AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.8.3.5

Sulfates

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**14**
Available paper years	**2008–2024**

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.

4.8.3.5 Sulfates

Answer 01 · Mark scheme

Question 6

question	answers	extra information	mark
(a)(i)		each correct test and one result = **1** mark one other result for any test = **1 mark** this mark can only be awarded once	 1
	Na_2CO_3: HCl → (odourless) gas (1) CO_2 / carbon dioxide (1)		1
	NaCl: $AgNO_3$ → white ppt (1) silver chloride (1)		1
	$NaNO_3$: Al + NaOH → pungent /sharp smell / choking gas (1) NH_3 / ammonia (1)		1
	Na_2SO_4: $BaCl_2$ → white ppt (1) barium sulfate (1)		1
(a)(ii)	all would give a yellow / yellow-orange (flame) / same coloured (flame) / same results **or** they all contain sodium owtte	allow orange (flame)	1
(b)	any **two** from: • fast / quick or comment about speed • small amounts • sensitive / accurate • ease of automation • sample not used up • reliable / efficient • can be left to run / continuous analysis	ignore cost ignore human error accept any valid answer accept operators do not need chemical skills ignore results can be saved	2
total			8

4.8.3.5 Sulfates

Answer 02 · Mark scheme

Question 4

question	answers	extra information	mark
4(a)	(acidified) barium chloride / nitrate	incorrect reagent **or** no reagent = **0** marks do **not** accept acidified with sulfuric acid (still allow result mark if correct) allow solution of barium ions / salt **not** barium solution **do not** accept barium hydroxide	1
	(white) precipitate / solid	do **not** accept incorrect colour for precipitate allow barium sulfate (formed) ignore 'it goes white / cloudy'	1
4(b)	(white) precipitate / solid	allow aluminium hydroxide (formed) **do not** allow incorrect colour for precipitate	1
	(precipitate) dissolves (in excess)	allow sodium aluminate (formed) allow goes clear / colourless if incorrect colour precipitate then allow dissolves (in excess)	1
4(c)	any **two** from: • yellow = sodium (alum) • lilac = potassium (alum) • colourless = ammonium (alum)	apply list principle allow orange **or** yellow orange allow purple if no colours given, allow 'different coloured flames' for **1** mark	2
Total			**6**

4.8.3.5 Sulfates

Answer 02 · Mark scheme

January 2010 | CHY3H | Original Q4 | Legacy

CHY3H

4.8.3.5 Sulfates

Answer 03 · Mark scheme

Question 2

question	answers	extra information	mark
2(a)(i)	(different) properties	allow ideas of different property / behaviour / element	1
2(a)(ii)	any **one** from: • they had high status **or** they were lecturers / doctors / professors / famous scientists • other scientists repeated experiments • they had proof **or** lots of / strong / conclusive / enough / clear evidence	they = Crawford + Cruikshank allow experiment could be repeated allow other scientists showed they had different properties ignore evidence unqualified	1
2(a)(iii)	other scientists obtained similar results / proved it **or** experiments were repeated		1

Question 2 continues on the next page

CHY 2H

Question 2 continued

question	answers	extra information	mark
2(b)(i)	any **one** from: • mass of solid / strontium (chloride) / barium (chloride) • volume of water • type of container	allow amount / volume allow amount / mass allow initial / starting temperature (of water) ignore room temperature / time / concentration ignore reference to hydrochloric acid	1
2(b)(ii)	2 **and** takes in heat / energy **or** 2 **and** temperature goes down (owtte)		1
2(b)(iii)	temperature increased for one experiment and decreased for the other (owtte) **or** one was exothermic and one was endothermic (owtte)	accept experiment 1 was exothermic	1
2(c)	any **one** from • positive / + (charge) • opposite (charges) attract	do **not** accept incorrect further qualification eg electrons / atoms / electrodes	1
Total			**7**

4.8.3.5 Sulfates

Answer 03 · Mark scheme June 2010 | CHY2H | Original Q2 | Legacy

CHY 2H

4.8.3.5 Sulfates

Answer 04 · Mark scheme

Question 5

question	answers	extra information	mark
5(a)	limewater / calcium hydroxide (limewater) goes milky / cloudy **or** gives white precipitate / solid	 do **not** allow this mark if lime water added to solution or powder	1 1
5(b)	eg flame colour of (Na) and flame colour of (K) interfere / mask / mix with each other	accept difficult to determine the colour **or** hard to distinguish accept some indication that two distinct colours are not seen	1
5(c)(i)	barium chloride (solution) / $BaCl_2$ white precipitate / white solid	ignore mention of acidification but do **not** allow sulfuric acid. wrong reagent = no mark allow white barium sulfate **or** barium sulfate precipitate	1 1
5(c)(ii)	white precipitate / white solid	ignore goes milky do **not** accept any mention of precipitate dissolving	1
Total			**6**

