Collins

AQA

GCSE

CHEMISTRY

F

SET A – Foundation Tier

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Answers

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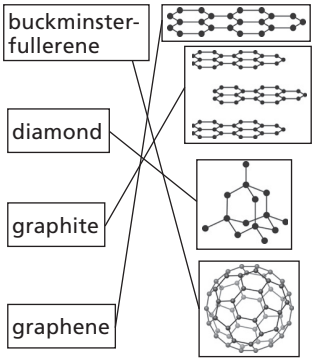
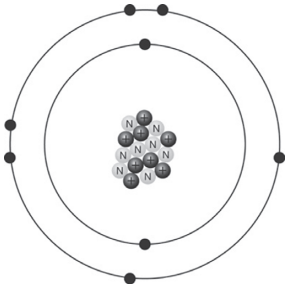
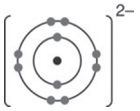
Paper 1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
01.1	The top right corner contains non-metals only.		1	**AO1** 4.1.2.1
01.2	have a full outer shell of electrons		1	**AO1** 4.1.2.4
01.3	Group 7 elements have seven electrons in the outer most shell. Group 7 elements form both ionic compounds and covalent molecules.		1 1	**AO1** 4.1.2.6
01.4	Reactivity increases / get more reactive		1	**AO1** 4.1.2.5
01.5	Reactivity decreases / get less reactive		1	**AO1** 4.1.2.6
01.6	Boiling points increase		1	**AO1** 4.1.2.4
01.7	any two from: higher melting points; higher boiling points; higher density; coloured compounds; stronger		2	**AO1** 4.1.3.1
02.1	magnesium sulfate		1	**AO2** 4.4.2.2
02.2	**Level 3**: A detailed and coherent comparison is given, which demonstrates a broad knowledge and understanding of the key scientific ideas. All processes are described and explained in logical order. Explanation for the processes are given. For example, excess magnesium oxide is added to make sure all the acid is reacted, or the solution is heated to evaporate and remove most of the water.		5–6	**AO3** 4.4.2.3
	Level 2: A description is given which demonstrates a reasonable knowledge and understanding of the key scientific ideas. The method is logical and the processes followed will produce salt solution. The processes of heating, filtration, evaporation and crystallisation are described in order.		3–4	
	Level 1: Demonstrates a basic knowledge of some of the relevant ideas. Key appropriate equipment are named correctly. Most of the main processes are present, but may not be in logical order. For example, evaporation may be placed before filtration.		1–2	
	No relevant content		0	

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	Indicative content • Add an appropriate volume of sulfuric acid (10 to 30 cm^3) to a beaker. Precise measurement of the acid is not required. • Heat the acid in a water bath to speed up the reaction. Limit the temperature to 40°C as acid is corrosive. • Add small amounts of magnesium oxide to the beaker and stir, until the magnesium oxide is seen to dissolve. • When there is excess insoluble magnesium oxide remaining, cool the beaker. • Filter the solution into a clean evaporating dish, with a funnel and filter paper. This removes any insoluble magnesium oxide. • Heat the evaporating dish on a tripod using a Bunsen burner, or in a water bath set to about 70°C, until about third of the solution remains. • Allow the dish to cool, so that crystals can form. • Dry the crystals between the folds of filter paper to remove any remaining water.			
02.3	bubbles / effervescence / evidence of hydrogen released		1	**AO2** 4.4.2.2
02.4	Measure the initial and maximum temperature of the sulfuric acid using a thermometer.		1	**AO3** 4.5.1.1
02.5	(in order) magnesium, zinc, iron, copper (2 marks for all four in correct order; 1 mark for two or three in correct order)		2	**AO3** 4.4.1.2 4.5.1.1
03.1	Nanoparticles have a diameter less than 2500 nm.		1	**AO1** 4.2.4.1
03.2	New jewellery		1	**AO1** 4.2.4.2
03.3	 (3 marks for all four in correct order; 2 marks for two correct or 1 mark for one correct)		3	**AO1** 4.2.3.1 4.2.3.2 4.2.3.3

