

# GCSE Physics and Combined Science Specification Focus Questions for Atomic Structure

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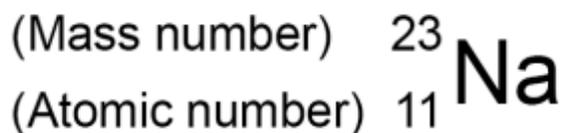
## The Structure of an Atom

1. What is the approximate radius of the atom? Hint: It is a very small number and it is in standard form e.g.  $10$  to the power of something.
2. What is the charge of the nucleus of an atom?
3. Is a proton positively or negatively charged?
4. Is an electron positively or negatively charged?
5. What charge is a neutron?
6. Where are the protons and neutrons found in the atom?
7. Where are the electrons found within the atom?

8. Copy and complete the following: The radius of a nucleus is less than \_\_\_\_\_ of the radius of an atom.
9. Where is most of the mass of the atom found?
10. Are the electrons in an atom arranged at the same distance from the nucleus?
11. Where do the electrons exist?
12. What happens to an electron if it absorbs electromagnetic radiation?
13. What happens when an electron moves closer to the nucleus of an atom?

## Mass number, atomic number and isotopes

1. In an atom what can you say about the number of protons compared to the number of neutrons?
2. What is the overall electrical charge on an atom?
3. Comment on the number of protons in all atoms of a particular element? For instance how many protons do all atoms of the element sodium have?
4. What is the number of protons in an atom of an element called? It begins with the letter 'a'.
5. What is the total number of protons and neutrons in an atom called? It begins with the letter 'm'.
6. Here is how sodium is represented on the periodic table.



7. How many protons does sodium have?
8. How many neutrons does sodium have?
9. How many electrons does sodium have?

10. What is being described here: – *Atoms of the same element can have different numbers of neutrons.*
11. What do atoms turn into if they lose one or more of their outer electrons?

## The development of the model of the atom (common content with chemistry)

1. What may new experimental evidence lead to?
2. What were atoms thought to be before the discovery of the electron?
3. What model of the atom did the discovery of the electron lead to? Mmmmm you could eat it!
4. Describe the model of the atom you wrote in the above question.
5. What was the conclusion of the results of the alpha scattering experiment? This video will help with the alpha scattering experiment.
6. Describe the alpha scattering experiment. What was fired at what? This Phet simulation is quite good on the [Rutherford scattering experiment](#).
7. What is the nuclear model of the atom and what did it replace?
8. Copy and complete this paragraph. *Niels Bohr adapted the nuclear model by suggesting that \_\_\_\_\_ orbit the nucleus at specific \_\_\_\_\_. The theoretical calculations of \_\_\_\_\_ agreed with \_\_\_\_\_ observations.*
9. What did later experiments prove you could do with the mass of positive charge?

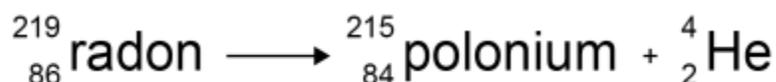
10. What did James Chadwick prove? How many years after the nucleus became an accepted scientific idea was this?

## Radioactive decay and nuclear radiation

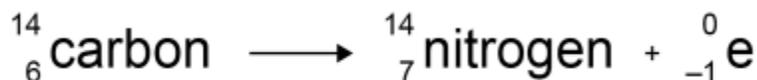
1. Copy and complete: Some atomic nuclei are \_\_\_\_\_.
2. What do nuclei give out as it changes to become more stable?
3. Radioactive decay is a random process. Explain this sentence.
4. What is meant by the activity of a radioactive source? In this answer, you have to explain the term rate.
5. What is the unit of activity?
6. What is meant by the count rate of a radioactive source?
7. What device is the count rate measured by?
8. What is an alpha particle?
9. Why can an alpha particle be written as a helium nucleus?
10. What is a beta particle?
11. What does a neutron turn into for a beta particle to be emitted?
12. What is a gamma-ray?
13. State a fourth type of nuclear radiation.
14. What are the greek symbols for an alpha, beta and gamma radiation?
15. Find out about the penetration of alpha, beta and gamma through different materials.
16. Find out about the range in air of alpha, beta and gamma radiation.
17. Find out about the ionising power of alpha, beta and gamma radiation.

## Nuclear Equations

1. What are nuclear equations used to represent?
2. What symbol is used to represent an alpha particle?
3. What symbol is used to represent a beta particle?
4. Write down this nuclear equation for alpha decay.



5. How does the atomic number of polonium compare to the atomic number of radon?
6. How does the mass number of polonium compare to the mass number of radon?
7. How does the mass of the nucleus change for alpha decay?
8. How does the charge of the nucleus change for alpha decay?
9. Write down this nuclear equation for beta decay?



10. How does the atomic number of nitrogen compare to the atomic number of carbon?
11. How does the mass number of nitrogen compare to the mass number of carbon?
12. How does the mass of the nucleus change for alpha decay?
13. How does the charge of the nucleus change for alpha decay?
14. Copy and complete this sentence: The emission of a \_\_\_\_\_ does not cause the \_\_\_\_\_ of the nucleus to change.

## Half-lives and the random nature of radioactive decay

1. Copy and complete: Radioactive decay is \_\_\_\_\_.
2. Copy and complete this paragraph: The half-life of a radioactive isotope is the time it takes for the number of \_\_\_\_\_ of the isotope in a \_\_\_\_\_, or the time it takes for the count rate (or activity) from a sample containing the isotope to fall to half its \_\_\_\_\_.
3. Watch these videos which tell you how to calculate half-life.  
<https://www.youtube.com/watch?v=zXw2cOSBB8E> and  
<https://www.youtube.com/watch?v=wj9BzGFao8k&t=1s>.

## Radioactive contamination

1. What is radioactive contamination?
2. What is the hazard of contamination due to?
3. What affects the level of hazard?
4. What is irradiation? How is this different to contamination?
5. Why does an irradiated object not become radioactive?
6. Why is it important for the findings of studies into the effects of radiation on humans to be published and shared with other scientists?
7. What is meant by peer review?

## Background Radiation - Physics Only

1. Give examples of natural sources of background radiation.
2. Give examples of man-made sources of background radiation.
3. What can the level of background radiation depend on?
4. What can radiation dose depend on?
5. What is the radiation dose measured in?
6. How many Sieverts is 1000 millisieverts (mSv) equivalent to?

## Nuclear Fission and Fusion - Physics Only

1. What is meant by nuclear fission?
2. Replace **get to got** for some of things you don't want to do. E.g. I've got to revise so that I can do well in my exams.
3. Is spontaneous fission common?
4. How does fission occur?
5. Copy and complete the following: The nucleus undergoing fission splits into two \_\_\_\_\_ nuclei, roughly \_\_\_\_\_ in size, and emits two or \_\_\_\_\_ neutrons plus gamma rays. Energy is \_\_\_\_\_ by the fission reaction.
6. What do all fission products have?
7. What may the neutrons go on and start?
8. How is the energy released controlled?
9. Name one use of an uncontrolled chain reaction.
10. What is the joining of two light nuclei to form a heavier nucleus called?
11. In this process what is some of the mass converted into?

