

Question number	Answer	Mark
1(a)(i)	An explanation that makes reference to: identification – knowledge (1 mark) and reasoning /justification – knowledge (1 mark): <ul style="list-style-type: none"> • a strong acid is completely ionised in solution/exists completely as ions (1) • but a weak acid is only partly ionised/exists mainly as molecules with very few ions present (1) 	(2)

Question number	Answer	Mark
1(a)(ii)	hydroxide ions react with hydrogen ions and reduce the hydrogen ion concentration therefore increase pH (1)	(1)

Question number	Answer	Mark
1(b)	ZnO + 2HNO ₃ → Zn(NO ₃) ₂ + 2H ₂ O <ul style="list-style-type: none"> • zinc nitrate formula (1) • full, balanced equation (1) 	(2)

Question number	Answer	Additional guidance	Mark
1(c)	mass = $50 \times \frac{40}{1000}$ (1) = 2 (g) (1)	Award full marks for correct numerical answer without working.	(2)

Question Number	Indicative content
1(d)	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p style="text-align: center;">AO2 (3 marks)</p> <ul style="list-style-type: none"> • suitable acid: sulfuric acid • suitable substance : magnesium oxide / magnesium carbonate / magnesium hydroxide / magnesium • equation for reaction: $MgO + H_2SO_4 \rightarrow MgSO_4 + H_2O/$ $Mg(OH)_2 + H_2SO_4 \rightarrow MgSO_4 + 2H_2O/$ $MgCO_3 + H_2SO_4 \rightarrow MgSO_4 + H_2O + CO_2/$ $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$ <p style="text-align: center;">AO3 (3 marks)</p> <ul style="list-style-type: none"> • add solid to warmed acid until in excess solid remains (oxide and hydroxide) / add solid a little at a time until no more bubbles (carbonate/metal) • filter off the excess solid, pour remaining solution into an evaporating basin • {heat solution / leave the water to evaporate} • until pure salt crystals form and then dry salt crystals with absorbent paper/leave to dry.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	<ul style="list-style-type: none"> • The plan attempts to link and apply knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. (AO2) • Analyses the scientific information but understanding and connections are flawed. An incomplete plan that provides limited synthesis of understanding. (AO3)
Level 2	3–4	<ul style="list-style-type: none"> • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. (AO2) • Analyses the scientific information and provides some logical connections between scientific enquiry, techniques and procedures. A partially completed plan that synthesises mostly relevant understanding, but not entirely coherently. (AO3)
Level 3	5–6	<ul style="list-style-type: none"> • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made between elements in the context of the question. (AO2) • Analyses the scientific information and provide logical connections between scientific concepts throughout. A well-developed plan that synthesises relevant understanding coherently. (AO3)

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	<p>an explanation linking the following</p> <ul style="list-style-type: none"> decomposition (of compound/substance /electrolyte)(1) using (direct) current (1) 	<p>splitting up/breaking down/breaking up</p> <p>ignore separating</p> <p>reject splitting of atoms/elements/molecules for M1</p> <p>using {electrical energy /electricity}</p> <p>reject alternating current/ac</p>	(2)

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	<ul style="list-style-type: none"> (damp blue) litmus (paper) (1) (turns red then) {bleaches / goes white} (1) 	<p>allow bleaches indicator for 1 mark</p> <p>ignore indicator goes lighter</p> <p>ignore smells of chlorine/swimming pools</p> <p>ignore any incorrect middle colour mentioned</p> <p>use of suitable named indicator with correct result</p> <p>e. (damp) universal indicator paper (1) (turns red then) bleaches (1)</p> <p>starch-iodide paper(1) turns blue-black(1)</p>	(2)

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	poly(chloroethene)	PVC/polyvinylchloride/ polychloroethene/poly(chlorethene)	(1)

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	D AgCl(s)		(1)

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	same/no change		(1)

Question Number	Answer	Acceptable answers	Mark
2(b)(iii)	$\text{HCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{HNO}_3$ <ul style="list-style-type: none"> • reactant formulae (1) • product formulae (1) 	$\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl}$ max 1 if any incorrect attempt to balance reject incorrect use of cases and non-subscripts	(2)

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	A calcium ion, Ca ²⁺		(1)

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	A description including <ul style="list-style-type: none"> white (1) precipitate/ppt/ppte/solid (1) 	<p>Maximum 1 mark if bubbles / fizzing / effervescence also mentioned</p> <p>Ignore colour of solution Ignore cloudy Ignore off white/milky</p> <p>Allow crystals (1) Ignore powder Ignore name of precipitate</p>	(2)

Question Number	Answer	Acceptable answers	Mark
3(b)	B lead chloride		(1)

