

**Name of the Student:** \_\_\_\_\_

**Max. Marks : 18 Marks**

**Time : 18 Minutes**

Q1.

Some isotopes are unstable.  
They emit  $\beta^-$  particles when they decay.

Explain how a nucleus changes when a  $\beta^-$  particle is emitted.

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**(Total for question = 2 marks)**

Q2.

Explain how neutrons enable a nuclear chain reaction to take place.

(2)

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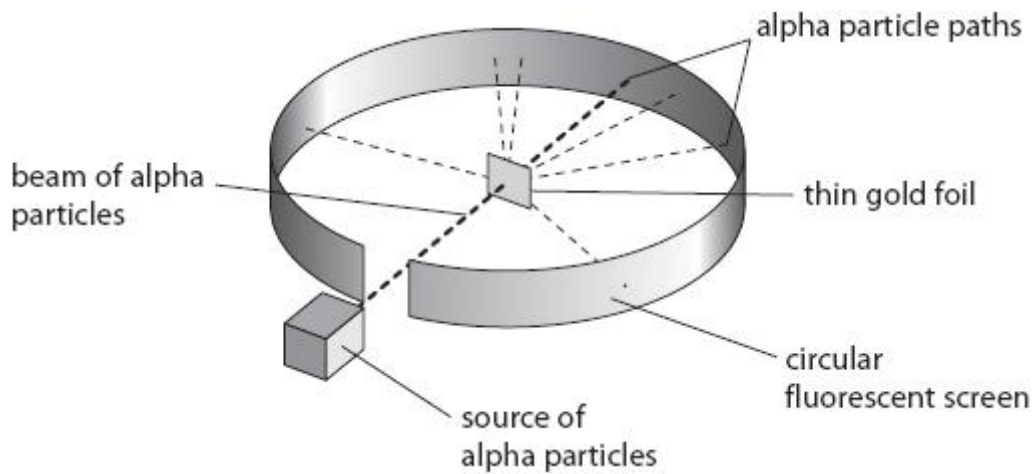
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**(Total for question = 2 marks)**

Q3.

Early in the twentieth century, scientists fired a beam of alpha particles at thin gold foil.

Figure 2 shows the main parts of their experiment with some results.



**Figure 2**

Explain how the results of the experiment shown in Figure 2 support the nuclear model of an atom.

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**(Total for question = 3 marks)**

Q4.

A teacher determines the background radiation count rate in a laboratory.

Explain how to determine a value for the background radiation count rate.

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**(Total for question = 3 marks)**

Q5.

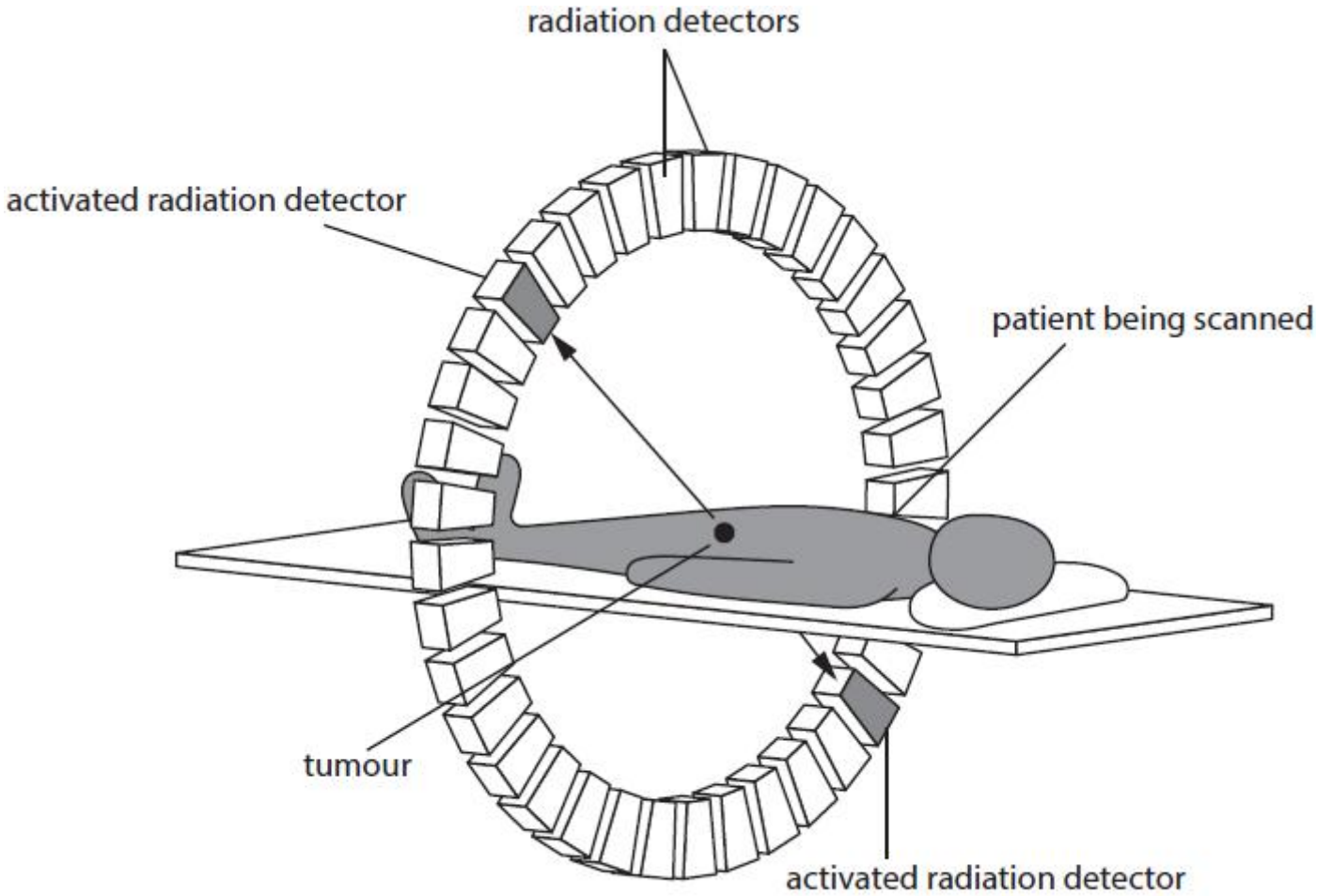
Figure 5 shows a PET scanner used to detect cancerous tumours.

A radioactive isotope is injected into a patient.

The isotope is absorbed by the tumour.

The isotope emits positrons from the location of the tumour.

The ring of radiation detectors rotates around the person.



**Figure 5**

(i) Explain how the scan can give the location of the tumour.

(3)

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(ii) Explain why the radioactive isotope injected into the patient must be produced near to the place where it is to be used.

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**(Total for question = 5 marks)**

Q6.

In a nuclear reactor, a chain reaction is produced and controlled.

Explain what happens inside a nuclear reactor if neutron speeds are not controlled.

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**(Total for question = 3 marks)**