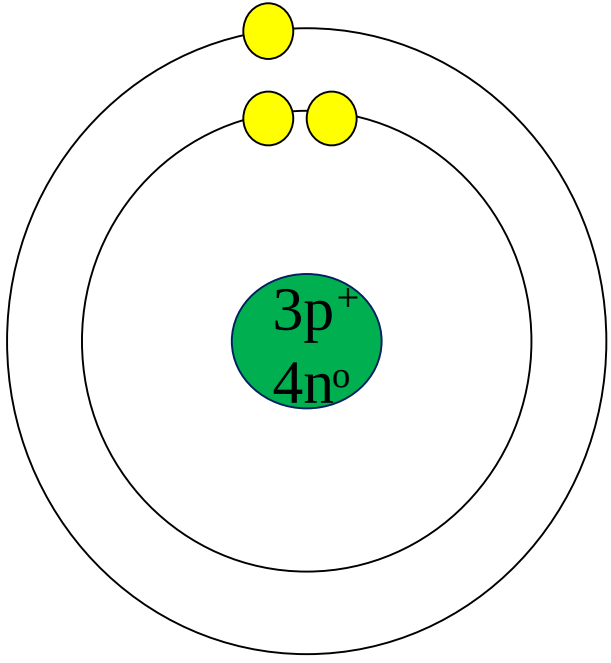
Lithium (Li)

Remember the first shell can only hold 2 electrons before being “full”

p^+ : **3**

n^o : **7 – 3 = 4**

e^- : **3**



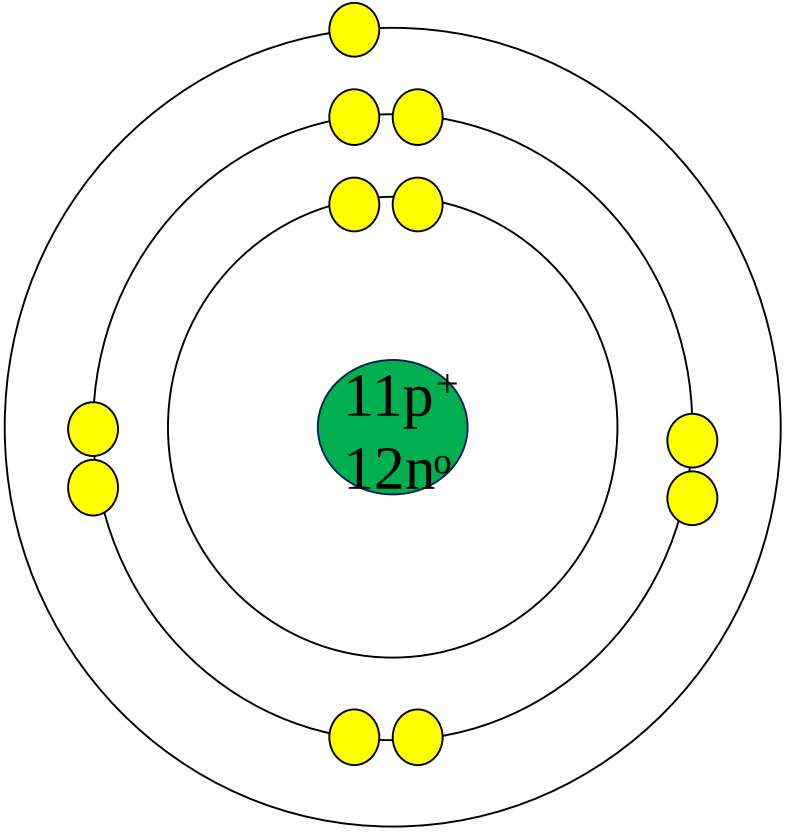
Sodium (Na)

