0 1 . 1 Complete the below table which describes the properties of three types of nuclear radiation.

Type of radiation	Description	Typical range in air	Stopped by
Alpha		5 – 10 cm	
	Fast-moving electron		Thin sheet of aluminium
	Electromagnetic radiation	Very long	

[6 marks]

0 1 . 2 An incomplete nuclear equation for the alpha decay of radium-222 is as follows:

$$^{222}_{88}\text{Ra} \longrightarrow {}^{x}_{y}\text{Rn} + {}^{4}_{2}\alpha$$

Calculate the values of the constants *x* and *y*.

x = _____

y = _____

[2 marks]

0 1 . 3 Another unstable isotope, lead-214, decays by a different process to form bismuth-214:

$$^{214}_{82}\text{Pb} \longrightarrow {}^{214}_{83}\text{Bi} + \boxed{?}$$

Determine the particle which lead-214 must emit to allow this decay to take place.

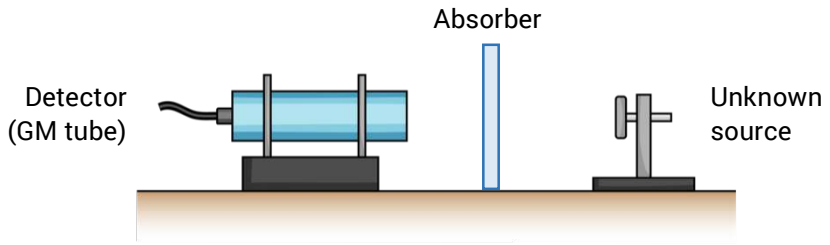
Particle: _____

[2 marks]

0 2

A radioactive waste adviser is asked to identify the type (or types) of nuclear radiation which are emitted by an unknown source.

She uses the following setup to investigate the source:



From her investigation, she obtains the following results:

Absorber used	None	Sheet of paper	Aluminium sheet	Thick piece of lead
Count rate in counts per second	210	90	90	27

0 2 . 1

State the type (or types) or radiation which are emitted by the source.

[1 mark]

0 2 . 2

Explain your previous answer.

[3 marks]

0 2 . 3

When the source is removed from the room, the GM tube still registers approximately 25 counts per second. Explain why.

[1 mark]