

Ngee Ann Secondary

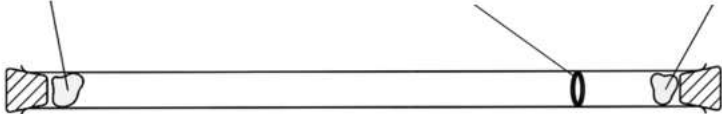
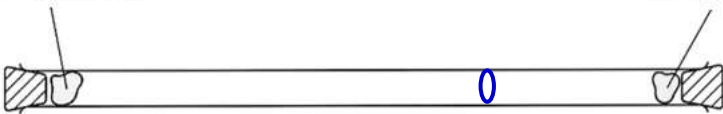
2026 4E Chemistry 6092 Prelim

Answers for 2026 4E Chemistry Paper 1

1	2	3	4	5	6	7	8	9	10
B	B	D	C	B	D	A	C	A	B
11	12	13	14	15	16	17	18	19	20
C	D	B	D	B	A	B	A	B	C
21	22	23	24	25	26	27	28	29	30
B	B	D	C	C	D	C	B	B	A
31	32	33	34	35	36	37	38	39	40
C	C	B	B	C	A	D	A	B	D

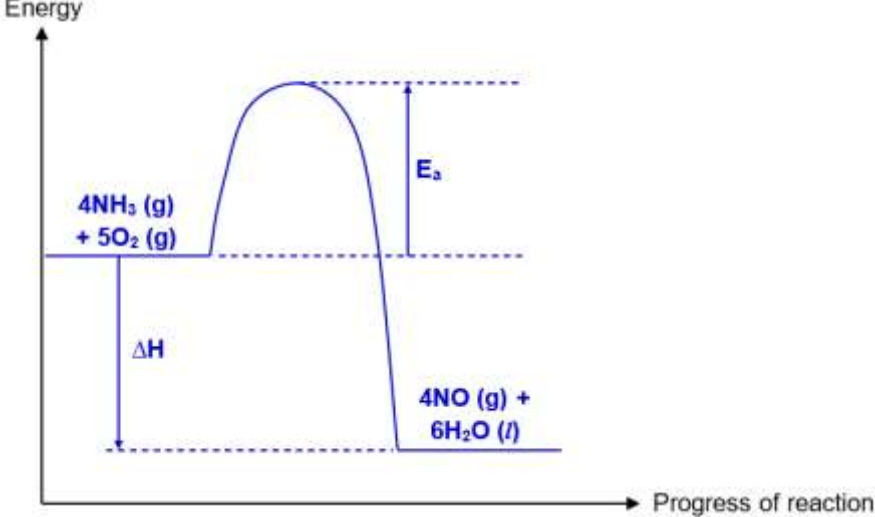
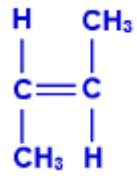
Paper 2: Structured [70 marks]

