Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

The radioactive isotope, carbon-14, decays by beta (β) particle emission.

(a) What is a beta (β) particle?

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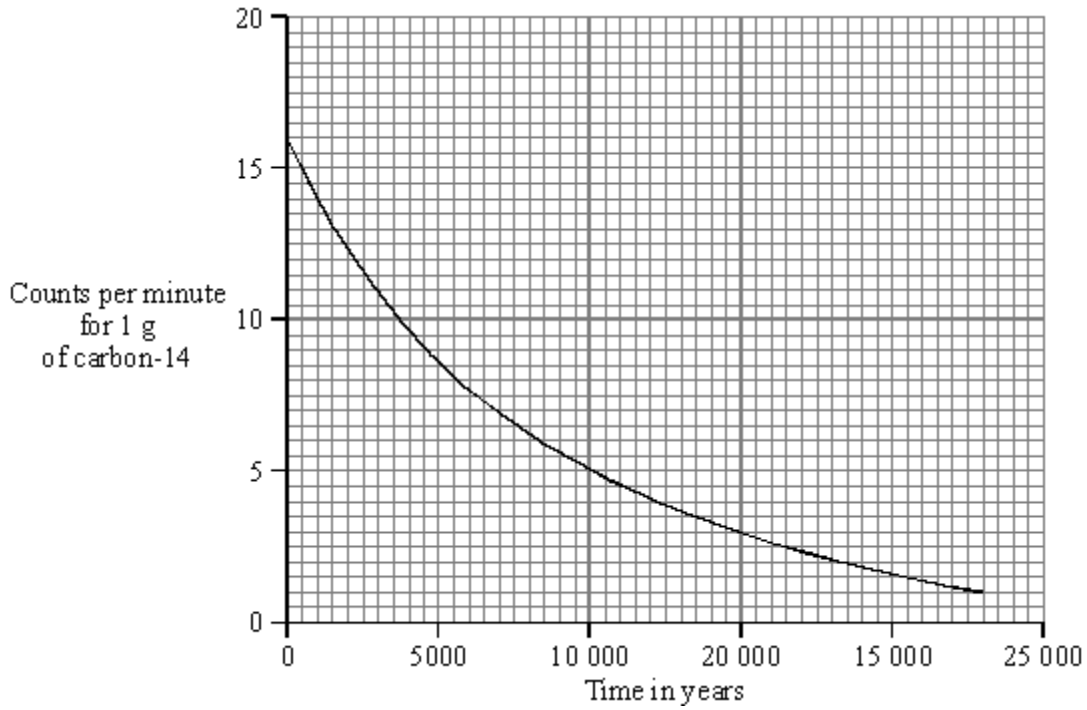
(1)

(b) Plants absorb carbon-14 from the atmosphere. The graph shows the decay curve for 1 g of carbon-l4 taken from a flax plant.



Use the graph to find the half-life of carbon-l4. You should show clearly on your graph how you obtain your answer.

Half-life = _____ years.

(2)

(c) Linen is a cloth made from the flax plant. A recent exhibition included part of a linen shirt, believed to have belonged to St. Thomas à Becket, who died in 1162. Extracting carbon-14 from the cloth would allow the age of the shirt to be verified.

If 1 g of carbon-14 extracted from the cloth were to give 870 counts in 1 hour, would it be

possible for the shirt to have once belonged to St. Thomas à Becket? You must show clearly the steps used and reason for your decision.

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(3)

(Total 6 marks)

Q2.

(a) The table gives information about five radioactive isotopes.

Isotope	Type of radiation emitted	Half-life
Californium-241	alpha (α)	4 minutes
Cobalt-60	gamma (γ)	5 years
Hydrogen-3	beta (β)	12 years
Strontium-90	beta (β)	28 years
Technetium-99	gamma (γ)	6 hours

(i) What is an alpha (α) particle?

_____

_____

(1)

(ii) What is meant by the term half-life?

_____

_____

(1)

(iii) Which **one** of the isotopes could be used as a tracer in medicine? Explain the reason for your choice.

