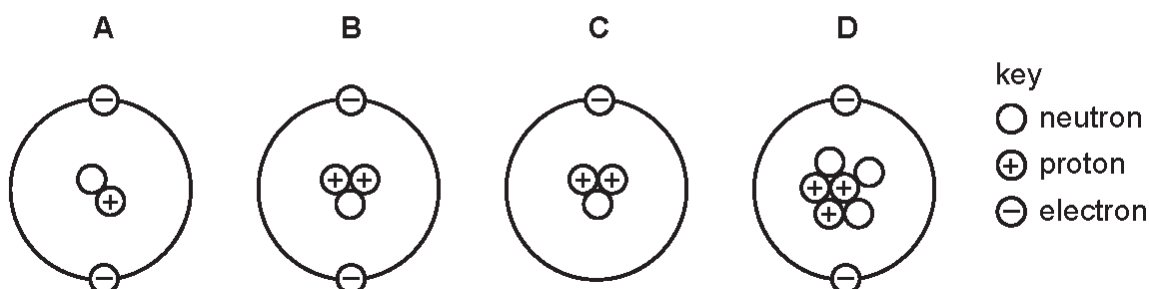


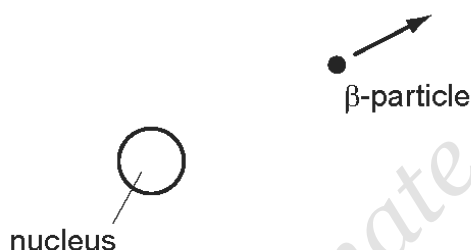
1 - (0625-S 2012-Paper 1 (Core)/3-Q37) - ATOMS AND RADIOACTIVITY

Which diagram could represent the structure of a neutral atom?



2 - (0625-S 2012-Paper 1 (Core)/1-Q38) - ATOMS AND RADIOACTIVITY

A radioactive nucleus emits a β -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.

3 - (0625-S 2012-Paper 1 (Core)/2-Q38) - ATOMS AND RADIOACTIVITY

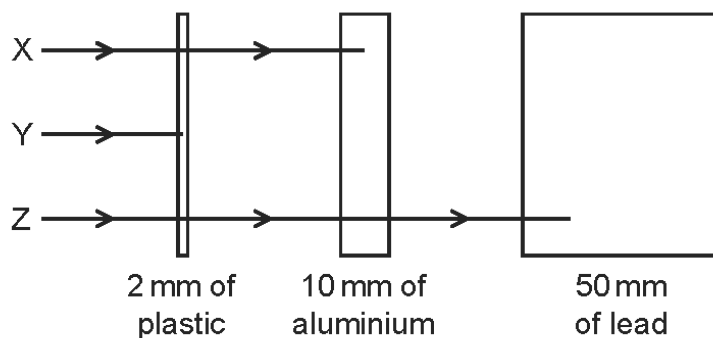
When measuring the emissions from a radioactive rock brought into the laboratory, a teacher mentions that background radiation must be taken into account.

What is this background radiation?

- A infra-red radiation from warm objects in the laboratory
- B infra-red radiation from the Sun
- C ionising radiation from the radioactive rock brought into the laboratory
- D ionising radiation in the laboratory when the radioactive rock is not present

4 - (0625-S 2012-Paper 1 (Core)/1-Q39) - ATOMS AND RADIOACTIVITY

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	α -particles	β -particles	γ -rays
B	β -particles	α -particles	γ -rays
C	β -particles	γ -rays	α -particles
D	γ -rays	α -particles	β -particles

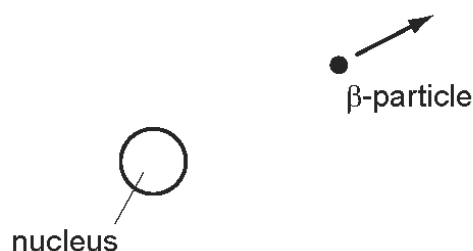
5 - (0625-S 2012-Paper 1 (Core)/2-Q40) - ATOMS AND RADIOACTIVITY

Which statement about a neutral atom of ${}^{226}_{88}\text{Ra}$ is correct?

