

Name:

Date:

P4 - Test 3
ATOMIC STRUCTURE
Beginner

GCSE

PHYSICS

AQA - Triple Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1. Four different processes are described in **List A**. The names of these processes are given in **List B**.

Draw a line to link each description in **List A** to its correct name in **List B**.
Draw only **four** lines.

List A	List B
the nuclei of two atoms joining together	gamma emission
the nucleus of an atom splitting into several pieces	electric current
an atom losing an electron	ionisation
an electric charge moving through a metal	nuclear fission
	nuclear fusion

(Total 4 marks)

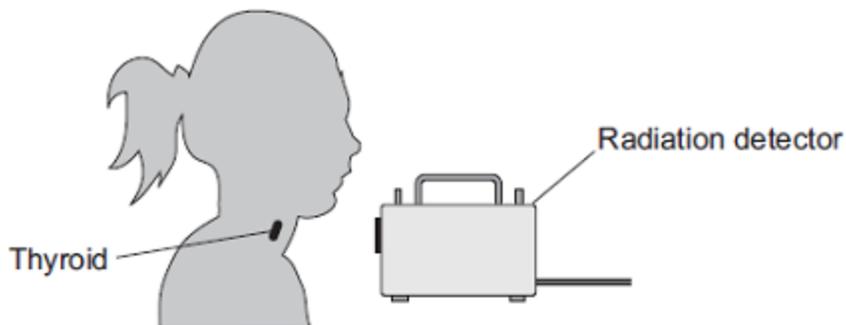
2. (a) The names of three types of radiation are given in **List A**. Some properties of these three types of radiation are given in **List B**.

Draw **one** line from each type of radiation in **List A** to its correct property in **List B**.

List A Type of radiation	List B Property of radiation
alpha	will pass through paper but is stopped by thin metal
beta	has the shortest range in air
gamma	will not harm human cells
	is very weakly ionising

(3)

- (b) The radioactive isotope iodine-123 can be used by a doctor to examine the thyroid gland of a patient. The iodine, taken as a tablet, is absorbed by the thyroid gland. The gamma radiation emitted as the iodine atoms decay is detected outside the body.



The doctor uses an isotope emitting gamma radiation to examine the thyroid gland rather than an isotope emitting alpha or beta radiation.

Which **one** of the following gives a reason why gamma radiation is used?

Tick (✓) **one** box.

Gamma radiation will pass through the body.

Gamma radiation is not deflected by a magnet.

Gamma radiation has a long range in air.

(1)

- (c) Iodine-123 has a half-life of 13 hours.

Use a word from the box to complete the sentence.

all	half	most
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After 13 hours _____ of the iodine-123 atoms the thyroid absorbed have decayed.

(1)

(d) Iodine-123 and iodine-131 are two of the isotopes of iodine.

Draw a ring around the correct answer to complete the sentence.

The nucleus of an iodine-123 atom has the same number of

electrons
neutrons
protons

as the

nucleus of an iodine-131 atom.

(1)

(Total 6 marks)

3.

Americium-241 (${}^{241}_{95}\text{Am}$) is an isotope of americium.

(a) Which of the isotopes given in the table below is **not** an isotope of americium?

