PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

CHEMISTRY



MARK SCHEME

TOPIC 2: STATES OF MATTER AND MIXTURES: METHODS OF SEPARATING AND PURIFYING SUBSTANCES (PAPER 1)

SCORE	PERCENTAGE
/134	%

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Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(i)	An explanation linking either • remove (delivery) tube from below water line (1) • so that {gas / water vapour / steam} can move through (delivery) tube / to prevent water being pushed up the delivery tube (1) or • (delivery) tube is too low (1) • {gas / water vapour / steam} not being able to get into the tube (1)	allow alternative description of delivery tube allow error circle on Figure 5 allow move delivery tube higher in conical flask ignore change the delivery tube (alone) MP2 depends on MP1 allow error circle on Figure 5 MP4 depends on MP3	(2) AO 3-3

Question number	Answer	Additional guidance	Mark
(ii)	Bunsen (burner) / spirit burner	allow electric heater ignore other forms of heat and equipment	(1) AO 2-2

(**Q02c 1SC0/1CF, June 2024**)

Q2.

Question number	Answer	Additional guidance	Mark
(i)	An explanation linking • simple covalent / simple molecular (1) • (because) <u>weak</u> intermolecular forces (of attraction) (1) • (so) only a small / low amount of {energy/heat} is needed (to break these forces) (1)	reject ionic / ions for MP1 & MP2 only ignore covalent alone allow weak intermolecular bonds reject weak covalent bonds reject hydrogen bonds reject weak (intermolecular) forces between bonds ignore less {energy / heat} reject breaking {covalent / ionic} bonds	(3) AO1.1

Question number	Answer	Mark
(ii)	**C** less less is the only correct answer **A** is incorrect as the particles will have less energy **B** is incorrect as the particles will move less **D** is incorrect as the particles will have less energy and move less	(1) AO1.1

Question number	Answer	Mark
(iii)	**B** Fractional distillation **A**, **C** and **D** are not correct as they would not separate oxygen and nitrogen	(1) AO2.2

(**QU03b 1SC0/1CH, June 2025**)

Q3.

Question number	Answer	Mark
(i)	**D** **Z** is the only correct answer. **A**, **B** and **C** are incorrect because they have more than one spot	**AO1-1 (1)**

Question number	Answer	Mark
(ii)	**C** **Y** is the only correct answer. **A**, **B** and **D** are incorrect because those inks have fewer spots	**AO3-1 (1)**

Question number	Answer	Additional guidance	Mark
(iii)	0.39 scores 2 marks with or without working $\frac{3.60}{9.20}$ = 0.39(1304...) (1) = 0.39 (1) (rounded to 2dp)	fraction $\frac{9}{23}$ scores 1 mark 1 mark for correct substitution and evaluation $\frac{3.60}{9.20}$ = 0.4 scores only 1 for correct evaluation to 1dp Note: 0.4 alone without working scores 0 1 mark for correct rounding (has to use the numbers 3.60 and 9.20 in the calculation) $\frac{9.20}{3.60}$ = 2.56 scores 1 (for 2dp) Note: by default 3.60 x 9.20 = 33.12 has an answer to 2dp, so 2nd mark is given	**AO2-1 (2)**

(**Q01a 1SC0/1CF, June 2023**)

Q4.

Question number	Answer	Additional guidance	Mark
(i)	An explanation linking • gain of electron(s) (1) • one electron (1)	MP2 depends on MP1 gains an electron (2)	**(2) AO 1-1**

Question number	Answer	Mark
(ii)	**D** to kill any bacteria in the water is the only correct answer **A**, **B**, **C** are not reasons why chlorine is added	**(1)** **AO 1-1**

Question number	Answer	Additional guidance	Mark
(iii)	any one from • ions {present / make test invalid} • the water is impure • tap water would interfere with analysis	allow named substances that could be present in tap water eg calcium ions / chlorine / chloride ions / magnesium ions / minerals allow (water) is not pure ignore 'sterile' / 'contains chemicals' / 'not clean' / 'contains bacteria' ignore any substances not found in tap water	**(1)** **AO 1-1**

(**Q02b 1SC0/1CF, June 2024**)