4.8.3.5 Sulfates

Answer 04 · Mark scheme

January 2011 | CHY3H | Original Q5 | Legacy

CHY3H

Question 5

question	answers	extra information	mark
5(a)(i)		incorrect test or no test = **0** mark testing the solution **or** using blue litmus = **0** mark	
	(test ammonia / gas with red) litmus	accept any acid-base indicator with correct result	1
	(goes) blue		1
	OR		
	(conc.) HCl (1)		
	white fumes / smoke / solid (1)	allow white gas / vapour	
	OR		
	(test ammonia / gas with) Universal Indicator (1)		
	blue / purple (1)		
5(a)(ii)		incorrect test or no test = **0** marks	
	add barium chloride / $BaCl_2$ (solution) **or** add barium nitrate / $Ba(NO_3)_2$ (solution)	do **not** accept H_2SO_4 added allow Ba^{2+} solution / aqueous added	1
	white precipitate / solid (formed)	allow white barium sulfate / $BaSO_4$ ignore barium sulfate / $BaSO_4$ alone	1
5(b)(i)	fully / completely ionised / dissociated **or** hydrogen ions fully dissociated	accept has more ions than weaker acid / alkali of same concentration ignore strongly ionised do **not** accept ions are fully ionised ignore concentrated **or** reference to concentrations of ions	1

Question 5 continues on the next page

Question 5 continued

question	answers	extra information	mark
5(b)(ii)	methyl orange	accept correct spelling only accept any strong acid-weak base indicator do **not** allow phenolphthalein / litmus / universal indicator	1
5(b)(iii)	32 × 0.05/1000 **or** 0.0016 (mole H_2SO_4) (reacts with) 2 × 0.0016 **or** 0.0032 (mole NH_3 in $25cm^3$) (0.0032 × 1000/25 =) 0.128	accept (0.05 x 32) = (V x 25) **or** 0.05 x 32 / 25 accept dividing rhs by 2 **or** multiplying lhs by 2 allow ecf from previous stage correct answer 0.128 **or** 0.13 with or without working gains all **3** marks	1 1 1
5(b)(iv)	2.176 **or** 2.18 **or** ecf from candidate's answer to (b)(iii) **or** 2.55 if 0.15 moles used	correct answer with or without working if answer incorrect or no answer 0.128 × 17 **or** 0.13 x 17 **or** their (b)(iii) × 17 **or** 0.15 × 17 gains **1** mark	2
Total			**11**

4.8.3.5 Sulfates

Answer 05 · Mark scheme

June 2011 | CHY3H | Original Q5 | Legacy

CHY3H

4.8.3.5 Sulfates

Answer 06 · Mark scheme

June 2014 | CH3HP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
7(a)	lithium yellow	*allow Li^+ / Li* *allow orange*	1 1	2 / 3.4.1a	E
7(b)	silver nitrate (solution) white precipitate	incorrect test = **0** marks ignore (nitric) acid do **not** allow other *named* acids	1 1	1 / 3.4.1e	E
7(c)	blue precipitate (with sodium hydroxide) indicates copper ions and white precipitate (with barium chloride) indicates sulfate ions but iron(II) ions produce a green precipitate (with sodium hydroxide)	*allow Cu^{2+}* *allow SO_4^{2-}* *accept compound X is copper sulfate/$CuSO_4$ for **1** mark*	1 1 1	3 / 3.4.1c/f	E
Total			7		

4.8.3.5 Sulfates

Answer 07 · Mark scheme

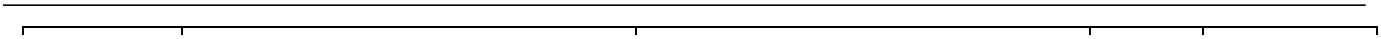
June 2015 | CH3HP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	**X:** Fe^{2+} / iron(II), SO_4^{2-} / sulfate	allow iron(II) sulfate **or** $FeSO_4$	1	**AO1/ AO2** 3.4.1.a/c/e/f
	Y: Na^+ / sodium, I^- / iodide	allow sodium iodide **or** NaI	1	
	Z: Fe^{3+} **/** iron(III), Br^- / bromide	allow iron(III) bromide **or** $FeBr_3$	1	
		correct identification of any two ions = one mark correct identification of any four ions = two marks		
7(b)	any **five** from: method 1 • weighing is accurate • not all barium sulfate may be precipitated • precipitate may be lost • precipitate may not be dry • takes longer • requires energy method 2 • accurate • works for low concentrations	allow converse arguments allow not all the barium hydroxide has reacted allow reliable / precise	5	**AO3** 3.4.1.a/c/e/f
Total			**8**	

