**Q1.**

Fluorine-18 has a biological half-life of 6.0 hours.

(a) Explain what is meant by this statement.

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**(2)**

In a PET scan, fluorine-18 is used as a tracer and is injected into the person being scanned.

(b) The physical half-life of fluorine-18 is 110 minutes.

Calculate the percentage of fluorine-18 that remains in the person 4.0 hours after it is injected.

percentage = _____ %

**(3)**

(c) Name the particles emitted when a fluorine-18 nucleus decays.

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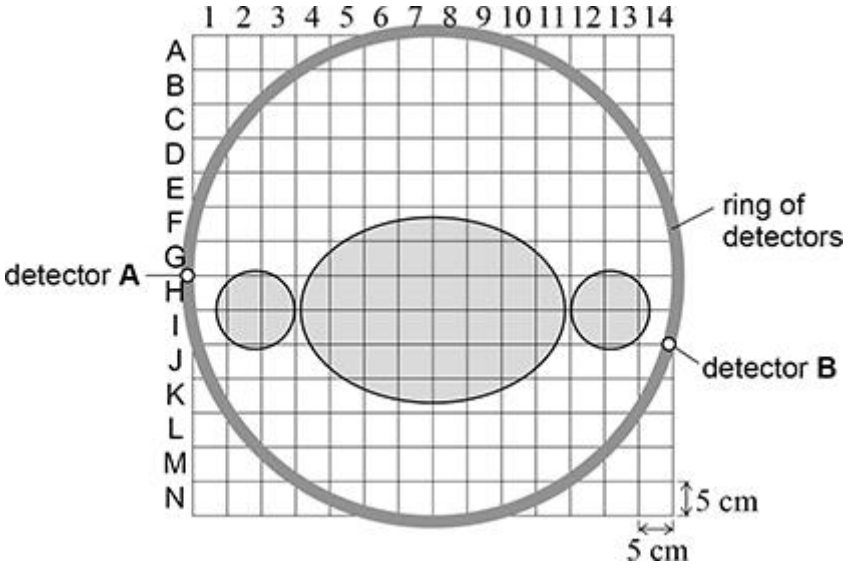
**(1)**

(d) The figure below shows the cross-section of a body inside a ring of detectors during a PET scan.
The side of each square represents 5 cm.




One of the products from the fluorine-18 decay goes on to produce two new particles.
These particles travel in opposite directions in the plane shown in the figure above.
The particles are then detected by the detectors labelled **A** and **B**.
Detector **A** detects a particle 0.79 ns before detector **B**.

Determine the square in the figure above in which the particles were produced.
You should identify the square with a letter and a number, eg B5.

square = _____

**(4)**

**(Total 10 marks)**

**Q2.**

Brachytherapy is used to treat small tumours. In this technique a sealed radioactive source is placed inside a patient's body next to the tumour.

Explain **one** advantage of using beta radiation rather than gamma radiation in brachytherapy.

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**(Total 2 marks)**