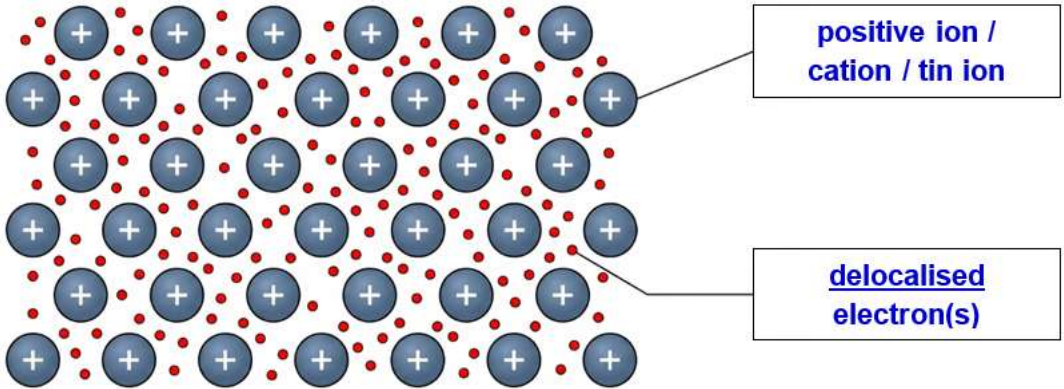
1a	trend down the group	only true for Group 1	only true for Group 17	true for both	[2]
	The number of electron shells increases.			✓	
	The density increases.			✓	
	The reactivity increases.	✓			
	The colour of the elements darken.		✓		
1 mark for every 2 ticks					
1b	<u>Fluorine is more reactive than iodine [1], and displaces iodine / iodide ions from potassium iodide, forming brown aqueous iodine / iodine solution [1] and potassium fluoride.</u> OR <u>Fluorine oxidises potassium iodide to form aqueous iodine while it is reduced to form potassium fluoride. [1] The aqueous iodine produced is a brown solution. [1]</u>				[2]
	Marker Comments for Question 1: Part (a) is not done well. Most students had the misconception that only Group 17 elements experience an increase in density down the group. A similar trend is observed for Group 1. Part (b) is also not well done. Many students provided incorrect statements such as “fluorine is more reactive than iodine”. Mark is not awarded if student say that aqueous iodine is red-brown.				
2ai	Both ${}^1_1\text{H}$ and ${}^2_1\text{H}$ have the <u>same number of protons / 1 proton</u> but have <u>different number of neutrons</u> / ${}^1_1\text{H}$ has <u>0 neutron</u> while ${}^2_1\text{H}$ has <u>1 neutron</u> . No need for students to list the number of protons and neutrons.				[1]
2aii	They have the <u>same number of valence electrons</u> / They have <u>1 valence electron</u> .				[1]
2bi	<u>Add aqueous sodium hydroxide and warm</u> / heat gently.				[1]

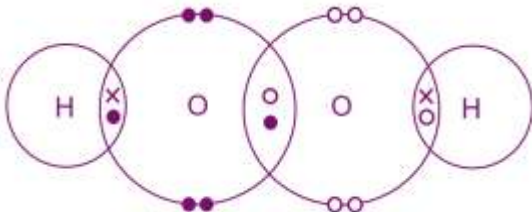
	<u>Gas evolved turns moist red litmus blue.</u>	
2bii	Experiment 1 cotton wool soaked in concentrated $\text{NH}_3(\text{aq})$ ring of ammonium chloride formed in Experiment 1 cotton wool soaked in concentrated $\text{HCl}(\text{aq})$  Fig. 2.2 Experiment 2 cotton wool soaked in concentrated $\text{ND}_3(\text{aq})$ cotton wool soaked in concentrated $\text{HCl}(\text{aq})$  Fig. 2.3 The <u>relative molecular mass / M_r of ND_3 is higher than that of NH_3, hence ND_3 diffuses slower than NH_3.</u> ND_3 would still diffuse faster than HCl. ND_3 would react with HCl in a position nearer to the left compared to the position of ammonium chloride. 1 mark for correct position of ND_4Cl on diagram <i>[shifted to the left, but not beyond the middle of the tube]</i> 1 mark for explanation	[2]
	Marker Comments for Question 2: For part (a)(i), some students are still unable to define isotopes. For part (a)(ii), many are unable to identify that the number of valence electrons are responsible for the chemical properties of elements. Many incorrectly gave protons and electrons as their answer. Part (b)(i) is poorly done. Many either fail to add sodium hydroxide or warm the reaction mixture before testing for the gas. Part (b)(ii) is generally ok. Many students are able to predict the position of ND_4Cl and correct explain the reason.	
3a	Magnesium is more reactive than zinc, which is more reactive than copper. [1] <i>Show correct ranking of reactivity: $\text{Mg} > \text{Zn} > \text{Cu}$</i> The <u>more reactive a metal, the higher the thermal stability of / the more thermally stable, the metal carbonate</u>, hence the metal carbonate took a longer time to decompose OR	[2]

