AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.7.2.4

Carboxylic acids

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**23**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.7.2.4 Carboxylic acids

Answer 01 · Mark scheme January 2007 | CHY1H | Original Q4 | Legacy

Question 4

	answers	extra information	mark
(a)(i)	(poly)unsaturated	accept monounsaturated	1
(ii)	(turns) colourless **or** colour disappears / decolourises	do **not** accept clear	1
	stays the same colour / orange / no change	allow yellow-orange / orange-brown / red-orange	1
(iii)	(react) with hydrogen / H_2 / hydrogenation		1
	any **one** from: • heated / 60°C • catalyst / nickel		1
(b)(i)	chromatography		1
(ii)	**K**		1
(iii)	**K and L**		1
(iv)	spots / dyes / colours are in different places **or** have travelled at different rates	i.e. the place / position of the dots	1
	colours made up of different combinations / mixtures of dyes / spots	i.e. the number / combination of spots	1
total			10

4.7.2.4 Carboxylic acids

Answer 02 · Mark scheme June 2007 | CHY1B | Original Q3 | Legacy

Three	**2**	**4**	**1**	**2**

Answer 03 · Mark scheme June 2008 | CHY3H | Original Q3 | Legacy

question	answers	extra information	mark
3(a)	test: add NaOH	allow any group 1 / 2 hydroxide **or** hydroxide (ions) **or** OH^- incorrect **or** no reagent = **0**, except add NaOH and aluminium **or** heat / warm could get <u>result</u> mark	1
	result: gas turns (red) litmus blue / ammonia is given off	accept alkaline gas / ammonia produced do **not** accept blue litmus turns blue allow any acid-base indicator with correct result	1
3(b)	test: add (dilute) acid	named acid incorrect **or** no reagent = 0	1
	result: gas gives (white) solid / precipitate with limewater **or** goes white with limewater	accept CO_2 produced gas turns limewater milky / cloudy / white (ignore misty) allow calcium hydroxide for limewater	1
Total			**4**

4.7.2.4 Carboxylic acids

Answer 03 · Mark scheme

June 2008 | CHY3H | Original Q3 | Legacy

COMPONENT NUMBER: CHY3H

COMPONENT NAME: Chemistry

STATUS: Final

DATE: June 2008

4.7.2.4 Carboxylic acids

Answer 04 · Mark scheme

question	answers	extra information	mark
4(a)	acts as barrier between sodium and air / oxygen / water (vapour)	accept because they are reactive ignore oil will not react	1
4(b)	**2**Na + **2**H_2O → **2**NaOH + H_2	allow multiples / fractions	1
4(c)	these metals react with water producing an alkaline solution **or** produce solution with pH greater than 7 / high pH	owtte allow produce OH^- ions **not** these metals are / form alkalis ignore 'strong' pH	1
4(d)	bigger atom **or** outer shell electron further from nucleus **or** more shells	it = potassium <u>outer</u> electron must be mentioned once for all **3** marks **or** converse argument for sodium less reactive provided sodium is specified	1
	less attraction to nucleus **or** more shielding	**not** less magnetic attraction	1
	outer electron more easily lost	**ignore** potassium reacts more easily	1
Total			**6**

4.7.2.4 Carboxylic acids

Answer 04 · Mark scheme

June 2008 | CHY3H | Original Q4 | Legacy

COMPONENT NUMBER: CHY3H

COMPONENT NAME: Chemistry

STATUS: Final

DATE: June 2008

4.7.2.4 Carboxylic acids

Answer 05 · Mark scheme

Question 7

question	answers	extra information	mark
7(a)	some mention that a proton is a hydrogen ion / H^+ (as an acid) it / aminoethanoic acid has lost / donated a proton / hydrogen ion (as a base) it / aminoethanoic acid has gained / accepted a proton / hydrogen ion	this mark can be gained in either part	1 1 1
7(b)(i)	0.11(04)	correct answer with or without working = **2** marks if answer incorrect (0.15 × 18.4) / 25 gains **1** mark	2
7(b)(ii)	phenolphthalein	allow any correct single acid-base indicator that changes colour in the appropriate pH range (8 – 10) do **not** accept UI / litmus / methyl orange	1
Total			**7**

4.7.2.4 Carboxylic acids

Answer 05 · Mark scheme

January 2010 | CHY3H | Original Q7 | Legacy

CHY3H

4.7.2.4 Carboxylic acids

Answer 06 · Mark scheme

January 2011 | CHY3H | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	H^+ and CH_3COO^-	allow H_3O^+ for H^+ allow $CH_3CO_2^-$ for CH_3COO^-	1
6(a)(ii)	not fully ionised / dissociated	accept partially / slightly ionised / dissociated accept does not ionise well ignore (does not produce many ions) do **not** accept ions ionise	1
6(a)(iii)	proton donor(s)	do **not** accept H^+ ions	1
6(b)(i)	colour change in right (pH) range **or** this is a weak acid and strong alkali titration	it = phenolphthalein accept methyl orange does not change colour **or** methyl orange changes in the wrong (pH) range accept methyl orange is for strong acid and weak alkali titration.	1

Question 6 continues on the next page

CHY3H

Question 6 contd

question	answers	extra information	mark
6(b)(ii)		must be description of an acid / alkali titration ie quantitative measures of volume no titration = **0** marks vinegar = ethanoic acid = acid	
	NaOH / alkali in burette	accept phonetic spelling do **not** accept biuret	1
	add NaOH until (indicator) changes from colourless to pink **or** until (indicator) changes colour	do **not** accept incorrect indicator **or** incorrect colour change allow unit indicator changes	1
	note (burette) volume used **or** final volume	allow work out the volume **or** see how much is used	1
	any **one** other point from • repeat • white tile / background • add dropwise / slowly • swirling / mix • read meniscus at eye level • some indication that some apparatus has been washed	ignore stir (with rod)	1

Question 6 continues on the next page

CHY3H

Question 6 contd

question	answers	extra information	mark
6(c)	0.06	correct answer with or without working = **2** marks if answer is incorrect (0.1 x 15)/25 **or** 0.0015 x 40 gains **1** mark	2
Total			**10**

4.7.2.4 Carboxylic acids

Answer 06 · Mark scheme

January 2011 | CHY3H | Original Q6 | Legacy

CHY3H

4.7.2.4 Carboxylic acids

Answer 07 · Mark scheme

June 2012 | CH1HP | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	any **two** from: • carbon dioxide dissolves in water/oceans • marine organisms use (dissolved) carbon dioxide to form their shells/skeletons **or** limestone was formed from the shells/skeleton of marine organisms • plants / algae photosynthesise/ absorb/use carbon dioxide	accept carbon dioxide became locked up in sedimentary rocks/carbonates/limestone **or** precipitation or formation of insoluble carbonates accept remains of plants/algae/ marine organisms contain locked up carbon dioxide/carbon in the form of fossil fuels do **not** accept plants use carbon dioxide for respiration	2
4(b)(i)	because these gases/molecules contain the elements / atoms in amino acids **or** the gases / they contain carbon, hydrogen and nitrogen	ignore oxygen	1

Question 4 continues on the next page . . .

