Cambridge Assessment International Education

Cambridge IGCSE™

10: Atomic physics – Topic questions

Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
12	2016	June	31
12	2016	March	32
12	2016	November	31

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

12 Two radioactive sources are used by a teacher. One source emits only alpha particles and the other source emits only beta particles.

(a) Suggest how the sources can be identified.

.....

.....

.....

.....

.....[2]

(b) The teacher also has a source that emits gamma rays.

State **two** ways in which gamma rays are different from alpha particles.

1. .....

2. .....

[2]

(c) State an effect of ionising radiation on living things.

.....[1]

[Total: 5]

12 Three types of ionising radiation are alpha, beta and gamma.

(a) Draw **one** straight line from each type of radiation to a property of that radiation.

type of radiation	property of radiation
alpha α	has a negative charge
beta β	has a long half-life
gamma γ	is stopped by paper
	is electromagnetic radiation

[3]

(b) Polonium-210 has the nuclide notation $^{210}_{84}Po$.

For one neutral atom of polonium-210,

(i) determine the number of protons, ...[1]

(ii) determine the number of neutrons. .....[1]

(c) Fig. 12.1 shows a decay curve for polonium-210.

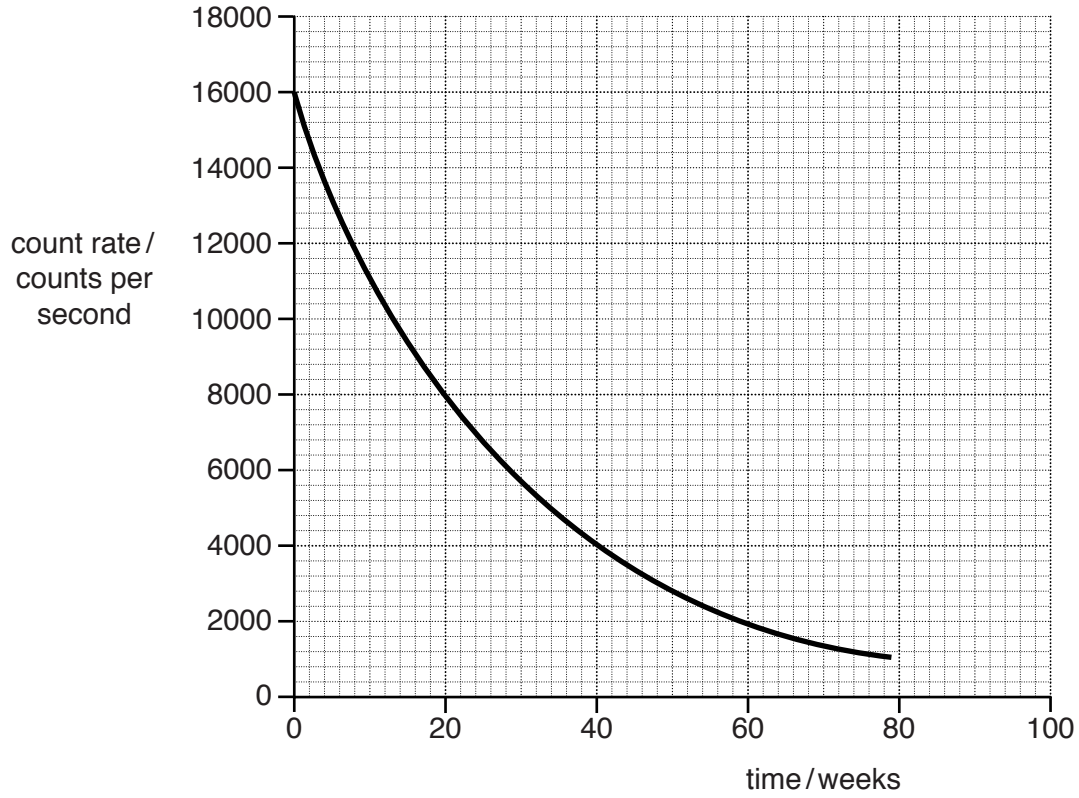

Fig. 12.1

Use the graph to determine the half-life of polonium-210.

half-life = ... weeks [2]

[Total: 7]

12 Caesium-137 is formed in nuclear reactors.

The nucleus of caesium-137 can be represented as

$$^{137}_{55}\mathrm{Cs}$$

(a) Complete Table 12.1 by stating the two types of particle in a nucleus of caesium-137, and the number of each particle present.

Table 12.1

type of particle	number of particles

[4]

(b) Caesium has more than one isotope.

Explain what is meant by the term *isotope*.

.....

.....

.....[2]

[Total: 6]

<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th></tr>
<tr><td>12 (a)</td><td>idea of paper between source and detector OR measuring range (in air) OR pass through an electric or magnetic field
alpha stopped by paper OR larger range in air for beta OR identify deflection when in field</td><td>B1
B1</td></tr>
<tr><td>12 (b)</td><td>any two from:
gamma travel at the speed of light
gamma rays have no charge
gamma rays have no mass
gamma is a wave OR part of the electromagnetic spectrum
gamma less ionising
greater penetration
not deflected by electric or magnetic fields</td><td>B2</td></tr>
<tr><td>12 (c)</td><td>damages cells / tissues / DNA OR causes (cell) mutations OR radiation sickness</td><td>B1</td></tr>
<tr><td colspan="3">Total: 5</td></tr>
<tr><td>12 (a)</td><td>line from alpha to stopped by paper
line from beta to negative charge
line from gamma to e.m. radiation</td><td>B1
B1
B1</td></tr>
<tr><td>12 (b) (i)</td><td>84</td><td>B1</td></tr>
<tr><td>12 (b) (ii)</td><td>126</td><td>B1</td></tr>
<tr><td>12 (c)</td><td>evidence of line from 8000 or idea of halving e.g. 8000 and 4000
20 ± 1.0 (weeks)</td><td>C1
A1</td></tr>
<tr><td colspan="3">Total: 7</td></tr>
<tr><td>12 (a)</td><td><table><tr><td>(type of particle)</td><td>(number of particles)</td></tr><tr><td>PROTON</td><td>52</td></tr><tr><td>NEUTRON</td><td>82</td></tr></table></td><td>B2
B2</td></tr>
<tr><td>12 (b)</td><td>(nucleus has)
same number of protons
different number of neutrons</td><td>B1
B1</td></tr>
<tr><td colspan="3">Total: 6</td></tr>
</table>

Notes about the mark scheme are available separately.