4.8.3.5 Sulfates

Answer 07 · Mark scheme

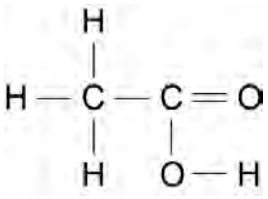
June 2015 | CH3HP | Original Q7 | Legacy



4.8.3.5 Sulfates

Answer 08 · 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	

4.8.3.5 Sulfates

Answer 08 · Mark scheme

June 2016 | CH3HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
2			6	2AO1 / 3AO2 / 1AO3 3.4.1g

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.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	There is a simple description of using some of the apparatus.	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.	There is a description of titrations that would allow a comparison to be made between the two solutions of hydrochloric acid.

examples of chemistry points made in the response could include:

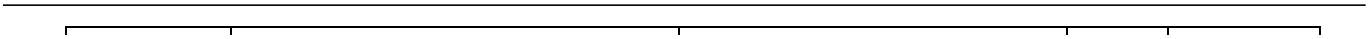
- acid in burette **or** flask
- alkali/sodium hydroxide **or** acid in burette or flask
- volume of acid **or** alkali measured using the pipette
- indicator in flask
- white tile under the flask
- slow addition
- swirling/mixing
- colour change of indicator
- burette volume measured

Total		6

4.8.3.5 Sulfates

Answer 08 · Mark scheme

June 2016 | CH3HP | Original Q1 | Legacy



4.8.3.5 Sulfates

Answer 09 · Mark scheme

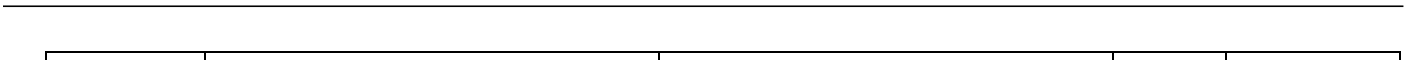
June 2018 | 8462/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	yellow	allow orange allow orange-yellow	1	AO1 4.8.3.1
01.2	copper (ion)	allow Cu^{2+} allow copper (II) allow barium (ion) allow Ba^{2+}	1	AO1 4.8.3.1
01.3	(flame) colours are masked	allow (flame) colours mix / blend allow only see one colour allow cannot see two colours at once ignore hard to distinguish	1	AO1 4.8.3.1
01.4	Li^+ Na^+		1 1	AO2 4.8.3.7
01.5	bromide (ion)	allow Br^- ignore bromine	1	AO1 4.8.3.4
01.6	add barium chloride (solution) add hydrochloric acid white precipitate produced	allow barium nitrate (solution) allow nitric acid allow acidified do **not** accept sulfuric acid dependent on use of a barium compound	1 1 1	AO1 4.8.3.5
Total			9	

4.8.3.5 Sulfates

Answer 09 · Mark scheme

June 2018 | 8462/2H | Original Q1



Answer 10 · Mark scheme

June 2019 | 8462/2H | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	add sodium hydroxide (solution to water sample) white precipitate (forms) (precipitate which is) soluble in excess (NaOH)	 dependent on correct test in MP1	1 1 1	AO1 4.8.3.2
07.2	add barium chloride (solution) **and** (dilute) hydrochloric acid (to water sample) white precipitate (forms)	allow barium nitrate (solution) allow (dilute) nitric acid dependent on addition of barium chloride / nitrate (solution) in MP1	1 1	AO1 4.8.3.5
07.3	**Level 2:** The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		3–4	AO1 4.10.1.2
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content • weigh (evaporating) basin / dish • add measured volume of water • weigh (evaporating) basin / dish and water • heat to evaporate water • reweigh • repeat heating until constant mass obtained • subtract mass of (evaporating) basin / dish from mass • repeat and calculate a mean, discarding anomalous results • calculate the mass in 100 cm^3 water if necessary			
Total			**9**	

4.8.3.5 Sulfates

Answer 11 · Mark scheme

November 2020 | 8462/2H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	green	allow blue-green	1	AO1 4.8.3.1 RPA 7
01.2	did not clean the metal wire (between tests) **or** copper sulfate (solution) is still present (so) colours are mixed / blended / masked		1 1	AO3 4.8.3.1 RPA 7
01.3	(copper sulfate solution) blue precipitate (calcium iodide solution) white precipitate	allow blue solid allow white solid	1 1	AO1 4.8.3.2 RPA 7
01.4	barium chloride (solution)	allow barium nitrate (solution)	1	AO1 4.8.3.5 RPA 7
01.5	silver nitrate (solution) yellow precipitate	 allow yellow solid allow pale yellow precipitate / solid	1 1	AO1 4.8.3.4 RPA 7
Total			8	