CH1HP

Question 4 cont'd…

question	answers	extra information	mark
4(b)(ii)	any **two** from: • nobody knows what was in the Earth's early atmosphere • there may not have been (continuous) lightning • Miller and Urey selected only the gases needed to produce amino acids	ignore small-scale / timescale ignore references to water/oceans or other theories accept these gases / hydrogen / methane / ammonia may not have been in the Earth's early atmosphere accept carbon dioxide / nitrogen may have been in the Earth's early atmosphere accept reference to Venus' present atmosphere ignore concentration of gases	2
Total			**5**

4.7.2.4 Carboxylic acids

Answer 07 · Mark scheme

June 2012 | CH1HP | Original Q4 | Legacy

CH1HP

4.7.2.4 Carboxylic acids

Answer 08 · Mark scheme

June 2012 | CH1HP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	olive oil does not dissolve in water	accept olive oil and water are immiscible allow there is no emulsifier ignore mustard ignore do not mix / different densities	1
6(a)(ii)	because mustard is an emulsifier **or** an emulsion forms **or** a suspension of oil in vinegar / water forms **or** vice versa	accept because an emulsifier is added	1
	the molecules have a 'head' / hydrophilic end which dissolves in / attracted to water	accept a diagram for either or both of these two marking points	1
	and a 'tail' / hydrophobic end which dissolves in / attracted to oil	if diagram contradicts the description or vice versa max one of these two marks	1
6(b)	(test:) bromine (water)	allow iodine (solution)	1
	(result:) turns colourless	allow orange colour disappears / decolourises ignore clear	1
6(c)	(olive oil is reacted with) hydrogen	accept hydrogenated	1
	using a nickel catalyst		1
	(at a temperature of about) 60 °C	allow 50 – 120°C ignore hot / heat	1
Total			**9**

4.7.2.4 Carboxylic acids

Answer 08 · Mark scheme

June 2012 | CH1HP | Original Q6 | Legacy

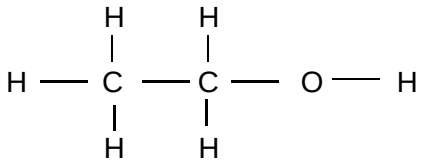
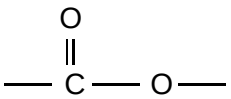
CH1HP

4.7.2.4 Carboxylic acids

Answer 09 · Mark scheme

June 2013 | CH3HP | Original Q2 | Legacy

Question 2

question	Answers	extra information	Mark
2(a)(i)		allow other arrangements provided connectivity is correct allow —OH	1
2(a)(ii)	oxygen oxidation	accept O_2 allow O allow oxidisation / oxidising / oxidised allow redox	1 1
2(b)(i)	ring around 		1
2(b)(ii)	ester(s)	do **not** allow ether(s)	1
2(b)(iii)	propanol	accept propan-1-ol allow propyl alcohol	1
Total			**6**

4.7.2.4 Carboxylic acids

Answer 10 · Mark scheme

June 2014 | CH3HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
4(a)(i)	calcium (carbonate) **or** magnesium (carbonate)	allow $CaCO_3$ allow $MgCO_3$	1	1 / 3.2.1b	E
4(a)(ii)	carbon dioxide	allow CO_2	1	1 / 3.4.1d	G
4(b)	– COOH group correctly displayed		1	1 / 3.6	E
4(c)(i)	 because hydrochloric acid is a strong(er) acid which ionises more	allow converse *throughout* 'it' refers to hydrochloric acid *allow because hydrochloric acid has lower pH* accept produces / has more hydrogen ions / H^+ ions	 1 1	1 + 3 / 3.6.2b	E
4(c)(ii)	corrosive	allow reacts with *heating* element / kettle *ignore dissolves*	1	3 / 3.6.2b	E
4(d)	0.2288	correct answer gains **3** marks with or without working accept 0.229 ***or*** *0.23* if answer is incorrect 28.6 x 0.2 ÷ 1000 (=0.00572) gains **1** mark 0.00572 x 1000 ÷ 25 or ecf gains **1** mark ***or*** 28.6 x 0.2 ÷ 25 gains **2** marks	3	2 / 3.4.1h	E
Total			**9**		

4.7.2.4 Carboxylic acids

Answer 10 · Mark scheme

June 2014 | CH3HP | Original Q4 | Legacy



4.7.2.4 Carboxylic acids

Answer 11 · Mark scheme

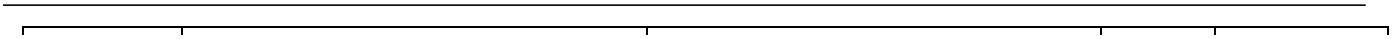
June 2015 | CH3HP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	any **two** from: • fuel • solvent • antiseptic	 allow source of energy allow perfume / aftershave allow antibacterial	2	**AO1** 3.6.1.b
5(b)	Hydrogen		1	**AO1** 3.6.1.b
5(c)(i)	oxidation	do **not** allow redox	1	**AO1** 3.6.1.c
5(c)(ii)	correct structure		1	**AO1** 3.6.2.a
5(c)(iii)	 ethanoic acid is a weak / weaker acid because it does not completely ionise.	it = ethanoic acid allow because it does not completely dissociate allow it has a lower concentration of hydrogen ions allow converse for hydrochloric acid do **not** allow ionising	 1 1	**AO1/ AO2** 3.6.2.b
5(d)(i)	ethyl ethanoate		1	**AO1** 3.6.2.b
5(d)(ii)	acid	allow any strong acid allow correct formulae	1	**AO1** 3.6.2.b
5(d)(iii)	evaporates easily / quickly	allow low boiling point do **not** allow flammable	1	**AO1** 3.6.3.a
Total			**10**	

