

### Cambridge IGCSE Chemistry

# Topic 3: atoms, elements and compounds

#### Atomic structure and the Periodic Table

Notes

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State the relative charges and approximate relative masses of protons, neutrons and electrons

sub-atomic particle	relative mass	relative charge
proton	1	+1
neutron	1	0
electron	1/1836	-1

Define proton number (atomic number)...

• The number of protons in the nucleus of an atom

#### Define nucleon number (mass number)...

• The total number of protons and neutrons in the nucleus of an atom

## *Use proton number and the simple structure of atoms to explain the basis of the Periodic Table with special reference to the elements of proton number 1 to 20*

- Elements are arranged in order of atomic (proton) number (bottom number) and so that elements with similar properties are in columns, known as groups.
- Elements in the same periodic group have the same amount of electrons in their outer shell, which gives them similar chemical properties.
- Elements are arranged in order of increasing atomic number, in rows called periods and elements, with similar properties are placed in the same vertical columns called groups

#### Define isotopes...

• Atoms of the same element which have the same proton number but a different nucleon number (different number of neutrons)

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(Extended only) Understand that isotopes have the same properties because they have the same number of electrons in their outer shell

- Isotopes have the same chemical properties because they have the same number of electrons in their outer shell and the number of electrons in the outer shell is responsible for chemical reactions
- they also have the same number of protons so are still classed as the same element

#### State the two types of isotopes as being...

• Radioactive and non-radioactive

State one medical and one industrial use of radioactive isotopes

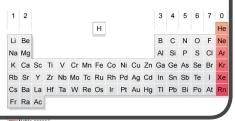
- Medical uses:
  - o Sterilising equipment
  - o Tracers
- Industrial uses:
  - o Smoke alarms
  - o Tracers

Describe the build-up of electrons in 'shells' and understand the significance of the noble gas electronic structures and of the outer shell electrons (The ideas of the distribution of electrons in s and p orbitals and in d block elements are **not** required.) Note: a copy of the Periodic Table, will be available in Papers 1, 2, 3 and 4.

- Electrons are arranged around the nucleus in shells. Starting with the first shell (closest to the nucleus), each shell is filled with electrons before any further shells gain any electrons
  - o First shell can have up to 2 electrons
  - o Second shell can have up to 8 electrons
  - o Third shell can have up to 8 electrons
- When reacting, all atoms will try to acquire this perfect arrangement of electrons

   i.e. having the maximum number of electrons as possible in their outer shell –
   therefore, all atoms try to have 8 electrons in their outer shell (unless they only
   have one shell then they will try to have only 2) because this is the most stable
   <u>arrangement</u>

 Nobles gases have 8 electrons in their outer shells already (except helium, which has 2), making them very stable so unreactive



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