

Chemistry

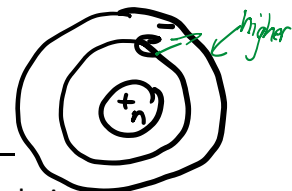
Bohr Diagrams

Learning Outcomes:

- I can draw Bohr diagrams of atoms and ions.

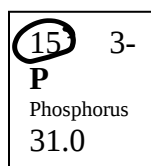
Structure of the Bohr Model

- protons and neutrons are tightly packed together in a central mass called the nucleus
 - often referred to as nucleons
 - nucleons are held together by the strong nuclear force
 - the strong nuclear force:
 - acts over a very small distance
 - strong enough to overcome the repulsion between protons
- electrons orbit the nucleus at specific distances called Orbitals or shells
- Neils Bohr discovered that the electrons exist in specific locations (orbitals) based on their energy.
 - Electrons will emit measurable wavelengths of light when dropping in energy
 - the further the electron is from the nucleus the more energy the electron has
 - More energy = Less stability



Bohr Model – Atom

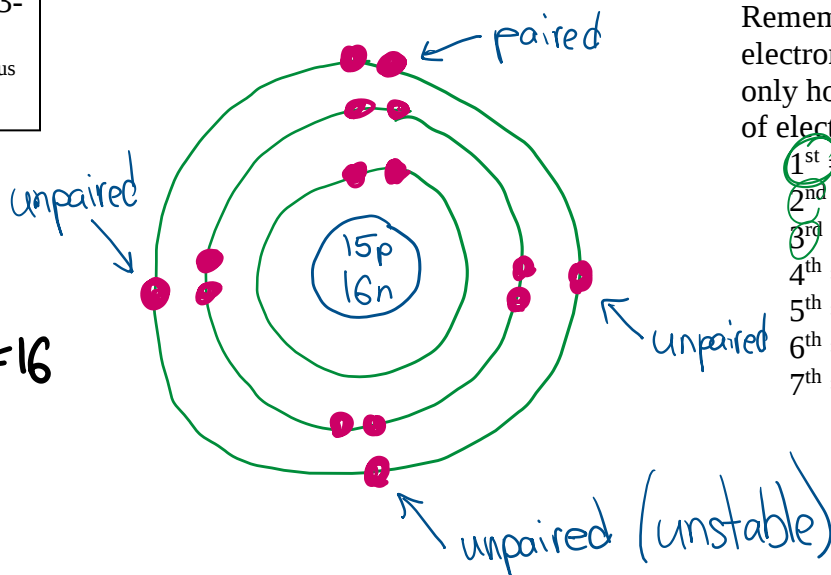
- Example: phosphorus



$$p = 15$$

$$e^- = 15$$

$$n = 31 - 15 = 16$$



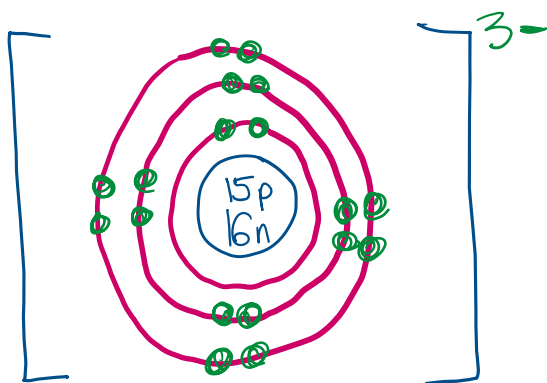
Remember that each electron **orbit** or **shell** can only hold a certain number of electrons:

1st = 2
 2nd = 8
 3rd = 18
 4th = 32
 5th = 50
 6th = 72
 7th = 98

Bohr Model – Ion

- Most atoms do not have a full outer shell (valence shell) of electrons
- try to fill it by either gaining or losing electrons
 - metals lose electrons
 - non-metals gain electrons
- Example: phosphorus will attract 3 more electrons
 - gains a charge of 3- (one for each electron gained).
 - represented by the ion charge on the Periodic Table for each element
 - when the phosphorus atom gains 3 more electrons, it becomes an ion

$$15 + 3 = 18e^{-}$$



Square brackets used to show the atom is now an ion and the charge is written just outside the bracket

1. Sodium atom and sodium ion
2. Magnesium atom and magnesium ion
3. Sulfur atom and sulfide ion
4. Neon atom (NO ION!)

Q: Why will Neon not form an ion?

