

AQA - Atomic structure – GCSE Physics1. **May/2020/Paper_1F/No.5****0 5**

Radioactive waste from nuclear power stations is a man-made source of background radiation.

0 5 . 1

Which of the following is also a man-made source of background radiation?

[1 mark]Tick (✓) **one** box.

cosmic rays

radiotherapy

rocks

stars

0 5 . 2

Nuclear power stations use the process of nuclear fission.

Complete the sentences to describe the process of nuclear fission.

Choose answers from the box.

[3 marks]

a neutron	a proton	an electron
cosmic rays	energy	gamma rays
		x-rays

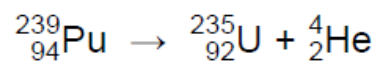
An unstable nucleus absorbs _____ and splits into two parts.

Two or three neutrons are released, as well as _____

and _____.

0 5 . 3 Plutonium-239 is one type of radioactive waste from nuclear power stations.

The following nuclear equation represents the decay of plutonium-239 (Pu-239).



How does the nuclear equation show that alpha radiation is emitted when plutonium-239 decays?

[1 mark]

Tick (✓) **one** box.

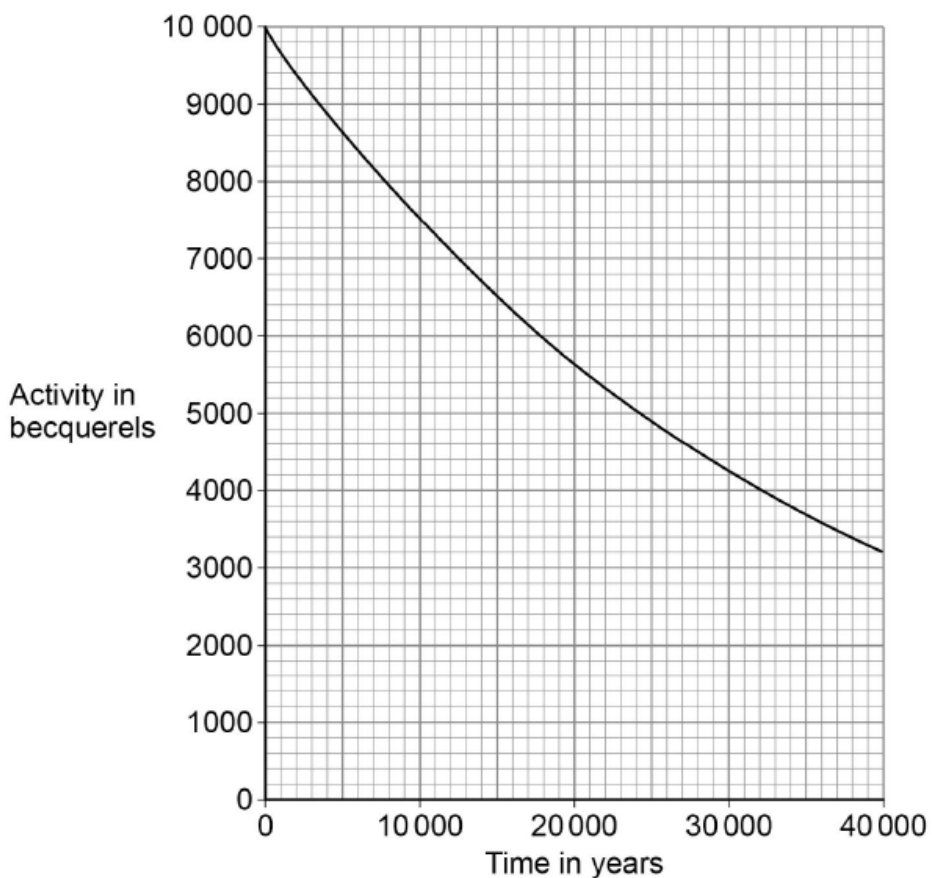
An alpha particle contains 92 protons.

An alpha particle has a mass number of 235.

An alpha particle is the same as a helium nucleus.

Figure 8 shows how the activity of a sample of plutonium-239 varies with time.

Figure 8



0 5 . 4

How much time will it take for the activity of the sample of plutonium-239 to fall to half of its initial activity?

[1 mark]

Time = _____ years

0 5 . 5

What is the half-life of plutonium-239?

[1 mark]

Half-life = _____ years

0 5 . 6

The radioactive waste from a nuclear power station is buried underground.

People are warned to stay away from places where radioactive waste is buried.

Suggest **one** risk of going near the place where radioactive waste is buried.

[1 mark]

2. May/2020/Paper_1H/No.5

0 5

Radioactive waste from nuclear power stations is a man-made source of background radiation.

0 5 . 1

Give **one** other man-made source of background radiation.

[1 mark]

Nuclear power stations use the energy released by nuclear fission to generate electricity.

0 5 . 2

Give the name of **one** nuclear fuel.

[1 mark]

0 5 . 3

Nuclear fission releases energy.

