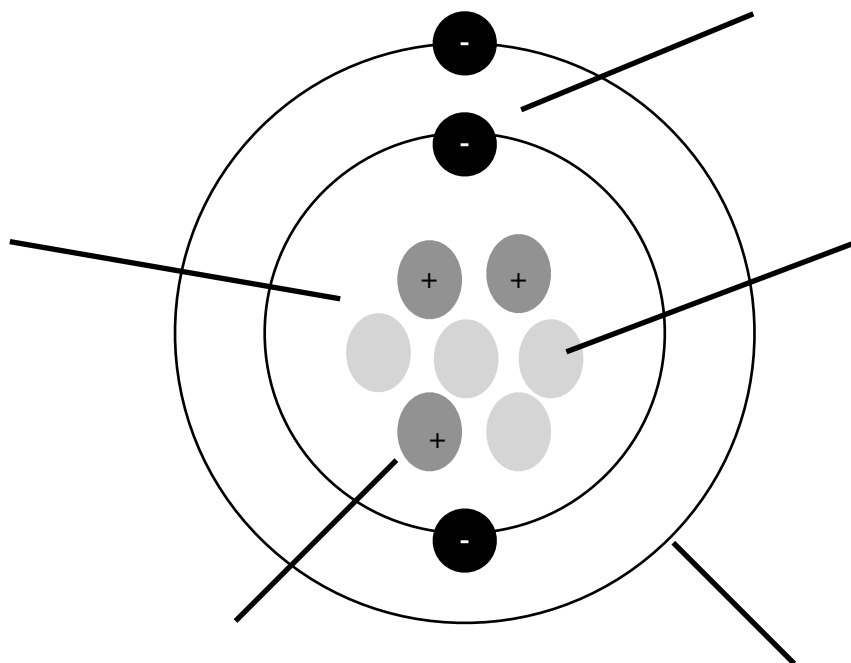


N5: Atomic Structure and Bonding

Elements are made of atoms. Atoms contain subatomic particles.



Subatomic particle	Mass	Charge	Location

Each element is defined by the number of _____, this is called the _____.

In a neutral atom the number of positive _____ is equal to the number of negative _____. Atoms can form ions by losing or gaining electrons.

The nucleus of the atom contains the protons and neutrons, they are the particles that contribute to the mass of the atom. The _____ for an individual atom is equal to the sum of proton and neutrons.

Some elements have atoms of different mass. These are called _____. They have the same number of _____ (_____ number) but different numbers of _____ (_____ number). The relative atomic masses found in the data book is an average of the masses of the _____ taking into account their proportions. The relative atomic mass of an element is closest to the mass of the _____ abundant isotope.

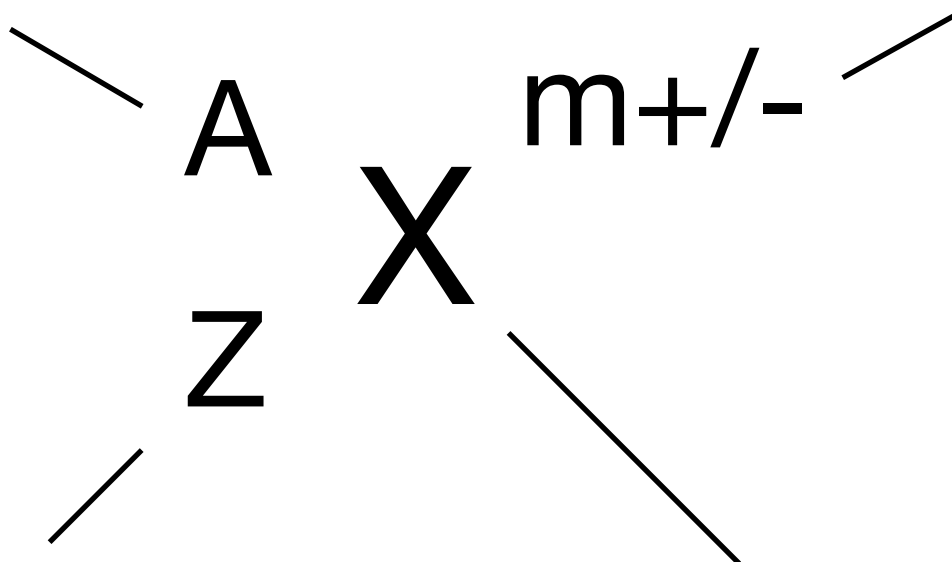


Chlorine has two isotopes, Cl-35 and Cl-37. The relative atomic mass of chlorine is 35.5. Which isotope is most abundant?



