

The Periodic Table

- Elements in the periodic table are arranged according to atomic number
- Remember: atomic number determines the identity of the element
- The horizontal rows of the elements on the periodic table are called periods
- The columns are called groups
- The group number tells the valence electrons

The Periodic Table

- The table is set up such that it indicates the number of electron shells in each atom
- The number of valence electrons
- As you go down the rows, the number of shells increases
- As you move from left to right in any row, the number of valence electrons increases
- So you can predict the structure of the next atom

- The number of elements in a period increases as you move down the periodic table
- Elements within a group share a number of properties:
 - Valence electrons
 - Chemical properties

Categories of Elements

- Elements of the periodic table belong to 3 basic categories
 - Metals
 - Non-metals
 - Semi-metals or metalloids
- Majority of elements in the periodic table are considered metals
- These metals in the periodic table are divided into groups

Groups of Metals

- Alkali metals
 - Group I
 - Form salts and many other compounds
 - Highly reactive
- Alkaline Earth metals
 - Group II
- Transition metals
 - Very hard
 - High melting and boiling points

Groups and Families

- Elements found in the same group tend to have similar properties
 - Because of similar valence electrons
- Elements in group VIII are called noble gases
 - Group VII

- Using the periodic table rows and groups one can predict a number of properties of atoms
- This is true for metals, non-metals and semi-metals
- In transition metals this simplified explanation of the properties of elements does not work

Importance of Valence Electrons

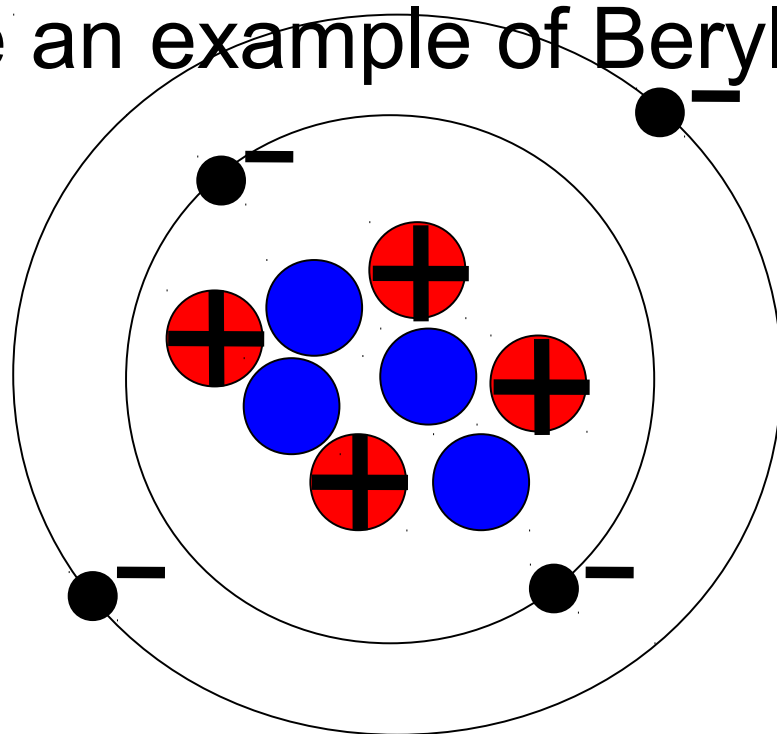
- They are electrons in the highest energy level
- They are exposed
- They are electrons that get most involved in chemical reaction
- Electron dot diagrams are used to show valence electrons
- Drawn around the symbol of the atom as if there is a square around it – with up to two dots per side

Valence Electrons

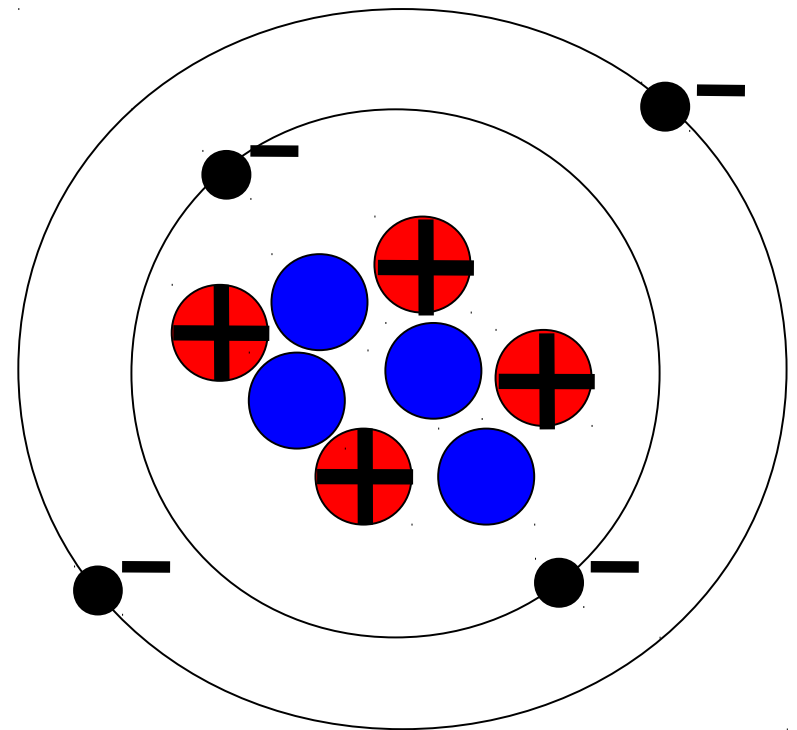
- Electrons in the outermost shell of an atom
- Valence electrons increase in number as you go across the period
- When you start the period, the number drops back to one and starts increasing again
- e.g. going from C, N to O, the valence electrons increase from 4 to 5 to 6
- Within a group in the periodic table, the valence number stays the same

Effective Nuclear Charge

- The nuclear charge felt by the valence electrons after you have taken into account the number of shielding electrons surrounding the nucleus
- Let us take an example of Beryllium:



- The nucleus itself has a +4 charge and anything near to it feels that charge
- The two electrons in the first energy level feel that charge
- The electrons that are in the valency energy level would be shielded from the nucleus by the two first energy level electrons
- The +4 nuclear charge is shielded by 2 electrons
- That gives an effective nuclear charge of +2 felt by valency electrons



nuclear
charge

shielding
electrons

effective
nuclear
charge

Be

+4

2

+2

B

C