- A** It has an equal number of neutrons and protons.
- B** It has more electrons than neutrons.
- C** It has more electrons than protons.
- D** It has more neutrons than protons.

6 - (0625-S 2012-Paper 1 (Core)/3-Q40) - ATOMS AND RADIOACTIVITY

A radioactive nucleus emits a β -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.

7 - (0625-W 2012-Paper 1 (Core)/1-Q38) - ATOMS AND RADIOACTIVITY

How does the ionising effect of α -particles compare with that of β -particles and γ -rays?

	compared with β -particles	compared with γ -rays
A	α -particles are less strongly ionising	α -particles are less strongly ionising
B	α -particles are less strongly ionising	α -particles are more strongly ionising
C	α -particles are more strongly ionising	α -particles are less strongly ionising
D	α -particles are more strongly ionising	α -particles are more strongly ionising

8 - (0625-W 2012-Paper 1 (Core)/2-Q38) - ATOMS AND RADIOACTIVITY

Which statement about a carbon nucleus represented by ${}^{14}_6\text{C}$ is correct?

- A It contains 6 neutrons.
- B It contains 6 electrons.
- C It contains 8 protons.
- D It contains 14 nucleons.

9 - (0625-W 2012-Paper 1 (Core)/3-Q38) - ATOMS AND RADIOACTIVITY

How do the ionising effect and the penetrating ability of α -particles compare with those of β -particles and γ -rays?

	ionising effect	penetrating ability
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

10 - (0625-W 2012-Paper 1 (Core)/1-Q39) - ATOMS AND RADIOACTIVITY

The table shows the count rates obtained from four radioactive sources. The measurements were taken at noon on four consecutive days.

Which source has the longest half-life?

	count rate / counts per second			
	day 1	day 2	day 3	day 4
A	100	48	27	11
B	200	142	99	69
C	300	297	292	290
D	400	202	99	48

11 - (0625-W 2012-Paper 1 (Core)/2-Q39) - ATOMS AND RADIOACTIVITY

How does the ionising effect of α -particles compare with that of β -particles and γ -rays?

	compared with β -particles	compared with γ -rays
A	α -particles are less strongly ionising	α -particles are less strongly ionising
B	α -particles are less strongly ionising	α -particles are more strongly ionising
C	α -particles are more strongly ionising	α -particles are less strongly ionising
D	α -particles are more strongly ionising	α -particles are more strongly ionising

12 - (0625-W 2012-Paper 1 (Core)/3-Q39) - ATOMS AND RADIOACTIVITY

A student is investigating how the radiation from a radioactive source changes with time.

The table shows the results from the detector.

time / min	count-rate / counts per min
0	340
2	180
4	100
6	60
8	40

The experiment is repeated by other students, who also measure the count-rate every two minutes.

The half-life of the source is known to be exactly two minutes.

Why is the measured count-rate **always** higher than half the previous value?

- A** Radioactive emissions occur randomly with time.
- B** The detector used is very close to the source.
- C** There is background radiation present.
- D** The radioactive source is decaying.

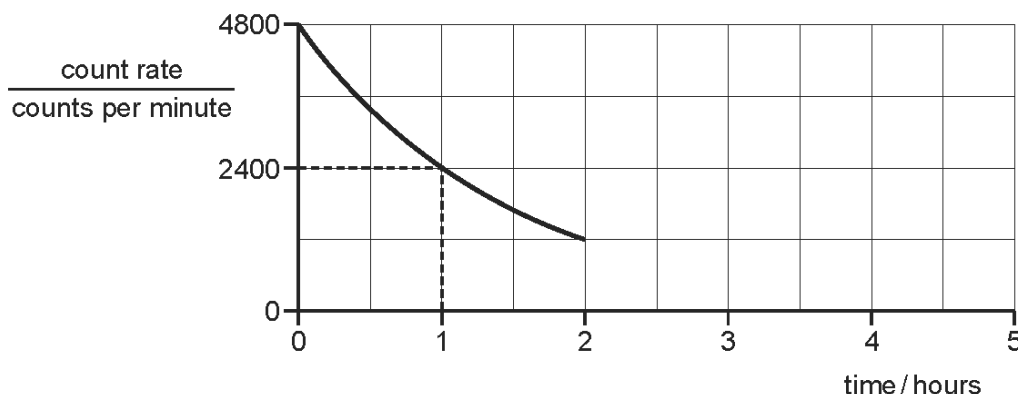
13 - (0625-W 2012-Paper 1 (Core)/3-Q40) - ATOMS AND RADIOACTIVITY