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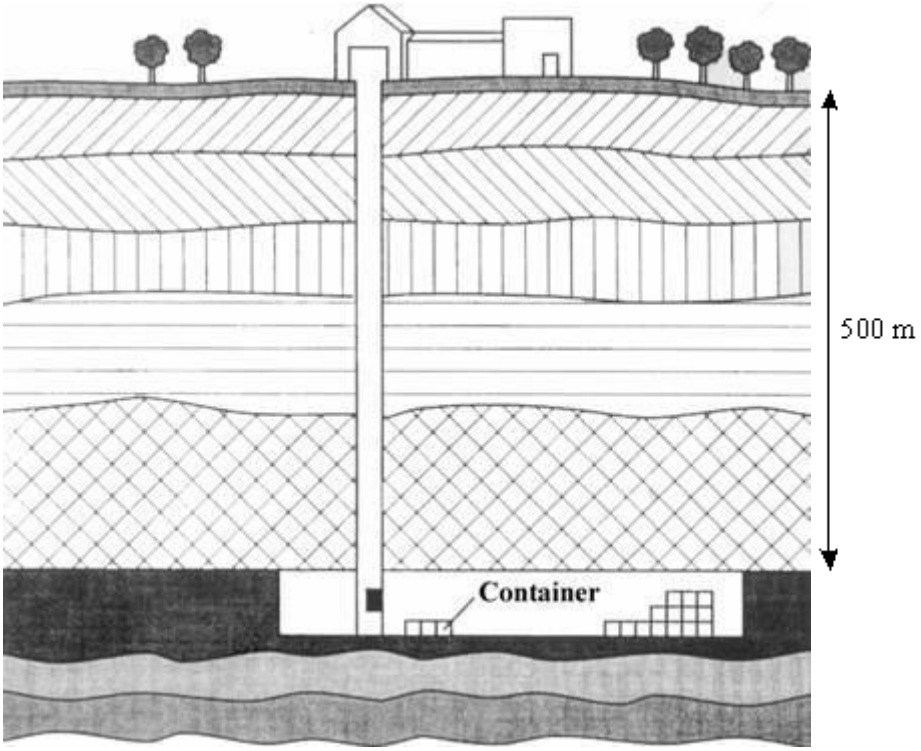
(3)

(b) The increased use of radioactive isotopes is leading to an increase in the amount of radioactive waste. One method for storing the waste is to seal it in containers which are then

placed deep underground.



Some people may be worried about having such a storage site close to the area in which they live. Explain why.

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(3)

(Total 8 marks)

Q3.

(a) The table shows the half-life of some *radioactive* isotopes.

Radioactive isotope	Half-life
magnesium-27	10 minutes
sodium-24	15 hours
sulphur-35	87 days

cobalt-60	5 years

(i) What is meant by the term *radioactive?*

_____

_____

(1)

(ii) Which **one** of the isotopes in the table could form part of a compound to be used as a tracer in medicine? Explain the reason for your choice.

_____

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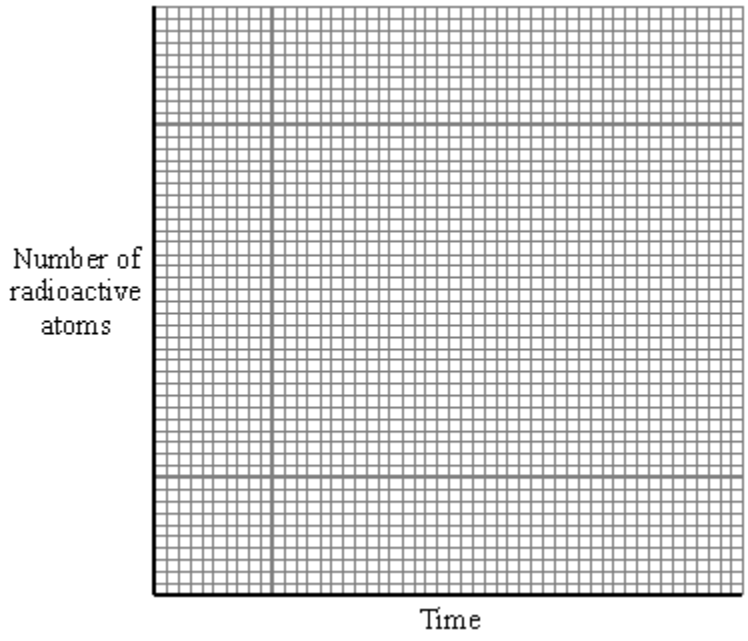
(3)

(iii) Draw a graph to show how the number of radioactive atoms present in the isotope cobalt-60 will change with time.



(3)

(b) Nuclear power stations provide about 17% of the world's electricity. They add less than 1% to the total background levels of radiation. Some people are opposed to the use of nuclear fuels for the generation of electricity. Explain why.

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(3)

(Total 10 marks)