

GCSE AQA Physics

Knowledge organiser

Yr10 Particles Part 2:

Atomic structure

Paper 1	Energy	Yr9 / 10
	Electricity	Yr10
	Particles	Yr10
Paper 2	Forces and motion	Yr10 / 11
	Waves	Yr11
	Electromagnetism	Yr11
	Space	Yr11

This is the final paper 1 topic.

Useful revision websites for the MOCK

<https://www.physicsandmathstutor.com/>

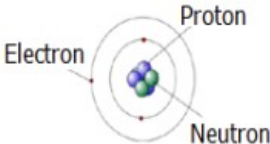
<https://www.savemyexams.com/>

The first has lots of exam Qs and answers to practice.

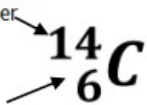
Section 1: Key Terms

Atom	The smallest part of an element that can exist. All substances are made of atoms. No overall electrical charge . Very small , radius of 0.1nm.
Element	An element contains only one type of atom . Found on the Periodic Table. There are about 100 elements.
Isotope	An atom of the same element with different numbers of neutrons .
Radioactive decay	When an unstable nucleus changes to become more stable and gives out radiation . Random .
Activity	The rate at which decay occurs . Measured in becquerels (Bq) .
Count rate	Number of decays recorded each second by a Geiger-Muller tube.
Half life	The time it takes for the number of nuclei of the isotope in a sample to halve Or, The time it takes for the count rate (or activity) from a sample containing the isotope to fall to half its initial level .
Contamination	Is when radioactive particles get into objects e.g. within liquids, with the body or on the skin.
Irradiation	When an object is exposed to radiation . The object does not become radioactive itself.
Ionisation	Radiation can ionize by removing electrons from atoms to form ions . If this happens in DNA it could lead to a mutation that causes cancer .
Peer review	The checking of scientific results by other scientific experts .

Section 2: Development of Atomic Model

Plum Pudding		Thompson's plum pudding model shows that the atom is a ball of positive charge with negative electrons embedded in it. Was incorrect .
Nuclear Model		Rutherford's alpha particle scattering experiment found a central area of positive charge . The nuclear model has a positive nucleus and electrons in shells . Later, neutrons were discovered and included in the nucleus.
Energy levels: Absorption of radiation may lead to electrons moving further from the nucleus (higher energy level). Emission of radiation may lead to electrons moving closer to the nucleus (lower energy level).		

Section 3: Atomic mass number and atomic number

Atomic mass number		Atomic number – the number of protons (the number of electrons is the same in an atom)
Atomic number		Mass number – the total number of protons and neutrons

Section 4: Properties of Sub-Atomic Particles

Sub-atomic particle	Mass	Charge	Position in Atom
Proton	1	+1	Nucleus
Neutron	1	0	Nucleus
Electron	$\frac{1}{2000}$	-1	Orbiting in shells

Section 5: Nuclear Radiation

Radiation	Range in air	Absorbed by	Ionizing Power	Product emitted when nuclei decays
Alpha	Short – up to 5cm	Paper and skin	Very High	2 protons and 2 neutrons
Beta	Medium – about 1m	About 5mm of aluminium .	Medium	Electron
Gamma	Unlimited – spreads out	Several centimetres of lead .	Low	Electromagnetic wave

Section 6: Nuclear Decay Equations

Alpha decay	$^{219}_{86}\text{Rn} \rightarrow ^{215}_{84}\text{Po} + ^4_2\text{He}$ In alpha decay a helium nucleus (2 protons and 2 neutrons) is emitted . The new element formed has a mass number that has decreased by 4 and atomic number that has decreased by 2 .
Beta decay	$^{14}_6\text{C} \rightarrow ^{14}_7\text{N} + ^0_{-1}\text{e}$ In beta decay a neutron turns into a proton . An electron is emitted . The new element formed has a mass number that stays the same and an atomic number which increased by 1 .
Gamma ray	There are no changes to the nucleus when gamma rays are emitted.

Section 7: Activity & half-life

Halve the initial activity ($80 \div 2 = 40$)
 Draw a line across on the graph until you reach the curve
 Draw a line down (half-life = 6 days)
 Half life **never** drops to zero.

