AQA GCSE Science Combined Higher

Practice answers

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	Niels Bohr – electrons orbit the nucleus at certain distances James Chadwick – the nucleus contains neutrons		1 1	AO1 4.1.1.3
01.2	alpha particles/helium nucleus fired at gold foil most passed through the gold foil – so most of the atom is empty space a small number bounced back so must have collided with something/mass/nucleus a small number passed through but were deflected/changed direction positively charged alpha particles passed near positively charged nucleus and were repelled		1 1 1 1 1 1	AO1 4.1.1.3
01.3	19		1	AO2 4.1.1.4
02.1	fractional distillation	do not accept 'distillation' or 'simple distillation'	1	AO2 4.1.1.2
02.2	mixture is heated both liquids will give off vapours before their boiling point vapours enter fractionating column (with glass beads) water will condense on glass beads as it has a higher boiling point (than isopropanol) isopropanol will continue to rise and pass into condenser will then condense and can be collected in separate vessel		1 1 1 1 1 1	AO1 4.1.1.2
02.3	boiling point too similar		1	AO2 4.1.1.2

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03.1	<u>similarities:</u> • both suggest that atoms are spherical • both suggest different elements have different atoms of different masses <u>differences:</u> • earlier model states that atoms cannot be divided • plum pudding model suggests that negative electrons are embedded in a ball of positive charge	one mark for each correct answer (up to a maximum of three marks) must include at least one similarity and one difference to gain full marks	3	AO1 4.1.1.3
03.2	**Level 3:** A detailed and coherent explanation is given, linking observations to aspects of the model.		5–6	AO3 4.1.1.3
	Level 2: A coherent explanation is given, but not all observations are linked to aspects of the model.		3–4	
	Level 1: Some correct points are made.		1–2	
	No Relevant content		0	

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	Indicative content
	• positively charged alpha particles fired at gold foil
	• most alpha particles travelled straight through the foil
	• a few alpha particles changed direction, including some that bounced back
	• scientists interpreted the evidence as showing that the charge and mass of atom is concentrated in small central nucleus
	  ○ the positively charged nucleus repelled positive alpha particles
	  ○ only those alpha particles that pass close to the nucleus change direction; most pass through the empty space between the nuclei
		allow answer in terms of plum pudding model e.g. "α particles would not have passed through if plum pudding model is correct" etc.		

04.1	16		1	AO2 4.1.1.4
04.2	17		1	AO2 4.1.1.4
04.3	Y		1	AO3 4.1.1.5
04.4	X and Z	both required for the mark	1	AO3 4.1.1.5

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05.1	17 (same as number of electrons)		1	AO1 4.1.1.4
05.2	17		1	AO1 4.1.1.4
05.3	chlorine has (two) isotopes with different abundance relative atomic mass is an average	chlorine isotope need not be given to gain mark accept calculation for two marks	1 1	AO1 4.1.1.5
05.4	$\frac{(69.2\times63)+(30.8\times65)}{100}$ = 63.616 = 63.6		1 1 1	AO2 4.1.1.6
05.5	other isotopes of copper exist		1	AO3 4.1.1.6
06.1	number of protons = number of electrons = 11 mass number = number of protons + number of neutrons = 11 + 12 = 23		1 1	AO2 AO3 4.1.1.5
06.2	**Level 3:** A detailed and coherent comparison is given, demonstrating a sound knowledge of electron shells.		5-6	AO2 4.1.1.7
	Level 2: A correct description is given of each electronic structure. Comparisons are made, but are not clearly articulated.		3-4	
	Level 1: Some correct points are made about each electronic structure. No comparisons are made.		1-2	
	No relevant content.		0	

Question	Answers	Extra information	Mark	AO / Specification reference
	Indicative content • in both atoms, the electrons are arranged in shells/energy levels • in both atoms, there are three shells/energy levels • in both atoms, the shell/energy level nearest the nucleus has two electrons/is full • in both atoms, the shell/energy level second from the nucleus has eight electrons/is full • in sodium, the outer shell/energy level has one electron only, and is not full • but in argon, the outer shell/energy level has eight electrons and is full			
06.3	$\frac{71}{10000} = 0.0\,071$ 7.1×10^{-3} pm	accept 0.0071pm for one mark	1 1	AO2 4.1.1.5
07.1	mass numbers: L = 14+14 = 28; M = 14+15 = 29; N = 14+16 = 30 percentage abundance of N = (100 – (92.2 + 4.68)) = 3.12% relative atomic mass = $\frac{(92.2\times28)+(4.68\times29)+(3.12\times30)}{100}$ =28.1092 = 28.1		1 1 1 1 1	AO2 4.1.1.6

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Question	Answers	Extra information	Mark	AO / Specification reference
07.2	three shells two electrons in first shell, eight electrons in second shell and four electrons in third shell	accept one shell shown with four electrons for one mark	1 1	AO1 4.1.1.7
07.3	both isotopes will have the same chemical properties as they have the same number of outer electrons		1 1	AO1 4.1.1.7
08.1	-1		1	AO1 4.1.1.4
08.2	two crosses in shell nearest centre eight crosses in next shell four crosses in outer shell		1	AO1 4.1.1.4
08.3	(Niels) Bohr		1	4.1.1.7
09.1	**one** of: • atoms of the same element with different numbers of neutrons • atoms with the same atomic number and different mass number • atoms with the same number of protons but different numbers of neutrons		1	AO1 4.1.1.5
09.2	the three isotopes have the same atomic number		1	AO1 4.1.1.5

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09.3	relative atomic mass = $\frac{(79.0\times24)+(10.0\times25)+(11.0\times26)}{100}$ = 24.32 = 24.3		1 1 1	AO1 AO2 4.1.1.6
10.1	zirconium		1	AO2 4.1.1.4
10.2	calcium		1	AO2 4.1.1.5
10.3	2.8.8.2		1	AO2 4.1.1.7
10.4	Points plotted at (10, 10) (20, 20) (30, 34) (40, 50) (50, 70) (57, 82)	one mark for correctly plotting at least three points two marks for correctly plotting all points	2	AO2 4.1.1.5
10.5		one for correct smooth curve of best fit	1	AO1 AO3 4.1.1.5
10.6	as the number of protons increases, so does the number of neutrons not directly proportional (as the number of protons increases, the number of neutrons increases more quickly)	 allow not linear/non-linear	1 1	AO1 AO3 4.1.1.5
11.1	triangle		1	AO2 4.1.1.1

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Question	Answers	Extra information	Mark	AO / Specification reference
11.2	A		1	AO2 4.1.1.1
11.3	C		1	AO2 4.1.1.1 4.1.1.2
11.4	B		1	AO2 4.1.1.1 4.1.1.2
11.5	NaCl	must have capital ‘N’ and ‘C’ and lower case ‘a’ and ‘l’ allow ClNa	1	