Question Number	Answer	Acceptable answers	Mark
3(c)(i)	(barium chloride (aq) + sodium sulfate (aq) →) sodium chloride (aq) + barium sulfate (s) <ul style="list-style-type: none"> sodium chloride (1) (sodium chloride) (aq) and barium sulfate (s) both state symbols matched to the correct product (1) 	<p>Allow NaCl (1) Do not allow sodium chlorine</p> <p>Accept BaSO₄ for barium sulfate Accept (aq) if sodium chlorine given Do not allow (solid) Do not allow (AQ)</p>	(2)

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	<p>An explanation linking</p> <ul style="list-style-type: none"> • {barium sulfate/it} is {insoluble / does not dissolve} (1) • so it {cannot enter/cannot mix with/is not absorbed} into the {blood(stream)/body} or it passes through the body (unchanged) (1) 	<p>{barium sulfate/it} does not dissolve into the blood(stream) (2)</p> <p>Allow barium is insoluble / does not dissolve (1) Ignore barium sulfate is a precipitate</p> <p>Ignore it cannot be digested</p>	(2)

Question Number	Answer	Acceptable answers	Mark
4(a)	C		(1)

Question Number	Answer	Acceptable answers	Mark
4(b)	CuCl ₂	ensure that 2 is subscript at most half the size of Cl and cases are correct ignore correct charges reject an overall charge	(1)

Question Number	Answer	Acceptable answers	Mark
4(c)	D		(1)

Question Number	Answer	Acceptable answers	Mark
4(d)	A description including the following <ul style="list-style-type: none"> • put/mix/react (sodium) carbonate and acid in (conical) flask (1) • put limewater in test tube(1) • (carbon dioxide produced) turns lime water {milky/cloudy/white precipitate} (1) 	2 max if reactants and limewater are in the wrong vessels with the correct test marks can be awarded for the first two marking points by labelling the diagram "reactants" for sodium carbonate and acid	(3)

Question Number	Answer	Acceptable answers	Mark
4(e)	<p>A description including three of the following</p> <ul style="list-style-type: none"> • make {solutions/dissolve}/ {mix/react} <u>solutions</u> (1) • precipitate (of copper carbonate) (1) • filter (1) • wash (with water) (1) • leave to dry/dry in oven/dry between filter paper (1) 	<p>max 2 marks if clear error in process, e.g. heat/add acid/evaporate</p> <p>ignore colours of precipitate accepts forms a solid for precipitate</p>	(3)

Question Number	Answer	Acceptable answers	Mark
5(a)	D		(1)

Question Number	Answer	Acceptable answers	Mark
5(b)	<p>an explanation linking the following</p> <ul style="list-style-type: none"> decomposition /break down of {compound / substance / electrolyte} (1) using electricity / electrical energy / d.c supply (1) 	<p>do not allow first point if mention of covalent molecule, substance etc.</p> <p>note examples in spec are water and Hydrochloric acid</p>	(2)

Question Number	Answer	Acceptable answers	Mark
5(c)	$\text{Cl}_2 + 2\text{NaOH} \rightarrow \text{NaOCl} + \text{NaCl} + \text{H}_2\text{O}$ <ul style="list-style-type: none"> reactant formulae (1) product formulae (1) balancing correct formulae (1) 	allow multiples	(3)

Question Number		Indicative Content	Mark
QWC	*5(c)	<p>an explanation linking some of the following:</p> <p>cause of acid rain</p> <ul style="list-style-type: none"> • burning sulfur • produces sulfur dioxide • escapes into atmosphere • dissolves in rain water • forming acidic solution / sulfurous / sulfuric acid • falls to the ground as acid rain <p>effect of acid rain</p> <ul style="list-style-type: none"> • acidification of lakes • kills fish • kills trees / forests • damage / erosion of stonework <p>reduction of damage</p> <ul style="list-style-type: none"> • calcium carbonate • from limestone • may be converted into calcium hydroxide • waste gases from power stations • passed through carbonate or hydroxide • removing sulfur dioxide <p>some of the above points could be made using word or symbol equations</p>	(6)
Level	0	No rewardable content	
1	1 - 2	<ul style="list-style-type: none"> • a limited explanation e.g. when fuels burn the sulfur makes sulfur dioxide that causes acid rain • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy 	
2	3 - 4	<ul style="list-style-type: none"> • a simple explanation e.g. when the fuel burns, sulfur impurities make sulfur dioxide which gives acid rain. Acid rain reacts with limestone statues. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy 	
3	5 - 6	<ul style="list-style-type: none"> • a detailed explanation e.g. when fuels burn, any sulfur impurities burn to make sulfur dioxide which dissolves in rain to make it more acidic. This rain corrodes metals and limestone. The problem can be solved by removing sulfur from the fuels • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors 	