	The <u>less reactive a metal</u> , the <u>lower the thermal stability of / the less thermally stable, the metal carbonate</u> , hence the metal carbonate took a lesser time to decompose [1]	
3bi	Mass of carbon dioxide = $2.00 - 1.29 = 0.71 \text{ g}$	[1]
3bii	2.00 g <i>Sodium carbonate is thermally stable and does not decompose.</i>	[1]
	Marker Comments for Question 3: For part (a), many students, in some part of their answers, interchange metals and metal carbonates. For instance, they incorrect mention that one metal carbonate is more reactive than another. Or incorrectly stating that one metal is more thermally stable than another. Hence, they were not awarded the mark. For 3(b)(i), most students were able to calculate the mass of carbon dioxide. Those who got this question wrong used the values for magnesium carbonate or zinc carbonate instead of copper(II) carbonate. Part 3(b)(ii) is poorly done. Only a small handful of students remembered that sodium carbonate is stable to heat and will not decompose.	
4a	Any two: • same <u>general formula</u> • same <u>functional group</u> • same <u>chemical properties</u> • show a <u>gradual change in physical properties</u> as the number of carbon atoms per molecule increase • <u>each member</u> in the series <u>differs from the earlier member by a CH_2 group</u>.	[2]
4b	As <u>molecular size of aldehyde increases</u>, the <u>strength of intermolecular forces of attraction</u> between the molecules <u>increases</u>. [1] <u>More energy is required to overcome the stronger intermolecular forces of attraction between bigger molecules, resulting in a higher boiling point.</u> [1]	[2]
4ci	Acidified potassium manganate(VII)	[1]
4cii	Purple solution turns decolourises / colourless	[1]
4d	Condensation reaction	[1]
4ei	Propanal and Compound 1 are isomers. explanation They have the <u>same molecular formula</u> ($\text{C}_3\text{H}_6\text{O}$), but <u>different structural formula</u>.	[2]
4eii	• Add <u>magnesium metal / carbonate</u> (accept any suitable metal or carbonate) Compound 2 will show <u>effervescence</u>. [1] • Add <u>aqueous bromine</u> Compound 1 will <u>decolourise red-brown aqueous bromine</u> / turn colourless [1]	[3]

	<u>Propanal will have no visible change with either magnesium / carbonate or aqueous bromine. [1]</u> <i>Do not accept: Use of acidified potassium manganate(VII) as both propanal and compound 1 will be oxidised to acid.</i>	
	Marker Comments for Question 4: Part (a) is not well done. Many students did not study for this simple recall question and did not get the mark. Many give molecular formula instead of general formula or simply mentioned the increase in boiling point instead of talking about a gradual change in physical properties as the number of carbon atoms increases. Part (b) is also not well done. Most students were unable to identify that the increasing size of the molecule was the reason for the increase in boiling point of aldehydes as the number of carbon atom increases. Also, a number of students incorrectly mentioned that the increase in boiling point is due to the increase in number of covalent bonds to be broken as number of carbon atoms increases. Part (c)(i) is also not well done. Many students forgot the need for an acidified solution. They also provided incorrect naming for the oxidising agent used. Part (d) is poorly done. Most students gave incorrect answers, where the most popular was condensation polymerisation. For 4(e)(i), many students misread the question and attempted to name the unknown compounds. Also, many did not know the definition for isomers. Part 4(e)(ii) is not well done. Some students were able to test using metal / carbonate and aqueous bromine but were unable to describe that propanal will show no visible change for both tests. Also, many used KMnO_4 to test of propanal.	
5a	<u>When the particle size is small [✓], the total exposed surface area in contact with reactant particles is larger. [✓]</u> <u>A catalyst provides an alternative pathway with a lower activation energy. [✓]</u> <u>This results in increased number of reactant particles colliding with energy greater than or equal to the activation energy. [✓]</u> <u>Together, this increases the frequency of effective collisions between particles, therefore rate of reaction increases. [✓]</u> 2 [✓] – 1 mark 3 to 4 [✓] – 2 mark 5 [✓] – 3 marks	[3]
5b	<u>A temperature of 800°C has higher percentage yield of NO. OR</u> <u>A temperature of 900°C has lower percentage yield of NO. [1]</u> <u>However, a temperature of 900 °C has a higher / faster rate of reaction OR</u> <u>A temperature of 800 °C has a lower / slower rate of reaction [1]</u>	[2]

