Beckfoot

Subject: Science (Physics)	Topic: Atomic Structure (Physics)	Year Group: 9

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Structure of the Atom

1	Radius of an atom	Approx. 1×10^{-10}m
2	Protons	Positively charged and found in the nucleus
3	Neutrons	No charge and found in the nucleus
4	Electrons	Negatively charged and found in energy levels at different distances from the nucleus
5	Nucleus	At the centre of the atom. Contains neutrons and protons
6	Representing atoms	(Mass number) 23 (Atomic number) 11 Na
7	Charge of an atom	Atoms have equal numbers of protons and electrons so are neutral

Models of the Atom through time

1	Early ideas	Atoms were thought to be tiny spheres that could not be divided
2	Plum Pudding	The plum pudding model suggested the atom was a ball of positive charge with negative electrons embedded in it
3	Nuclear Model	The alpha particle scattering experiment showed that the mass of the atom was concentrated in a nucleus at the centre and that this nucleus was positively charged
4	Niels Bohr	Suggested electrons orbit the nucleus at specific distances
5	James Chadwick	About 20 years after the nucleus was accepted, Chadwick discovered evidence for neutrons in the nucleus

Nuclear Radiation

1	Structure	Alpha - Beta - Gamma -	- 2 Protons + 2 Neutrons / stopped by paper or few cm in air - High energy electron / stopped by thin metal or a metre in air - Electromagnetic wave / stopped by thick lead and concrete
2	Decay equation	Alpha – Beta – Gamma –	- Mass number -4 and Atomic number -2 - Mass number no change and Atomic number +1 - No change
3	Ionising power	Alpha – Beta – Gamma –	- Strongly ionising due to 2+ charge - Moderately ionising due to 1- charge - Weakly ionising due to no charge
4	Decay examples	Alpha – Beta –	$^{219}_{86}\text{radon} \longrightarrow {}^{215}_{84}\text{polonium} + {}^{4}_{2}\text{He}$ $^{14}_{6}\text{carbon} \longrightarrow {}^{14}_{7}\text{nitrogen} + {}^{0}_{-1}\text{e}$

Key Vocabulary

1	Mass Number	The atom's total number of Protons added to the number of Neutrons
2	Atomic Number	The number of protons in an atom. Will also be equal to the number of electrons
3	Isotopes	An atom with the same number of protons but a different number of neutrons
4	Half-life	The time taken for the activity of a radioactive sample (or the number of radioactive nuclei) to halve
5	Contamination	The unwanted presence of radioactive atoms on other materials
6	Irradiation	The process of exposing an object to nuclear radiation (the object does not become radioactive)
7	Random	Something that cannot be predicted – you do not know when a radioactive nucleus will decay

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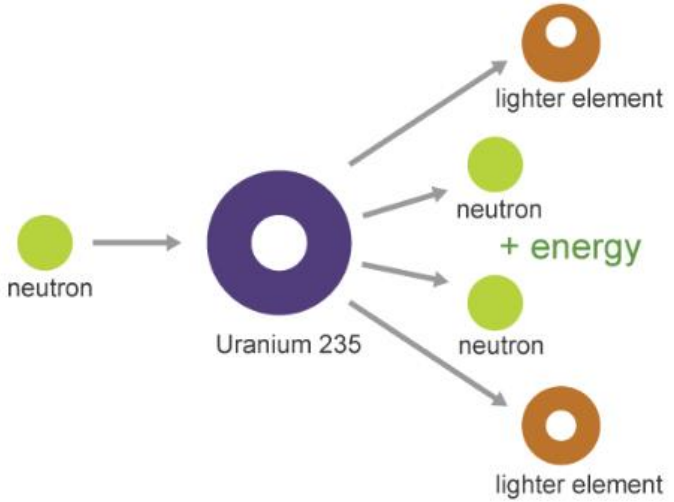
Background radiation and radiation dose: **(Physics only)**

1	Natural sources	a) Rocks b) Cosmic rays
2	Man made sources	a) Nuclear weapons testing b) Nuclear accidents
3	Background radiation and dose may be affected by…	a) Occupation (e.g. pilot, radiographer, etc) b) Location (e.g. Cornwall)
4	Units	Radiation dose is measured in sieverts (Sv) or millisieverts (mSv)
5	Half-life	Different isotopes have a range of half-lives and this can affect the hazards involved
6	Nuclear radiation is used in medicine for…	a) Providing images of internal organs b) Controlling or destroying unwanted tissues

Nuclear Fusion: **(Physics only)**

1	This is the joining of two light nuclei to form a heavier nucleus
2	During the process, some of the mass may be converted into energy. This is what happens in stars (including the Sun) to release heat and light.

Nuclear Fission: **(Physics only)**

1	This is the splitting of a large, unstable nucleus into two smaller nuclei
2	Usually this happens when the unstable nucleus absorbs a neutron
3	Either two or three neutrons are released during fission, as well as Gamma rays and energy. The neutrons can go on to start a chain reaction if they are absorbed by other unstable nuclei. 
4	A nuclear explosion is a chain reaction that has not been controlled