AQA GCSE Science Combined Higher

Practice answers

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	beta and gamma particles would not be stopped by the smoke but alpha particles are		1 1	AO2 4.4.2.1
01.2	the atomic number is 95 - 2 = 93 the atomic mass is 241 - 4 = 237		1 1 1 1	AO2 4.4.2.2
01.3	the atomic number has changed/the number of protons has changed every element has a different atomic number/number of protons		1 1	AO2 4.4.2.1
02.1	5600	accept between 5500 and 5700	1	AO3
02.2	evidence of using graph to find the time when the activity is 5.0 counts per minute = 8000 years	using graph to read answer	1	AO2
02.3	no made of wood from a tree that died about 8000 years ago (so is too young)		1 1	AO3 4.4.2.3
03.1	the activity of the sample is measured in Becquerels (Bq) the activity of the sample is the number of decays recorded per second		1 1	AO1 4.4.2.1
03.2	Geiger counter/Geiger Muller tube/GM tube		1	AO1 4.4.2.1

AQA GCSE Science Combined Higher

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<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Specification reference</th></tr>
<tr><td>03.3</td><td>
<table>
<tr><th>Type of radiation</th><th>Is a particle</th><th>Has no charge</th></tr>
<tr><td>alpha</td><td>✓</td><td></td></tr>
<tr><td>beta</td><td>✓</td><td></td></tr>
<tr><td>gamma</td><td></td><td>✓</td></tr>
<tr><td>neutron</td><td>✓</td><td>✓</td></tr>
</table>
</td><td>one mark for each correct column</td><td>2</td><td>AO1
4.4.2.1
4.4.2.2</td></tr>
<tr><td>03.4</td><td>radioactive decay is a random process
as is throwing a die
or
you never know which nucleus will decay next
or know which face on the die will appear next</td><td></td><td>1
1
or
1
1</td><td>AO2
4.4.2.1</td></tr>
<tr><td>04.1</td><td>
<table>
<tr><th>Type</th><th>Range in air</th></tr>
<tr><td>gamma</td><td>> 3 m</td></tr>
<tr><td>beta</td><td>1 m</td></tr>
<tr><td>alpha</td><td>< 10 cm</td></tr>
</table>
</td><td>one mark for one or two correct
two marks for all correct</td><td>2</td><td>AO1
4.4.2.1</td></tr>
</table>

AQA GCSE Science Combined Higher

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04.2	no the radiation that is the most ionising (is alpha) (which) has the smallest range in air		1 1 1	AO2 4.4.2.1
04.3	the aluminium absorbs alpha and beta radiation (so the activity goes down) gamma is not stopped by the aluminium (so you can still detect the gamma radiation)		1 1	AO2 4.4.2.1
05.1	the number of half-lives = $\frac{90}{30}$ = 3 $\left(\frac{1}{2}\right)^3$ = 0.125 **or** $\frac{1}{8}$ 0.125 x 24 = 3 g		1 1 1	AO2 4.4.2.3
05.2	56 $^{0}_{-1}\beta$ **or** e		1 1	AO2 4.4.2.2
05.3	sheep (eat the grass and) become contaminated the radioactive material inside them decays/emits radiation / could cause cancers		1 1	AO3 4.4.2.2
06.1	contamination means the presence of radioactive materials inside or on the human body irradiation is the process of exposing the strawberries to radiation		1 1	AO1 4.4.2.4

AQA GCSE Science Combined Higher

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06.2	you are not taking radioactive material into your body (so there is little or no increase in risk due to ionizing radiation) **or** the radiation passes through the strawberry, it does not stay inside it, so you are not ingesting any radioactive material		1	AO3 4.4.2.4
06.3	scientist do experiments and collect data/draw conclusions their results are checked by other scientists in a process called 'peer review' appropriate reason e.g., • the regulations deal with radioactive material which can be harmful • the hazards of radioactive material to the human body are significant • people could be harmed if the data is not correct		1 1 1	AO2 4.4.2.4
07.1 07.2	one mark for graph for sodium starting at 100 one mark for exponential decay shape one mark for showing half-life of about 15 hours [i.e. goes through (15, 50) (30, 25) and (45, 12.5)] one mark for graph for radium starting at 100 one mark for horizontal line		3 2	AO2 4.4.2.3
07.3	when a nucleus decays by alpha decay the atomic mass is reduced by four/goes down by four the difference between the atomic masses of polonium and bismuth shown in the table is three (215 - 212)		1 1	AO3 4.4.2.2
08.1	beta		1	AO2 4.4.2.2

AQA GCSE Science Combined Higher

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08.2	beta particle high speed/fast moving electron	no marks for charge of -1/no mass	1	AO2 4.4.2.2
08.3	neutron converted into proton neutrons and protons have the same mass		1 1	AO2 4.4.2.1 4.4.2.2
08.4	83 protons before X emitted, 84 after (as a neutron changes to a proton) the neutron has no charge, and a proton has a charge of +1 (so the charge increases by one)		1 1	AO2 4.4.2.2
09	**Level 3**: Identification of beta radiation with detail about how the process works detailed reasons why alpha/gamma not suitable.		5-6	AO3 4.4.2.1
	Level 2: Identification of beta radiation with detailed reasons why alpha/gamma not suitable.		3-4	
	Level 1: Identification of beta radiation with a reason why alpha/gamma not suitable.		1-2	
	No relevant comment.		0	

AQA GCSE Science Combined Higher

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Question	Answers	Extra information	Mark	AO / Specification reference
	Indicative content: • you need a radioactive material that emits beta radiation • if the paper is too thick the detector detects less radiation, • so commands the rollers to press harder • alpha radiation would be stopped by the paper • so the detector would not detect any radiation • gamma radiation would go straight through the paper • so the detector would not detect any change in radiation • there would be no command for the rollers, so the paper would be too thick or too thin			
10.1	curved line of best fit	one mark for line of best fit	1	AO2
10.2	two points chosen from count rate, and time worked out from them one mark for use of two values from graph one mark for correctly reading times and subtracting e.g., 90 – 30 one mark correct answer ignore any units written award two marks for halving initial count-rate and reading time		3	AO3 4.4.2.3
10.3	no radioactive decay is radon, so there will be a scatter of points on the graph		1 1	AO2 4.4.2.3
10.4	they have not put unit labels on the axes of the graph		1	AO 4.4.2.3

AQA GCSE Science Combined Higher

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11.1	a positively charged mass with negatively charged electrons embedded in it		1 1	AO1 4.4.2.3
11.2	**two** correct points, e.g., • the electron was smaller/less massive than the atom • it showed that there were particles that were smaller than the atom • It was negatively charged showing that there was positive and negative charge in the atom	one mark for each correct answer up to a maximum of two points	2	AO1 AO2 4.4.1.3
11.3	all of the alpha particles would go through or all the alpha particles would come back		1	AO1 4.4.1.3
11.4	some of the alpha particles would come back, but most went through which could not be explained by the current model, so the model had to change		1 1	AO1 AO2 4.4.1.3
11.5	correct suggestion, e.g., • the scientists were using the results of develop an alternative model • the results were being checked by other scientists		1	AO2 4.4.1.3
12.1	resistor		1	AO1 4.2.2

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12.2	in circuit one, the voltmeter reads 3 V in circuit two, the voltmeter reads 6 V in circuit one, the potential difference is split between the components/resistors in circuit two, the voltmeter is connected directly across the battery.		1 1 1 1	AO2 4.2.2
12.3	there would be no change to the readings the potential difference would still be split in half if the bulbs are identical in circuit one the potential difference is still connected across the battery in circuit two		1 1	AO3 4.2.2