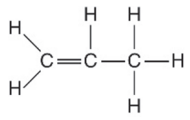
Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
03.4	They are made from carbon atoms only. The atoms are joined by covalent bonds.		1 1	**AO2** 4.2.3.1 4.2.3.2 4.2.3.3
03.5	all solids (except mercury) at room temperature high melting / boiling points conduct electricity when molten		1 1 1	**AO2** 4.2.2.7 4.2.2.3
03.6	Similarities: both made from C atoms only strong covalent bonds between C atoms giant covalent structure Differences: graphite has delocalised electrons; diamond does not graphite has weak intermolecular forces between layers; diamond does not form layers		5	**AO2** 4.2.3.2 4.2.3.1
04.1	sodium + oxygen → sodium oxide		1	**AO2** 4.1.1.1
04.2	Oxidation		1	**AO2** 4.4.1.1
04.3	It will increase		1	**AO2** 4.4.1.1 4.3.1.1
04.4	Na transfers one electron to form Na^+ O gains two electrons to form O^{2-} Therefore, two Na atoms react with one O atom… …and therefore the formula is Na_2O		1 1 1 1	**AO2** 4.2.1.2
04.5	$4Na + O_2 \rightarrow 2Na_2O$		1	**AO2** 4.1.1.1
04.6	55 ÷ 62 × 100 = 88.7%		1	**AO2** 4.3.3.1
04.7	100% because there are no other products		1 1	**AO3** 4.3.3.2
04.8	$Na_2CO_3 \rightarrow Na_2O + CO_2$		1	**AO2** 4.1.1.1
04.9	It will decrease		1	**AO1** 4.3.1.3
04.10	It will be lower because there is another product.		1 1	**AO2** 4.3.3.2
05.1	A = 10.5; B = –5.67; C = 25.5; D = –11.0		4	**AO2** 4.5.1.1
05.2	random error not all the results are affected in the same way.		1 1	**AO1** 4.5.1.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
05.3	any three from: A and C are exothermic reactions. B and D are endothermic reactions. D is more endothermic than B. C is more exothermic than A. Allow any other conclusions consistent with the correct data. Also allow ecf from miscalculation (or incorrect use of +/-) in 05.1 – as long as conclusion is consistent with data in 05.1.		3	**AO3** 4.5.1.1
05.4	A = X; B = Y; C = X; D = Y allow ecf from miscalculation (or incorrect use of +/-)	2 marks for all four correct; 1 mark for three correct; no marks for one or two correct only	2	**AO2** 4.5.1.2
06.1	potassium nitrate and water		1	**AO1** 4.4.2.2
06.2	10 ÷ 40 = 0.25 g (in 25 cm^3)		1 1	**AO2** 4.3.2.5
06.3	**Level 3**: A detailed and coherent comparison is given, which demonstrates a broad knowledge and understanding of the key scientific ideas. Precise information about filling burette with nitric acid; pipette to measure quantity of KOH solution; addition of indicator; care near end-point; repeat until consistent results obtained.		5–6	**AO2** 4.4.2.5
	Level 2: A description is given which demonstrates a reasonable knowledge and understanding of the key scientific ideas. Use of burette and pipette for measuring volumes, need for an indicator.		3–4	
	Level 1: Demonstrates a basic knowledge of some of the relevant ideas. Simple statements are made, such as nitric acid is added to KOH solution until the colour changes; mention of need to measure volumes.		1–2	
	No relevant content		0	

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
	Indicative content • Pour nitric acid in burette. • Use a 25 cm^3 pipette/measuring cylinder for KOH. • Add a few drops of named indicator e.g. phenolphthalein. • Correct colour change of indicator before and after neutralisation. • Add nitric acid dropwise, until indicator just changes colour permanently. • Record volume of nitric acid used. • Repeat until results are consistent (to within 0.1 cm^3).			
07.1	polystyrene, or any suitable insulator		1	**AO1** 4.5.1.1
07.2	*x*-axis labelled 'volume', with units *y*-axis labelled 'temperature', with units suitable even scale for each axes points correctly plotted		1 1 1 1	**AO2** 4.4.2.2 4.4.2.4
07.3	lines of best fit correctly drawn		2	**AO2** 4.4.2.2 4.4.2.4
07.4	20 cm^3		1	**AO3** 4.4.2.2 4.4.2.4
07.5	$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$		1	**AO1** 4.4.2.2 4.4.2.4
07.6	10 cm^3 — pH 2–4 15 cm^3 — pH 2–4 25 cm^3 — pH 10–12 40 cm^3 — pH 10–12		1 1 1 1	**AO2** 4.4.2.2 4.4.2.4
08.1			1	**AO1** 4.1.1.7
08.2		1 mark for correct number of electrons; 1 mark for brackets and 2^-	1 1	**AO2** 4.1.1.7
08.3	The radius of an atom is about 0.1 nm		1	**AO1** 4.1.1.5
08.4	Isotopes contain the same number of protons. Isotopes contain the same number of electrons.		1 1	**AO1** 4.1.1.5

