

## THE STRUCTURE OF ATOMS

### Introduction

All substances are made of atoms

A substance with only one sort of atom is called an **ELEMENT**

There are just over 100 different elements.

### ATOMS

Atoms consists of a small central **nucleus** made up of **protons** and **neutrons**.

Around the nucleus you find the **electrons** which exist in **energy levels** or **shells**.

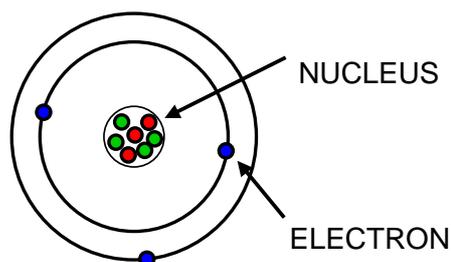
Most of the mass of an atom is concentrated at the centre in the nucleus.

	Relative mass	Relative charge	Position
<b>PROTON</b>	<b>1</b>	<b>+1</b>	<b>in the nucleus</b>
<b>NEUTRON</b>	<b>1</b>	<b>0</b>	<b>in the nucleus</b>
<b>ELECTRON</b>	negligible	<b>-1</b>	<b>around the nucleus</b>

**Atoms are neutral** - they have the **same number of electrons as protons**

A LITHIUM ATOM

	<i>charge</i>			
<b>3 protons</b>	+	+	+	
<b>4 neutrons</b>	0	0	0	0
<b>3 electrons</b>	-	-	-	
<b>overall charge</b>	=	0	(neutral)	



### Symbols

Atoms of an element are represented by a symbol.

- some have one capital letter

**H C K**

- others have a capital letter followed by a lower case letter

**Na Mg Cu**

### Q.1

What are the names of the elements with the following symbols?

*F*

*Ne*

*Na*

*P*

*S*

*K*

### Protons

- Atoms of a particular element have the same number of protons
- Protons are not responsible for the chemical properties of elements

**Atomic (proton) Number (Z) = number of protons**

### Neutrons

The number of neutrons in a nucleus can vary.

**Mass (nucleon) Number (A) = number of protons + neutrons**

- Electrons**
- atoms are neutral, they have the **same number of electrons as protons**
  - electrons exist outside the nucleus in energy levels (shells)
  - each energy level can hold up to a certain maximum number of electrons

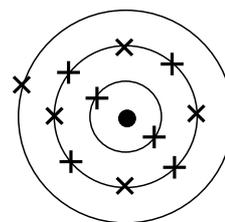
shell	position	energy	max no of electrons
1st	nearest the nucleus	lowest energy	2
2nd	further away	higher energy	8
3rd	..	..	18 <i>only 8 go in to begin with!</i>
4th	..	..	32

- inner shells are filled first; when full, the electrons enter the next available level
- the arrangement of electrons is known as the **electronic configuration**

### Electronic configuration

A way of representing the arrangement of electrons in an atom or ion.  
 e.g. the electronic configuration of calcium atoms is 2,8,8,2

An alternative way is to show the electrons in rings around the nucleus



e.g. Sodium 2,8,1

