GCSE Checklist – Atomic Structure.

By the end of this topic (Topic 4 in the AQA GCSE Physics textbook, pages 120-146), you should be able to do the following things:

		Page(s)
Explain how the Rutherford and Marsden scattering experiment led to the 'plum pudding' model of the atom being replaced by the **nuclear model**		120-1
Describe the **nuclear model** and the **particles** that are found within an atom		122
Know the **relative masses** and **relative electric charges of protons, neutrons and electrons**		122-123
Explain how, in an atom, the number of electrons is equal to the number of protons in the nucleus so that the atom has no overall electrical charge		123
Know that all atoms of a particular element have the same number of protons, and atoms of different elements have different numbers of protons. The total **number of protons** in an atom is called the **atomic number**		123
Know that the total number of **protons and neutrons** in an atom is called the **mass number**		123
Explain how atoms of the same element which have different numbers of neutrons are called **isotopes**		124
Understand how the nuclei of some isotopes are **unstable** and they therefore emit **radiation** (**alpha**, **beta** or **gamma**) to become more stable. We say that such isotopes are **radioactive**.		126-129
Describe how an **alpha particle** consists of 2 protons and 2 neutrons (like a helium-4 nucleus), and how, when it is given out by a radioactive nucleus, the atomic number goes down by 2 and the mass number down by 4		126
Describe a **beta particle** as a high energy electron given out by a nucleus when a neutrons splits into a proton. When a beta particle is given out by a radioactive nucleus, the atomic number goes up by one and the mass number stays the same		127
Explain the properties of alpha, beta and gamma radiation in terms of their **range in air**, and the amount/type of material required to **absorb** them		126-7
Understand why **alpha** and **beta** radiation may be deflected by an **electric or magnetic field**, but **gamma** radiation may not		126-7
Describe the **ionising** power of alpha, beta and gamma radiation, and explain why how dangerous a source of radiation is may depend on whether it is inside or outside the body		126-7
Use **nuclear equations** to represent **alpha** and **beta decay** and understand the **changes** that happen inside a **nucleus** as a result of these decays		127-9
Explain what is meant by the idea that radioactivity is a **random** process		130

Define the term **half-life** of a radioactive isotope, and be able to calculate the proportion of radioactive nuclei remaining after a certain number of half-lives		130-1
Use a graph of number of radioactive nuclei remaining against time to determine the half-life of a particular isotope		132
Define the terms **irradiation** and **contamination** and explain the difference between them		134
Describe the origins of **background radiation**, including man-made sources (e.g. medical, weapons testing) and natural (e.g. cosmic rays, radon, food and drink) **(triple only)**		135-6
Explain what is meant by the term **radiation dose (triple only)**		135
Describe how the use that can be made of a radioactive isotope depends on both the type of radiation it emits and its half-life, and use this idea to evaluate the usefulness of an isotope for a particular purpose**(triple only)**		138
Explain a number of **uses** of radioactive isotopes including **medical tracers** and **radiotherapy (triple only)**		138
Describe the **effects of radiation** on **living cells (triple only)**		137
Understand how the **benefits** and **risks** of radiation are weighed up when decided whether it should be used **(triple only)**		139
Explain how the process of **nuclear fission** is the splitting of a larger nucleus into two smaller nuclei and how **energy** is released in the process **(triple only)**		140
Explain how the neutrons released in nuclear fission may go on to cause other nuclei to split and may produce a **chain reaction (triple only)**		140
Sketch a labelled diagram to illustrate how a chain reaction may occur **(triple only)**		140
Describe how **nuclear fusion** is the joining of two (lighter) nuclei to make one larger nucleus **(triple only)**		140-1
Understand that nuclear fusion is the process by which energy is released inside stars **(triple only)**		140-1

Key Vocabulary

nucleus proton neutron electron isotope

radioactive radiation alpha beta gamma

absorb random half-life background

fission chain reaction fusion irradiation contamination