Q5.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	A description including carbon (1) atom(s) (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	covalent Ignore giant molecular		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	fractional distillation (2)	distillation fractionation	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)	**A** 0.25		**(1)**

Question Number		Indicative Content	Mark
QWC	*** (d)**	A description/explanation including some of the following points content could be shown in diagram(s) **practical procedure** • ignite magnesium /put magnesium in (Bunsen) flame • use of tongs/crucible / tube or gas jar of {oxygen/air} • lift lid (to let air in)- if crucible used • magnesium burns/oxidises/exothermic reaction • (bright) white {flame/light} • white powder/ash/solid formed **bonding** • magnesium atoms have 2 electrons in the outer shell • magnesium atoms {lose/transfer} electrons • form Mg^{2+}/ions with positive charge • oxygen atoms have 6 electrons in the outer shell • oxygen atoms gain electrons • forms O^{2-}/ions with negative charge • {8 electrons in /full/complete} outer shell • two electrons transferred/gained/lost • ions with opposite charges attract each other/ Mg^{2+} attracts O^{2-} ions	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description e.g. magnesium burns / magnesium atoms lose electrons • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description e.g. magnesium burns with a white flame / magnesium forms positive ions and oxygen forms negative ions • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description including the experiment and bonding e.g. magnesium burns with a white flame, magnesium atoms give their 2 outer electrons to oxygen atoms • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question = 12 marks)

(**Q05 1SC0/1CF, June 2014**)

Q6.

Question number	Answer	Additional Guidance	Mark
	0.528/ 0.53 with or without working scores 2 • distance = R_f x solvent front distance/ 0.22 x 2.4 (1) • = 0.528/ 0.53 (cm) (1)	MP1 for **rearranged** equation or values note : any unambiguous wording accepted in formula If additional calculation steps used, score 0 for whole question. 0.5 scores 2 only with working No ecf for MP2	**AO2 1 (2)**

(**QU06b 1SC0/1CH, June 2023**)

Q7.

Question number	Answer	Additional guidance	Mark
(i)	0.6 or $\frac{3.9}{6.5}$		**(1)**

Question number	Answer	Additional guidance	Mark
(ii)	longer paper/ different {medium/ paper}	ignore repeat experiment ignore more accurate ruler	**(1)**

Question number	Answer	Additional guidance	Mark
(iii)	An explanation linking use a different solvent (1) so that the ink will dissolve (1)	 allow any suitable named solvent allow because the ink does not dissolve in water	**(2)**

Q8.

Question number	Answer	Mark
(i)	**C** sedimentation filtration chlorination is the only correct answer **A** and **B** are incorrect as sedimentation is the first step **D** is incorrect as chlorination is the last step	**(1)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(ii)	to kill {bacteria / microorganisms / microbes / pathogens}	ignore germs / diseases allow viruses allow 'remove' / 'get rid of' / eliminate for kill allow to sterilise / disinfect (the water) ignore to clean / purify / bleach / make water clear	**(1)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(iii)	A description including: • (put waste) water in tank / left to (stand / settle) (1) • {particles / dirt / impurities / sediment / solid} <u>fall</u> to bottom (1)	 allow any put in suitable large or small container e.g. container / beaker allow for MP1 add a substance that causes clumping / aluminium sulfate must have idea that particles sink reject large(r) pieces e.g– sand / rocks / branches etc - that would be filtered ignore any references to filtration before or after sedimentation	**(2)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(iv)	an explanation linking: • (the water) contains {chlor**ide** / fluor**ide**, nitr**ate** / sulf**ate** / copper / magnesium / ions / salts } (1) • (therefore) <u>more than</u> just water (molecules) / it does not contain <u>just</u> water / which are impurities / pure substances contain <u>only</u> one substance / pure water does not contain ions (1)	allow chemicals / minerals / substances ignore particles / metals / elements / molecules / things allow pure water is just H_2O / contains hydrogen and oxygen only reject pure substances contain only one element allow pure water does not contain any of {ions in the table / these ions / specifically named ions from table} for 2 marks	**(2)** **AO3-** **2a – 1** **2b – 1**

(**Q02a 1SC0/1CF, June 2022**)

Q9.