4.7.2.4 Carboxylic acids

Answer 11 · Mark scheme

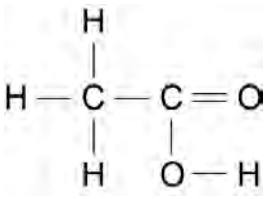
June 2015 | CH3HP | Original Q5 | Legacy



4.7.2.4 Carboxylic acids

Answer 12 · Mark scheme

June 2016 | CH3HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
1(a)(i)	fizz / effervescence / bubbles	allow calcium carbonate decreases in size or dissolves	1	AO2/AO3 3.4.1d, 3.6.2b
	because carbon dioxide produced / released	allow because gas produced / released	1	
	limewater turns cloudy / milky / white		1	
	because (a precipitate of or solid) calcium carbonate forms	allow because of carbon dioxide if not already credited	1	
1(a)(ii)		allow –OH do not allow lower case 'h'	1	AO1 3.6.2a
1(a)(iii)	acid	must be in this order ignore any name of an acid	1	AO1 3.6.2b
	ester(s)		1	
1(b)	white (precipitate) no change no change no change	all four correct 2 marks any two correct 1 mark	2	AO2 3.4.1e,f
1(c)(i)	lilac red	must be in this order allow purple	1 1	AO1 3.4.1a
1(c)(ii)	colours are masked / changed by each flame colour		1	AO3 3.4.1a
Total			12	

4.7.2.4 Carboxylic acids

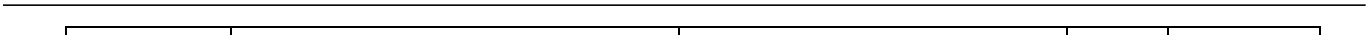
Answer 12 · Mark scheme

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / SpecRef</th></tr>
<tr><td>2</td><td></td><td></td><td>6</td><td rowspan="6">2AO1 / 3AO2 / 1AO3
3.4.1g</td></tr>
<tr><td colspan="4">Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a ‘best-fit’ approach to the marking.</td></tr>
<tr><td colspan="4"><table>
<tr><th>0 marks</th><th>Level 1 (1–2 marks)</th><th>Level 2 (3–4 marks)</th><th>Level 3 (5–6 marks)</th></tr>
<tr><td>No relevant content.</td><td>There is a simple description of using some of the apparatus.</td><td>There is a description of an experimental method including addition of acid to alkali which may include an indicator or colour change and may include a measurement of volume.</td><td>There is a description of titrations that would allow a comparison to be made between the two solutions of hydrochloric acid.</td></tr>
</table></td></tr>
<tr><td colspan="4">examples of chemistry points made in the response could include:
• acid in burette or flask
• alkali/sodium hydroxide or acid in burette or flask
• volume of acid or alkali measured using the pipette
• indicator in flask
• white tile under the flask
• slow addition
• swirling/mixing
• colour change of indicator
• burette volume measured</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>Total</td><td></td><td></td><td>6</td><td></td></tr>
</table>

4.7.2.4 Carboxylic acids

Answer 12 · Mark scheme

June 2016 | CH3HP | Original Q1 | Legacy



4.7.2.4 Carboxylic acids

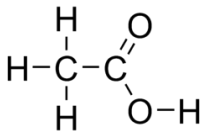
Answer 13 · Mark scheme

June 2017 | CH3HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	any **one** from: • for undiscovered elements • so elements with similar properties were in same column / group	ignore so they fit the pattern	1	**AO1** 3.1.1b
3(a)(ii)	any **one** from: • they have different properties from elements above them • they are (transition) metals .	ignore electronic configuration ignore they did not fit the pattern allow transition elements	1	**AO1** 3.1.1a,b
3(b)(i)	7 electrons in outer shell / highest energy level	ignore gain of 1 electron	1	**AO2** 3.1.2b
3(b)(ii)	for bromine: outer shell closer to nucleus stronger force of attraction (to nucleus) electron more easily gained to outer shell	'outer' must be mentioned once for 3 marks. comparatives required. ignore references to bromide / iodide allow converse for iodine allow fewer shells allow smaller atom allow less shielding	1 1 1	**AO1** **AO2** 3.1.3g,h

4.7.2.4 Carboxylic acids

Answer 13 · Mark scheme

3(c)(i)	yellow precipitate	allow yellow or dark yellow or light yellow or pale yellow allow dark yellow or light yellow or pale yellow precipitate allow dark yellow or light yellow or pale yellow ppt allow dark yellow or light yellow or pale yellow solid do **not** allow yellow solution	1	**AO1** 3.4.1e
3(c)(ii)	green precipitate	allow green or dark green or light green or pale green or dirty green allow dark green or light green or pale green or dirty green precipitate allow dark green or light green or pale green or dirty green ppt allow dark green or light green or pale green or dirty green solid do **not** allow green solution	1	**AO1** 3.4.1b
3(d)	one colour obscures the other	allow colours mix / blend allow only one colour seen	1	**AO3** 3.4.1a
3(e)(i)		allow -OH in the structure without the -O-H bond shown	1	**AO1** 3.6.2a

4.7.2.4 Carboxylic acids

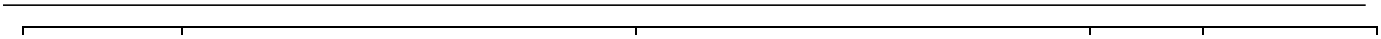
Answer 13 · Mark scheme

3(e)(ii)	weak acid (because) ethanoic acid is not fully ionised / dissociated	allow converse for hydrochloric acid allow (the solution) has a lower concentration of hydrogen ions allow (produces) fewer hydrogen ions. do **not** allow ionising	1 1	**AO3** 3.6.2a,b
Total			**12**	

