



HOMWORK BOOKLET

P4 Higher

Isotopes

Complete the table below to compare two isotopes of iodine.

Isotope	Atomic Number	Mass Number	Protons	Neutrons	Electrons
iodine-127	53				
iodine-131					

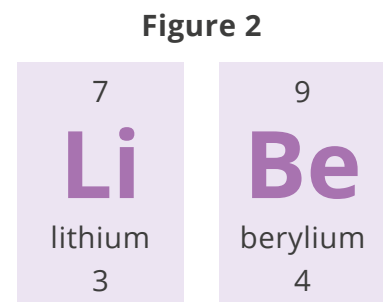
Two isotopes of uranium are uranium-235 and uranium-238.

Compare the structure of an atom of each of these isotopes of uranium.

Changing the Number of Subatomic Particles

Figure 2 shows information from the periodic table about lithium and beryllium.

Compare the number of subatomic particles in an atom of each of these elements.



An atom of lithium can lose an electron in some reactions.

Describe the type of particle which would be formed.

Radioactive Decay

Use suitable words to complete the passage about radioactive decay.

Radioactive decay is a _____ process that occurs when unstable nuclei emit radiation until they become more _____ .

The rate at which a source of unstable nuclei decays is known as _____ .

This is measured in _____ using a detector such as a _____ tube.

The _____ of a source is the number of decays recorded by the detector each _____ .

Nuclear Radiation

Decide which type of nuclear radiation is being described by each statement.

Statement	Alpha	Beta	Gamma
an electromagnetic wave			
has a short range in air of around one metre			
the least penetrating form of nuclear radiation			
a high-speed electron			
has the greatest ionising power			
has the shortest range in air			
has the least ionising power			
can only be stopped by lead or thick concrete			
a negatively charged particle			
created when a neutron turns into a proton			
a helium nucleus			
has the longest range in air			
a positively charged particle			
can pass through thin paper but not aluminium foil			
most likely to damage body cells it collides with			

Nuclear Equations

Describe the changes to the nucleus of an atom that has undergone alpha decay.

Americium has an atomic number of 95. Americium-241 is a radioactive isotope used in smoke detectors. It undergoes alpha decay to form an isotope of the element neptunium.

Complete the equation to show the alpha decay of americium-241.



Explain why the atomic number of an atom increases when it undergoes beta decay.

Strontium-90 is a beta-emitting radioactive isotope used to check the blades of helicopters for cracks. It decays to form an isotope of yttrium, which has an atomic number of 39.

Complete the equation to show the beta decay of strontium-90.



The yttrium atom produced as a result of the beta decay of strontium-90 undergoes a further beta decay reaction.

State the mass number of the daughter nucleus formed. _____

Suggest why the yttrium atom undergoes further beta decay.

Explain the effect of emitting gamma radiation on the number of subatomic particles in the nucleus of an atom.

Half Life

Iodine-131 is a radioactive isotope used in medicine as a diagnostic tool. It has a half-life of eight days.

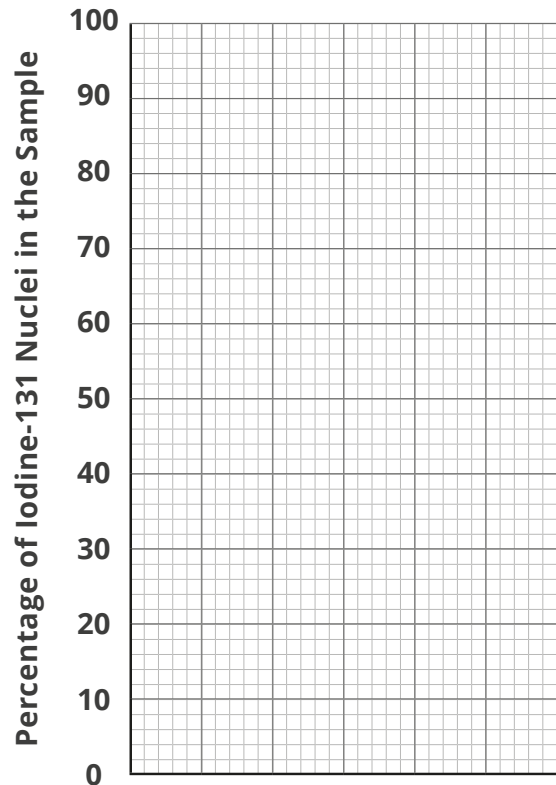
Plot a graph showing how the percentage of a pure sample of radioactive iodine-131 in a sample changes over 40 days.

Calculate the proportion of iodine-131 that will remain after six half-lives.

A sample of iodine containing 120g of radioactive iodine-131 is left for 24 days.

After this time, the sample is tested and found to contain 15g of iodine-131.

Calculate the net decline of the sample of iodine-131.



Radioactive Contamination

Smoke detectors usually contain americium-241 which undergoes alpha decay. It has a half-life of about 432 years. The radioactive source is secured inside a fixed, plastic casing and is usually placed on the ceiling of a room.

Explain why the risk of irradiation to users of smoke detectors is very low.

Technetium-99m is a type of gamma-emitting radioisotope with a half-life of about six hours. It is used in medical scanning to diagnose health conditions. During the scan, technetium-99m is injected into the body.

Explain why technetium-99m is safer to use for medical scanning than americium-241.
