

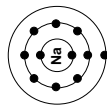
### ATOMIC STRUCTURE

Particle	Mass	Charge	Position
Proton	1	+1	nucleus
Neutron	1	0	nucleus
Electron	1/1836	-1	outside nucleus

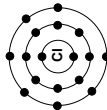
Atoms have a **small nucleus** containing protons and neutrons. Electrons are in shells around the nucleus.

### ELECTRONIC CONFIGURATIONS

- only a certain number of electrons can go into a shell
- 1st shell = 2    2nd shell = 8    3rd shell = 8 (initially)
- sodium atoms have 11 electrons arranged 2,8,1
- chlorine atoms have 17 electrons arranged 2,8,7



sodium  
2,8,1



chlorine  
2,8,7

- the no. of electrons in the outer shell affects reactivity
- when a shell is complete a new period starts
- atoms in the same Group have similar outer shells
- Gp 1; lithium 2,1 sodium 2,8,1 potassium 2,8,8,1

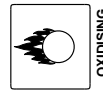
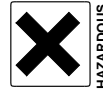
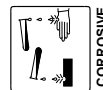
### ATOMS

- atoms are neutral; no. of electrons = no. of protons
- atoms of the same element have same no. of protons

### IONS

- are charged particles - can be negative or positive
- positive ions have fewer electrons than protons
- negative ions have more electrons than protons

### SAFETY



### THE PERIODIC TABLE

- atoms are arranged in order of their proton numbers
- over three-quarters of elements are metals
- non-metals are on the right hand side of the table
- horizontal rows are called PERIODS
- vertical columns are called GROUPS

Group I ALKALI METALS Li, Na, K, Rb, Cs, Fr  
 Group VII HALOGENS F, Cl, Br, I, At  
 Group 0 NOBLE GASES He, Ne, Ar, Kr, Xe, Rn

### GROUP I - THE ALKALI METALS

Element	Symbol	At. No.	Electron config.	Ion	Hydroxide	Chloride
LITHIUM	Li	3	2,1	Li <sup>+</sup>	LiOH	LiCl
SODIUM	Na	11	2,8,1	Na <sup>+</sup>	NaOH	NaCl
POTASSIUM	K	19	2,8,8,1	K <sup>+</sup>	KOH	KCl

- are reactive metals
- get more reactive down the Group
- melting points get lower down the Group
- give up an electron to form positive ions with charge +1
- react with chlorine to form ionic chlorides of formula MCl
- react with water releasing hydrogen gas
- form soluble hydroxides which give alkaline solutions
- sodium + water → sodium hydroxide + hydrogen
- 2Na(s) + 2H<sub>2</sub>O(l) → 2NaOH(aq) + H<sub>2</sub>(g)
- (g) = gas (l) = liquid (s) = solid (aq) = dissolved in water

### GROUP VII - THE HALOGENS

- are reactive non-metals
- exist as diatomic molecules - F<sub>2</sub>, Cl<sub>2</sub>, Br<sub>2</sub>
- get less reactive down the Group
- melting and boiling points increase down the Group
- gain an electron to form negative ions with charge -1
- can bleach dyes and kill bacteria in water

Element	Atomic No.	Electron config.	State (rtp)	Vapour colour	Molecular formula	Ion
FLUORINE	9	2,7	gas	yellow	F <sub>2</sub>	F <sup>-</sup>
CHLORINE	17	2,8,7	gas	green	Cl <sub>2</sub>	Cl <sup>-</sup>
BROMINE	35	2,8,18,7	liquid	brown	Br <sub>2</sub>	Br <sup>-</sup>
IODINE	53	2,8,18,18,7	solid	purple	I <sub>2</sub>	I <sup>-</sup>

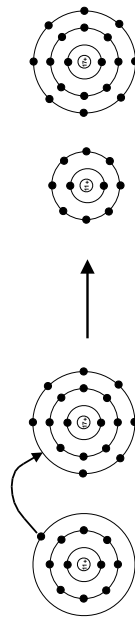
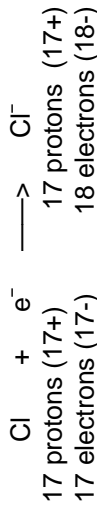
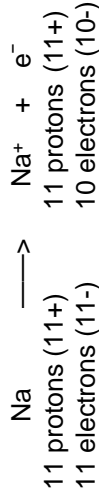
### IONIC COMPOUNDS

- solid ionic compounds do not conduct electricity
- molten ionic compounds conduct electricity
- solutions of ionic compounds in water conduct electricity
- conduction takes place because the ions can move
- sodium chloride is a typical ionic compound

### FORMATION OF SODIUM CHLORIDE (NaCl)

- sodium atoms have an electronic configuration 2,8,1
- chlorine atoms have an electronic configuration 2,8,7
- noble gases have complete outer shells 2,8 or 2,8,8
- atoms like to get complete outer shells of electrons

If a sodium atom TRANSFERS an electron to a chlorine atom the sodium atom becomes a positive sodium ion and the chlorine atom becomes a negative **chloride** ion.



Na (2,8,1)    Cl (2,8,7)    Na<sup>+</sup> (2,8)    Cl<sup>-</sup> (2,8,8)

- the ions formed are oppositely charged
- oppositely charged ions attract each other strongly
- this gives sodium chloride a very high melting point
- the ions are arranged in a regular crystal lattice
- when melted or put in water, the ions move apart

**You can calculate the formulae of salts by balancing the positive and negative charges on ions**

lithium	Li <sup>+</sup>	fluoride	F <sup>-</sup>
sodium	Na <sup>+</sup>	chloride	Cl <sup>-</sup>
potassium	K <sup>+</sup>	bromide	Br <sup>-</sup>
potassium bromide	KBr	(one - balances one +)	