Which of the following is **not** a charged particle?

- A** α -particle
- B** β -particle
- C** neutron
- D** proton

14 - (0625-S 2013-Paper 1 (Core)/1-Q39) - ATOMS AND RADIOACTIVITY

The graph shows how the count rate on a detector due to a radioactive source changes with time.



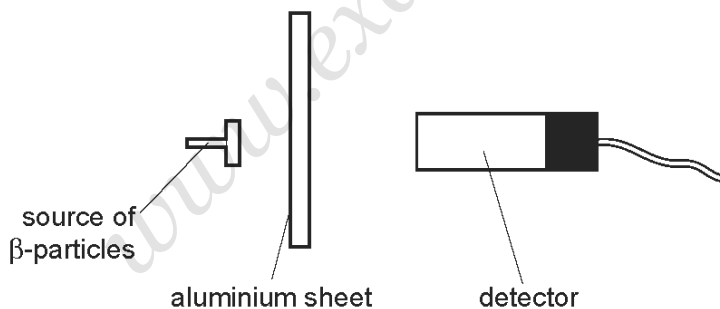
What is the count rate at 5.0 hours?

- A** 960 counts per minute
- B** 600 counts per minute
- C** 150 counts per minute
- D** 0 counts per minute

15 - (0625-S 2013-Paper 1 (Core)/2-Q39) - ATOMS AND RADIOACTIVITY

A radiation detector is placed close to a source of β -particles.

Aluminium sheets of increasing thickness are placed between the source and the detector.



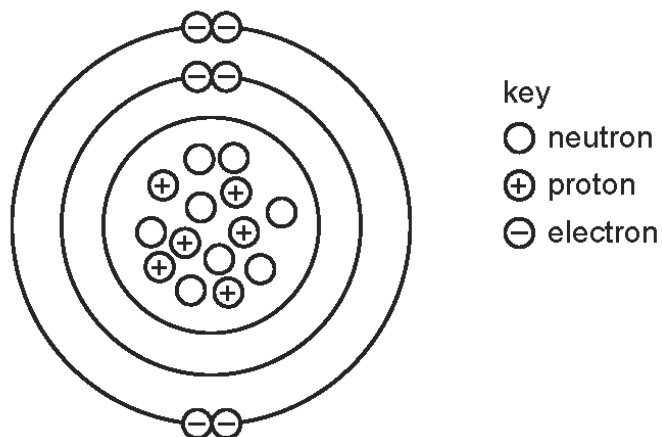
Eventually a sheet which is 2.0 cm thick is used. The reading on the detector decreases, but does not fall to zero.

Why does the reading not fall to zero?

- A** Some of the β -particles go round the edges of the sheet.
- B** The detector is too close to the source.
- C** There is always some background radiation.
- D** The sheet can never be thick enough to absorb all the β -particles.

16 - (0625-S 2013-Paper 1 (Core)/3-Q39) - ATOMS AND RADIOACTIVITY

The diagram represents a carbon atom.



What is the nucleon number (mass number) for this atom?

- A** 6 **B** 8 **C** 14 **D** 20

17 - (0625-S 2013-Paper 1 (Core)/2-Q40) - ATOMS AND RADIOACTIVITY

A nuclide is represented by the notation shown.

