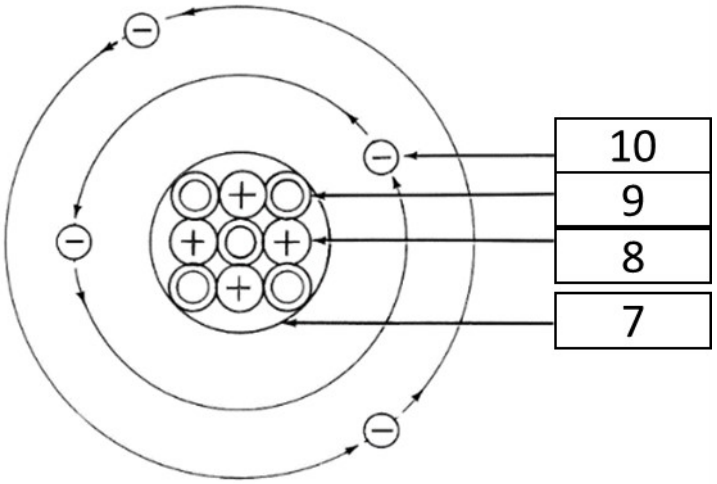
Year 10 Physics 4: Atomic Structure Knowledge Organiser

1. Keywords

1. Atom	The smallest possible piece of an element. Has a radius of 0.1nm (or $1x10^{-10}$m).
2. Element	A substance in which all the atoms have the same atomic number.
3. Isotope	Atoms with the same number of protons but different numbers of neutrons.
4. Molecule	Two or more atoms bonded together
5. Compound	Two or more <u>different</u> atoms bonded together
6. Mixture	At least two different elements or compounds together. Can be separated easily.
7. Nucleus	The centre of an atom. Contains protons and neutrons
8. Proton	A positively charged particle found in the nucleus
9. Neutron	A neutral particle found in the nucleus. Has no charge
10. Electron	A negatively charged particle found in energy levels (shells) around the nucleus



2. Properties of sub-atomic particles

Particle	Relative	Relative	Location
Proton	1	+1	Nucleus
Neutron	1	0	Nucleus
Electron	0	-1	Shells

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

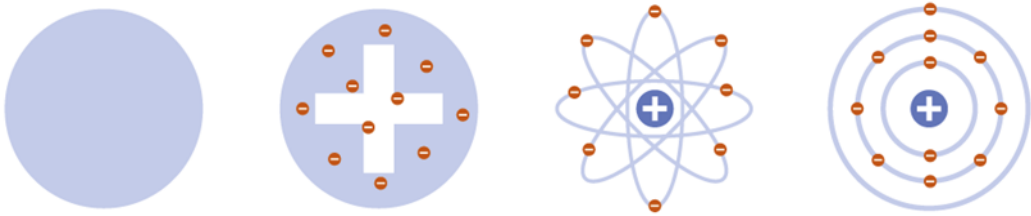
1
H
hydrogen
1

3. Using the periodic table

Number of..	Is the…	Found by..
Protons	Atomic (proton) number	Smaller number on periodic table
Electrons	Atomic (proton) number	Smaller number on periodic table
Neutrons	Difference between the atomic mass and atomic number	Big number – small number

4. History of the atom

Discovery	By	Model	Diagram
Solid particle called atom	John Dalton	Particle: solid spheres	1
The electron	JJ Thompson	Plum pudding: positive 'cake' with negative 'plums'	2
Nucleus	Rutherford	Nuclear: Positive nucleus surrounded by electrons	3
Neutron	James Chadwick	Nuclear: Now with protons and neutrons in nucleus	3
Energy levels (shells)	Niels Bohr	Planetary: Electrons now 'orbit' in different shells	4



