Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Q1.

In 2011 an earthquake caused severe damage to a nuclear power station in Japan.

The damage led to the release of large amounts of radioactive iodine-131 $(^{131}_{53}\text{I})$ into the atmosphere.

(a) The table gives some information about an atom of iodine-131 $(^{131}_{53}\text{I})$.

Complete the table.

mass number	131
number of protons	53
number of neutrons	

(1)

(b) Complete the sentence.

The number of protons in an atom is called the proton number or

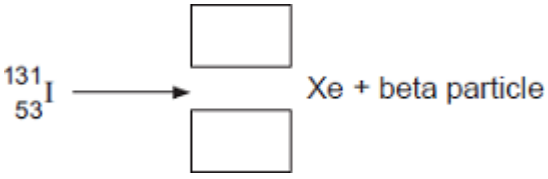
the _____ number.

(1)

(c) An atom of iodine-131 decays into an atom of xenon (Xe) by emitting a beta particle.

(i) The decay of iodine-131 can be represented by the equation below.

Complete the equation by writing the correct number in each of the **two** boxes.



(2)

(ii) A sample of rainwater contaminated with iodine-131 gives a count rate of 1200 counts per second.

Calculate how many days it will take for the count rate from the sample of rainwater to fall to 75 counts per second.

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Half-life of iodine-131 = 8 days

Show clearly how you work out your answer.

_____

_____

_____ days

(2)

(iii) If people drink water contaminated with iodine-131, the iodine-131 builds up in the thyroid gland. This continues until the thyroid is saturated with iodine-131 and cannot absorb any more. The radiation emitted from the iodine-131 could cause cancer of the thyroid.

In Japan, people likely to be drinking water contaminated with iodine-131 were advised to take tablets containing a non-radioactive isotope of iodine.

Suggest why this advice was given.

_____

_____

_____

_____

(2)

(Total 8 marks)

Q2.

There are many different isotopes of gold. The isotope, gold-198, is radioactive.
An atom of gold-198 decays by emitting a beta particle.

(a) Complete the following sentences.

All atoms of gold have the same number of _____

and the same number of _____ .

The atoms from different isotopes of gold have different numbers of _____ .

