

# Radioactivity

## Question Paper 2

Level	IGCSE
Subject	Physics (0625/0972)
Exam Board	Cambridge International Examinations (CIE)
Topic	General Physics
Sub-Topic	Radioactivity
Booklet	Question Paper 2

**Time allowed:** 21 minutes

**Score:** /17

**Percentage:** /100

### Grade Boundaries:

9	8	7	6	5	4	3	2	1
>85%	75%	68%	60%	55%	50%	43%	35%	<30%

## Question 1

A radioactive substance has a half-life of 2 weeks. At the beginning of an investigation, a sample of the substance emits 3000  $\beta$ -particles per minute.

How many  $\beta$ -particles will it emit per minute after 6 weeks?

- A 0                      B 375                      C 500                      D 1500

## Question 2

The table shows the results of an experiment to find the half-life of a radioactive substance.

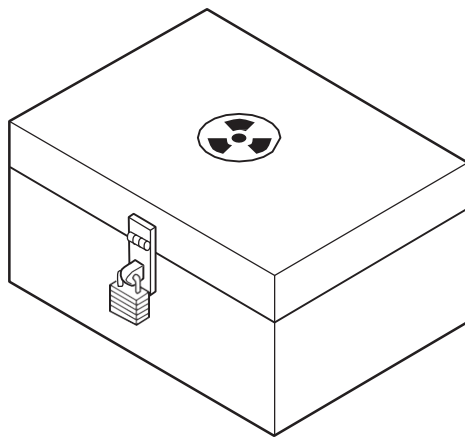
time/s	count rate from substance counts / second
0	150
60	120
120	95
180	75
240	60

What is the half-life of the substance?

- A. 60 seconds
- B. 120 seconds
- C. 180 seconds
- D. 240 seconds

### Question 3

The diagram shows a box used for storing radioactive sources.



Which material is best for lining the box to prevent the escape of most radioactive emissions?

- A. aluminium
- B. copper
- C. lead
- D. steel

## Question 4

Compared with  $\beta$ -particles and  $\gamma$ -rays,  $\alpha$ -particles

- A are the only type of radiation to carry a charge
- B have the greatest ionising effect.
- C. have the greatest penetrating effect.
- D. have the smallest mass.

## Question 5

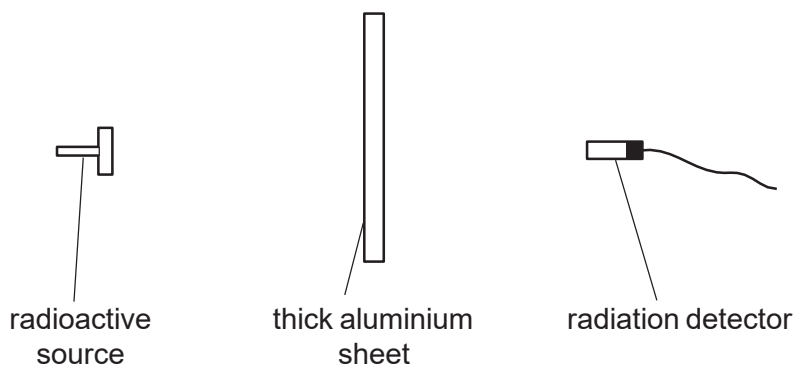
In a cathode-ray tube, a hot tungsten cathode releases particles by thermionic emission.

What are these particles?

- A.  $\alpha$ -particles
- B. electrons
- C. protons
- D. tungsten atoms.

## Question 6

The diagram shows a radioactive source, a thick aluminium sheet and a radiation detector.



The radiation detector shows a reading greater than the background reading.

Which type of radiation is being emitted by the source and detected by the detector?

- A  $\alpha$ -radiation
- B  $\beta$ -radiation
- C  $\gamma$ -radiation
- D infra-red radiation

## Question 7

The count rate from a radioactive isotope is recorded every hour. The count rate is corrected for background radiation.

The table shows the readings.

time / hours	0	1	2	3	4	5
$\frac{\text{corrected count rate}}{\text{counts/s}}$	800	620	480	370	290	220

What estimate of the half-life of the isotope can be obtained from the readings in the table?

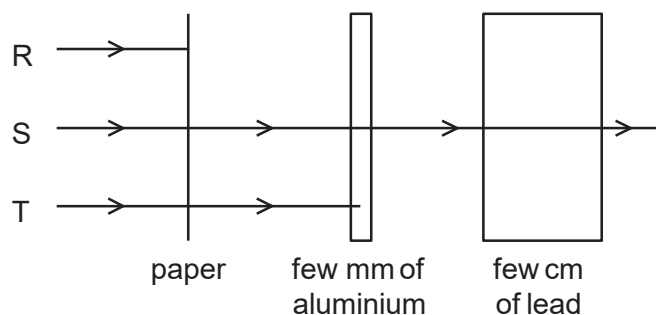
- A. between 1 and 2 hours
- B. between 2 and 3 hours
- C. between 3 and 4 hours
- D. between 4 and 5 hours



## Question 8

A radioactive source emits three types of radiation R, S and T.

The diagram shows an experiment set up to study the penetrating properties of R, S and T.



Which types of radiation are R, S and T?

	R	S	T
A	$\alpha$ -particles	$\beta$ -particles	$\gamma$ -rays
B	$\alpha$ -particles	$\gamma$ -rays	$\beta$ -particles
C	$\beta$ -particles	$\alpha$ -particles	$\gamma$ -rays
D	$\gamma$ -rays	$\beta$ -particles	$\alpha$ -particles

## Question 9

The half-life of a radioactive substance is 10 minutes. A sample of the radioactive substance contains 2000 nuclei.