Describe the process of nuclear fission inside a nuclear reactor.

[4 marks]

0 5 . 4 A new type of power station is being developed that will generate electricity using nuclear fusion.

Explain how the process of nuclear fusion leads to the release of energy.

[2 marks]

0 5 . 5 Nuclear fusion power stations will produce radioactive waste. This waste will have a much shorter half-life than the radioactive waste from a nuclear fission power station.

Explain the advantage of the radioactive waste having a shorter half-life.

[2 marks]

3. May/2019/Paper_1F/No.2

0 2

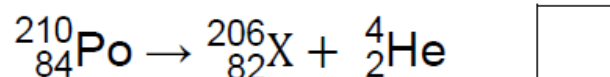
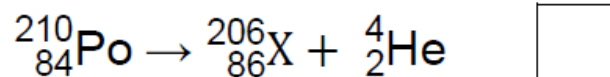
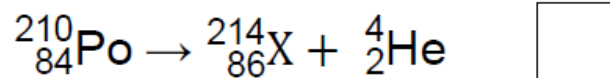
Polonium-210 ($^{210}_{84}\text{Po}$) is a radioactive isotope that decays by emitting alpha radiation.

0 2 . 1

Which is the correct decay equation for polonium-210?

[1 mark]

Tick (✓) **one** box.



0 2 . 2

Why is alpha radiation dangerous inside the human body?

[1 mark]

Tick (✓) **one** box.

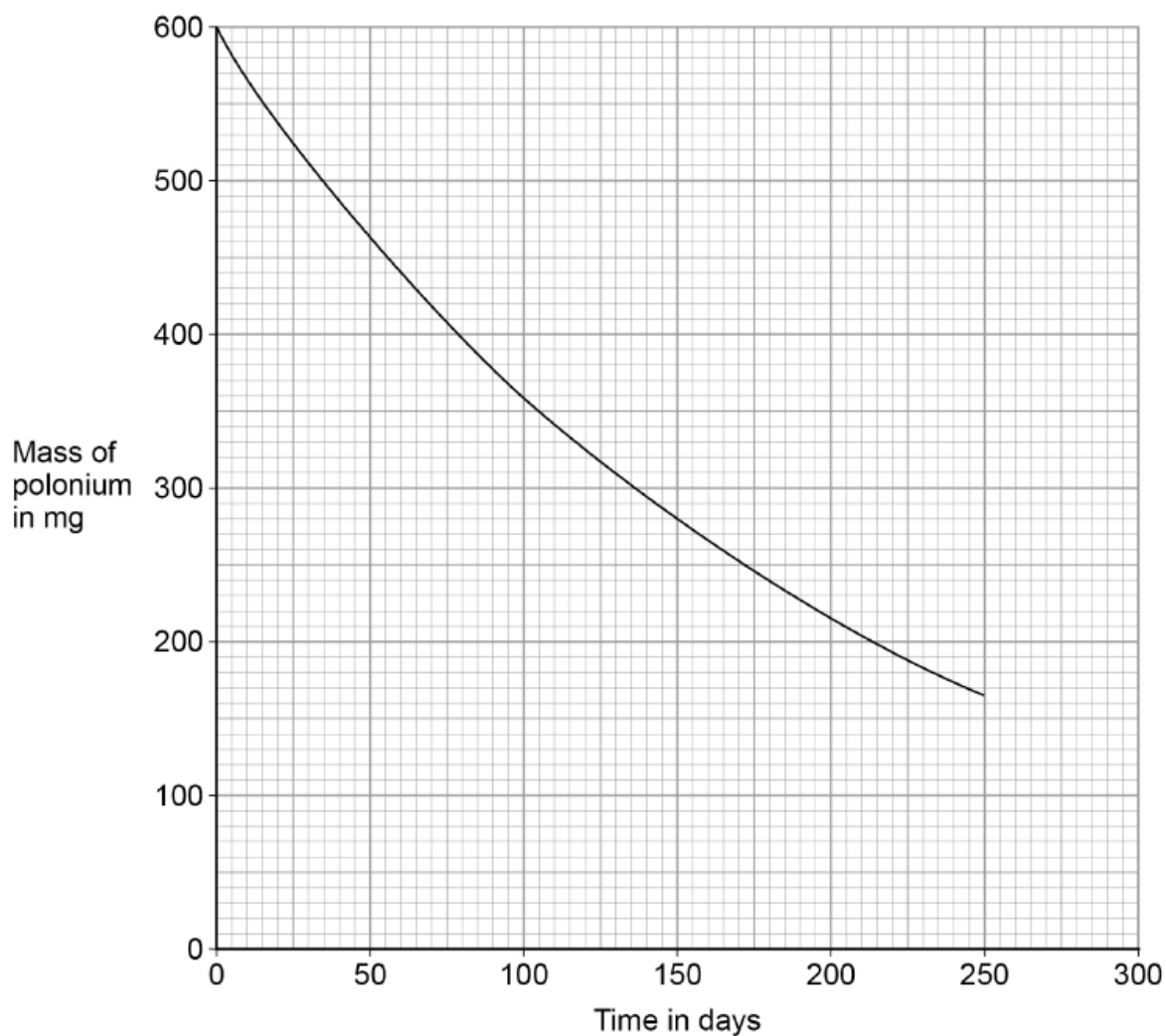
Alpha radiation is electromagnetic radiation.