4.7.2.4 Carboxylic acids

Answer 13 · Mark scheme

June 2017 | CH3HP | Original Q3 | Legacy



4.7.2.4 Carboxylic acids

Answer 14 · Mark scheme

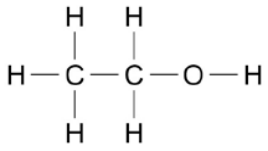
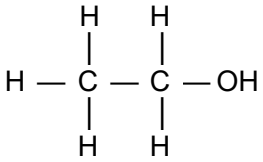
June 2018 | 8462/2H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	formulation		1	AO1 4.8.1.2
02.2	$\frac{23.3}{265.5 + 23.3 + 3.0 + 1.5}$ (× 100) = 7.9 (%)	an answer of 7.9 (%) scores **2** marks allow $\frac{23.3}{293.3}$ (× 100) allow 7.944084555 (%) rounded correctly	1 1	AO2 4.8.1.2
02.3	to deter consumption / drinking (by people)		1	AO3 4.7.2.3
02.4	any **one** from: • fuel • solvent • antiseptic	do **not** accept as an alcoholic drink allow specific uses eg • fuel additive • cleaning products • hand-sanitisers	1	AO2 4.7.2.3
02.5	ferment(ation) add yeast anaerobic (conditions) **or** warm	ignore distillation allow in the absence of oxygen allow a temperature value in range 5 – 45 °C inclusive allow room temperature ignore hot / heat ignore high temperature	1 1 1	AO1 4.7.2.3

4.7.2.4 Carboxylic acids

Answer 14 · Mark scheme

June 2018 | 8462/2H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6		allow 	1	AO1 4.7.2.3
02.7	hydrogen	allow H_2	1	AO1 4.7.2.3
02.8	oxidising (agent)	allow permanganate / dichromate ions allow [O] ignore oxygen	1	AO1 4.7.2.3
Total			11	

4.7.2.4 Carboxylic acids

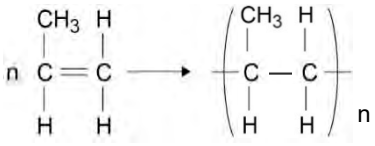
Answer 14 · Mark scheme

June 2018 | 8462/2H | Original Q2

4.7.2.4 Carboxylic acids

Answer 15 · Mark scheme

June 2018 | 8462/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	water	allow H_2O allow hydrogen chloride **or** HCl	1	AO1 4.7.3.2
06.2		an answer of  scores **3** marks		AO2 4.7.3.1
	single C–C bond and nothing added to the trailing bonds		1	
	3 × H and CH_3 correct	must be four single bonds	1	
	n at bottom right		1	
		must be fully correct to score all **3** marks		
06.3	any **two** from: • poly(propene) comes from a non-renewable source • poly(propene) requires a lot of energy to make • poly(propene) is not biodegradable • a wool carpet needs replacing more often • wool requires the use of large areas of land (which could be used to grow food crops)	allow converse arguments allow poly(propene) will run out must refer to the carpet, not just the fibre ignore references to cost ignore pollution ignore landfill	2	AO3 4.10.1.1

4.7.2.4 Carboxylic acids

Answer 15 · Mark scheme

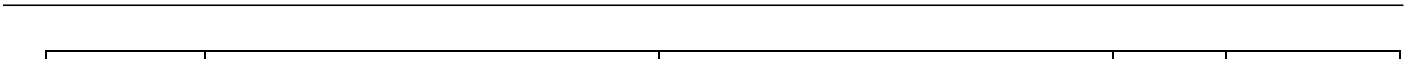
June 2018 | 8462/2H | Original Q6

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.4	any **four** from: advantages of polyester • better flame resistance (so burns less easily) • higher melting point (so melts less easily) • absorbs water so less likely to ignite disadvantages of polyester: • high density so uniform is heavy • absorbs water so firefighter gets wet • absorbs water so uniform becomes heavy • justified conclusion	allow converse arguments throughout. **max 3** marks if only advantages or only disadvantages of one type of fibre allow good flame resistance so protects the firefighter allow high melting point so uniform is not damaged	4	AO3 4.7.3.1 4.7.3.2
Total			**10**	

4.7.2.4 Carboxylic acids

Answer 15 · Mark scheme

June 2018 | 8462/2H | Original Q6

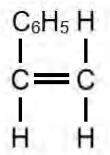


4.7.2.4 Carboxylic acids

Answer 16 · Mark scheme

June 2019 | 8462/2H | Original Q6

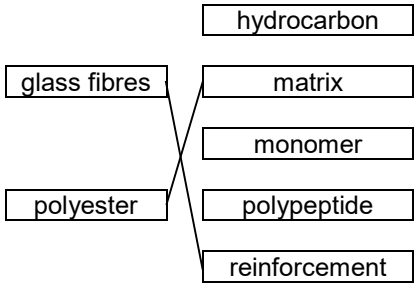
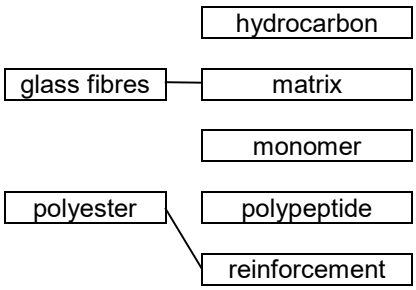
Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	C=C bond in correct position 3× C-H **and** 1× C-C bond in correct positions	 do **not** accept any additional bonds or atoms ignore brackets and n before and after displayed structural formula an answer of  scores **2** marks	1 1	AO2 4.7.3.1
06.2	carboxylic acid (group)	allow carboxyl (group)	1	AO1 4.7.2.4
06.3	water	allow H_2O	1	AO1 4.7.3.2
06.4	(polyester is) thermosoftening (polyester has) no cross-links	allow (polyester is) thermoplastic ignore thermoforming allow intermolecular forces are weak do **not** accept references to breaking covalent bonds or breaking chains	1 1	AO1 AO3 4.10.3.3

4.7.2.4 Carboxylic acids

Answer 16 · Mark scheme

June 2019 | 8462/2H | Original Q6

06.5		allow for **1** mark: 	1 1	AO3 4.10.3.3
06.6	any **two** from: (to make the board) • harder • stronger • tougher • more rigid • waterproof	must be implied comparative statements	2	AO3 4.10.3.3
Total			**10**	

4.7.2.4 Carboxylic acids

Answer 17 · Mark scheme

November 2020 | 8462/2H | Original Q7

Question 7

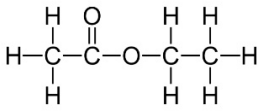
Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	HCOOH propanoic acid	allow HCO_2H	1 1	AO1 4.7.2.4
07.2	incomplete / partial ionisation (because) reaction is reversible	allow incomplete / partial dissociation allow (because) reaction is in equilibrium	1 1	AO3 4.7.2.4
07.3	mass (of flask and contents) decreases (because) carbon dioxide is produced (and) carbon dioxide escapes (from the flask)	allow **1** mark for the gas produced escapes (from the flask)	1 1 1	AO1 AO2 AO2 4.3.1.3 4.7.2.4
07.4	(0.01 mol/dm^3) methanoic acid has a lower pH (so 0.01 mol/dm^3) methanoic acid has a higher concentration of hydrogen ions (therefore) more collisions per unit time	allow converse argument for ethanoic acid allow (0.01 mol/dm^3) methanoic acid is a stronger acid	1 1 1	AO2 AO2 AO3 4.6.1.2 4.6.1.3 4.7.2.4
07.5	ethyl ethanoate		1	AO1 4.7.2.4