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
08.5	Similarities: All isotopes have 8 protons / 8 electrons / or they all have the same number of protons **and** the same number of electrons. Differences: They all have different number of neutrons.		1 1	**AO1** 4.1.1.5
08.6	(70 × 16) + (25 × 17) + (5 × 18) ÷ 100 = 16.35		1 1 1	**AO2** 4.1.1.6
09.1	The beam produced is deflected by an electric field. Flashes of light were observed when particles hit the screen.		1 1	**AO1** 4.1.1.3
09.2	Evidence: Most alpha particles passed straight through the gold foil. A small proportion of alpha particles rebounded. Explanation: As most passed through, the atom must be made mostly of empty space. Rebounding suggests the alpha particles hit a central **positive** nucleus.		2 2	**AO3** 4.1.1.3

Paper 2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
01.1	Oxygen from a cylinder		1	**AO2** 4.8.1.1
01.2	Formulations must be pure substances in order to be safe.		1	**AO1** 4.8.1.1 4.8.1.2
01.3	(top to bottom) F, M, F, M		4	**AO1** 4.8.1.1 4.8.1.2
01.4	Oxygen		1	**AO1** 4.9.3.1
01.5	carbon dioxide methane		1 1	**AO1** 4.9.2.2
02.1	Methane, ethane, propane, butane		1	**AO1** 4.7.1.1
02.2	Alkanes and alkenes are both part of a homologous series.		1	**AO1** 4.7.1.1 4.7.2.1
02.3	…they can flow less easily and are harder to pour. …the boiling point increases.		1 1	**AO2** 4.7.1.3
02.4			1	**AO2** 4.7.2.1

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
02.5	(in order) mixture, boiling, evaporate, cool, condense		5	**AO1** 4.7.1.2
03.1	Alkanes and alkenes are both very reactive.		1	**AO1** 4.7.2.2 4.7.2.3 4.7.2.4
03.2	Propane		1	**AO2** 4.7.2.2
03.3	Steam cracking takes place at a higher temperature than catalytic cracking. More alkenes are produced in steam cracking than catalytic cracking.		1 1	**AO1** 4.7.1.4
03.4	add bromine water turns colourless with propene (but remains orange with propane)		1 1	**AO2** 4.7.1.4
03.5	C_5H_{12} or $2C_4H_8 + CH_4$		2	**AO2** 4.7.1.4
03.6	ethene		1	**AO2** 4.7.2.3
03.7	fermentation — low temperature and pressure AND anaerobic adding water to a hydrocarbon — high temperature and pressure AND addition of a metal catalyst		1 1	**AO1** 4.7.2.3
04.1	The rate of reaction is faster with a higher concentration.		1	**AO1** 4.6.1.2
04.2	m/s		1	**AO2** 4.6.1.1
04.3	Measure the total volume of hydrogen in the gas syringe and divide by the time taken to make it.		1	**AO2** 4.6.1.1
04.4	correctly plotted points correct line of best fit anomalous result highlighted (1; 100)		1 1 1	**AO3** 4.6.1.1
04.5	900 ÷ 15 = 60 (cm^3/s)	2 marks for correct value without working	1 1	**AO2** 4.6.1.1
04.6	rate increases with increasing concentration		1	**AO3** 4.6.1.2
04.7	at a higher concentration, there are more particles reacting particles collide more frequently, so greater chance of collision being successful		1 1	**AO2** 4.6.1.3