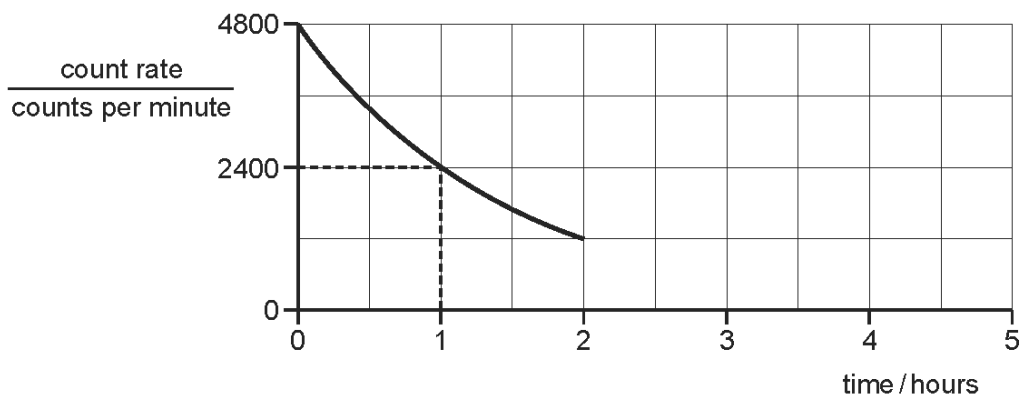


How many nucleons are there in one atom of this nuclide?

- A** P **B** Q **C** P + Q **D** P – Q

18 - (0625-S 2013-Paper 1 (Core)/3-Q40) - ATOMS AND RADIOACTIVITY

The graph shows how the count rate on a detector due to a radioactive source changes with time.



What is the count rate at 5.0 hours?

- A** 960 counts per minute
- B** 600 counts per minute
- C** 150 counts per minute
- D** 0 counts per minute

19 - (0625-W 2013-Paper 1 (Core)/2-Q38) - ATOMS AND RADIOACTIVITY

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** α -emission
- B** β -emission
- C** γ -emission
- D** nuclear fission

20 - (0625-W 2013-Paper 1 (Core)/2-Q39) - ATOMS AND RADIOACTIVITY

A nucleus X has 17 protons and 18 neutrons.

Which notation is correct for this nucleus?

- A** ${}_{18}^{17}\text{X}$
- B** ${}_{35}^{17}\text{X}$
- C** ${}_{17}^{18}\text{X}$
- D** ${}_{17}^{35}\text{X}$

21 - (0625-W 2013-Paper 1 (Core)/3-Q39) - ATOMS AND RADIOACTIVITY

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.

22 - (0625-W 2013-Paper 1 (Core)/3-Q40) - ATOMS AND RADIOACTIVITY

A nucleus of helium has the symbol ${}^3_2\text{He}$.

Which diagram represents an atom of ${}^3_2\text{He}$?

Diagram showing four atomic models (A, B, C, D) and a key.

Key:

- p = proton
- n = neutron
- e = electron

Model A: Nucleus contains 3 protons (p), 0 neutrons. 2 electrons (e) are shown in the shell.

Model B: Nucleus contains 2 protons (p), 1 neutron (n). 2 electrons (e) are shown in the shell.

Model C: Nucleus contains 0 protons, 2 neutrons (n). 3 electrons (e) are shown in the shell.

Model D: Nucleus contains 1 proton (p), 2 neutrons (n). 2 electrons (e) are shown in the shell.

23 - (0625-S 2014-Paper 1 (Core)/3-Q37) - ATOMS AND RADIOACTIVITY

A lithium nucleus contains 3 protons and 4 neutrons.

What is its nuclide notation?

