AQA GCSE Science Combined Higher

Practice answers

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	ten		1	AO2 4.4.1.2
01.2	the number of electrons is the same as the number of protons electrons and protons have opposite charges/charge cancels/atoms are neutral so have equal positive and negative charges		1 1	AO1 AO2 4.4.1.1
01.3	A and B		1	AO1 4.4.1.2
01.4	isotopes have the same number of protons but different numbers of neutrons		1 1	AO1 4.4.1.2
02.1	particle B there are the same number of those particles in each nucleus		1 1	AO1 4.4.1.2
02.2	particle A is a neutron		1	AO1 4.4.1.2
02.3	the element is lithium it has an atomic number of three		1 1	AO1 4.4.1.2
02.4	isotope one: ${}^{6}_{3}Li$ isotope two: ${}^{7}_{3}Li$		1 1	AO1 4.4.1.2
02.5	the same the charge comes from/depends on the number of protons, which is the same		1 1	AO1 4.4.1.2
03.1	10^{-10} m		1	AO1 4.4.1.1

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03.2	an orbit/distance from the nucleus where there are electrons		1	AO1 4.4.1.1
03.3	when hydrogen absorbs electromagnetic radiation, the electrons move up a level e.g., from level one to level two or three when the electron moves back down, it emits electromagnetic radiation e.g., when it moves from level three to two or from two to one		1 1 1 1	AO1 4.4.1.1
04.1	looking at the atomic/bottom number/seven subtracting the atomic/bottom number from the mass/top number looking at the atomic/bottom number/seven/ it is the same as the number of protons		1 1 1	AO1 4.4.1.2
04.2	no there are atoms where the mass/top number/atomic mass is not double the atomic/bottom number/atomic number		1 1	AO1 4.4.1.2
05	**Level 3**: Description of the how the nuclear model came to be proposed, and the limitations of it. Comment about the refinement of the model when the proton and neutron were discovered.		5-6	AO1 4.4.1.3
	Level 2: Description of the nuclear model and some discussion about how the structure of the nucleus wasn't worked out until later		3-4	
	Level 1: Some comment about the development of the model in terms of the alpha scattering experiment and/or discovery of particles in the nucleus.		1-2	

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	No relevant comment.		0	
	Indicative content: • the discovery of the electron was before the nuclear model was proposed • Rutherford knew that electrons were negatively charged and that atoms were neutral • so he knew that there had to be positive charge in the nucleus • the results of the alpha particle experiment showed that there was a massive, small positively charged object at the centre of the atom • and that most of the atom was empty space • his model included a positive massive nucleus but did not include the names or number of particles in it • the model was refined when the proton and neutron were discovered and named			
06.1	the plum pudding model is a model with a positive mass with negatively charged electrons embedded in it		1 1 1	AO1 4.4.1.3
06.2	the plum pudding model replaced the Dalton model, which was that atoms were tiny spheres that could not be divided.		1	AO1 4.4.1.3
06.3	most alpha particles went straight through a gold foil but some came back/were deflected through more than 90°		1 1	AO1 4.4.1.3

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07.1	percentage = $\frac{33+43+52+70}{142141}$ x 100 % = $\frac{198}{142141}$ x 100 % = 0.14 %		1 1	AO2 4.4.1.3
07.2	percentage of particles going through = 100 - 0.14 = 99.86 %		1	AO2 4.4.1.3
07.3	the majority of particles went through the foil so the part of the atom/nucleus deflecting alpha particles was very small		1 1	AO3 4.4.1.3
07.4	positive/2+		1	AO1 4.4.1.3
07.5	if the nucleus is negative the alpha particles would be attracted to the nucleus and there would be no particles repelled and no deflections greater than 90° if it is positive, they would be repelled and be deflected by small or larger angles		1 1 1 1	AO1 AO3 4.4.1.3
08.1	A, D, E, F	two marks for three or four correct one mark for one or two correct	2	AO1 4.4.1.1

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08.2	B C		1 1	AO1 4.4.1.1
08.3	E F		1 1	AO1 4.4.1.1
08.4	positive (2+)		1	AO3 4.4.1.2
08.5	the nucleus is smaller by a factor of so the nucleus should be $\frac{0.2}{10000}$ $= 2\times10^{-6}$ m this is $\frac{1}{1000}$ of a millimetre/too small to draw		1 1 1 1	AO1 4.4.1.1
09.1	some energy from the gravitational potential energy store at the start is transferred to the thermal energy store of the surroundings when the ball bounces so there is less energy in the gravitational potential energy store at the end of the bounce		1 1	AO1 4.1.1.1
09.2	one mark for three of four points of data plotted correctly (+/- half square) one mark for all points plotted correctly one mark for acceptable line of best fit		3	AO2 AO3
09.3	the anomalous result is for 60 cm drop/49 cm bounce		1	AO3

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09.4	yes/bounce height is proportional to the drop height the line of best fit is a straight line through (0, 0)/origin or as drop height doubles, the bounce height doubles		1 1	AO3
10.1	if the current in the circuit becomes too large the wire inside a fuse melts which breaks the circuit (and helps to prevent injury)		1 1	AO1/1 4.2.3.2
10.2	it takes a certain amount of energy to raise the temperature of the metal sufficiently to melt the fuse wire. the energy required depends on the mass of the wire/thinner wires can only carry smaller currents if the wire needs to melt at a higher current the mass needs to be bigger, so the wire needs to be thicker		1 1 1	AO1/1 AO2/1 4.3.2.2
10.3	mass = density × volume		1	AO1/1
10.4	0.5 cm = 5×10^{-3} m volume = length x area = $5\times10^{-3} \times 1\times10^{-6}$ = 510^{-9} mass = $7000 \times 5\times10^{-9}$ mass = 3.5×10^{-5} kg		1 1 1 1 1	AO1 AO2
10.5	energy = mass × specific heat capacity × change in temperature = $3.5\times10^{-5} \times 230 \times (687 - 20)$ =5.37J (5.4) energy = mass × specific latent heat = $3.5\times10^{-5} \times 300\ 000$ = 10.5 J total energy = 5.37 + 10.5 = 15.87 = 15.9 J		1 1 1 1 1	AO2 4.3.1.1 4.3.2.2 4.3.2.3

Question	Answers	Extra information	Mark	AO / Specification reference
10.6	energy transferred = power × time		1	AO1
10.7	power = current^2 × resistance	allow $E = I^2Rt$	1	AO1
10.8	$15.87 = \text{current}^2 \times 1.8 \times 0.5$ $\text{current} = \sqrt{\frac{15.87}{1.8 \times 0.5}}$ = 4.20 A **or** $P = \frac{E}{t} = \frac{15.87}{0.5} = 31.74\ \text{W}$ $I^2 = \frac{P}{R} = \frac{31.74}{1.8} = 17.63$ $I = \sqrt{17.63} = 4.2\ \text{A}$		1 1 1 **or** 1 1 1	AO2 4.2.4.2