4.7.2.4 Carboxylic acids

Answer 17 · Mark scheme

November 2020 | 8462/2H | Original Q7

Question 7 (continued)

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6			1	AO2 4.7.2.4 4.7.3.2
Total			12	

4.7.2.4 Carboxylic acids

Answer 18 · Mark scheme

November 2021 | 8462/1H | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	a dilute solution of a strong acid		1	AO2 4.3.2.5 4.4.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	1.0 mol/dm^3 hydrogen chloride solution		1	AO2 4.4.2.4 4.4.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	any **two** from: • swirl (the solution) • white tile (under the flask) • add (ethanedioic) acid dropwise (near the endpoint) • repeat **and** calculate mean		2	AO3 4.4.2.5 RPA2

Question 9 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	(concentration = 90 × 0.0480 =) 4.32 (g/dm^3)		1	AO2 4.3.2.1 4.3.2.5 4.3.4
	(mass = 4.32 × $\frac{250}{1000}$) = 1.08 (g)	allow correct use of an incorrectly calculated value of concentration in g/dm^3	1	
	alternative approach: (moles = 0.0480 × $\frac{250}{1000}$ =) 0.012 (mol) (1)			
	(mass = 0.012 × 90) = 1.08 (g) (1)	allow correct use of an incorrectly calculated value of number of moles		

Question 9 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	(moles $H_2C_2O_4 = \frac{15.0}{1000} \times 0.0480$) = 0.00072 (mol)		1	AO2 4.3.4 4.4.2.5 RPA2
	(moles NaOH = moles $H_2C_2O_4 \times 2$ =) 0.00144 (mol)	allow correct use of an incorrectly calculated value of number of moles of $H_2C_2O_4$	1	
	(concentration= $\frac{0.00144}{25.0} \times 1000$) = 0.0576 ($mol/dm^3$)	allow 0.058 (mol/dm^3) allow correct use of an incorrectly calculated value of number of moles of NaOH	1	
	alternative approach: $\frac{\text{volume} \times \text{conc (acid)}}{\text{volume} \times \text{conc (NaOH)}} = \frac{1}{2}$ (1)	allow inverse		
	(conc NaOH =) $2 \times \frac{15.0 \times 0.0480}{25.0}$ (1)	allow correct use of incorrect mole ratio		
	= 0.0576 (mol/dm^3) (1)			

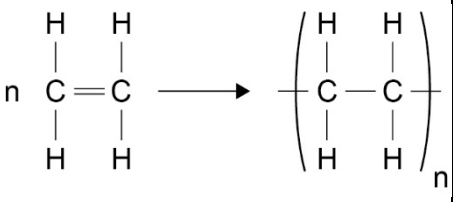
Total			9

4.7.2.4 Carboxylic acids

Answer 19 · Mark scheme

November 2021 | 8462/2H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1		if equation incorrect allow **1** mark for 5 single bonds **or** allow **1** mark for n	2	AO1 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2		allow converse statements about thermosetting polymers		
	(poly(ethene)) melts	allow thermosoftening polymers melt	1	AO1
	(so) can be reshaped (into new products)		1	AO3 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	use different (reaction) conditions	allow use different temperatures / pressures	1	AO1 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4		allow converse statements about LDPE		AO3 4.10.3.3
	(in HDPE) polymer chains / molecules are closer together	allow (HDPE has) unbranched polymer chains / molecules	1	
	(so) more atoms per unit volume	allow (so) more molecules per unit volume	1	

Question 4 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	circle around HO– **or** –OH on monomer **A**		1	AO2 4.7.2.3 4.7.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	H_2O **and** HCl	must be in this order	1	AO3 4.7.3.2

Total			9

4.7.2.4 Carboxylic acids

Answer 20 · Mark scheme

June 2023 | 8462/1H | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(the acid is only) partially ionised (in aqueous solution)		1	AO1 4.4.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	the mass of acid dissolved is doubled and the volume of the solution is halved		1	AO2 4.3.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	methyl orange from yellow to red / orange / pink **OR** phenolphthalein (1) from pink to colourless (1) **OR** litmus (1) from blue to red (1)	MP2 is dependent on the award of MP1 if no other marks awarded, allow **1** mark for universal indicator turns from purple / blue to green / yellow / orange / red	1 1	AO1 4.4.2.5 RPA2

4.7.2.4 Carboxylic acids

Answer 20 · Mark scheme

June 2023 | 8462/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	OH^-		1	AO1 4.4.2.4

4.7.2.4 Carboxylic acids

Answer 20 · Mark scheme

June 2023 | 8462/1H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	(moles $Na_2CO_3 = \frac{25.0}{1000} \times 0.124$) = 0.0031(0)		1	AO2 4.3.4 4.4.2.5 RPA2
	(moles $HNO_3 = 2 \times 0.0031(0)$) = 0.0062(0)	allow correct use of an incorrectly determined number of moles of Na_2CO_3	1	
	(concentration =) $\frac{0.0062(0)}{23.6} \times 1000$	allow correct use of an incorrectly determined number of moles of HNO_3	1	
	= 0.262711864		1	
	= 0.263 (mol/dm^3)	allow an answer correctly rounded to 3 significant figures from an incorrect calculation which uses all the data in the question	1	
	alternative approach:			
	$\left(\text{ratio } \frac{\text{moles } HNO_3}{\text{moles } Na_2CO_3} = \right)$	allow inverted expression		
	$\frac{2}{1} = \frac{23.6 \times \text{concentration}}{25.0 \times 0.124}$ (2)	allow **1** mark for the expression with an incorrect mole ratio		
	(concentration =) $\frac{2 \times 25.0 \times 0.124}{23.6}$ (1)	allow correct use of the expression with an incorrect mole ratio		
	= 0.262711864 (1)			
	= 0.263 (mol/dm^3) (1)	allow an answer correctly rounded to 3 significant figures from an incorrect calculation which uses all the data in the question		

4.7.2.4 Carboxylic acids

Answer 20 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	3.16×10^{-3} (mol/dm^3)		1	AO2 4.4.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	argon / Ar		1	AO2 4.1.2.4 4.2.1.2