How many radioactive nuclei were in the sample half an hour earlier?

- A 250                      B 4000                      C 6000                      D 16000

## Question 10

A radioactive substance emits a particle from the nucleus of one of its atoms. The particle consists of two protons and two neutrons.

What is the name of this process?

- A  $\alpha$ -emission
- B  $\beta$ -emission
- C  $\gamma$ -emission
- D nuclear fission

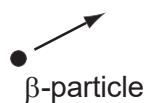
## Question 11

Why are some radioactive sources stored in boxes made from lead?

- A. Lead absorbs emissions from the radioactive sources.
- B. Lead decreases the half-life of radioactive sources.
- C. Lead increases the half-life of radioactive sources.
- D. Lead repels emissions from the radioactive sources.

## Question 12

A radioactive nucleus emits a  $\beta$ -particle.

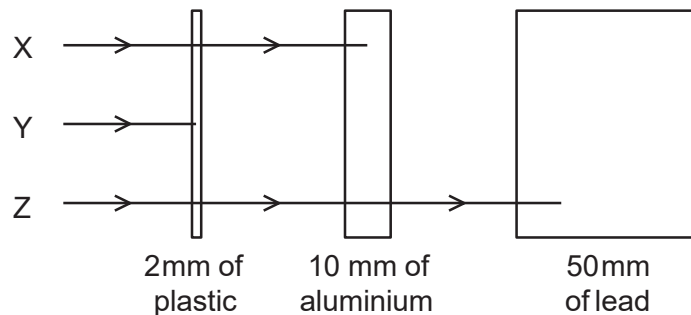


What happens to the proton number (atomic number) of the nucleus?

- A It stays the same.
- B It increases by 1.
- C It decreases by 2.
- D It decreases by 4.

## Question 13

The diagram shows the paths of three different types of radiation, X, Y and Z.



Which row in the table correctly identifies X, Y and Z?

	X	Y	Z
A	$\alpha$ -particles	$\beta$ -particles	$\gamma$ - rays
B	$\beta$ -particles	$\alpha$ -particles	$\gamma$ - rays
C	$\beta$ -particles	$\gamma$ -rays	$\alpha$ -particles
D	$\gamma$ -rays	$\alpha$ -particles	$\beta$ -particles

## Question 14

A powder contains 400mg of a radioactive material that emits  $\alpha$ -particles.

The half-life of the material is 5 days.

What mass of that material remains after 10 days?

- A 0 mg            B 40 mg            C 100mg            D 200mg

## Question 15

Which row shows the relative ionising effects and penetrating abilities of  $\alpha$ -particles and  $\beta$ -particles?

	ionising effect	penetrating ability
A	$\alpha$ greater than $\beta$	$\alpha$ greater than $\beta$
B	$\alpha$ greater than $\beta$	$\alpha$ less than $\beta$
C	$\alpha$ less than $\beta$	$\alpha$ greater than $\beta$
D	$\alpha$ less than $\beta$	$\alpha$ less than $\beta$



## Question 16

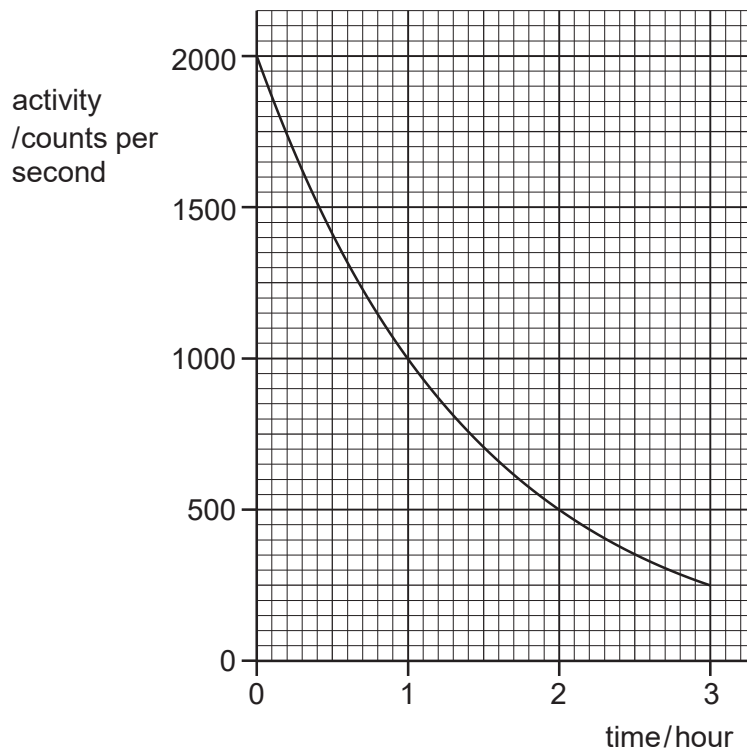
A scientist needs to use a source of  $\gamma$ -rays as safely as possible.

Which action will **not** reduce the amount of radiation that reaches the scientist?

- A. keeping the distance between the source and the scientist as large as possible
- B. keeping the temperature of the source as low as possible
- C. keeping the time for which the scientist uses the source as small as possible
- D. placing a lead screen between the scientist and the source

## Question 17

The graph shows the activity of a radioactive source over a period of time.



What is the half-life of the source?

- A  $\frac{1}{2}$  hour      B 1 hour      C  $1\frac{1}{2}$  hours      D 3 hours