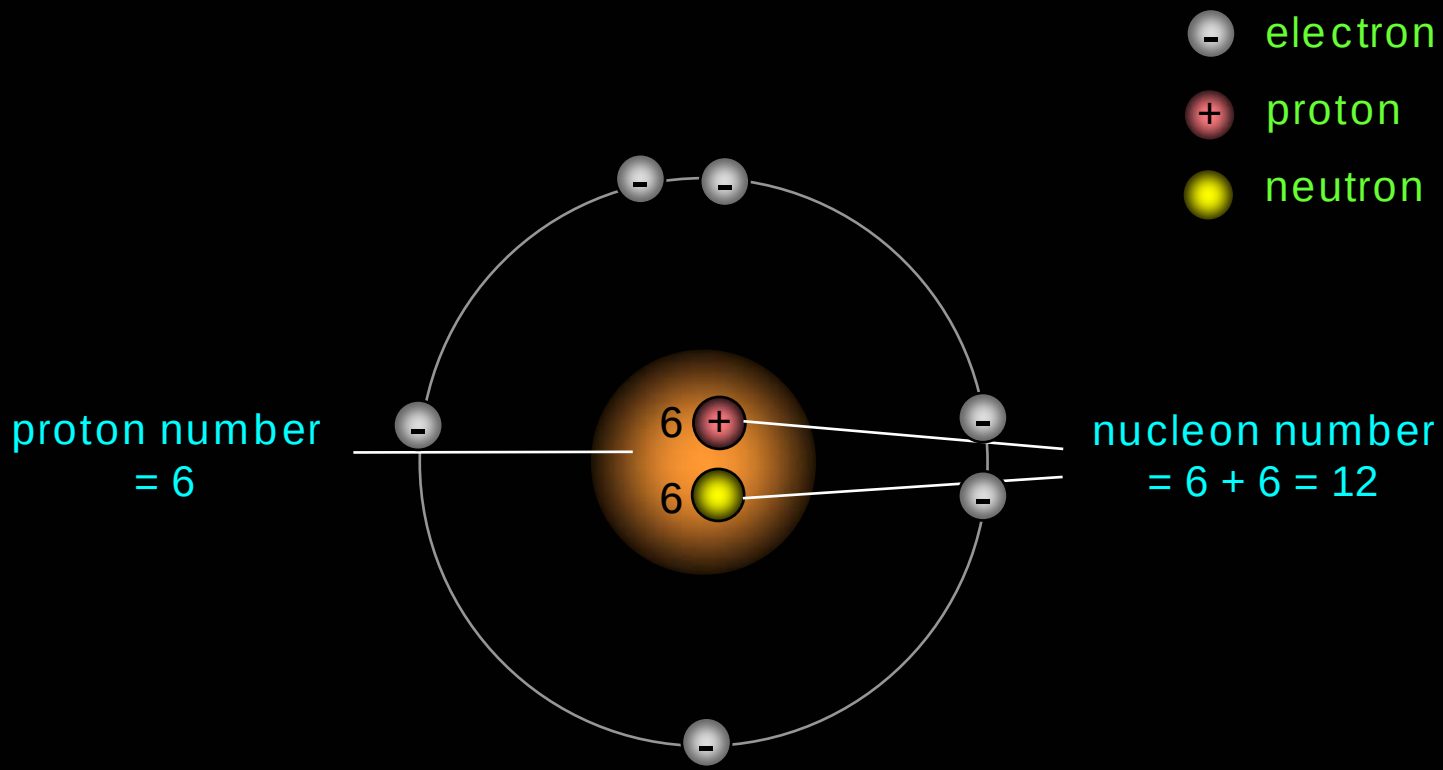
Structure of Atoms

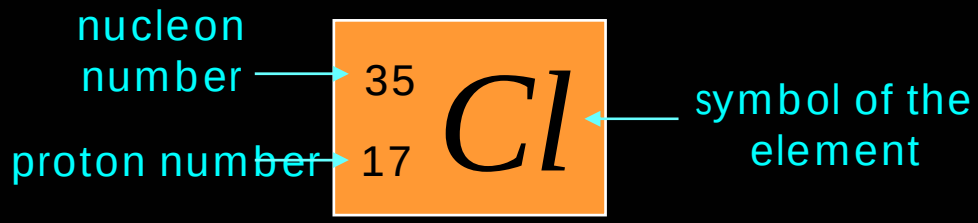
simplified structure



structure of a carbon atom

Structure of Atoms

Symbol Form



symbol tells us that the atom:

- is of element chlorine
- has proton number 17
- has 17 electrons
- has nucleon or mass number 35
  it must contain 35 – 17 = 18 neutrons

Structure of Atoms

Example

Isotopes	$^{23}_{11}Na$	$^{56}_{26}Fe$
number of protons		
number of electrons		
number of neutrons		

Structure of Atoms

Example

Isotopes	$^{23}_{11}Na$	$^{56}_{26}Fe$
number of protons	11	26
number of electrons	11	26
number of neutrons	23 - 11 = 12	56 – 26 = 30

Since number of electrons (-ve)= number of protons (+ve)
⇒ atom is ***electrically neutral***

Electron Arrangement in Atoms

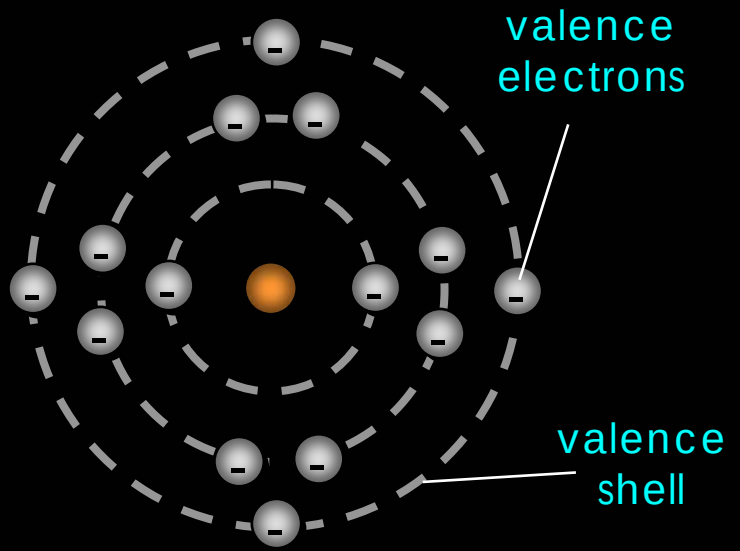
- Electrons are arranged around the nucleus of the atom in shells
- Atomic nucleus (positive charge) attracts the electrons (negative charge) by an electrostatic force
- Each shell can hold a maximum number of electrons

Shell Number	Maximum Number of Electrons
1	2
2 and above	8

- Electrons always go into the shell nearest to the nucleus, if there is room; otherwise they go to the next available shell

Electron Arrangement in Atoms

- The following diagram shows two ways of showing the electronic structure of a silicon atom.
- The outer most shell is called the valence shell and electrons on the outer most shell are called the valence electrons.