- A** ${}^3_4\text{Li}$
- B** ${}^4_3\text{Li}$
- C** ${}^7_3\text{Li}$
- D** ${}^7_4\text{Li}$

24 - (0625-S 2014-Paper 1 (Core)/1-Q38) - ATOMS AND RADIOACTIVITY

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

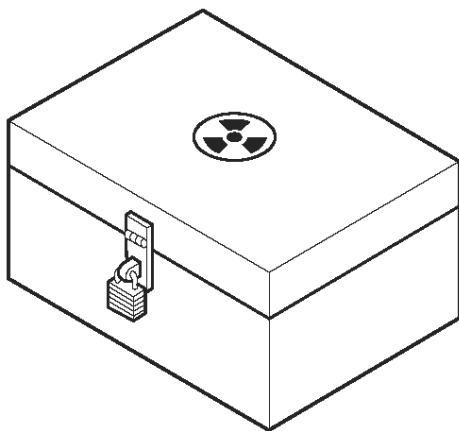
25 - (0625-S 2014-Paper 1 (Core)/2-Q38) - ATOMS AND RADIOACTIVITY

Compared with β -particles and γ -rays, α -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.

26 - (0625-S 2014-Paper 1 (Core)/3-Q38) - ATOMS AND RADIOACTIVITY

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

27 - (0625-S 2014-Paper 1 (Core)/2-Q40) - ATOMS AND RADIOACTIVITY

A particular nuclide of chlorine can be represented by the symbol shown.

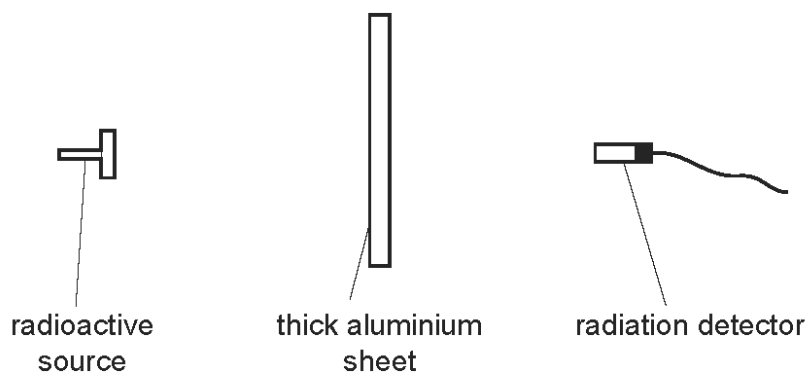


How many electrons are there in a neutral atom of this nuclide?

- A 17 B 20 C 37 D 54

28 - (0625-W 2014-Paper 1 (Core)/2-Q37) - ATOMS AND RADIOACTIVITY

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** α -radiation
- B** β -radiation
- C** γ -radiation
- D** infra-red radiation

29 - (0625-W 2014-Paper 1 (Core)/2-Q38) - ATOMS AND RADIOACTIVITY

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

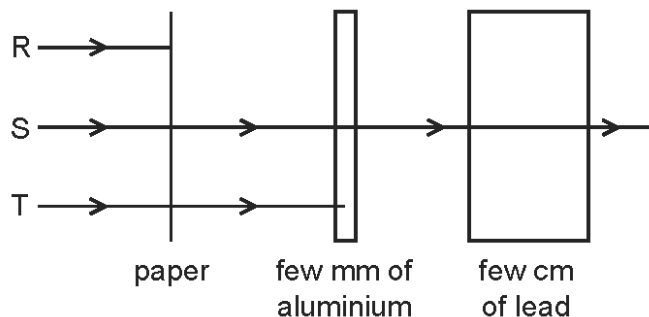
What estimate of the half-life of the isotope can be obtained from the readings in the table?

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

30 - (0625-W 2014-Paper 1 (Core)/3-Q38) - ATOMS AND RADIOACTIVITY

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	α -particles	β -particles	γ -rays
B	α -particles	γ -rays	β -particles
C	β -particles	α -particles	γ -rays
D	γ -rays	β -particles	α -particles

31 - (0625-W 2014-Paper 1 (Core)/2-Q39) - ATOMS AND RADIOACTIVITY

A nuclide is represented by the symbol P_QX .

How many neutrons are in one nucleus of the nuclide?

- A** P **B** Q **C** P + Q **D** P – Q

32 - (0625-W 2014-Paper 1 (Core)/3-Q39) - ATOMS AND RADIOACTIVITY

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