A: Already has a full valence shell (stable).

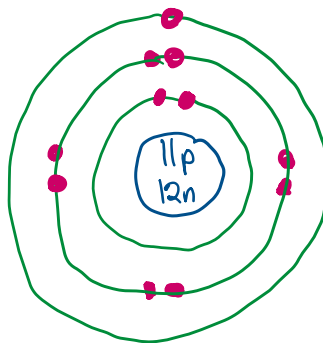
$^{11}_{23}\text{Na}$

Na Atom

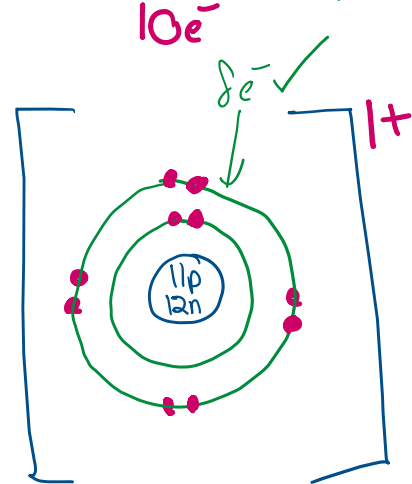
$$p = 11$$

$$e = 11$$

$$n = 23 - 11 = 12$$



Na Ion (loses $1e^-$)



Mg Atom

$^{12}_{24}\text{Mg}$

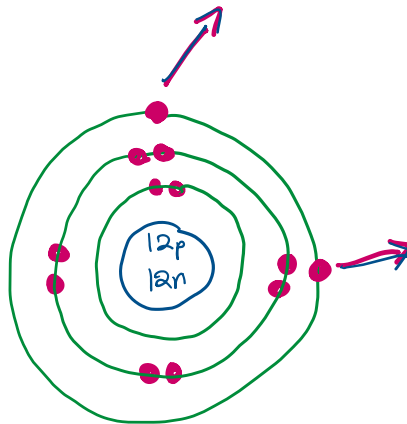
Mg

24

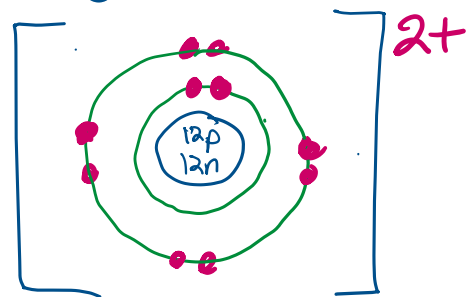
$$p = 12$$

$$e = 12$$

$$n = 12$$

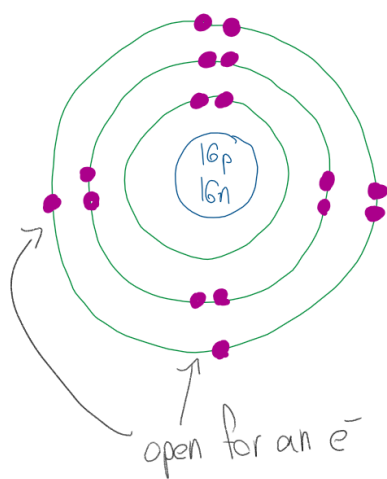


Mg Ion (loses $2e^-$)

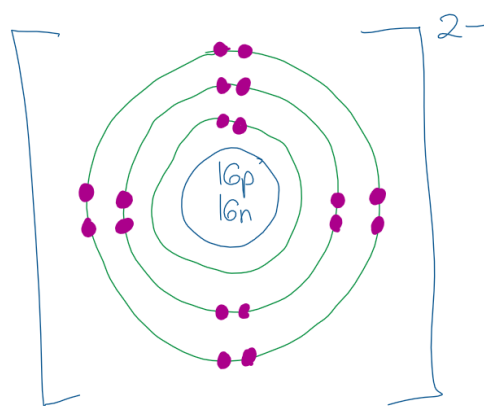


Sulfur atom

16
S
32
 $p = 16$
 $e = 16$
 $n = 32 - 16 = 16$



S ion (gain 2e⁻)



10
Ne
20

$p = 10$
 $e = 10$
 $n = 20 - 10 = 10$