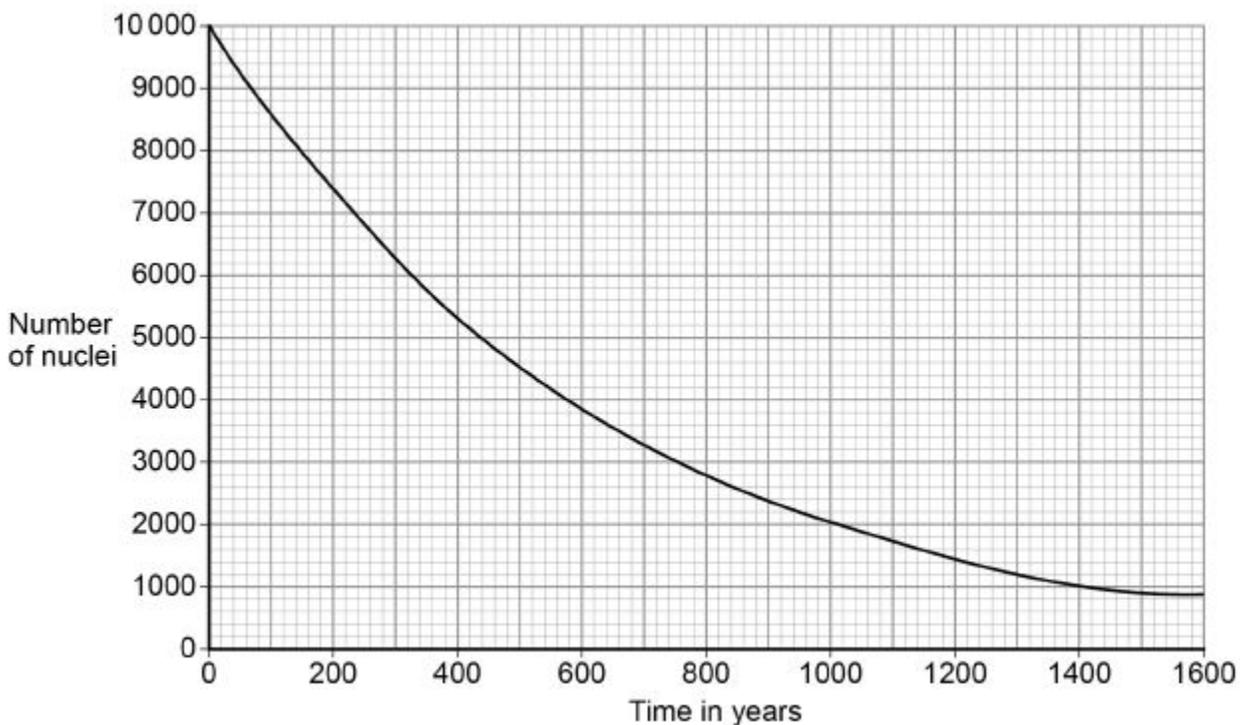
Isotope	Mass number	Atomic number
A	243	95
B	243	94
C	242	95

Isotope _____

Give a reason for your answer.

(2)

The graph below shows how the number of americium-241 nuclei in a sample changes with time.



(b) How many years does it take for the number of americium-241 nuclei to decrease from 10 000 to 5000?

Time = _____ years

(1)

(c) What is the half-life of americium-241?

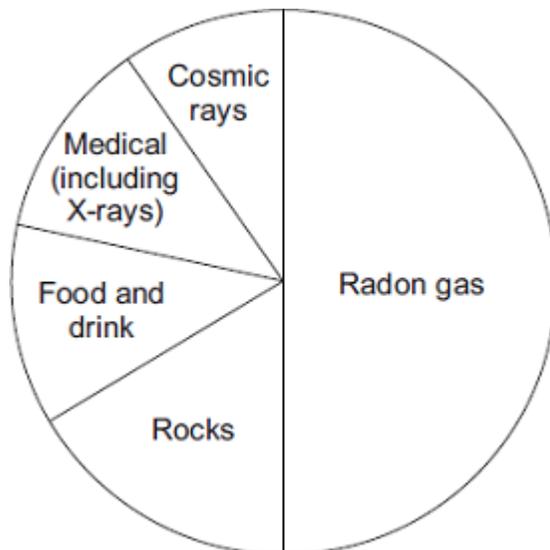
Half-life = _____ years

(1)

(Total 4 marks)

4.

The pie chart shows the average proportions of background radiation from various sources in the UK.



- (a) Three sources of background radiation are given in **List A**.
Statements about sources of background radiation are given in **List B**.

Draw **one** line to link each source of background radiation in **List A** to the statement about that source given in **List B**.

Draw only **three** lines.

List A

X-rays

Cosmic rays

Radon gas

List B

Are used to show broken bones.

The radiation comes from outer space.