Putting electrons around in pairs at the quadrants makes it easier to count later

p^+ : **11**

n^o : **23 – 11 = 12**

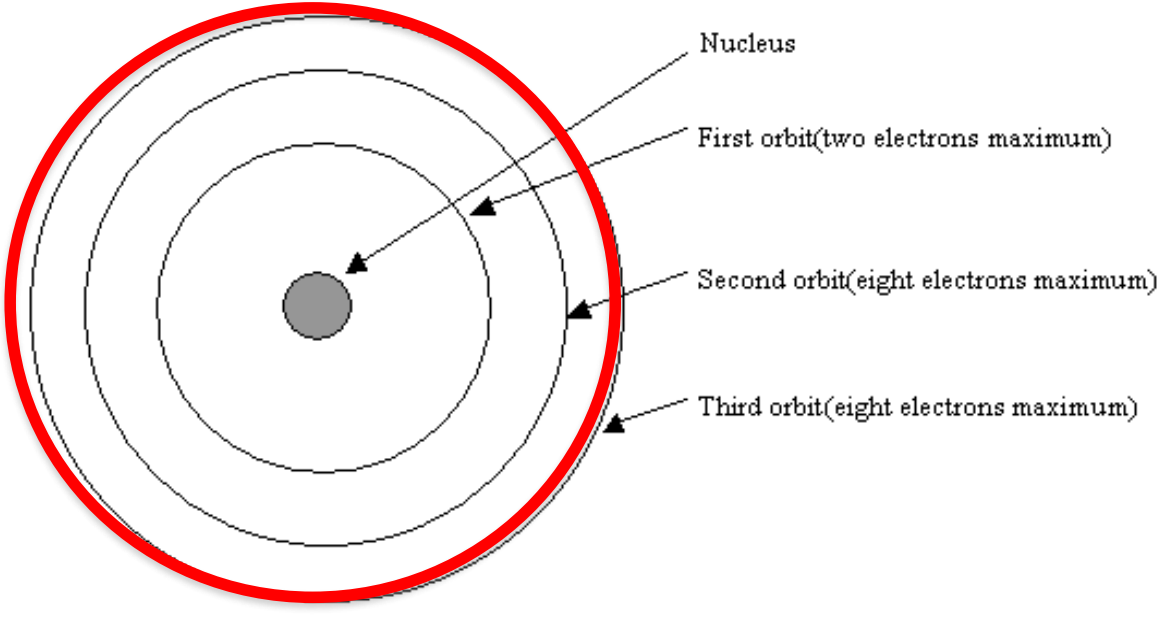
e^- : **11**

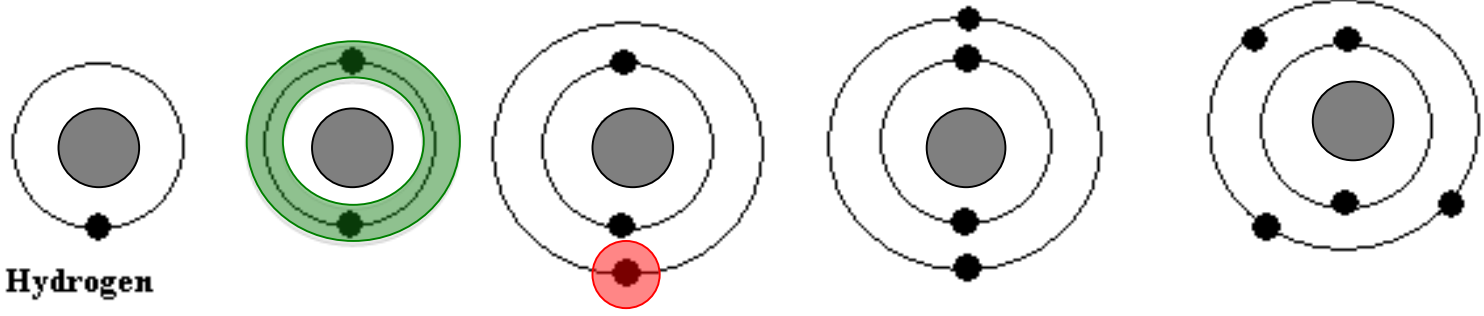


Valence:

- **Last** (outer) atom **orbit**
- ***All*** electrons in **last orbit** are called **valence electrons**

The number of **valence** electrons in an atom determines how the atom **chemically reacts**





Hydrogen has a total of **1** e^- (**1 valence** e^-)

Boron has a total of **5** e^- (**3 valence** e^-)

Neon has a total of **10** e^- (**8 valence** e^-)