Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

Figure 22 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.

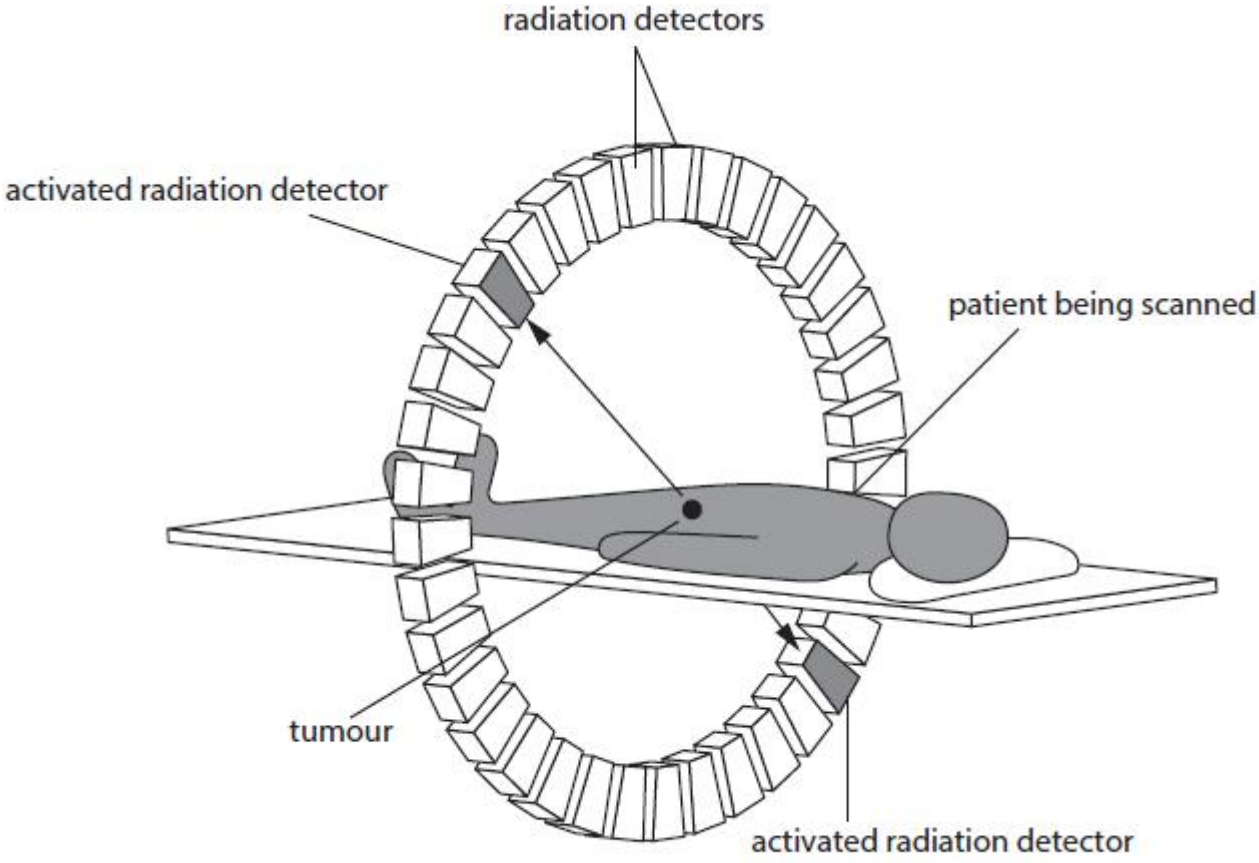

Figure 22

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

(3)

.....

.....

.....

.....

.....

.....

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

(2)

.....

.....

.....

.....

(Total for question = 5 marks)

Q2.

The teacher moves the radiation detector to different distances from the radioactive source.

The teacher determines the mean detector reading at each distance from the source.

The teacher plots the results on graph paper, as shown in Figure 14.