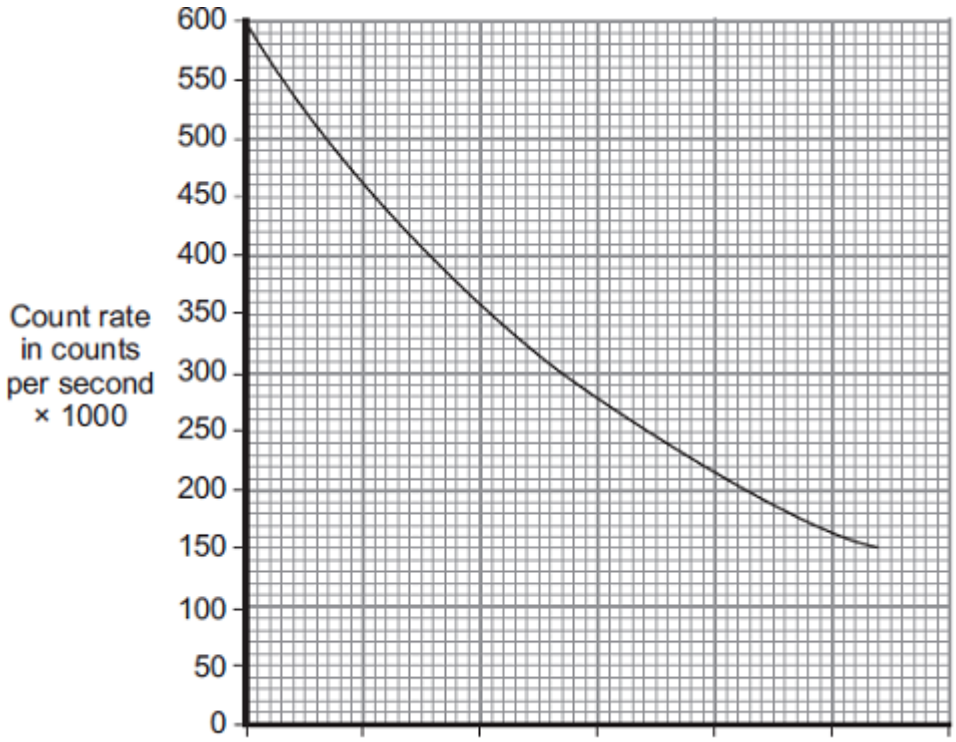
A beta particle is an _____ emitted

from the _____ of an atom.

(3)

(b) The graph shows how the count rate from a sample of gold-198 changes with time.

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Use the graph to calculate the half-life of gold-198.

Show clearly on the graph how you obtain your answer.

_____

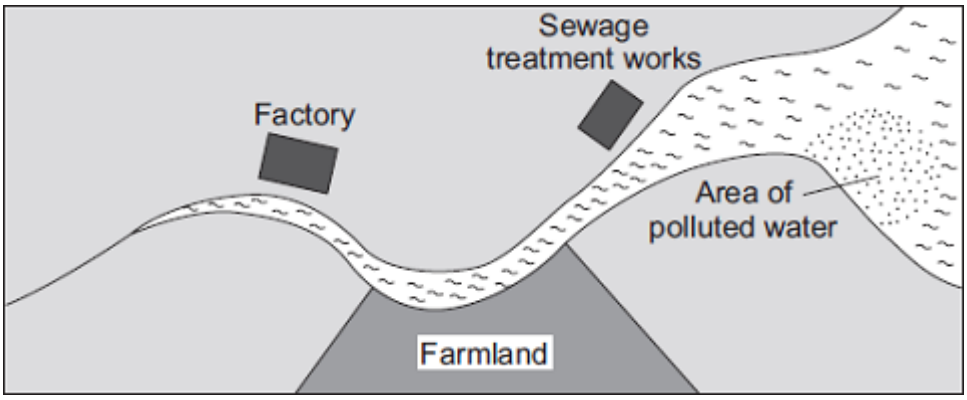
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Half-life = _____ days

(2)

(c) The diagram shows a map of a river and the river estuary.

Environmental scientists have found that water flowing into one part of the river estuary is polluted. To find where the pollution is coming from, the scientists use a radioactive isotope, gold-198.



The gold-198 is used to find where the pollution is coming from.

Explain how.

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_____

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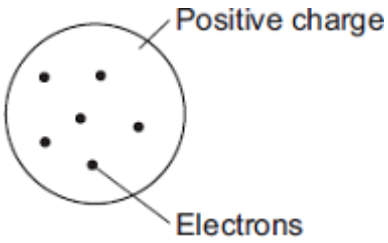
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(2)

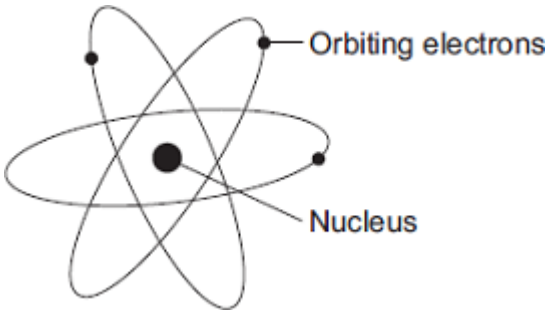
(Total 7 marks)

Q3.

In the early part of the 20th century, scientists used the 'plum pudding' model to explain the structure of the atom.



Following work by Rutherford and Marsden, a new model of the atom, called the 'nuclear' model, was suggested.



Describe the differences between the two models of the atom.

_____

_____

_____

_____

_____

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_____

_____

(Total 4 marks)

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