4.8.3.5 Sulfates

Answer 12 · Mark scheme

November 2021 | 8462/2H | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	flame test lilac (flame)	allow description of flame test	1 1	AO1 4.8.3.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	flame emission spectroscopy		1	AO1 4.8.3.6 4.8.3.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	white precipitate	ignore precipitate dissolves	1	AO1 4.8.3.2 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	(add) excess sodium hydroxide (solution) precipitate dissolves	allow (add) more sodium hydroxide (solution)	1 1	AO3 AO1 4.8.3.2 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	add barium chloride (solution) add (dilute) hydrochloric acid white precipitate	allow add barium nitrate (solution) allow add (dilute) nitric acid dependent on MP1 being awarded	1 1 1	AO1 4.8.3.5 RPA7

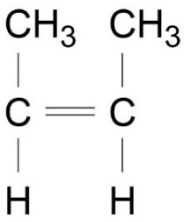
Total			9

4.8.3.5 Sulfates

Answer 13 · Mark scheme

June 2022 | 8462/2H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	C=C bond		1	AO2 4.7.3.1
	2x C-H bonds **and** 2x C-CH_3 bonds	do **not** accept extra bonds	1	
		an answer of  scores **2** marks		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	any **one** from: • (otherwise) the copper (produced) would be impure • (otherwise) the copper (produced) would be a mixture • (otherwise) the insulation would burn / melt (during recycling) • copper and poly(butene) are recycled by different methods	allow (otherwise) the copper (produced) would be contaminated allow (otherwise) poly(butene) could produce toxic fumes	1	AO3 4.10.2.2

4.8.3.5 Sulfates

Answer 13 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	(wire heated until) copper melts (re)cast / reformed (into pipes)	 allow (re)shaped / extruded / (re)moulded	1 1	AO1 4.10.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	 any **two** from: (recycling scrap copper) • uses less energy • conserves copper (ore) • (produces) less waste • specified environmental impact	allow converse statements for extracting copper from ores ignore references to cost allow less landfill required	 2	AO1 4.10.1.1 4.10.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	 sodium hydroxide (solution) blue precipitate	MP2 dependent on MP1 allow NaOH for sodium hydroxide allow blue solid	 1 1	AO1 4.8.3.2 RPA7

4.8.3.5 Sulfates

Answer 13 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	(add acidified) barium chloride (solution)	MP2 dependent on MP1 allow $BaCl_2$ for barium chloride allow (add acidified) barium nitrate (solution) do **not** accept add sulfuric acid	1	AO1 4.8.3.5 RPA7
	white precipitate	allow white solid	1	

Total Question 1		11

4.8.3.5 Sulfates

Answer 14 · Mark scheme

June 2024 | 8462/2H | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1		ignore (hydrochloric / nitric / sulfuric) acid		AO1 4.8.3.5
	(test) add barium chloride (solution)	allow add barium nitrate (solution)	1	
	(result) white precipitate		1	
		MP2 is dependent upon MP1 being awarded		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	the yield is smaller at higher temperatures because the reaction is exothermic		1	AO2 4.6.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3		allow converse		AO2 4.6.2.7
	there are more moles / molecules (of gas) on the left	ignore particles	1	
	(so the position of) equilibrium shifts to the right		1	

4.8.3.5 Sulfates

Answer 14 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	any **two** from: • the yield is already high • more energy required • risk of explosion is increased • higher income from increased yield is outweighed by the extra expenditure • increased cost of safety precautions	allow requires stronger vessels allow requires thicker walls	2	AO3 4.6.2.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	vanadium (V)		1	AO3 4.1.3.2

Total Question 7	**8**

4.8.3.5 Sulfates

Answer 09 · Examiner comments

June 2018 | 8462/2H | Original Q1

Question 1 (standard demand)

01.1 80% of students gave yellow or orange. There was a lot of variety in the wrong answers with all the colours of the spectrum represented.

01.2 This was well answered. Copper was the most common answer given although a few gave barium and gained credit.

01.3 60% of students achieved this mark. Popular incorrect responses implied that the flame colours were similar or the same.

01.4 87% of students could correctly identify both of the ions in the flame emission spectrum.