Alpha radiation is highly ionising.

Alpha radiation is very penetrating.

Figure 3 shows how the mass of a sample of polonium-210 changes with time.

Figure 3



0 2 . 3

Determine the change in mass of the sample of polonium-210 between 50 and 150 days.

[2 marks]

Change in mass = _____ mg

0 2 . 4 Estimate the mass of polonium-210 remaining after 300 days.

[1 mark]

Mass = _____ mg

0 2 . 5 Nuclear radiation can cause ionisation.

Complete the sentences.

Choose answers from the box.

[2 marks]

a negative	an electron	a neutron	a positive	a proton	a zero
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An atom becomes an ion when it loses _____.

The resulting ion has _____ charge.

4. May/2019/Paper_1F/No.4

0 4

The ancient Greeks thought that atoms were tiny spheres that could not be divided into anything smaller.

Since then, different discoveries have led to the model of the atom changing.

Some of the discoveries are given in Table 1.

Table 1

The mass of an atom is concentrated in the nucleus.	A
Electrons orbit the nucleus at specific distances.	B
The nucleus contains neutrons.	C
The nucleus contains positively charged protons.	D

0 4 . 1

Which discovery was the earliest?

[1 mark]

Tick (✓) one box.

A B C D

0 4 . 2

Which discovery was the most recent?

[1 mark]

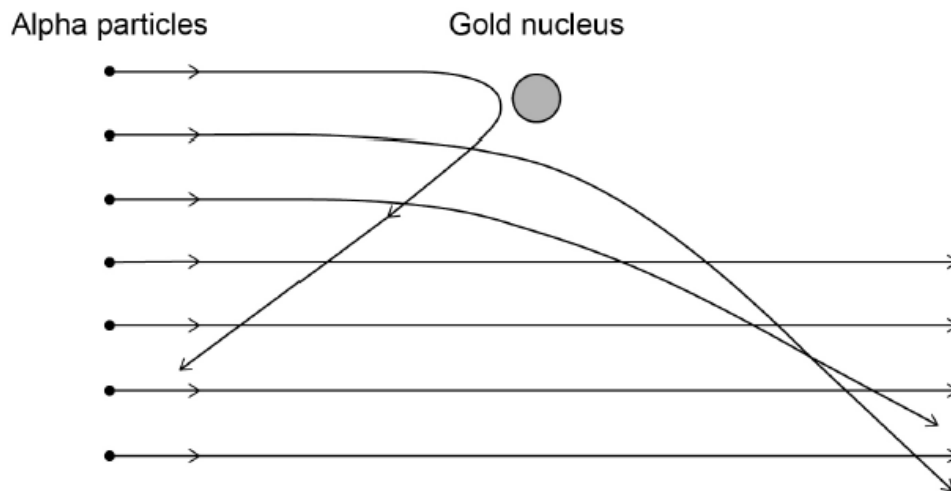
Tick (✓) one box.

A B C D

0 4 . 3 The alpha particle scattering experiment led to the nuclear model of the atom.

Figure 5 shows the paths of alpha particles travelling close to a gold nucleus.

Figure 5



Complete the sentences.

Choose answers from the box.

Each answer may be used once, more than once or not at all.

[3 marks]

attracts	decreases	does not change
increases	reflects	repels

Alpha particles and gold nuclei are both positively charged.

The gold nucleus _____ the alpha particles.

As the alpha particle approaches the gold nucleus, the electric field strength experienced by the alpha particle _____.

As an alpha particle approaches the gold nucleus, the force experienced by the alpha particle _____.

0 4 . 4 The results of the alpha particle scattering experiment were reproducible.

What does reproducible mean?

[1 mark]

Tick (✓) **one** box.

Another scientist repeats the experiment and gets the same results.

Another scientist repeats the experiment and gets different results.

The same scientist repeats the experiment and gets the same results.

The same scientist repeats the experiment and gets different results.

5. May/2019/Paper_1H/No.5

0 5

Polonium-210 (${}^{210}_{84}\text{Po}$) is a radioactive isotope that decays by emitting alpha radiation.

0 5 . 1

Complete the decay equation for polonium-210

[2 marks]



0 5 . 2

Explain why contamination of the inside of the human body by a radioactive material that emits alpha radiation is highly dangerous.

[3 marks]

0 5 . 3 A sample of polonium-210 was left for 414 days.

After this time it had a mass of 1.45×10^{-4} g

The half-life of polonium-210 is 138 days.

Calculate the initial mass of the sample.

[3 marks]

Initial mass = _____ g