5c	 1 mark for <u>correct shape and formula</u> of reactants and products 1 mark for <u>correct labelling</u> of <u>activation energy</u> and <u>enthalpy change</u> <i>Marks penalised for double-sided arrows, or arrows that were “floating” in the middle.</i>	[2]
5d	<u>Nitrogen monoxide reacts with oxygen and water / dissolves to form acid rain.</u> [1] <u>Acid rain damages limestone buildings / harms aquatic life and plants.</u> [1] OR <u>Nitrogen monoxide causes irritation to eyes / nose / throat</u> [1], resulting in <u>respiratory problems / asthma</u> [1]. OR <u>Nitrogen monoxide results in photochemical smog</u> [1], resulting in <u>respiratory problems/asthma</u> [1].	[2]
	Marker Comments for Question 5: Part (a) is not well done. Many students either described only the effects of catalyst affect the rate of reaction or described only the particle size. Also, most students who talked about particle size failed to mentioned that powdered catalyst has a smaller particle size. Many students mixed and matched phrases throughout their answers and hence were unable to receive any credit. Part (b) is generally well done as many students were able to point out the impact of the different temperatures on rate and percentage yield. Question 5c was fairly well done. Question 5d was poorly done. Many students were not familiar with air pollutants and incorrectly linked oxides of nitrogen to greenhouse gas and global warming.	
6a	A	[1]
6b	C	[1]
6c	 name butene	[2]

6d	Cracking: Polymers, such as poly(ethene), can undergo <u>cracking</u> under high temperature and pressure <u>to form smaller molecules of hydrocarbons</u>. [1] The short-chain hydrocarbons can be used as fuel or used to make other useful chemicals. Depolymerisation: During <u>depolymerisation</u>, polymers are <u>broken down into its monomers via acid hydrolysis</u>. [1] The monomers can be converted into other useful chemicals.	[2]
	Marker Comments for Question 6: Many students wrote B for Qn 6b, when c neglecting to consider the number of carbon atoms in the carboxyl group (C=O) in the monomer. Qn 6c was also poorly done, with many who drew the structure of the repeat unit or the polymer instead of the monomer. Qn 6d. It was clear that many students did not study the recycling of plastics, and left blanks.	
7a		[1]
7bi	Solder is <u>harder / stronger</u> than pure tin. [1] Solder has a <u>lower melting point</u> than pure tin OR Solder <u>melts over a range of temperatures</u> while pure tin melts at a fixed temperature [1]	[2]
7bii	$\text{SnO}_2 + 2\text{H}_2\text{SO}_4 \rightarrow \text{Sn}(\text{SO}_4)_2 + 2\text{H}_2\text{O}$	[1]
7biii	Tin serves as a protective <u>layer / barrier / coating</u> to <u>prevent</u> iron in steel from being <u>exposed to water and oxygen</u>, hence preventing rusting.	[1]
7c	In <i>diamond</i>, <u>all 4 valence electrons of carbon atoms used for bonding</u> [✓], <u>no delocalised electron</u> [✓] to act as mobile charge carrier and cannot conduct electricity. In <i>graphite</i>, <u>3 out of 4 valence electrons in carbon atom used for bonding</u> [✓], <u>presence of delocalised electron to act as mobile charged carrier</u> [✓] and can conduct electricity. In <i>diamond</i>, a <u>large amount of energy is required</u> [✓] <u>to overcome</u> the <u>numerous strong covalent bonds between the carbon atoms</u> [✓], resulting in a hard material.	[5]