Bromine has two isotopes, Br-79 and Br-81. The relative atomic mass of bromine is 80. What does this tell you about the abundance of bromine isotopes?

Nuclide notation is a shorthand way to represent atoms and the subatomic particles present.



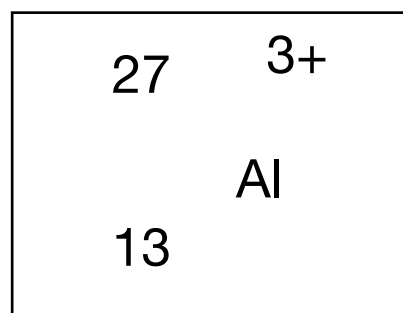
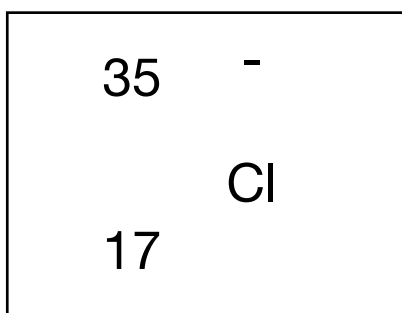
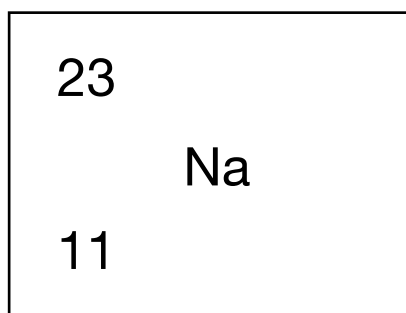
Number of protons =

Number of neutrons =

Number of electrons =

?

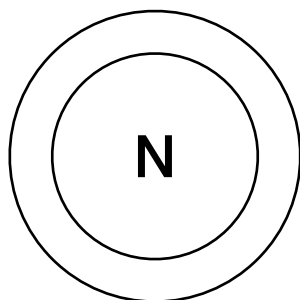
How many protons, electrons and neutrons are present in each nuclide notation?



?

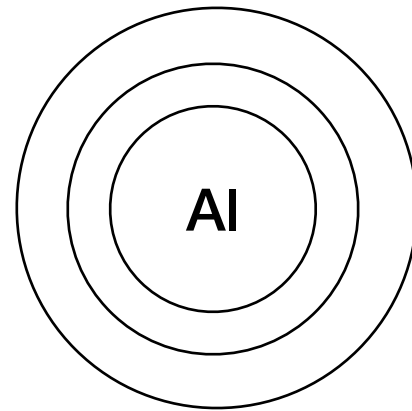
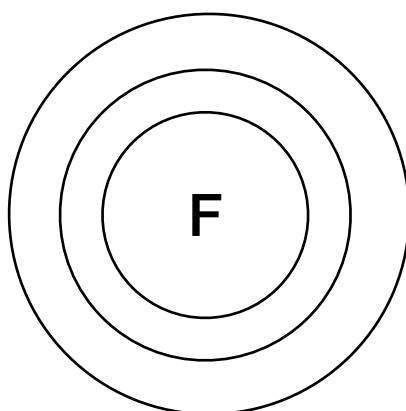
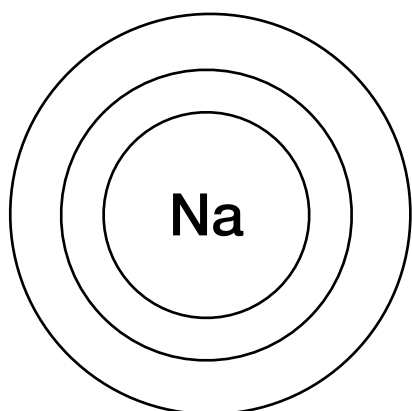
A particle contains 8 protons, 8 neutrons and 10 electrons. Write the nuclide notation.

Electrons fill the electron shells following the _____ rule.
Electrons fill _____ before pairing.



?

Write and draw the electron arrangements for sodium, fluorine and aluminium. Use page 6 of your data book to help.