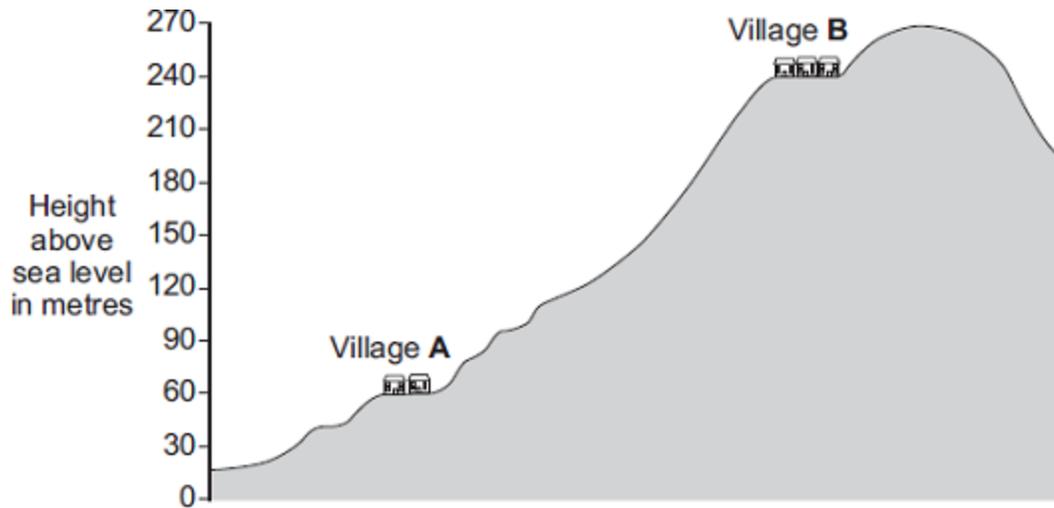
Comes from soil containing a radioactive isotope of potassium.

On average gives 50% of all background radiation.

(3)

- (b) The level of background radiation from cosmic rays is not the same everywhere. For every 30 metres above sea level, the amount of background radiation increases by one unit.

The diagram shows the position of two villages, **A** and **B**, built on a hill.



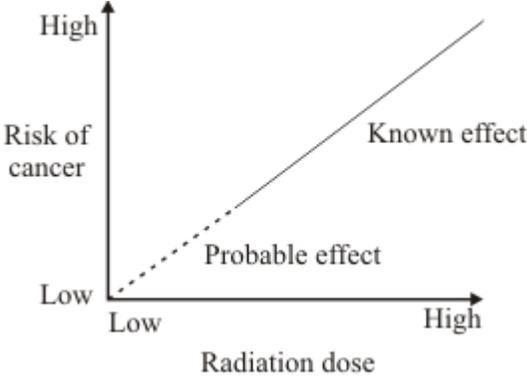
How is the amount of background radiation from cosmic rays different in village **A** compared to village **B**?

To obtain full marks, you must include a calculation in your answer.

(3)
(Total 6 marks)

5.

(a) Radiation can cause cancer. The graph shows that the risk of cancer depends on the radiation dose a person is exposed to.



Complete the following sentence.

The _____ the dose of radiation a person gets, the greater the risk of cancer.

(1)

(b) A worker in a nuclear power station wears a special badge (diagram 1). Diagram 2 shows what is inside the badge. When the film inside the badge is developed, it will be dark in the places where it has absorbed radiation.