	In <u>graphite</u>, the hexagonal <u>layers</u> [✓] are <u>held by weak intermolecular forces of attraction</u> [✓], hence <u>layers are able to slide across each other / require less energy to overcome</u> [✓] easily, hence is soft and slippery. 2 [✓]: 1 mark 3 - 4 [✓]: 2 marks 5 - 6 [✓]: 3 marks 7 - 8 [✓]: 4 marks 9 [✓]: 5 marks	
	Marker Comments for Question 7: For 7b(i), many students were not aware that adding impurities (in solder) will lower the melting point compared to pure tin. Almost all students wrote that solder would have a higher melting point than tin. For 7b(iii), many students assumed that tin is more reactive than iron and would protect the iron from rusting through sacrificial protection. For 7c, this question surfaced many misconceptions in students, most notable confusion between atoms and electrons, and also the type of bonding present in diamond. Wrong statements include • In graphite, three out of four carbon atoms are involved in bonding. • In graphite, there is one carbon atom not involved in bonding, which is delocalised that acts as mobile charge carrier. • Diamond contains strong intermolecular forces of attractions between atoms.	
8a	Oxidation state of S <u>increases</u> from <u>+4 in SO₂ to +6 in SO₄²⁻</u>, hence <u>SO₂ / S in SO₂ oxidised</u>. Oxidation state of C/ <u>decreases</u> from <u>+1 in C/O⁻ to -1 in C₂⁻</u>, hence <u>C/O⁻ / C/ in C/O⁻ is reduced</u>. Correct change on oxidation state of S [1] Correct change on oxidation state of C/ [1] Correct reactants oxidised / reduced [1]	[3]
8bi	 Correct drawing of electrons involved in bonding [1] Correct drawing of electrons that are unbonded [1]	[2]
8bii	It breaks down into <u>water and oxygen</u>, which are <u>harmless to the environment</u>.	[1]
8ci	Sodium percarbonate dissolves in water to form an <u>alkaline</u> solution (pH is 10.5 from Table 8.1), hence it is able to <u>saponify fat</u> into glycerol and fatty acids which can be rinsed away easily. [1] OR <u>Alkaline</u> environment of sodium percarbonate promotes <u>saponification of fats</u> [1]	[1]

8cii	Number of moles of Na_2CO_3 = $\frac{5.3}{2(23) + 12 + 3(16)}$ = 0.0500 mol [1] From Equation 3: $2\text{Na}_2\text{CO}_3 \cdot 3\text{H}_2\text{O}_2(\text{aq}) \rightarrow 2\text{Na}_2\text{CO}_3(\text{aq}) + 3\text{H}_2\text{O}_2(\text{aq})$ Mole ratio of $\text{Na}_2\text{CO}_3 : \text{H}_2\text{O}_2 = 2 : 3$ From Equation 2: $2\text{H}_2\text{O}_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$ Mole ratio of $\text{H}_2\text{O}_2 : \text{O}_2 = 2 : 1$ Hence, number of moles of O_2 = $0.0500 \times \frac{3}{2} \times \frac{1}{2}$ = 0.0375 mol [1] Volume of $\text{O}_2 = 0.0375 \times 24$ = 0.900 dm³ [1]	[3]		
8d	<table border="1"><tr><td style="text-align: center;"> H H H H—C—C—C—O—H H H H organic product </td><td style="text-align: center;"> H O H—C—C—O⁻ Na⁺ H fatty acid salt </td></tr></table>	H H H H—C—C—C—O—H H H H organic product	H O H—C—C—O⁻ Na⁺ H fatty acid salt	[2]
H H H H—C—C—C—O—H H H H organic product	H O H—C—C—O⁻ Na⁺ H fatty acid salt			
	Marker Comments for Question 8: 8a: Many students lost marks as they did not correctly identify what was reduced or oxidised. 8b: Most students were able to draw the dot and cross diagram of hydrogen peroxide by following the structure shown. However, students should stick to using dot and cross symbols, and not use other shapes like stars, triangles for the electrons. 8c(i). The question indicated to describe the key reason for using sodium percarbonate for a grease stain. Many students wrote that sodium percarbonate provides an alkaline environment that causes a faster breakdown of hydrogen peroxide, this is not a key reason to clean a greasy stain – which is an alkaline environment breaks down the ester bonds in the fat molecules in grease (saponification). 8d. More able students knew the correct structure of propyl ethanoate, and applied the knowledge that saponification causes the breaking down of the ester bond, resulting in two products. H O H—C—C— H H H H O—C—C—C—H H H H The process is similar to how an ester breaks down to form its initial reactants – a carboxylic acid and an alcohol. The portion with the single O atom → forms propanol			