Total Question 5	12

4.7.2.4 Carboxylic acids

Answer 21 · Mark scheme

June 2023 | 8462/2H | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(mass =) $\frac{39.8}{29.6}$ (×1) = 1.34 (g)	 allow 1.34459459 (g) correctly rounded to at least 2 significant figures	1 1	AO2 4.7.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	all six points plotted correctly	allow a tolerance of ± ½ a small square allow **1** mark for four or five points plotted correctly	2	AO2 4.7.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	40.6 (kJ)	allow a value in the range 40.4 – 40.8 kJ allow a value consistent with the plotted points	1	AO2 4.7.2.3

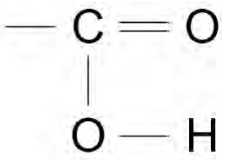
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	calcium hydroxide		1	AO1 4.8.2.3

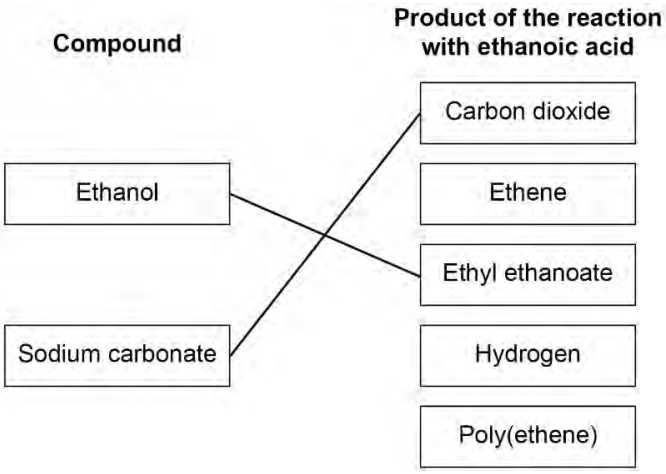
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	(limewater turns) milky / cloudy	allow white precipitate (formed) allow calcium carbonate is produced	1	AO1 4.8.2.3

4.7.2.4 Carboxylic acids

Answer 21 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	an oxidising agent		1	AO1 4.7.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7			1	AO1 4.7.2.4

Question	Answers	Mark	AO / Spec. Ref.
02.8	 do **not** accept more than **one** line from a box on the left	1 1	AO1 4.7.2.4

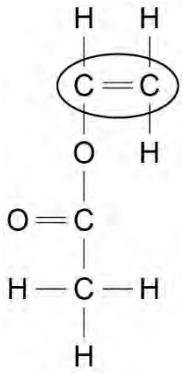
Total Question 2	11

4.7.2.4 Carboxylic acids

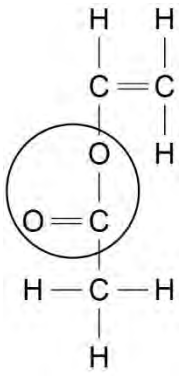
Answer 22 · Mark scheme

June 2024 | 8462/2H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1			1	AO2 4.7.2.1

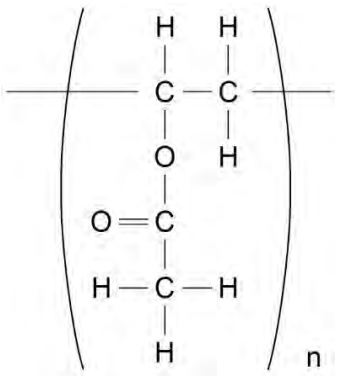
Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	orange (bromine water) turns colourless	allow yellow / brown allow is decolourised ignore clear	1 1	AO2 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3			1	AO3 4.7.2.4 4.7.3.2

4.7.2.4 Carboxylic acids

Answer 22 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	$2\ C_4H_6O_2 + 9\ O_2 \rightarrow 8\ CO_2 + 6\ H_2O$	allow multiples allow **1** mark for $C_4H_6O_2 + O_2 \rightarrow$ with incorrect / no multipliers allow **1** mark for $\rightarrow CO_2 + H_2O$ with incorrect / no multipliers ignore state symbols	3	AO2 4.7.2.1 4.1.1.1 4.3.1.1 4.7.2.1 4.7.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	single C-C bond in polymer repeating unit n after polymer repeating unit	do **not** accept extra atoms added to trailing bonds an answer of  scores **2** marks	1 1	AO2 4.7.3.1

4.7.2.4 Carboxylic acids

Answer 22 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	addition polymer		1	AO2 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.7	thermosoftening	allow thermoplastic	1	AO1 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.8	cross-links between (polymer) chains (so) too much energy needed to overcome the cross-links	allow covalent bonds between (polymer) chains allow (so) too much energy needed to overcome the covalent bonds between (polymer) chains	1 1	AO1 4.2.2.5 4.10.3.3

Total Question 8	13

Answer 23 · Mark scheme

June 2025 | 8462/2H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	calcium (ions) **or** magnesium (ions)	allow Ca^{2+} (ion) allow Mg^{2+} (ion) allow zinc / Zn^{2+} (ion)	1	AO1 4.8.3.2 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	(test) add excess sodium hydroxide (solution) (result) with sodium hydroxide the (white) precipitate dissolves	 allow with sodium hydroxide a colourless solution is produced	1 1	AO1 4.8.3.2 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	Ca^{2+}	ignore calcium	1	AO1 4.2.1.2 4.8.3.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	Cl^-	ignore chloride	1	AO1 4.2.1.2 4.8.3.4 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	(test) (bubble the gas through) limewater	allow (bubble the gas through) calcium hydroxide solution	1	AO1 4.8.2.3 4.8.3.3 RPA7
	(result) (which) turns milky / cloudy	MP2 is dependent upon MP1 being awarded	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6		allow converse argument		
	(using ethanoic acid) the rate of reaction is lower		1	
	(because) ethanoic acid is a weak(er) acid		1	
	(so) the concentration of hydrogen ions is lower	allow (so) ethanoic acid is (only) partially ionised	1	
	(and) the frequency of collisions is lower		1	

Total Question 6	11

4.7.2.4 Carboxylic acids

Answer 14 · Examiner comments

June 2018 | 8462/2H | Original Q2

Question 2 (standard demand)

02.1 28% of students recognised a formulation from this part of the specification.

02.2 This question presented little difficulty, with 81% of students achieving full marks.

02.3 Reading the stem would have avoided answers such as ‘to make it more attractive to drink’. 33% of students realised that it was to warn people not to drink it.