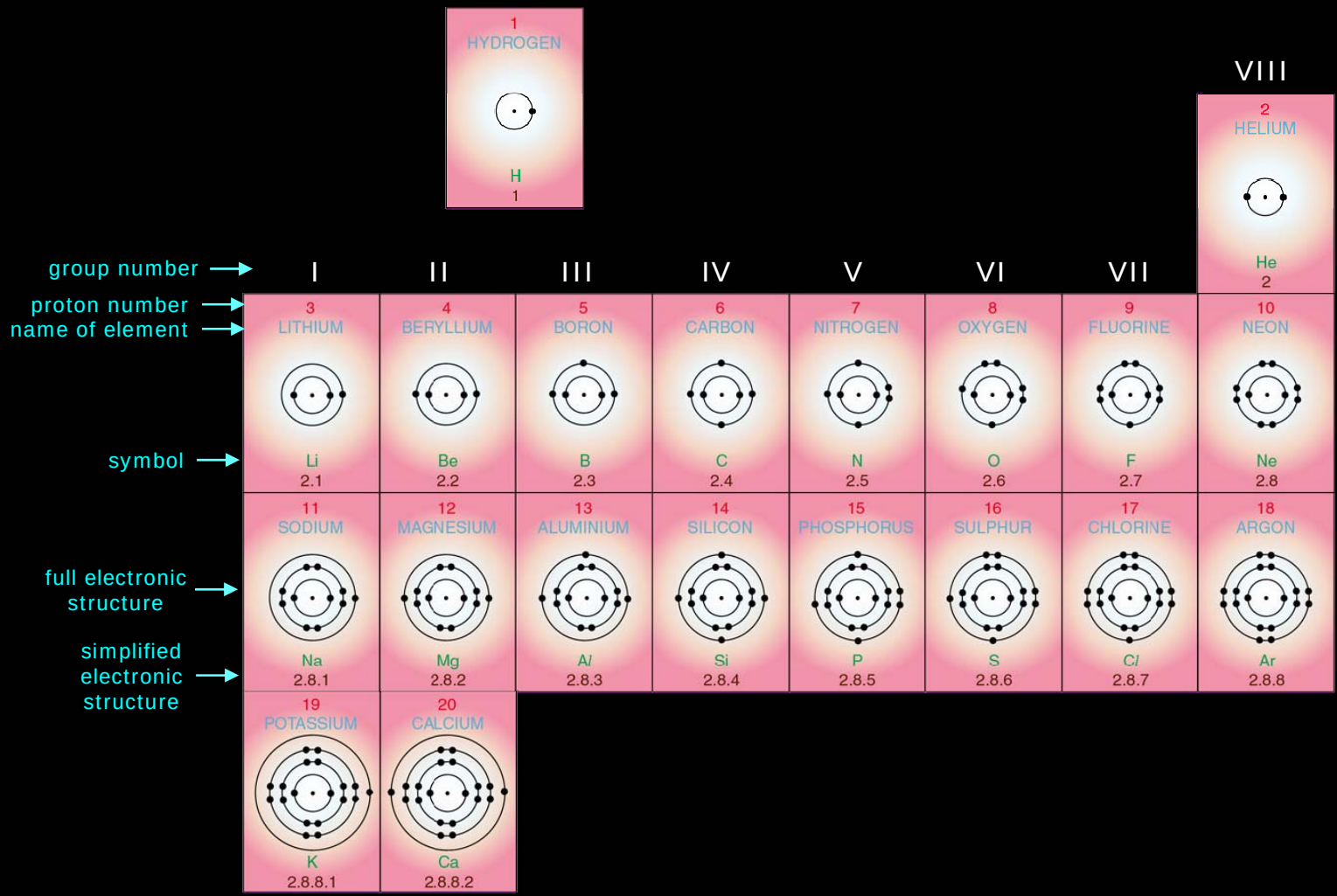
full electronic
structure

2.8.4

electronic
structure

Electron Arrangement in Atoms

The Periodic Table is an arrangement of elements based on the atomic number and electronic structure of their atoms.



The Periodic Table

- Arrangement of elements in a table
- Periods show the elements arranged horizontally in order of proton number (atomic number)
- Across each **period**, the number of outer shell electrons increases from 1 to 8
- **Groups** show the elements with the same number of outer electrons arranged in vertical columns

Ions

- Ions are charged particles; can be either positively or negatively charged
- They are formed when an atom gains or loses electrons to obtain the electronic structure of a noble gas.

	Negative Ions	Positive Ions
movement of electrons	atom takes in electron(s)	atom loses electron(s)
type of atoms	non-metallic	metallic

Ions

- A negative ion is formed when an atom gains electron(s), resulting in having more electrons than protons.