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
05.1	hydrogen — insert burning splint; a pop sound is heard chlorine — place damp litmus into the gas; litmus will turn white oxygen — insert glowing splint; splint will relight carbon dioxide — bubble gas through limewater; limewater will turn cloudy		1 1 1 1	**AO1** 4.8.2.1 4.8.2.2 4.8.2.3 4.8.2.4
05.2	Cu^{2+}	allow copper 2+ or copper(II) or copper, 2+ charge	1	**AO2** 4.8.3.2
05.3	add barium chloride with hydrochloric acid a white precipitate is observed if sulfate ions are present		1 1	**AO1** 4.8.3.5
05.4	cation in salt A – lithium anion in salt A – bromide cation in salt B – iron(III) anion in salt B – sulfate		1 1 1 1	**AO2** 4.8.3.1 4.8.3.2 4.8.3.4 4.8.3.5
05.5	more accurate more sensitive more rapid / faster / quicker		1 1 1	**AO1** 4.8.3.6
05.6	it is potassium (K)… …the lines match / are in the same place as the spectra for K		1 1	**AO2** 4.8.3.7
06.1	any three from: more nitrogen in present atmosphere / no nitrogen in early atmosphere more oxygen in present atmosphere / no oxygen in early atmosphere more carbon dioxide in early atmosphere / less carbon dioxide in present atmosphere small amounts of ammonia in early atmosphere / no ammonia in atmosphere today		3	**AO3** 4.9.1.1
06.2	description **and** explanation required for each any two from: description: photosynthesis of green plants and algae explanation: CO_2 is taken in / absorbed so less CO_2 today description: CO_2 dissolved in the oceans (producing carbonates) explanation: turned into limestone rock / locked away in limestone rock description: CO_2 absorbed by plants which then decompose explanation: CO_2 is locked away in fossil fuels such as coal, crude oil and natural gas		4	**AO2** 4.9.1.2 4.9.1.4

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
06.3	$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$	1 mark for correct substances; 1 mark for correct balancing	2	**AO1** 4.9.1.3
06.4	any two from: ice cap melt sea level rise climate change / more precipitation changes in biodiversity / extinctions loss of habitat (allow any other potential effects)		2	**AO2** 4.9.2.3
06.5	description **and** explanation required for each any four from: reduce the burning of fossil fuels, so less CO_2 is released reduce deforestation, so more CO_2 is absorbed reduce waste to landfill, so less methane is produced capture methane from landfill, so it doesn't enter the atmosphere reduce livestock farming, so less methane is produced increase energy efficiency, so less fossil fuels are burnt increase use of renewable fuels, so less fossil fuels are burnt (allow any other actions that would lead to a reduction in CO_2)		4	**AO2** 4.9.2.3 4.9.2.4
07.1	(both are safe to drink but) potable water contains dissolved substances / pure water does not contain any dissolved substances		1	**AO1** 4.10.1.2
07.2	River B three reasons (referring to choice and safety recommendations): less chloride than A **and** within safe limits less sodium than A **and** within safe limits pH higher than A **and** within safe limits		1 1 1 1	**AO3** 4.10.1.2
07.3	filtration sterilisation		1 1	**AO1** 4.10.1.2
07.4	to kill pathogens / to sterilise		2	**AO1** 4.10.1.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
07.5	**Level 3**: A detailed and coherent comparison is given, which demonstrates a broad knowledge and understanding of the key scientific ideas. The response makes logical links between the points raised and uses sufficient examples to support these links.		5–6	**AO3** 4.10.1.2
	Level 2: A description is given which demonstrates a reasonable knowledge and understanding of the key scientific ideas. Comparisons are made but may not be fully articulated and/or precise.		3–4	
	Level 1: Simple statements are made which demonstrate a basic knowledge of some of the relevant ideas. The response may fail to make comparisons between the points raised.		1–2	
	No relevant content		0	
	Indicative content Both sources – sterilisation with one of ozone, chlorine or ultraviolet radiation **Seawater only** Desalination by distillation or reverse osmosis Large amounts of energy required Can only occur near a sea/ ocean Plentiful supply **Groundwater only** Needs to be pumped up from groundwater source Already naturally filtered through rock so extra filtration not needed May be contaminated with pesticides or fertilisers which need to be removed Limited supply – if overused may run out Overuse can lead to subsidence			
08.1	reaction is reversible		1	**AO1** 4.6.2.1
08.2	it is endothermic		1	**AO1** 4.6.2.2
08.3	450 °C iron catalyst 200 atmospheres		1 1 1	**AO1** 4.10.4.1
08.4	ammonium hydroxide phosphoric acid		1 1	**AO2** 4.10.4.2

Question	Answer(s)	Extra info	Mark(s)	AO/Spec ref.
08.5	N = nitrogen, P = phosphorus, K = potassium	1 mark for two correct; 2 marks for all three correct	2	**AO1** 4.10.4.2
08.6	calcium phosphate + nitric acid → calcium nitrate + phosphoric acid	in each equation: 1 mark for products and 1 mark for reactants	2	**AO2** 4.10.4.2
	phosphoric acid + ammonium hydroxide → ammonium phosphate + water		2	