

# Types of radiation

# Radioactive decay

# Contamination and irradiation

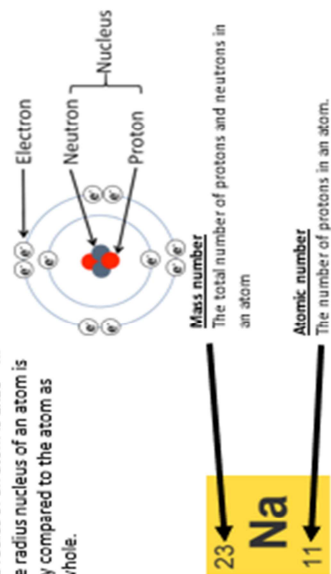
## Knowledge organiser

### Key words

Isotope  
Radioactive decay  
Alpha  
Beta  
Gamma  
Half-life  
Irradiation  
Contamination  
Ionisation  
Becquerel

#### Structure of an atom

The radius of an atom is  $1 \times 10^{-10} \text{m}$   
The radius nucleus of an atom is tiny compared to the atom as a whole.



#### Isotopes

Atoms of the same element that have the same number of protons but they have different numbers of neutrons. E.g.

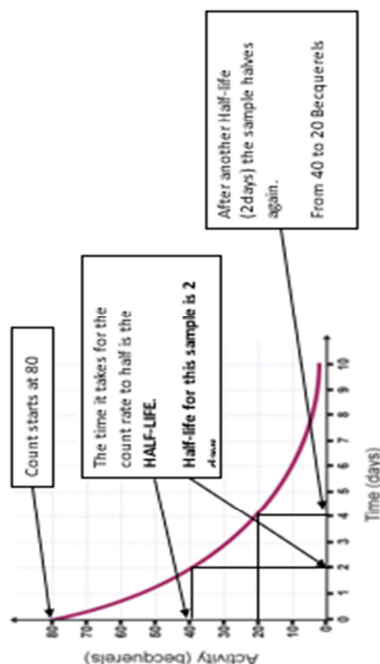
Chlorine-35



Chlorine-37

#### Half-life

Nuclei with too many, or too few, neutrons are unstable and will decay by emitting radiation. Decay is a random process, it is impossible to tell when and which nuclei will decay. We can predict when half of a sample of unstable nuclei will have decayed, this is called the **HALF-LIFE**.  
**HALF-LIFE** = Time taken for half of the unstable nuclei in a sample to decay or for the count rate to halve.



#### Irradiation and Contamination

Irradiation	Contamination
Occurs when an object is exposed to a source of radiation outside the object	Occurs if the radioactive source is on or in the object
Doesn't cause the object to become radioactive	A contaminated object will be radioactive for as long as the source is on or in it
Can be blocked with suitable shielding	Once an object is contaminated, the radiation cannot be blocked from it
Stops as soon as the source is removed	It can be very difficult to remove all of the contamination

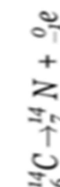
#### Radiation

Type of radiation	Particle	Penetrative properties	Ionising strength
Alpha	2 neutrons, 2 protons (Helium nucleus)	Blocked by paper and skin	Strongly
Beta	1 high energy electron	Blocked by a thin layer of aluminium	Middle
Gamma	Electromagnetic wave from the nucleus.	Slowed down by thick concrete and lead	Weakly

#### Beta decay - 1 high energy electron

- A neutron splits forming a proton and electron.
- Mass number stays the same.
- Atomic number increases by 1.
- Element changes and an electron is emitted.

#### Example



#### Nuclear equations

##### Alpha decay - 2 protons and 2 neutrons

- Mass number decreases by 4.
- Atomic number decreases by 2.
- The element changes and an alpha particle is emitted.

#### Example