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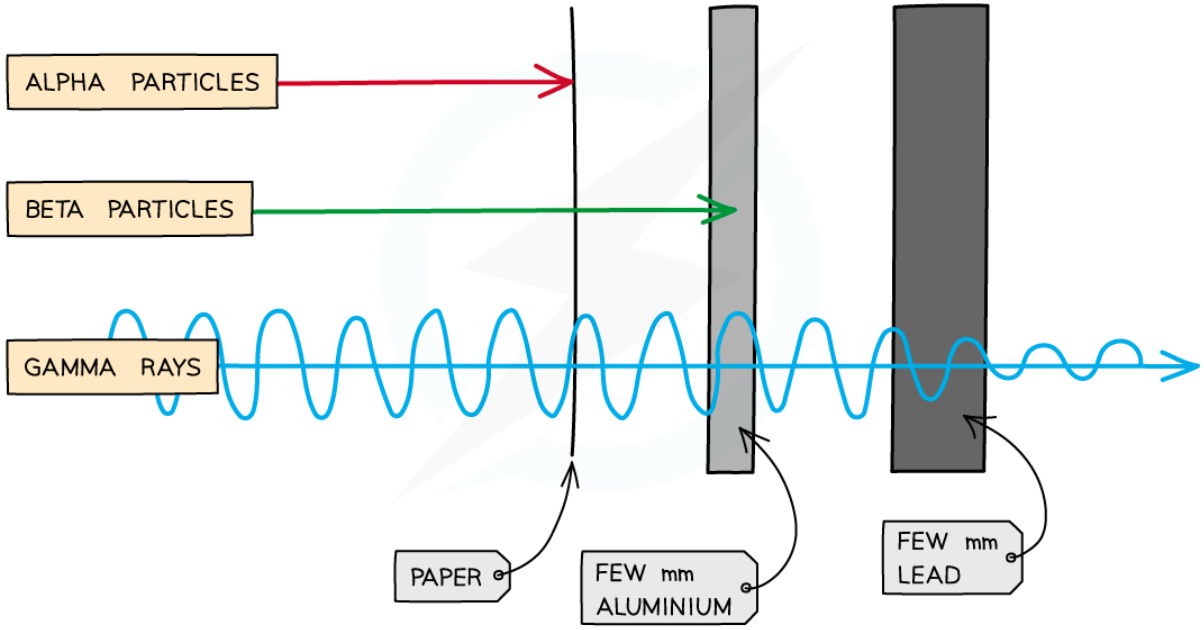
5. Radioactive decay keywords	
Unstable	The ability for a nucleus to decay
Radioactive de-cay	The RANDOM process of radiation being released by a nucleus. A different element in formed
Nuclear radiation	The energy and particles released when an un-stable nucleus decays
Activity	How quickly a radioactive sample decays
Becquerel	The unit of activity
Geiger-Muller tube	A device to measure the count rate of a radioac-tive source
Count rate	The number of radioactive decays per second
Ionising power	How well it knocks off electrons and damages cells
Half life	The time it takes half of a group of radioactive nuclei to decay
Radioactive con-tamination	Unwanted hazardous materials containing radio-active atoms
Peer review	When the findings of one expert are double checked by another expert to make sure they are correct



6. Ionising radiation							
	Name	Symbol	Made of	Charge	Range in air	Penetration	Ionising power
1	Alpha	α	Helium nucleus	**+2**	5 cm	Blocked by paper and skin	High
2	Beta	β	Fast moving electron	**-1**	15 cm	Blocked by thick aluminium	Medium
3	Gamma	γ	Electromagnetic wave	N/A	Very long	Blocked by thick lead	low

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7. Background radiation (TRIPLE ONLY)

Background radiation is the radiation all around us all the time

Natural sources:	Man-made sources:
•Rocks	•Fallout from weapons testing
•Cosmic rays	•Fallout from nuclear incidents

8. Uses of nuclear radiation (TRIPLE ONLY)

Use	Half life	Penetration power	Ionising power	Preferred emitter
Exploring internal organs	A few hours	Med-high	Low	Gamma
Radiotherapy	A few years	High	Med/Low	Gamma (or Beta)

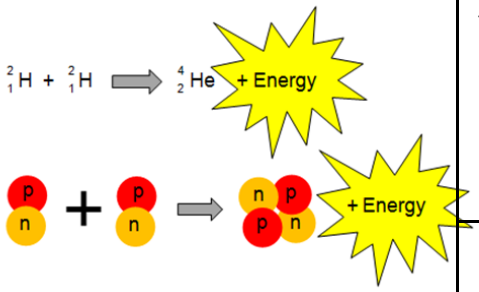

Figure 1

9. Nuclear Fission vs Fusion (TRIPLE ONLY)

Nuclear fission	When a large nuclei breaks into smaller nuclei releasing energy	E.g: •Nuclear power stations •Atomic bombs •The core of the Earth
Nuclear fusion	When small nuclei join together to form larger nuclei. Some mass in converted into energy	E.g: •The Sun •Hydrogen bombs

10. Nuclear fission (TRIPLE ONLY)

1	A slow neutron hits the nucleus
2	The nucleus becomes unstable and splits roughly in half
3	3 neutrons and gamma rays are released
4	These neutrons hit other nuclei causing a chain reaction
5	If this is uncontrolled then it will result in an explosion