

Nuclear Radiation

1. Which of the following statements always true about the structure of an atom? (1)

A	It has more electrons than protons
B	It has more protons than neutrons
C	It has an equal number of protons and electrons
D	It has more neutrons than protons
E	It has an equal number of neutrons and electrons

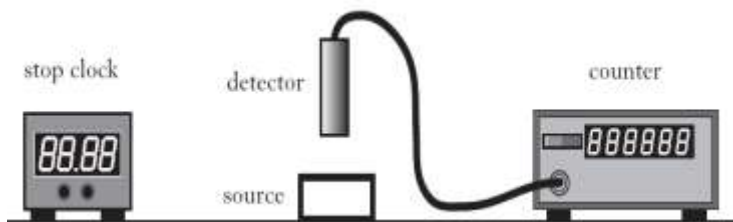
2. Which row in the table describes the correct configuration for an atom? (1)

A	Orbiting the nucleus Protons only	Inside the nucleus
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4. A radioactive source emits alpha particles and has a half life of 2.5 hours. The source has an initial activity of 4.8 kBq.

- a) Calculate the time taken for its activity to decrease to 300 Bq. (3)
- b) Calculate the number of decays in the sample in 15 seconds when the activity of the source is 1.2 kBq. (3)
- c) Some sources emit alpha particles and are stored in lead cases despite the fact that alpha particles cannot penetrate paper. Suggest a possible reason for storing these sources using this method. (1)

5. Students observe an experiment with radioactive sources. The radiation is measured using a detector and counter.



Different absorbing materials are then placed, in turn, between source and detector and readings for each material are recorded. This is repeated for each source. The results are shown in the table.

Source	Corrected count rate (counts per minute)			
	No absorbing material	paper	5 mm of aluminium	2 cm of lead
A	480	480	480	200
B	720	300	300	180
C	600	580	0	0

One source emits beta radiation only, one emits gamma only and one emits both alpha and gamma radiation.

- a) Copy and complete the following table to identify the source. (2)

Type of radiation	Source
Beta only	
Both alpha and gamma	

- b) One source has a half life of 30 minutes. The source has an initial activity of 18000 Bq. Calculate its activity after 2 hours. (3)

6. The following table gives information about radioactive substances used in medicine. These substances are also called ionising radiations.

Radioactive substance	Type of ionising radiation emitted	Half-life
Iodine-131	Beta and gamma	8 days
Technetium-99m	gamma	6 hours
Cobalt 60	Beta and gamma	5.3 years

- a) Explain what is meant by the term ionisation. (2)
- b) State a type of ionising radiation not mentioned in the table above. (1)
- c) A sample of iodine-131 is delivered to a hospital 24 days before it is given to a patient. The activity of the iodine-131 when it is given to the patient is 6 MBq. Calculate the initial activity, in MBq, of the sample when it was delivered to the hospital (2)

(25 marks)