02.4 Uses of ethanol, and therefore methylated spirits, as a solvent, steriliser and fuel were well known.

02.5 Few students could give both yeast and the reaction conditions for the production of ethanol from sugar solution by fermentation. Some knew the name of the process but could give no correct detail.

02.6 34% of students could complete the displayed formula for ethanol. Ethane was the most common incorrect answer, but ethanoic acid was also frequently seen.

02.7 45% of the students knew that hydrogen would be the gas produced.

02.8 6% of students knew that an oxidising agent was required.

Answer 15 · Examiner comments

Question 6 (standard / high & high demand)

06.1 There was a variety of incorrect answers for the small molecule lost during condensation polymerisation, some of which were not molecules. However, 56% of students knew the answer was water.

06.2 Of those students who lost marks here, there was no clear-cut marking point that caused the problem. Some students did not make it clear that the bond joined on to the C atom of the methyl group, but were given benefit of the doubt provided it didn't join to the H_3. 28% of students gave faultless answers.

06.3 This question was not answered well, mainly because students did not appreciate that they were making a comparison with both of the fibres used alone.

- Some students restated the question stem by saying 'wool wears out quickly'.
- There was little mention of land usage for wool production or that poly(propene) is not biodegradable.
- There were many uncreditworthy references to cost, and the greater comfort of wool.
- Many students failed to make it clear whether they were talking about the fibre or the carpet, or whether they were comparing the mixed fibre carpet with wool or poly(propene) alone.

Most students who achieved any marks at all (39%) were only able to score one of the available marks.

06.4 This was generally well answered with 99% of students achieving at least one mark. There were various advantages and disadvantages given for the uniform absorbing water as covered by the marking points on the mark scheme (including an advantage of 'it would absorb lots of sweat'). 44% of the students were able to achieve all four marks.

4.7.2.4 Carboxylic acids

Answer 17 · Examiner comments — November 2020 | 8462/2H | Original Q7

Question 7 (standard, standard / high and high demand)

07.1 Propanoic acid was named correctly much more often than a correct formula was given for methanoic acid. CHCOOH was a commonly seen error here.

07.2 Many students scored at least one mark here. A common misconception was that incomplete / partial ionisation means that each CH_3COOH molecule produces only one H^+ ion, i.e. that the three hydrogen atoms in the CH_3COO^- ion would also form H^+ ions if ionisation were complete.

Answer 17 · Examiner comments — November 2020 | 8462/2H | Original Q7

07.3 This part was quite well answered. Most students stated that the mass decreases. Not all of the students who identified carbon dioxide as a product of the reaction went on to explain that it is the escape of this gas that causes the mass to decrease.

07.4 This part was poorly answered by many students. Many recognised that the pH of methanoic acid was lower but far fewer made the link to hydrogen ion concentration. Only a small proportion of students referred to collisions between particles and, of those that did, a significant minority referred to 'more collisions', which was insufficient for the mark, or incorrectly justified the increased collision frequency in terms of the particles having more energy.

07.5 A minority of students were able to name ethyl ethanoate.

07.6 A majority of students were able to identify the displayed structural formula of ethyl ethanoate.

Answer 18 · Examiner comments

Question 9 (standard, standard / high and high demand)

09.3 Many students included reading the bottom of the meniscus at eye level; this is just normal technique rather than an improvement to the method given. Many suggested repeating the titration, but this is pointless unless a mean of the accurate results is taken.

09.4 As with other calculations, students often failed to explain what they were doing, which made it difficult for the examiners to award partial credit. Numbers were scattered around without helpful words such as 'moles =' or 'mass ='. Although most students convert the volume of a solution to dm^3 for a titration calculation, far fewer did in this calculation, so their calculated number of moles was 1000 times the correct value.

09.5 Many students were successful at this straightforward titration calculation. Most used the mole ratio, although some tried to apply this to concentrations or volumes rather than moles. Some students tried to bring relative formula mass into their calculation.

Concluding Remarks

The paper was broadly comparable with previous papers. Students did poorly on the questions on ionic bonding and electrolysis but performed well on the question on extraction of metals. There continues to be a lack of precision when recalling definitions and other statements from the specification.

4.7.2.4 Carboxylic acids

Answer 18 · Examiner comments

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.7.2.4 Carboxylic acids

Answer 19 · Examiner comments November 2021 | 8462/2H | Original Q4

Question 4 (standard, standard / high and high demand)

04.1 Around half of the students either drew five single bonds or wrote ‘n’. Around one third provided a completely correct response.

04.2 Many of the students scored one mark, usually for stating that poly(ethene) melts. The consequence in terms of recycling was less well known.

04.3 How poly(ethene) is produced from ethene was not well known.

04.4 Approaching half of the students scored one mark but only a tiny number scored both. The fact that the chains are closer together or unbranched was well known but not how that linked to density.

04.5 Some students seem to think that any -OH is an alcohol group even if it is part of a carboxylic acid group. Other students circled whole molecules rather than functional groups.

04.6 Very few students were able to use the diagrams to work out that hydrogen chloride was the small molecule formed when a polyester was produced from monomers **A** and **B**.

Answer 20 · Examiner comments June 2023 | 8462/1H | Original Q5

Question 5 (standard, standard/high and high demand)

05.1 More than half of the students were able to state that a weak acid is one which is only partially ionised or dissociated in aqueous solution. Common incorrect responses were

---

Answer 20 · Examiner comments

that the acid is partially ionising (it does not ionise other species) or that hydrogen ions are ionised (it is the acid molecule which ionises to form H^+ ions). Attempted responses in terms of pH were not accepted.

05.2 The great majority of students gave the correct response. The most common distractor was the mass of acid dissolved is halved and the volume of the solution is doubled, which would decrease the concentration. The other two options would not change the concentration.

05.3 Fewer than a third of students could recall the name of an appropriate indicator and the correct colour change from this required practical. Any single acid-base indicator was allowed, with its associated colour change. Phenolphthalein was the most popular choice of indicator; with phonetic spellings accepted. The colour change was often the wrong way round, as acid is being added to the alkali, and some students described the final colour incorrectly as 'clear' rather than colourless.

05.4 About three fifths of students knew that the OH^- ion is responsible. When asked for a formula, an equation is not an appropriate response.

05.5 This question discriminated very well. Some scaffolding was given to help the students and bring the demand of the question down. This resulted in two fifths of students scoring full marks on the question and nearly three quarters scoring at least one mark.