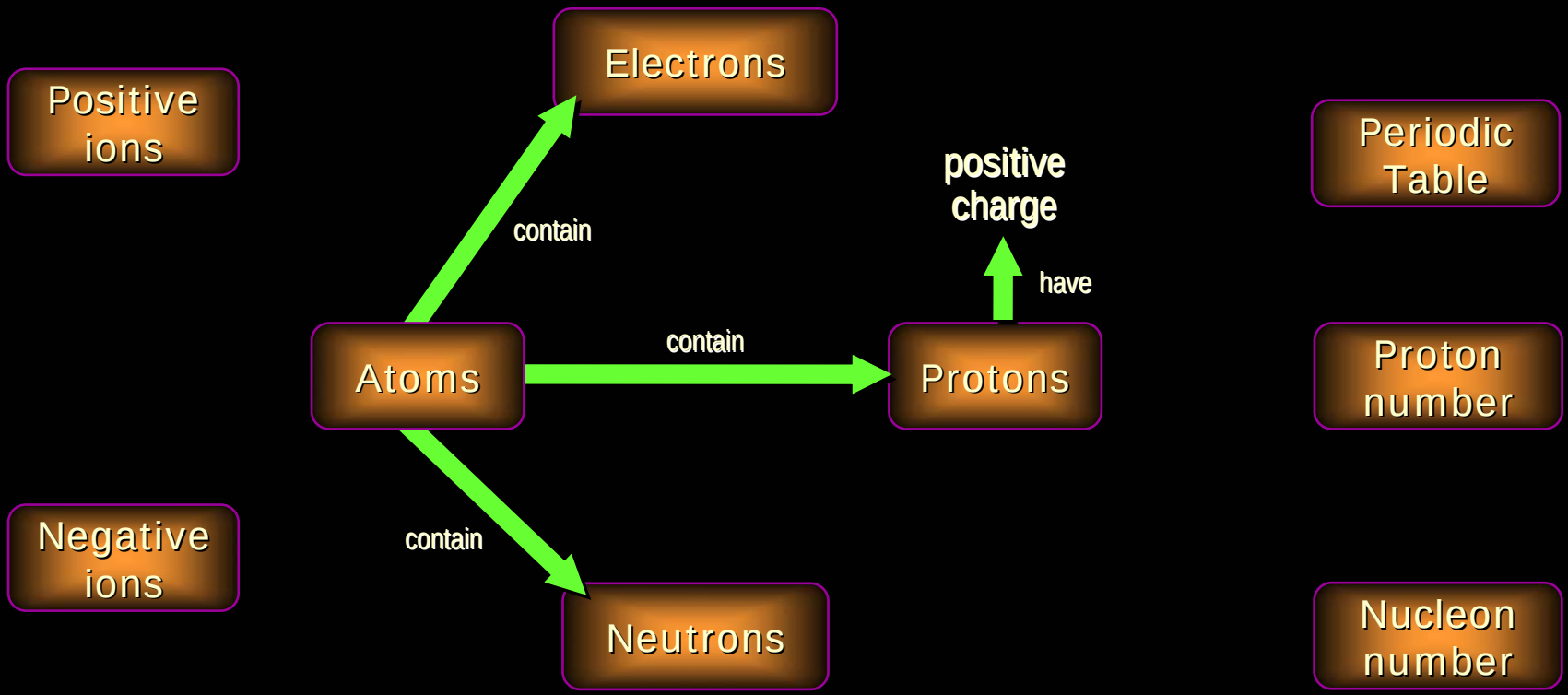
	Cl atom	Cl^- ion	O atom	O^{2-} ion
No of protons	17	17	8	8
Number of electrons	17	18	8	10