Elements are arranged in order of _____
_____ on the periodic table.

The diagram shows a blank periodic table grid. It consists of 7 rows and 18 columns. The first two rows have gaps at the beginning and end, representing the s-block elements. The third row has a gap at the beginning and end, representing the d-block elements. The fourth, fifth, sixth, and seventh rows are solid blocks of 18 cells each, representing the p-block elements. Below the main grid is a separate 2x14 grid representing the lanthanide and actinide series.

Indicate

- **Metals/non-metals**
- **Alkali metals**
- **Transition metals**
- **Halogens**
- **Noble gases**

Elements in groups have the _____
_____ of _____
_____. This means they have the
same _____ and _____
_____.

Alkali metals:

Halogens:

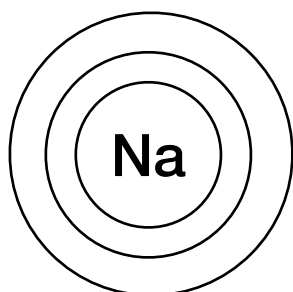
Noble gases:

Ions are _____ particles. Ions form when atoms _____ or _____ electrons to achieve _____ electron arrangements of noble gases. The number of electrons lost/gained is equal to the valency.

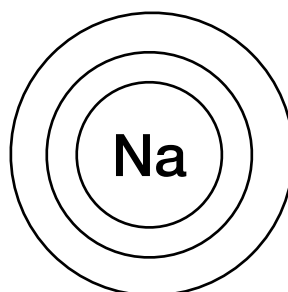
Positive ions form when metal atoms _____
_____.

E.g. sodium

Atom



Ion



Positive protons =
Negative electrons =
Charge =

Positive protons =
Negative electrons =
Charge =

This change can be represented using an ion-electron equation:

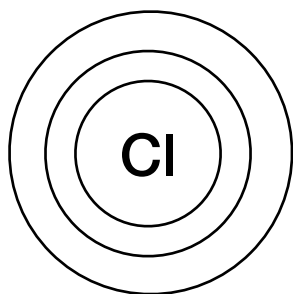


Write the ion-electron equation for the formation of magnesium ions.

Negative ions form when non-metal atoms _____
_____ to _____ the _____.

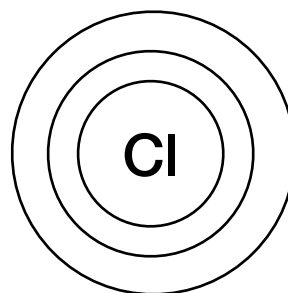
E.g chlorine

Atom



Positive protons =
Negative electrons =
Charge =

Ion



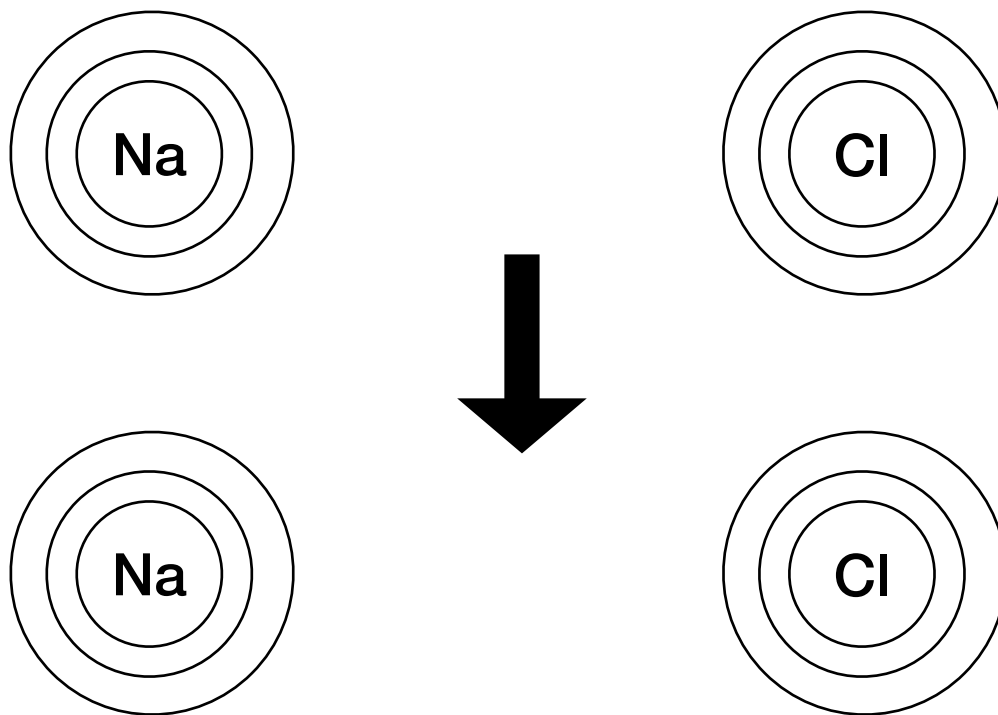
Positive protons =
Negative electrons =
Charge =