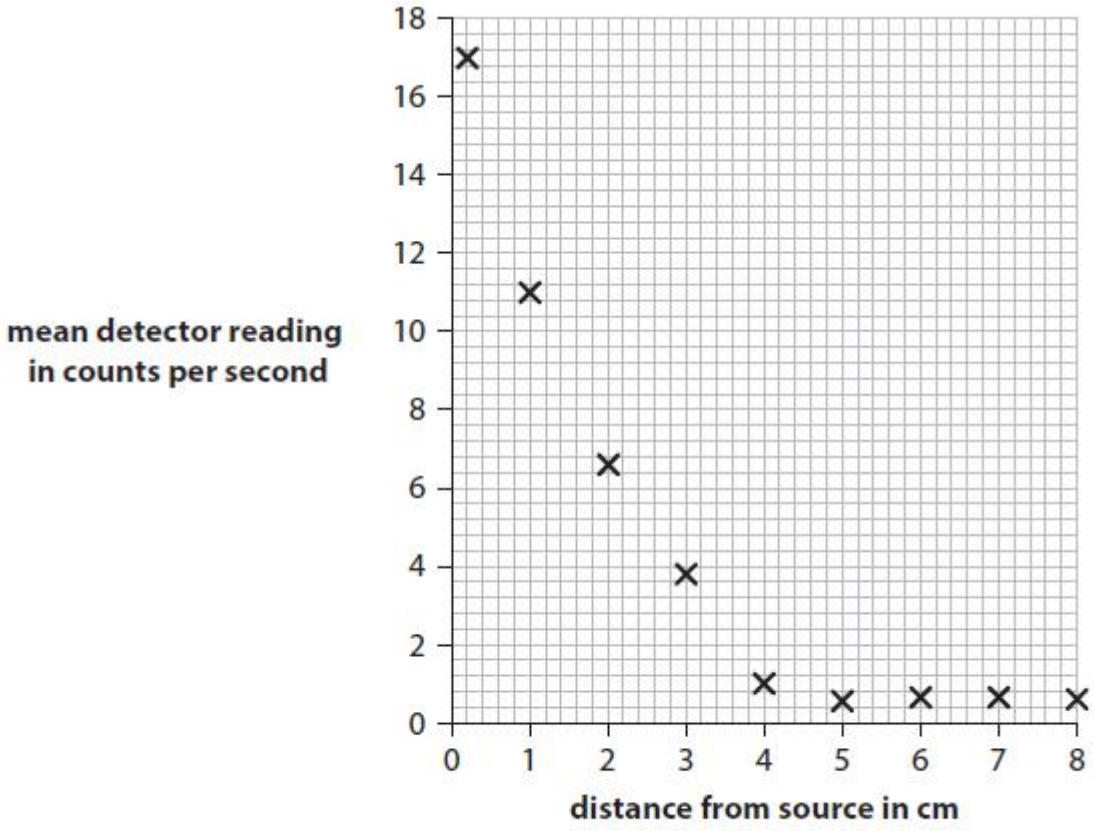

Figure 14

(i) The source emits alpha radiation **only**.

Explain how the graph in Figure 14 shows that the source only emits alpha radiation.

(2)

.....

.....

.....

(ii) Give a reason why the mean detector reading in Figure 14 does not fall to zero in this experiment.

(1)

.....

.....

(Total for question = 3 marks)

Q3.

* Radioactive isotopes can be used to investigate cancer and other illnesses.

The thyroid gland in the neck absorbs most of the iodine that our bodies need.

A person can become ill if their thyroid absorbs too little iodine.

Explain how a radioactive isotope with suitable properties may be used to investigate the uptake of iodine by this gland.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 6 marks)

Q4.

In 1908 a scientist called Rutherford was investigating ideas about atoms.

His students fired a beam of alpha particles at a thin piece of gold foil.

Figure 10 shows the arrangement of the experiment.

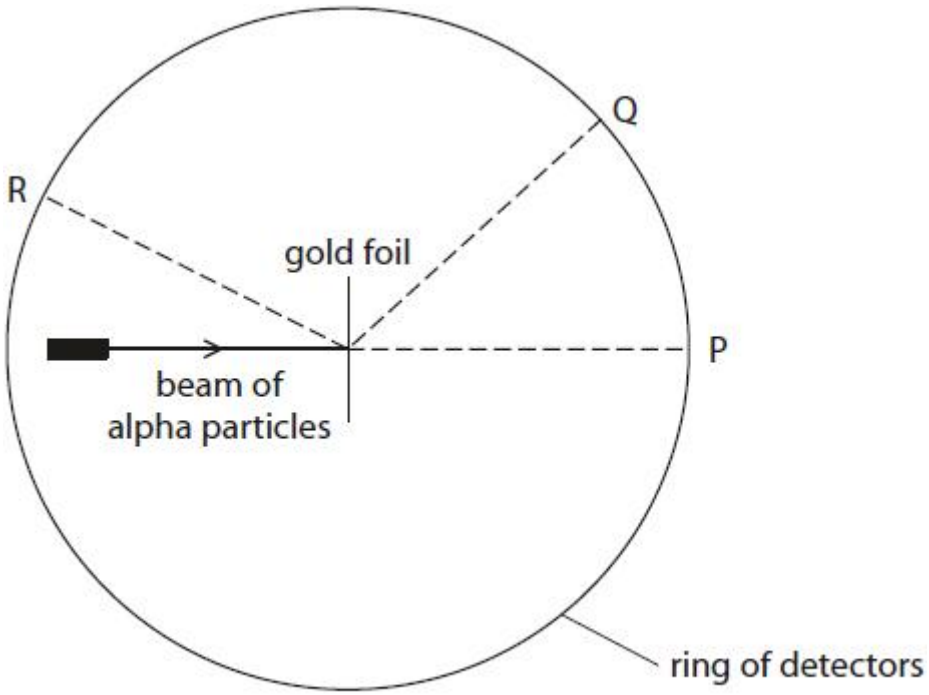

Figure 10

Some alpha particles were found at all parts of the ring of detectors.

The table in Figure 11 shows how many alpha particles were detected at P, at Q and at R, in one experiment.

position	number of alpha particles detected
P	72340
Q	25
R	2

Figure 11

Explain what the information in Figure 10 and Figure 11 shows about the structure of an atom.

(6)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 6 marks)