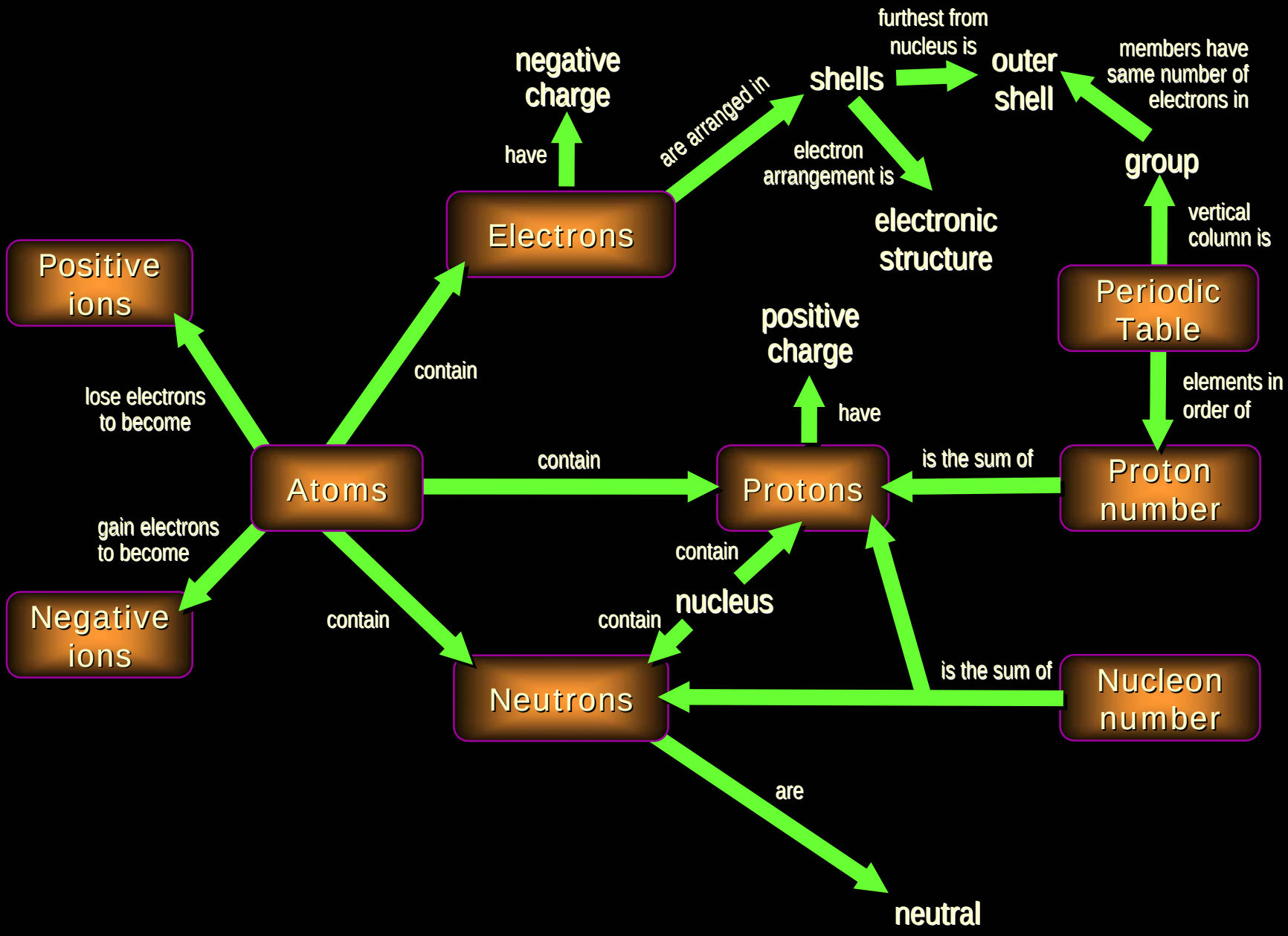
- A positive ion is formed by when an atom loses electron(s), resulting in having more protons than electrons.

	Na atom	Na^+ ion	Mg atom	Mg^{2+} ion
No of protons	11	11	12	12
Number of electrons	11	10	12	10

- Note how ions are represented by including the **charge** of the ions on the symbols.

Come up with a mindmap for atomic structure with the following terms.




Positive ions
Electrons
negative charge
have
are arranged in
shells
furthest from nucleus is
outer shell
members have same number of electrons in
group
vertical column is
Periodic Table
elements in order of
Proton number
is the sum of
electron arrangement is
electronic structure
positive charge
have
lose electrons to become
contain
Atoms
contain
Protons
gain electrons to become
Negative ions
contain
contain
nucleus
contain
Neutrons
is the sum of
Nucleon number
are
neutral