

Q1. (2018)

0 4

The Chernobyl disaster was a nuclear accident that happened in 1986

Radioactive isotopes were released into the environment.

The radioactive isotopes emitted alpha, beta and gamma radiation.

a)

0 4 . 1

What is an alpha particle?

[1 mark]

Tick **one** box.

2 charged particles and 2 neutral particles.

☐

2 charged particles and 4 neutral particles.

☐

4 charged particles and 2 neutral particles.

☐

4 charged particles and 4 neutral particles.

☐

b)

0 4 . 2

Which statement about beta radiation is true?

[1 mark]

Tick **one** box.

It is the fastest moving type of radiation.

☐

It is the type of radiation with a negative charge.

☐

It is the type of radiation with the greatest mass.

☐

It is the type of radiation with the greatest range in air.

☐

c)

0 4 . 3

Which statement about gamma radiation is true?

[1 mark]

Tick **one** box.

It is a low frequency electromagnetic wave.

☐

It causes the charge of the nucleus to change.

☐

It causes the mass of the nucleus to change.

☐

It has a very long range in air.

☐

Q2. (2019)

0 6

Lanthanum-140 is a radioactive isotope.

a)

0 6 . 1 A nucleus of lanthanum-140 emits gamma radiation.

What happens to the mass number and the charge of the nucleus when gamma radiation is emitted?

[1 mark]

Tick (✓) **one** box.

Mass number	Charge	
Decreases	Decreases	☐
Decreases	Stays the same	☐
Stays the same	Decreases	☐
Stays the same	Stays the same	☐

b)

The teacher investigated how the thickness of lead affected the amount of gamma radiation that could pass through it.

Figure 6 shows the apparatus.

Figure 6

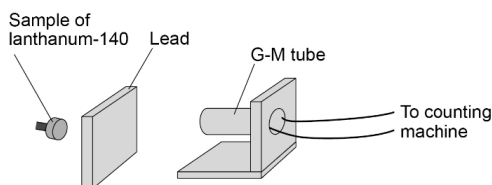


Table 1 shows the results.

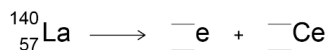
Table 1

Thickness of lead in cm	Count rate in counts per second
0.5	110
1.0	60
1.5	33
2.0	18
2.5	10

0 6 . 6 Lanthanum-140 can also emit beta radiation and change into cerium.

Complete the equation showing the decay of lanthanum (La) 140 into cerium (Ce).

[2 marks]

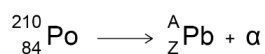


Q3. (2020)

0 2 Different radioactive isotopes emit different types of nuclear radiation.

A polonium-210 (Po) nucleus emits an alpha particle (α) and turns into a lead (Pb) nucleus.

This can be represented by the equation:



a)

0 2 . 1 What is the value of A in the equation?

[1 mark]

Tick (✓) **one** box.A = 206 ☐A = 208 ☐A = 210 ☐A = 211 ☐

b)

0 2 . 2 What is the value of Z in the equation?

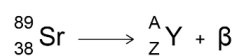
[1 mark]

Tick (✓) **one** box.Z = 80 ☐Z = 82 ☐Z = 85 ☐Z = 86 ☐

c)

0 2 . 3 A strontium-89 nucleus (Sr) emits a beta particle (β) and turns into an yttrium nucleus (Y).

This can be represented by the equation:



What are the values of A and Z in the equation?

[2 marks]

A = _____

Z = _____

Q4. (2020)

0 2 . 4 Gamma radiation is another type of nuclear radiation.

What does gamma radiation consist of?

[1 mark]

Tick (✓) **one** box.High energy neutrons ☐Electromagnetic waves ☐Particles with no charge ☐Positively charged ions ☐

Q5. (2020)

0 2 . 5 Explain the differences between the properties of alpha, beta and gamma radiations.

[6 marks]

Q6. (2021)

0 2 . 2 Alpha particles can ionise atoms in the air.

What happens to an atom when it is ionised by an alpha particle?

[2 marks]

Tick (✓) **two** boxes.

A neutron in the atom becomes a proton.

☐

The atom becomes a positive ion.

☐

The atom gains a neutron.

☐

The atom gains a proton.

☐

The atom loses an electron.

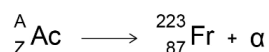
☐

Q7. (2022)

0 6 . 2 Actinium (Ac) is one source of alpha radiation.

An actinium (Ac) nucleus emits an alpha particle (α) and turns into a francium (Fr) nucleus.

This can be represented as:



Determine the values of **A** and **Z**.

[2 marks]

Q8. (2022)

0 6 . 3 A teacher wanted to find out what nuclear radiation is emitted from a source.

The teacher placed different barriers between the source and a detector.

The teacher recorded the count for 30 seconds after each barrier was put in place.

Table 2 shows the results.

Table 2

Barrier	Thickness in millimetres	Count after 30 seconds
None		985
Paper	0.1	149
Aluminium	5.0	0
Lead	20.0	0

Explain what nuclear radiation was emitted by the source.

[4 marks]

Q9. (2023)

0 4 A scientist investigated a sample of a radioactive material to determine if it would be suitable for medical use.

a)

0 4 . 3 The activity of a radioactive source is the rate at which the nuclei of the source decay.

What is the unit for the activity of a radioactive source?

[1 mark]

b)

- 0 4 . 4 The scientist placed a radiation detector near the sample and measured the count-rate.

Explain why the count-rate is less than the activity of the sample.

[2 marks]

c)

- 0 4 . 5 The scientist recorded the count-rate from the sample with the radiation detector at different distances from the sample.

Table 2 shows the results.

Table 2

Distance between the sample and the detector in centimetres	Count-rate in counts/second
2.0	300
5.0	24
10.0	0

Explain which type of radiation was emitted by the sample.

[2 marks]

d)

- 0 4 . 7 The scientist had a second sample of the radioactive material.

The scientist made appropriate measurements, then calculated the half-life of each sample.

Why was the half-life calculated from the second sample slightly different from the half-life calculated from the first sample?

[1 mark]

Tick (✓) one box.

Radioactive decay is a random process.

☐

The count-rate from a radioactive sample is predictable.

☐

The samples were at different temperatures.

☐

The size of each sample was different.

☐

Q10. (2024)

- 0 2 Last century, scientists used evidence from the alpha particle scattering experiment to develop a new model of the atom.

In the experiment, alpha particles were directed towards a piece of gold foil.

- 0 2 . 1 What does an alpha particle consist of?

[1 mark]

Q11. (2024)

A scientist tested some water that had been left in a revigator.

The water contained radon-222 and vanadium-52.

0 5 . 2 Vanadium-52 (V) decays by emitting beta particles.

What is the correct nuclear equation for this process?

[1 mark]

Tick (✓) **one** box.