	However, the portion with the carbonyl group (C=O) → forms the fatty acid salt.	
9a	at the positive electrode $4\text{OH}^- (\text{aq}) \rightarrow \text{O}_2 (\text{g}) + 2\text{H}_2\text{O} (\text{l}) + 4\text{e}^-$ at the negative electrode $\text{Cu}^{2+} (\text{aq}) + 2\text{e}^- \rightarrow \text{Cu} (\text{s})$	[2]
9b	Any one: <u>Effervescence at the positive electrode / anode</u> <u>Reddish-brown / pink solid / deposit at the negative electrode / cathode</u> <u>Cathode / positive electrode increases in size / mass</u> <u>Blue electrolyte / solution fades / turns colourless / decolourises</u>	[1]
9ci	The <u>result at 30th min</u> is likely an error / <u>mass of 4.56 g</u> recorded incorrectly / <u>mass should not be 4.56 g</u> .	[1]
9cii	<u>All the copper(II) ions in the electrolyte have been discharged / reduced / converted / reacted to form copper.</u>	[1]
9ciii	At the end of experiment, <u>blue litmus paper turns red</u> [1] <u>Cu^{2+} and OH^- are preferentially discharged at the electrodes</u> [1] Resulting solution becomes <u>acidic as H^+ and SO_4^{2-} ions / H_2SO_4 remain in the solution / increase concentration of H^+</u> [1]	[3]
	Marker Comments for Question 9: 9a and 9b were meant to be simple questions, but a handful of students are not familiar with the half equations of electrolysis reactions. 9ci: Almost the entire cohort could not recognise the error. At the negative electrode (cathode), copper is deposited. As the current carries charge at a fixed flow rate, and copper(II) ions gain electrons to form copper at the cathode, the mass deposited per min should be constant. Students should be able to infer from 0 to 20 min, there is ~0.40 g increase for every 10 min. However, from 20th – 30th min, the mass increase was only 0.23 g (which is unusual). 9cii: Answer needs to reflect some scientific precision. Not accepted: All copper(II) ions were used up. [No understanding that copper(II) ions were discharged, or were converted to form copper] 9ciii. Most students were able to describe the colour change of the litmus and recognised that the electrolyte became acidic as the electrolysis proceeded. However, students merely spoke about the solution having a decrease in OH^- or increase in H^+ without referring to preferentially discharged of Cu^{2+}. For these cases, students were NOT awarded the final mark for explaining that the solution is acidic as the overall answer is not coherent.	
10ai	molecular formula $\text{C}_2\text{H}_2\text{O}_4$ empirical formula CHO_2	[1]

10aii	Number of moles of $C_2H_2O_4 = \frac{0.45}{2(12) + 2(1) + 4(16)}$ $= 0.00500 \text{ mol}$	[1]
10a iii	The pH of sulfuric acid is lower than oxalic acid. [✓] Sulfuric acid is a <u>strong acid</u>, <u>dissociates completely in water</u> [✓] to form high concentration of hydrogen ions, while oxalic acid is a <u>weak acid that dissociates partially in water</u> [✓] to give a <u>lower concentration of hydrogen ions</u>. [✓] 2 - 3 [✓]: 1 mark 4 [✓]: 2 mark	[2]
10a iv	<u>carbon dioxide</u> and <u>water</u>	[1]
10bi	<u>Hydrochloric acid</u> and <u>ethanoic acid</u> are <u>monobasic acids</u> [✓]. Hence, they contain the <u>same concentration / amount / number of hydrogen ions</u> [✓], requiring the <u>same volume of NaOH to neutralise</u> [✓]. <u>Sulfuric acid</u> is a <u>dibasic acid</u> [✓]. The same volume and <u>concentration of sulfuric acid</u> contains <u>twice the amount / concentration / number of hydrogen ions</u> [✓] compared to hydrochloric acid and ethanoic acid, which require <u>twice the volume of NaOH to neutralise</u> [✓]. 2 – 3 [✓]: 1 mark 4 – 5 [✓]: 2 mark 6 [✓]: 3 marks	[3]
10bii	number of moles of H^+ in HCl/ $= \frac{25}{1000} \times 0.40$ $= 0.0100 \text{ mol}$	[1]
10 biii	Volume of aqueous sodium hydroxide: <u>16.70 cm³</u> <i>Ethanedioic acid is a dibasic acid.</i> <i>Hence, 0.00500 mol of ethanedioic acid in (a)(ii) will contain 0.01 mol of H^+ which will require 16.70 cm³ of NaOH for complete neutralisation.</i>	[1]
	Marker Comments for Question 10: More students chose question 10, and students generally performed better for qn 10 compared to qn 11. 10aiii While students could understand the concept that sulfuric acid was strong, and oxalic acid was weak, their answers were incomplete. Complete answers must 1) define strong and weak acids in terms of extent of dissociation, then 2) link the difference in pH to the difference in concentration of H^+ ions. 10aiv It was surprising that students did not recognise that burning in excess oxygen is a complete combustion reaction. 10bi. Students gave quality answers. However, students lost marks as they did not define monobasic or dibasic acids correctly. Some wrong or incomplete definitions • Monobasic acids contain 1 H^+ ion. • Monobasic acid dissociates to form 1 H^+ ions; while dibasic acid dissociates to form 2 H^+ ions. Students should describe that is that <u>every 1 mol of monobasic acid molecule dissociates to form 1 mol of H^+ ions.</u>	