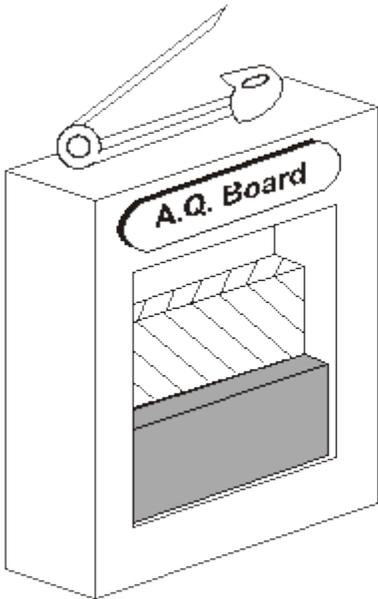


Diagram 1

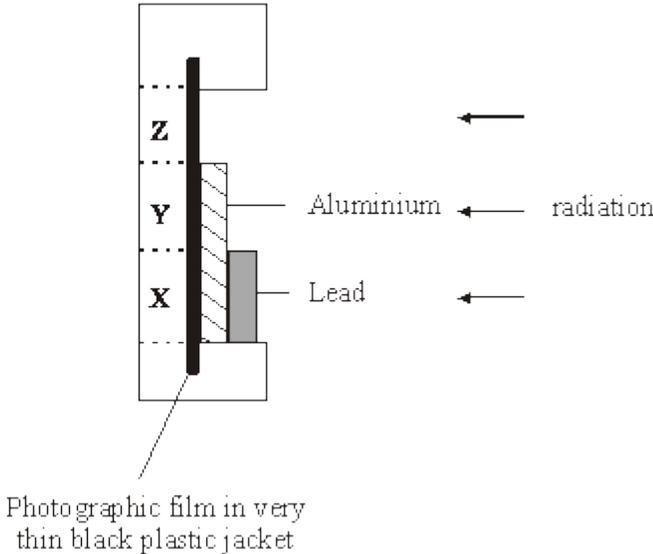


Diagram 2

Which part of the film, **X**, **Y** or **Z**, would darken if the worker had received a dose of alpha radiation?

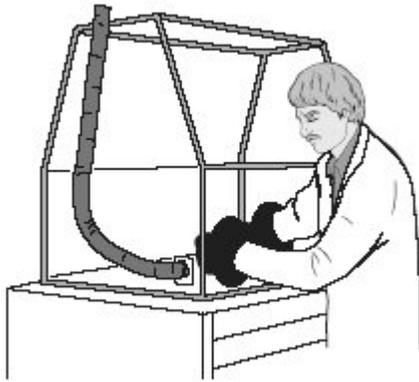
Give a reason for your answer.

(2)

(Total 3 marks)

6.

The picture shows a man at work in a factory that uses radioactive materials.



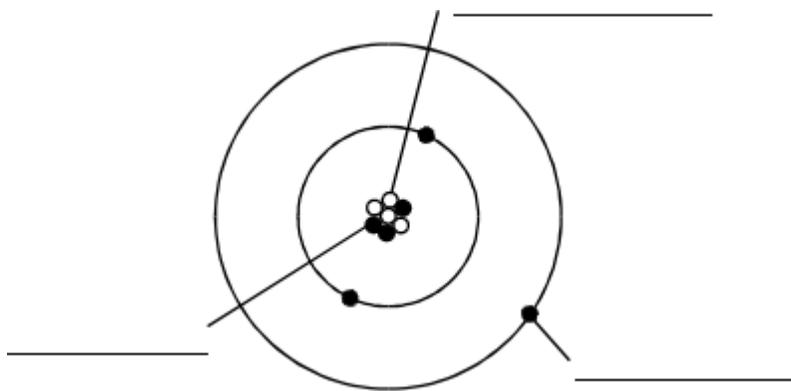
The radioactive material is kept behind glass shields. The man wears gloves so that he cannot touch the radioactive material directly.

Explain, as fully as you can, why these precautions are taken.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

(Total 4 marks)

7. The diagram represents an atom of lithium.



(i) Complete the diagram by writing in the spaces the name of each type of particle. Use only words given in the box. Each word may be used once or not at all.

electron	neutron	nucleus	proton
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(3)

(ii) Which type of particle found inside the atom is uncharged?

(1)

(iii) What is the mass number of this atom, 3, 4, 7 or 10?

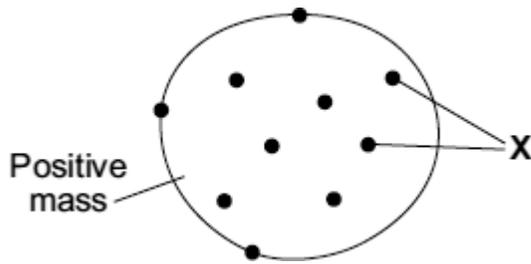
Give a reason for your choice.