01.5 33% of students identified the correct answer as bromide. A few put bromine but many seemed to guess.

01.6 The test for sulfate ions was not well known with many students gaining only the acidification mark. 27% of students achieved full marks.

4.8.3.5 Sulfates

Answer 11 · Examiner comments November 2020 | 8462/2H | Original Q1

Question 1 (standard demand)

01.1 The majority of students were able to answer this item.

01.2 Most students were aware that the wire should be cleaned, though many suggested the wire (loop) should be sterilised. Far fewer were able to describe the effect on the results with many just repeating the third line of the question stem.

01.3 Few of the students were able to give correct precipitate colours for both copper and calcium ions. There was no real pattern in the incorrect responses, but green or brown were often seen.

01.4 Few students were able to name barium chloride (solution). Many unsuitable reagents were named, including silver nitrate

01.5 Some students were able to name the solution. Those who gave the correct solution sometimes gave the result for a different halide ion.

Answer 12 · Examiner comments November 2021 | 8462/2H | Original Q7

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

07.1 Over half of the students knew that a flame test should be used but fewer knew the correct result for potassium.

07.2 Only a few students mentioned flame emission spectroscopy as an instrumental alternative to a flame test.

07.3 Just over a third of students gave white precipitate.

07.4 Very few students were able to complete the steps needed to differentiate between metal ions producing a white metal hydroxide precipitate.

07.5 Students found this difficult with many students unable to go beyond the need to acidify the solution being tested.

4.8.3.5 Sulfates

Answer 13 · Examiner comments

June 2022 | 8462/2H | Original Q1

Question 1 (Standard demand)

01.1 This was well answered by many students. The most common errors were to omit the double bond, or to add additional bonds to the carbon atoms. Brackets and/or the inclusion of the letter n were ignored. Around two-thirds of the students scored both marks.

01.2 The majority of responses correctly referred to the insulation being burned or melted or the lack of purity or 'contamination' of the copper produced. Around 60% of students scored this mark.

01.3 This was generally well answered as the copper melting and being reformed/moulded into new pipes were commonly seen. Responses referring to 'heating the wire' were insufficient to gain credit. Around 70% of the students scored both marks.

01.4 The most common correct responses referred to the conservation of copper and the use of less energy in this process. Relatively few answers identified specified environmental impacts.

Weaker responses referred to 'pollution' alone which was insufficient to gain credit. Only around 30% of the students were able to identify two advantages of recycling.

Answer 13 · Examiner comments

June 2022 | 8462/2H | Original Q1

01.5 The specific correct reagent used and correct result, were not well known.

A variety of tests were chosen, with the most common incorrect response being the use of flame tests.

Acceptable results included shades of blue precipitate, e.g. pale/light blue, but answers giving two colours such as green/blue were not credited. Around a third of students scored both the marks.

01.6 The use of barium chloride or barium nitrate as the reagent for the test was generally followed by the correct result. Again, around a third of the students scored both the marks.

The most common incorrect responses were the use of a flame test or the use of an incorrect reagent.

The mark for the result of the test was dependent upon a mark being being awarded for a correct test.

4.8.3.5 Sulfates

Answer 14 · Examiner comments

June 2024 | 8462/2H | Original Q7

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

07.1 Around 40% of students scored two marks for this question. However, many students were not able to name the correct reagent for the test. White precipitate was often given as the result of the test, but this answer was not creditworthy unless the correct reagent had been named. Sodium hydroxide and silver nitrate were the most common incorrect reagents. A significant number of students left the answer space blank.

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Answer 14 · Examiner comments

June 2024 | 8462/2H | Original Q7

07.2 This multiple-choice question was well answered with two-thirds of students gaining the mark.

07.3 Around 30% of students scored both the marks on this question. Clear descriptions about the numbers of moles / molecules on each side of the equation and the resulting shift in the position of equilibrium at higher pressure were seen. A number of students failed to score the first marking point because they did not give a comparison of the number of moles or molecules of gas on each side of the equation. Answers that focused on changes in the rate of reaction or particle collisions were not creditworthy, nor were those which stated that the equilibrium shifted to the side with lower pressure.

07.4 This question was not well answered and only around 2% of students were awarded both marks. The most common creditworthy responses were based on the idea that a higher pressure is not used because the yield is already high or because more energy would be required to achieve a higher pressure. Many answers could not be given credit because they were not comparative. Higher risk of explosion or higher cost of safety precautions were creditworthy responses that focused on the consequences of using higher pressure compared to using a lower pressure.

07.5 This multiple-choice question was answered correctly by around a quarter of students who used their periodic table to locate and identify vanadium as a transition metal.