Some intermediate marks were not awarded because students didn't convert the volume into dm^3 when calculating the number of moles of sodium carbonate. A second mark was then often not awarded in calculating the concentration of nitric acid because students divided by a volume in cm^3 instead of dm^3. Those students who tried to bring relative formula masses into the calculation (when no data had been given to enable them to do so) rarely scored more than two marks; one for applying the mole ratio and one for rounding an answer to 3 significant figures if all the data supplied had been used.

A few students did not use the method suggested, but used a ratio method instead. On this occasion full credit was given to these answers. However, students should be aware that purely mathematical methods, which do not demonstrate an understanding of the chemical principles, are not always appropriate.

05.6 Over a third of students scored the mark in this high demand question. As the pH has decreased by a factor of 2, the concentration of hydrogen ions increases by a factor of 10^2. However, many students did not realise this and attempted to calculate a concentration by applying a linear, instead of logarithmic, scale factor. Some students divided by 100 instead of multiplying.

05.7 Only two fifths of the students worked out that the element must be argon. Sulfur was a popular incorrect response (one electron subtracted instead of added), but other halogens were also popular.

4.7.2.4 Carboxylic acids

Answer 21 · Examiner comments

June 2023 | 8462/2H | Original Q2

Question 2 (standard demand)

02.1 This simple calculation was answered correctly by more than three-quarters of the students. Occasionally errors were seen using 38.9 kJ/g rather than 39.8 kJ/g. In these cases, it was impossible to tell whether this was a transcription error or use of the value for hexanol. Either way, we cannot award credit for transcription errors.

02.2 Nearly 9 in 10 students were able to plot the data within tolerance on all points. However, nearly all drew a line of best fit, which for a discrete variable in this context was not appropriate. These lines of best fit were ignored.

02.3 Around two-thirds of students gained this mark. The answer, within the tolerances stated in the mark scheme, was estimated from the plotted points alone, and was as stated in the mark scheme unless misplotted points (usually for hexanol and/or heptanol) suggested otherwise.

02.4 Fewer than half of students knew that lime water is aqueous calcium hydroxide.

02.5 Around 90% of students could describe the result of this test adequately to gain credit.

02.6 More than half of the students gave a correct response. ‘An alkali metal’ was a strong distractor.

02.7 This was not well known, with only around 30% scoring the mark. Many students completed a square of bonds around the four atoms provided.

02.8 More than half of the students gained both marks. There was no discernible pattern amongst those who scored one mark.

Answer 22 · Examiner comments

Question 8 (standard, standard / high and high demand)

08.1 Around 60% of students correctly identified the C=C bond. For students who were not awarded the mark common mistakes were incorporating the 3 Hs and 1 O atom attached to the C=C group in their circle or also circling the C=O group. Others circled only the double bond and not the carbon atoms on either side.

08.2 Those students who were awarded marking point 1 used a range of the colours allowed in the mark scheme to describe the starting colour of bromine water. The most common colours were orange or brown. A small number of students described the bromine water as turning clear rather than colourless. For students who were awarded one mark there seemed to be an even split between those awarded marking point 1 and those awarded marking point 2. Just over half scored both.

08.3 A variety of areas in the molecule were circled in an attempt to answer this question. A mistake some students made who were not awarded this mark was incorporating one of the C atoms either side of the ester bond in their circle. Around 40% of students gained credit.

08.4 Those students awarded 3 marks for this question often balanced the equation using half the values of those in the mark scheme and gained credit. A common error was use of inaccurate formulae, particularly a small O on H_2O or CO_2. Just over one-third of students gained all three marks.

08.5 For those students awarded one mark there was an even split between those achieving marking point 1 and marking point 2. A minority of students added atoms or groups to the extension bonds, which contradicted marking point 1. Around 40% gained both marks.

© 2024 AQA and its licensors. All rights reserved.

4.7.2.4 Carboxylic acids

Answer 22 · Examiner comments June 2024 | 8462/2H | Original Q8

08.6 This multiple-choice question was well answered, with three quarters of students gaining the mark.

08.7 An array of answers were given for this question. Common incorrect responses included condensation, meltable, polyester, hydrocarbon and alkene. 'Thermoforming' was regarded as a process and not a description of the polymer used in that process. Nearly half of students gained a mark here.

08.8 Only around 10% of students achieved two marks for this question.

Common mistakes for marking point 1 were referencing crosslinks but saying they were between the polymers or molecules rather than the polymer chains, or mentioning bonds between polymer chains but not stating they were covalent. A number of students also referred to crosslinks between monomers in the polymer or crosslinks between bonds in the polymer.

For marking point 2 many students were not awarded the mark as they gave generalised answers about a lot of energy, or high amounts of energy being needed to break the strong bonds but did not make it clear that **too much** energy was needed to break the bonds between polymer chains.

Answer 23 · Examiner comments

Question 6

06.1 Three quarters of students correctly identified either calcium or magnesium. A few students gained credit for zinc.

06.2 Just over a quarter of students scored both marks on this item. Many students repeated the information given to them in the stem of the question, stating that they would add sodium hydroxide and observe a white precipitate, which did not gain marks. Some described adding more sodium hydroxide, without specifying that this should be until excess and whilst these students were not awarded the first marking point, they still had access to the second marking point.
Descriptions of the result were often vague. Some responses stated that 'the precipitate would dissolve' but failed to identify the reagent. Others simply said, 'it' will redissolve, become clear, or turn colourless, which was insufficient. There was a misconception that the aluminium dissolves, rather than the precipitate.

06.3 Both the correct symbol and the charge on the ion were required to gain the mark for this item. A quarter of students did this. Many others wrote the name, or the symbol without a charge.

06.4 As with 06.3, both the symbol and the charge on the ion were needed to gain the mark. As with 06.3, a quarter of students answered this correctly. Similar mistakes, writing the name or a symbol without a charge were commonly seen.

06.5 Around two thirds of students gained both marks on this item. A small number of students described adding limewater to solution C, rather than bubbling the gas produced through limewater.

06.6 Around half of students identified ethanoic acid as a weak acid and stated that the rate of reaction was lower. Fewer students were able to describe a lower concentration of hydrogen ions, with some describing fewer hydrogen ions without making any reference to volume. Credit was given to those who described ethanoic acid as partially ionised, however, there was the misconception that less hydrogen ions were ionised. Only a minority of students made a correct reference to the frequency of collisions.