	However, some students also showed poor understanding, and linked the volume of NaOH required for neutralisation to the strength of the acid instead. 10bii Many students were confused, and started to calculate the number of H⁺ ions using Avogadro's constant. The question was very clear, calculate the amount of hydrogen ions, in moles. Students should calculate the number of moles of HCl based on concentration and volume. Since HCl is a strong, monobasic acid, No of moles of HCl = No of moles of H⁺ ions $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$ 10biii Poorly done. This was designed to be a difficult question and many students showed guesswork in their answers.	
11a	<u>Filter the mixture</u> [✓] to <u>remove excess barium carbonate</u> / <u>obtain barium chloride as the filtrate</u> [✓] <u>Evaporate / heat the filtrate</u> to form a <u>saturated solution</u> [✓] and then <u>cool</u> [✓] to allow crystals to form. Filter to obtain crystals, <u>wash the crystals with a little, cool distilled water</u> [✓] and <u>dry the crystals between sheets of filter paper</u> [✓] 2 – 3 [✓]: 1 mark 4 – 5 [✓]: 2 mark 6 [✓]: 3 marks	[3]
11b	Barium carbonate will <u>react with acid</u> in the stomach / body to <u>form toxic barium ions</u> .	[1]
11c	M_r of BaCl_2 = $137 + 2(35.5) = 208$ M_r of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ = $208 + 2[2(1) + 16] = 244$ [1] Mass of BaCl_2 = $\frac{208}{244} \times 4.88$ = <u>4.16 g</u> [1] OR Number of moles of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O} = \frac{4.88}{137 + 2(35.5) + 2[2(1) + 16]}$ = <u>0.0200 mol</u> [1] Mass of BaCl_2 = $0.0200 \times [137 + 2(35.5)]$ = <u>4.16g</u> [1]	[2]
11di	$\text{Ba}(\text{OH})_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{H}_2\text{O}(\text{l})$	[1]
11dii	<u>White precipitate</u> is observed.	[1]
11dii	<u>Electrical conductivity reaches zero</u> as the <u>reaction is complete / all acid is used up / complete neutralisation</u>. [1] AND Only <u>barium sulfate</u> and <u>water</u> are left in the mixture, hence <u>absence of mobile charged carriers / mobile ions / delocalised electrons to conduct electricity</u> [1] OR	[2]

	<u>Barium sulfate</u> formed is a <u>solid ionic compound</u>; <u>water</u> is a <u>neutral/covalent molecule</u>. Both <u>do not conduct electricity</u>. [1]	
	Marker Comments for Question 11: 11a_{iii} Many students lost marks as they could not describe the steps of salt preparation completely. Some wrote evaporation to dryness instead, or some described the steps of precipitation reaction. 11b This question was poorly done. Students were expected to use knowledge from the text that barium ions in the aqueous state is toxic to humans (since barium sulfate solid can be safely ingested). Barium carbonate reacts with stomach acid to form aqueous barium ions that are toxic. Most students wrote that barium carbonate reacts with acid in the stomach to form carbon dioxide gas that cause the toxicity, which is wrong. 11c. Students encountered difficulties calculating the M_r of the substances, and hence could not solve the question. 11d It was surprising that students could not identify barium sulfate as a white precipitate. The last explanation was poorly done. To get full credit, students need to recognise that the reaction was complete when 20cm^3 of barium hydroxide was added Identify that barium sulfate and water were the only products left behind, and these are non-conductors of electricity due to their structure.	