(2)

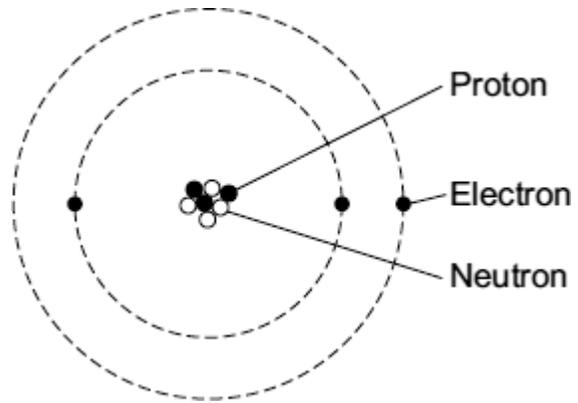
(Total 6 marks)

8.

The diagrams show two different models of an atom.



'Plum pudding' model



Model used today

- (a) The particles labelled 'X' in the plum pudding model are also included in the model of the atom used today.

What are the particles labelled 'X'?

(1)

- (b) Scientists decided that the 'plum pudding' model was wrong and needed replacing.

Which **one** of the following statements gives a reason for deciding that a scientific model needs replacing?

Tick (✓) **one** box.

The model is too simple.

The model has been used by scientists for a long time.

The model cannot explain the results from a new experiment.

(1)

- (c) The table gives information about the three types of particle that are in the model of the atom used today.

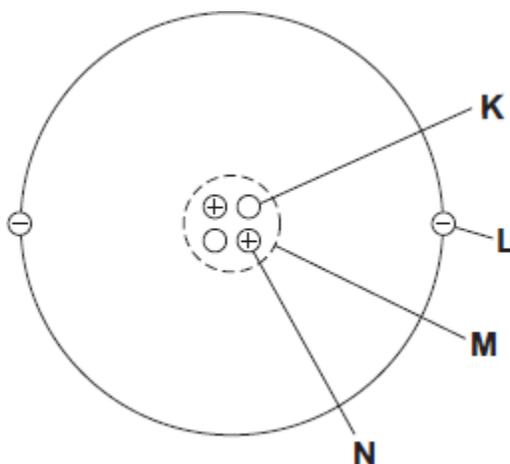
Particle	Relative mass	Relative charge
	1	+1
	very small	-1
	1	0

Complete the table by adding the names of the particles.

(2)
(Total 4 marks)

9.

- (a) The diagram represents a helium atom.



- (i) Which part of the atom, **K**, **L**, **M** or **N**, is an electron?

Part

(1)

- (ii) Which part of the atom, **K**, **L**, **M** or **N**, is the same as an alpha particle?

Part

(1)

(b) A radioactive source emits alpha particles.

What might this source be used for?

Put a tick (✓) in the box next to your answer.

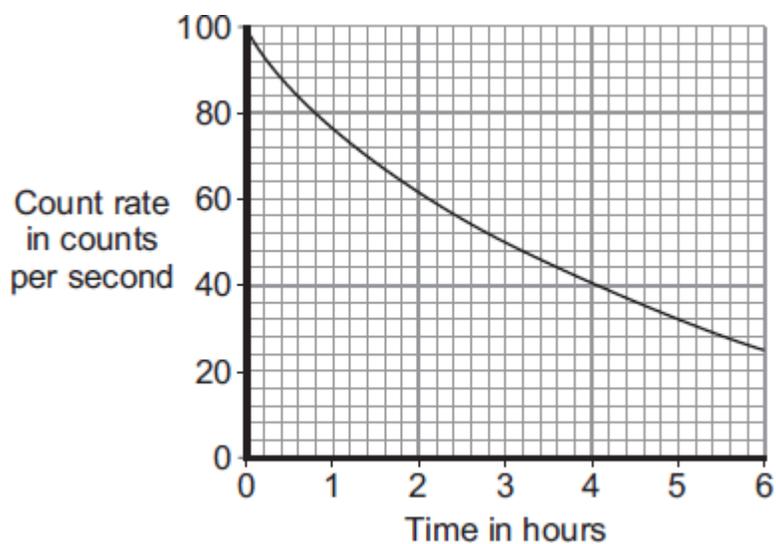
to monitor the thickness of aluminium foil as it is made in a factory

to make a smoke detector work

to inject into a person as a medical tracer

(1)

(c) The graph shows how the count rate from a source of alpha radiation changes with time.



What is the count rate after 4 hours?

_____ counts per second

(1)

(Total 4 marks)