This change can be represented using an ion-electron equation:

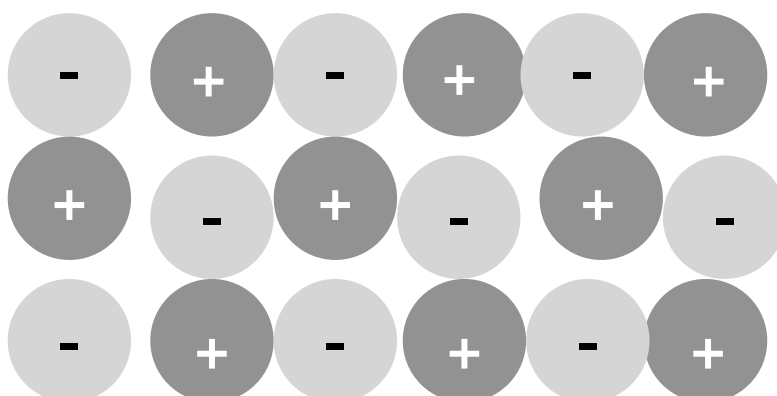


Write the ion-electron equation for the formation of oxygen ions.

Ions form by transfer of electrons from _____ to _____ atoms. The oppositely charged ions that form are then _____, forming ionic bonds.



Ionic compounds form 3D _____ structures. Each _____ ion is surrounded by _____ ions and each _____ ion is surrounded by _____ ions. The formulae of ionic compounds represents _____.



When two non-metal atoms bond they do so by _____
their _____.
This is called _____ bonding.

A _____ bond forms when two _____ nuclei are held together by their _____ for a _____ pair of _____ between them.

Covalent bonding occurs in two ways:

-
-

A molecule is _____

Covalent molecules occur in both elements and compounds.

There are seven elements which exist as diatomic molecules that form using covalent bonds:

-
-
-
-
-
-
-

The covalent bonds in a molecule can be represented using outer

electron (dot and cross) diagrams. The formula of a covalent molecule represents _____

E.g. hydrogen, H_2



Draw an outer electron picture for hydrogen chloride (HCl), water (H_2O), ammonia (NH_3) and methane (CH_4).

Atoms can form multiple covalent bonds with other atoms.

E.g. Oxygen, O₂

Nitrogen, N₂

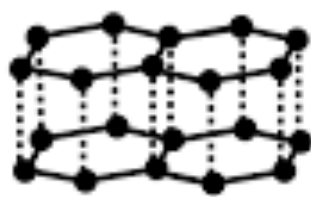
Molecules can have different shapes depending on the number of bonds and their orientation to a central atom.

Compound	Formula	Shape diagram	Shape name
Hydrogen chloride			
Water			
Ammonia			
Methane			

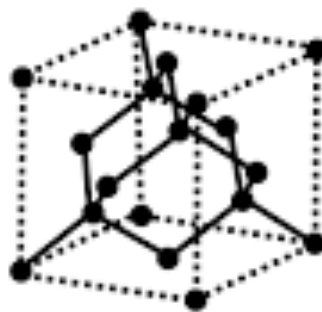
The wedges represent bonds coming towards you out of the page, the dashes represent bonds going away from you and the lines are in the plane of the paper.

Covalent network structures can exist for elements or compounds. Covalent networks consist of a _____ of _____ bonded atoms. The formulae of covalent networks represents _____.

Examples include _____, _____ and _____.



Graphite Structure



Diamond Structure

The different types of bonding lead to different properties.

Type of bonding	Melting/ Boiling point	Conduction of electricity	Solubility in water
Ionic			
Covalent molecular			
Covalent network			