AQA GCSE Science Combined Higher

Practice answers

Question	Answers	Extra information	Mark	AO / Specification reference
01.1	Metal		1	AO1 4.1.2.3
01.2	rubidium hydroxide and hydrogen		1	AO2 4.1.2.5
01.3	rubidium + oxygen → rubidium oxide		1	AO1 4.1.2.5
01.4	$2Na(s) + Br_2(l) \rightarrow 2NaBr(s)$	one mark for balancing one mark for state symbols	2	AO2 4.1.2.5
01.5	rubidium is more reactive that sodium/sodium less reactive because it is further down Group 1/it has more electron shells outer electron is further from the nucleus/the nucleus is more shielded so easier to transfer to bromine/easier to remove		1 1 1 1	AO1 4.1.2.5
02.1	left gaps for elements (he predicted existed but that had not been discovered) in some placed, changed the order of elements (based on atomic weights)		1 1	AO1 4.1.2.2
02.2	elements could be arranged in order of atomic number/proton number so elements grouped according to their chemical properties		1 1	AO1 4.1.2.2

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02.3	elements in the same group of the periodic table have the same number of electrons in their highest energy level/outer shell number of electrons in highest energy level/outer shell determine the chemical properties of an element		1 1	AO1 4.1.2.2
02.4	the existence of neutrons makes possible the existence of isotopes		1	AO2
03.1	Group 0 – inert Group 1 – react with water to make alkaline solutions Group 7 – react with metals to make ionic compounds		1 1 1	AO1 4.1.2.4 4.1.2.5 4.1.2.6
03.2	**Level 3:** Clearly links trend in reactivity for both groups to electron structure.		5-6	AO2 4.1.2.5 4.1.2.6
	Level 2: Clearly links trend in reactivity for one group to electron structure **or** correctly states trends in reactivity for both groups.		3-4	
	Level 1: Correctly states trends in reactivity for one/both groups.		1-2	
	No relevant comment.		0	

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Question	Answers	Extra information	Mark	AO / Specification reference
	Indicative content: • Group 1 gets more reactive down the group • Group 1 loses outer electron to form full outer shell/nearest Noble Gas • electron is further from the nucleus, so becomes easier to remove • Group 7 gets less reactive down the group • Group 7 atoms gain electron to form full outer shell/nearest Noble Gas • less attraction felt by positive nucleus charge further away from nucleus			
03.3	inert/unreactive atoms already have full outer electron shell	ignore references to heavier noble gases forming some compounds	1	AO1 4.2.1.4
04.1	outer electrons of xenon are far away from nucleus weaker electrostatic force between outer electrons and positively charged nucleus		1 1 1	AO3 4.1.2.4 4.1.2.6
04.2	1 Xe atom and 4 F atoms are Xe atom has 8 dots and 4 crosses, each F atom has 7 crosses and 1 dot each F atom shares 1 dot and 1 cross with Xe atom		2	AO3 4.2.1.4
04.3	covalent		1	AO1 4.2.1.4

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05.1	Group 1		1	AO1 – 1 4.1.2.5
05.2	so that the big lump of sodium does not react with oxygen/water from the air		1	AO3 – 1
05.3	to avoid sodium reacting with water on fingers/to prevent injury to hand		1	AO3 – 1
05.4	use filter paper to remove oil from the surface to the sodium/scrape the surface of the sodium to expose the metal or remove some sodium oxide		1	AO3 – 1
05.5	hydrogen/H_2	reject H	1	AO1 – 1 4.1.2.5
05.6	add universal indicator to the water colour change from green to purple/blue	allow other indicators with correct colour change given	1 1	AO1 – 2 4.1.2.5
05.7	• atoms of all Group 1 elements lose an electron in their reactions • atoms get bigger down the group, so the outer electron is further from nucleus/Na has an extra shell **or** Li has one fewer shell • electrostatic force of attraction between positive nucleus and negatively charged electron decreases down the group • so easier to lose electron / easier to transfer electron	allow references to shielding	1 1 1	AO1 – 3 4.1.2.5

Question	Answers	Extra information	Mark	AO / Specification reference
05.8	very vigorous reaction/caesium catches fire/very vigorous bubbling	allow any correct observations allow damage to glass trough answers only if it is related to the high reactivity of Cs	1	AO2 – 1 4.1.2.5
06.1	**Level 3:** Solutions X, Y and Z are correctly identified, and the justification is correct and explained coherently and logically.		5-6	AO3 – 6 4.1.2.6
	Level 2: Solutions X, Y and Z are correctly identified, and some aspects of the justification are correct. The explanation lacks coherence and logic.		3-4	
	Level 1: One or two solutions are correctly identified, and one or two points of explanation are made. The explanation lacks coherence and logic.		1-2	
	No relevant comment.		0	

Question	Answers	Extra information	Mark	AO / Specification reference
	Indicative content: • X is potassium bromide, Y is potassium chloride, Z is potassium iodide • a Halogen displaces a less reactive Halogen from an aqueous solution of its salt • chlorine is more reactive than bromine, so chlorine displaces bromine from potassium bromide solution (solution X) and iodine from potassium iodide solution (solution Z) • bromine is more reactive than iodine, so bromine displaces iodine from potassium iodide solution (solution Z) • iodine is less reactive than both chlorine and bromine, so displaces neither of these compounds from solutions of their salts	allow correct chemical symbols (KCl, KBr, KI, Cl_2, Br_2, I_2) throughout penalise if formulae are incorrect		
07	**Level 3:** The prediction is correct, and the explanation is clear, coherent and logical.		5-6	AO1 – 5 AO3 – 1 4.1.2.5 4.1.2.6
	Level 2: The prediction is correct, but the explanation lacks some clarity and coherence.		3-4	
	Level 1: The prediction is incorrect, but one or two aspects of the explanation are correct.		1-2	
	No relevant content.		0	

