AQA GCSE Physics

Practice answers

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	10		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 4.4.1.1
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

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02.4	isotope one: $^{6}_{3}Li$ isotope two: $^{7}_{3}Li$	one mark for correct top number/atomic mass in each case one mark for correct bottom number/atomic number in each case one mark for correct symbol (credit once only)	5	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
03.2	an orbit/distance from the nucleus where there are atoms		1	AO1 4.4.1.1
03.3	when hydrogen absorbs electromagnetic radiation, the electron will 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 three to two, or from two to one		1 1 1 1	AO1 AO1 4.4.1.1

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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 suitable example e.g., Be, Na		1 1	AO1 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 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	
	No relevant comment.		0	

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	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	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	AO1 AO2 4.1.1.1

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06.2	points should be plotted at: (20, 16), (40, 30), (60, 49), (80, 55), (100, 70)	one mark for correct variables on the x and y-axes one mark for appropriate scales on the x and y-axes with labels and units one mark for plotting three or four points of data correctly (within ± 0.5 squares) two marks for plotting all points of data correctly one mark for drawing an acceptable line of best fit	5	AO2 AO3
06.3	the anomalous results is for the 60 cm drop/49 cm bounce		1	AO3
06.4	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
07.1	percentage = $\frac{33+43+52+70}{142141}$ x 100 % = $\frac{198}{142141}$ x 100 % = 0.14 %		1	AO2 4.4.1.3

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07.2	percentage 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 (or 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^{o} 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
08.2	B C		1 1	AO1 4.3.3.2
08.3	E F		1 1	AO1 4.4.1.1
08.4	positive (2+)		1	AO3 4.4.1.2

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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	the plum pudding model is a model with a positively charged mass with negatively charged electrons embedded in it		1 1 1	AO1 4.4.1.3
09.2	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
09.3	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
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 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 AO2 4.3.2.2

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10.3	mass = density × volume		1	AO1
10.4	0.5 cm = $5x10^{-3}$ m volume = length x area = $5x10^{-3} \times 1x10^{-6}$ = $5x10^{-9}$ mass = $7000 \times 5x10^{-9}$ = 3.5×10^{-5} kg		1 1 1 1 1	AO1 AO2
10.5	energy = mass × specific heat capacity × change in temperature = $3.5\times10^{-5} \times 230 \times (687 - 20)$ =5.37 J (5.4 J) 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
10.6	energy transferred = power × time		1	AO1
10.7	power = current^2 × resistance		1	AO1

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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** $P = \frac{E}{t} = \frac{15.87}{0.5} = 31.74$ W $I^2 = \frac{P}{R} = \frac{31.74}{1.8} = 17.63$ $I = \sqrt{17.63} = 4.2$ A	allow $E = I^2Rt$ accept 4.2 with no working shown for two marks	1 1 1 **or** 1 1 1	AO2 4.2.4.2
11.1	one mark for battery, ammeter and component in series one mark for voltmeter in parallel with the component one mark for battery, ammeter and voltmeter correctly labelled		3	AO2 4.2.1.4
11.2	(connect up the circuit, and) measure the potential difference and current record the measurements change the potential difference of the battery/add a variable resistor, and take another set of measurements repeat for different values of potential difference calculate the ratio of potential difference to current/plot a graph of potential difference against current. if the ratio/gradient is constant and straight line goes through origin is constant, the component is ohmic		1 1 1 1	AO1 AO1 4.2.1.4

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11.3	gradient of this graph = $\frac{1}{V}$ which equals $\frac{1}{R}$ **or** R = $\frac{1}{\text{gradient}}$		1	AO1 AO1 4.2.1.4
11.4	one mark for drawing the graph in third quadrant one mark for curved lines one mark for correct curvature		3	AO3 4.2.1.4
11.5	potential difference = current × resistance		1	AO1 4.2.1.3
11.6	resistance = $\frac{V}{I}$ = $\frac{6}{0.6}$ = 10 Ω		1 1	AO1 4.2.1.3
11.7	the resistance changes by a factor of two (is not constant)/not a straight line through the origin so the component is non-ohmic		1 1	AO3 4.2.1.4
12.1	greater than greater than same as		1 1 1	AO1 AO1 4.3.2.1
12.2	greater than		1	4.3.2.1

Question	Answers	Extra information	Mark	AO / Specification reference
12.3	the specific heat capacity for hot water is the same as for cold water		1	4.3.2.2
12.4	the average speed and specific heat capacity will stay the same because these quantities do not depend on the number of particles in the beaker. the kinetic energy, potential energy and internal energy will be halved because the number of particles in the beaker has halved.		1 1 1 1	AO1 AO1 AO2 4.3.2.1
13	**Level 3:** Clear and coherent description and comparison of fission and fusion.		5-6	AO1 AO1 4.4.4.1 4.4.4.2
	Level 2: Processes of fission and fusion described but not compared.		3-4	
	Level 1: A relevant part or description of fission or fusion with no comparison.		1-2	
	No relevant comment.		0	

Question	Answers	Extra information	Mark	AO / Specification reference
	Indicative content: • fission is the splitting of large unstable nuclei • into smaller nuclei • fusion is the joining together of smaller nuclei • to make larger nuclei • fission processes can be started and maintained easily • fission occurs at lower temperatures / fusion occurs at higher temperatures • fission is a process that happens in nuclear power stations but there are no nuclear fusion power stations • fission causes a chain reaction/fusion does not • both release energy (more energy released in fusion)			
14.1	a positively charged mass with negatively charged electrons embedded in it		1 1	AO1 4.4.1.3
14.2	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 point up to a maximum of two marks	2	AO1 AO2 4.4.1.3
14.3	all of the alpha particles would go through or all the alpha particles would come back		1	AO1 4.4.1.3

Question	Answers	Extra information	Mark	AO / Specification reference
14.4	some of the alpha particle came back, but most went through which could not be explained by the current model, so the model had to change		1	AO2 4.4.1.3
14.5	correct suggestion e.g., the scientists were using the results to develop an alternative model the results were being checked by other scientists		1	AO2 4.4.1.3