Year 10 Science – Term Two KO

1. Tier 3 Vocab

- **Atom** Basic building block of all substances
- **Proton** A subatomic particle found in the nucleus of an atom. It has a positive charge.
- **Neutron** A subatomic particle found in the nucleus of an atom. It has no charge (neutral).
- **Electron** A subatomic particle found in shells around the nucleus of an atom. It has a negative charge.
- **Mass number** The sum of the protons and neutrons in an atom.
- **Atomic number** The number of protons in the nucleus of an atom.
- **Isotopes** Atoms of an element with the same number of protons but different numbers of neutrons.
- **Radioactivity** When the nuclei of certain isotopes decay by emitting nuclear radiation to lose energy.
- **Ionising** Causes electrons to be knocked out of atoms.
- **Alpha particle** A type of nuclear radiation consisting of two protons and two neutrons bound together.
- **Beta particle** A type of nuclear radiation consisting of a high speed electron
- **Gamma ray** A type of nuclear radiation consisting of electromagnetic waves
- **Half-life** The time take for half the remaining unstable atoms in a sample to decay.

2. Alpha, beta and gamma

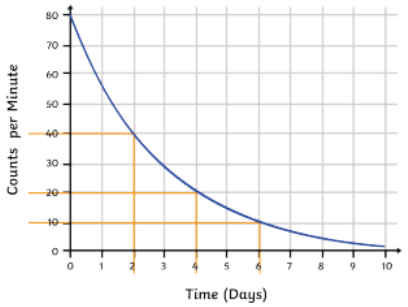
- Alpha
  - Two protons and two neutrons.
  - Charge of +2; mass of 4; highly ionising.
  - Stopped by paper or a about 5 cm of air.
- Beta
  - High speed electron emitted from nucleus.
  - Charge -1; mass very small (negligible); weakly ionising.
  - Stopped by thin aluminium or about 50 cm of air.
- Gamma
  - Electromagnetic wave.
  - Zero mass and charge; very weakly ionising.
  - Stopped by few cm of lead, or many metres of concrete.

3. Contamination vs irradiation

- Irradiation
  - This occurs when materials are near a radioactive source and the nuclear radiation emitted by the source passes through the material.
  - It can be dangerous for living things, but non-living things are not affected and are perfectly safe to handle afterwards
- Contamination
  - This occurs when unwanted radioactive atoms get onto an object.
  - The object is then giving out nuclear radiation making it dangerous to handle or be around.

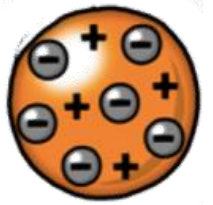
4. Half life

- Half-life is the time taken for the number of radioactive nuclei in a sample to halve.
- Radioactivity is a random process so it is not possible to predict which nuclei will decay, only how many will decay.
- A decay graph can be used to calculate the half-life of a sample:



5. History of the atom

- The atom was originally thought to be a solid sphere that could not be divided.
- In 1897 JJ Thomson discovered the electron, a negative particle found inside atoms. He proposed the plum pudding model: a ball of positive charge with negative electrons embedded within it (see diagram top-right).
- Ernest Rutherford used alpha particle scattering experiments to discover the nucleus. He pictured the atom to have a tiny positive nucleus which contained most of the mass, with electrons orbiting around it.
- Bohr modified this to predict that electrons are only found at specific distances called shells.



6. Command Words

These are the key words in a question that tell you how the question should be answered.

State – requires you to recall a key fact without any further information needed.

Example:
State what is meant by isotopes.
Answer: Atoms of an element with the same number of protons but different numbers of neutrons.

Describe – say what will happen, but <u>without</u> any reason why.

Example:
Describe the properties of an alpha particle.
Answer: An alpha particle is made of two protons and two neutrons. It has a relative charge of +2 and a relative mass of 4. It is highly ionising, but can be stopped by thin paper or a few centimetres of air