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Question	Answers	Extra information	Mark	AO / Specification reference
	Indicative content: • D – sodium and fluorine • fluorine is most reactive of the Halogens given and sodium is most reactive of the Alkali Metals given • in the reaction, each fluorine atom gains an electron and each sodium atom loses an electron • fluorine atom attracts electrons to it more strongly than bromine because its atoms are smaller • so incoming electrons are attracted to the nucleus more strongly • sodium loses its electrons more easily than lithium because its atoms are bigger • so the outer shell/highest energy level electrons are less strongly attracted to the nucleus			
08.1	Noble Gases		1	AO1 – 1 4.1.2.4
08.2	B		1	AO2 – 1 4.1.2.4
08.3	B		1	AO2 – 1 4.1.2.4
08.4	Ne atom is drawn with 2 shells, the first shell has 2 dots, the second shell has 8 dots		1	AO1 – 1 4.1.2.4

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Question	Answers	Extra information	Mark	AO / Specification reference
08.5	**two** from: • their atoms have a full outer shell • highest energy level • stable electron arrangement	one mark for each correct answer up to two marks	2	AO2 – 1 4.1.2.4
09.1	Q		1	AO2 – 1 4.1.2.1
09.2	R because its outer electron shell/highest energy level is full/atoms have stable arrangement of electrons		1 1	AO2 – 1 4.1.2.4
09.3	P and S	both required for the mark	1	AO2 – 1 4.1.2.1
10.1	• increases • because like Group 1, atoms of Group 2 elements react by losing electrons • atoms get bigger down the group, so the outer electrons are further from the nucleus • so the force of attraction between the nucleus and outer electrons decreases	no mark for increases alone	1 1 1 1	AO2 – 2 AO3 – 2 4.1.2.5
10.2	giant (metallic) structures atoms arranged in regular pattern electrons of outer shells of atoms delocalised and free to move through the whole structure		1 1 1	AO1 4.2.1.5

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10.3	less sodium reacts vigorously with cold water		1 1	AO3 4.1.2.5
10.4	$MgCl_2$		1	AO3 4.1.2.5
11.1	F and H atom are drawn with 1 shell each F atom has 7 crosses and 1 dot H atom has 1 dot and 1 cross which it shares with F atom		2	AO2 4.1.2.6 4.2.1.4
11.2	**Level 3:** The electronic structures are correctly stated or drawn, and the explanation is clear, coherent and logical.		5-6	AO2 4.1.2.6
	Level 2: The electronic structures are correctly stated or drawn, but the explanation lacks some clarity and coherence.		3-4	
	Level 1: One of the electronic structures are correctly stated or drawn, and one or two parts of an explanation are included.		1-2	
	No relevant content.		0	

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Question	Answers	Extra information	Mark	AO / Specification reference
	Indicative content: • correctly stated or drawn electronic structures of fluorine (2,7) and chlorine (2,8,7) atoms. • atoms of fluorine and chlorine gain an electron in their reactions • chlorine is bigger than fluorine, so its outer electrons are further from nucleus • electrostatic force of attraction between positive nucleus and incoming negatively charged electron is greater for fluorine than chlorine			
	• product of reaction three melts at higher temperature • product of reaction two has small molecules / simple molecular, so low melting point • product of reaction three has (giant) ionic structure, so high melting point		1 1 1	AO2 AO3 4.1.2.6
12.1	alkali metals		1	AO1 4.1.2.6
12.2	they have the same number of electrons in the shell furthest from the nucleus		1	AO1 4.1.2.1
12.3	metals		1	AO1 4.1.2.3

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Question	Answers	Extra information	Mark	AO / Specification reference
12.4	caesium bromide		1	AO2 4.1.2.5 4.1.2.6
13.1	B		1	AO2 4.2.2.1
13.2	2, 8, 8		1	AO 4.1.1.7
13.3	one electron from potassium outer shell transferred to chlorine outer shell forms +1 potassium ion and -1 chlorine ion electrostatic attraction between oppositely charged ions		1 1 1 1	AO1 4.2.1.2
13.4	ions/charges are free to move		1	AO2 4.2.2.3
13.5	place solution in round-bottom flask attach to condenser heat with Bunsen burner water will evaporate and condense in the condenser and collect in separate vessel potassium chloride will remain in round-bottom flask		1 1 1 1 1 1	AO1 4.1.1.2
14.1	discovery of neutrons led to discovery of isotopes explained why atomic weight order was not correct		1 1	AO1 4.1.2.2

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14.2	has one electron in the outermost shell does not share properties with the rest of Group 1 elements	 accept a named property	1 1	AO3 4.1.2.5
14.3	number of protons		1	AO1 4.1.1.5
14.4	$\frac{(28 \times 92.2)+(29 \times 4.7)+(30 \times 3.1)}{100}$ =28.109 =28.1		1 1 1	AO2 4.1.1.6