Question number	Answer	Mark
(i)	**C** the impurities in the waste water settle to the bottom of their container **C** is the only correct answer. **A**, **B** and **D** are incorrect because no sediment is formed	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
(ii)	to remove {insoluble substances / solids}	allow named solid substances eg sand ignore materials removed by initial screening eg twigs, debris etc ignore to produce clean/pure water reject remove bacteria	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
(iii)	to kill {bacteria / microorganisms}	ignore to cleanse, purify, clean, make safe allow to remove bacteria / germs	(1) AO1

(**Q06b 1SC0/1CF, Nov 2021**)

Q10.

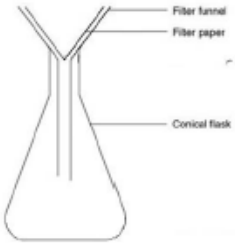
Question number	Answer	Mark
(i)	C the impurities in the waste water settle to the bottom of their container C is the only correct answer. A, B and D are incorrect because no sediment is formed	(1) AO1

Question number	Answer	Additional guidance	Mark
(ii)	to remove {insoluble substances / solids}	allow named solid substances eg sand ignore materials removed by initial screening eg twigs, debris etc ignore to produce clean/pure water reject remove bacteria	(1) AO1

Question number	Answer	Additional guidance	Mark
(iii)	to kill {bacteria / microorganisms}	ignore to cleanse, purify, clean, make safe allow to remove bacteria / germs	(1) AO1

(**Q02b 1SC0/1CH, Nov 2021**)

Q11.

Question number	Answer	Additional guidance	Mark
(i)	 (2) OR diagram: funnel with separate filter paper and (conical) flask (1) labels: (filter) **funnel and filter paper and** (conical) flask (1)	reject diagram with funnel 'closed' at bottom/top but can score MP2 allow 'closed' filter paper allow any suitable apparatus for conical flask e.g. beaker 'flask' label should be appropriate to apparatus drawn ignore labelling of filtrate/residue etc	(2)

Question number	Answer	Additional guidance	Mark
(ii)	a description including any three from: • heat solution (to concentrate) (1) then either • leave solution {in warm place / to crystallise} (1) • scrape crystals (from container) / pat dry between filter papers (1) OR • leave solution {to crystallise / to cool} (1) • filter off crystals / decant liquid from the crystals / pat dry between filter papers / dry in oven (1)	if no other marks are scored , allow max 1 for crystallisation (1)	(3)

(**Q03a 1SC0/1CH, Nov 2020**)

Q12.

Question number	Answer	Additional guidance	Mark
	A description including • (simple/fractional) **distillation** (1) • heat/ boil (1) • nickel tetracarbonyl {{boils/evaporates} off first / is obtained from top of column/ vapour is condensed by condenser} ORA (1)	 allow 'raise temp. to 50°C' etc. (temp >42 and <90) allow lower boiling point liquid for nickel tetracarbonyl	**(3)**

(**Q03c 1SC0/1CH, June 2019**)

Q13.

Question number	Indicative content	Mark
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **SEPARATION** • distillation • solution in flask • heat • water evaporates • water vapour into condenser • cooling water jacket • water vapour condensed back to liquid • water collected in beaker • solid remains in flask • boiling point = 100 °C **TEST** • take distilled water in a test tube • add a few drops of neutral litmus/Universal Indicator • correct neutral colour OR • pH probe • pH = 7	**(6)** **AO1** **AO3**

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then:
Level 1	1–2	Additional Guidance	Gives simple parts of the plan or describes the test to show the water is neutral. e.g. heat the solution (1) use the Bunsen burner to heat the solution (2) use universal indicator to test the water, it should turn green (2)
Level 2	3–4	Additional Guidance	Gives a more detailed plan or a simple part of the plan with the test to show the water is neutral. e.g. heat the solution with a Bunsen burner, the water evaporates at 100ºC (3) Heat the solution in a flask, the water will evaporate and move into the condenser where it turns back to a liquid (4) Heat the solution to evaporate the water and then use the condenser, use universal indicator to test the water which should turn green. (4)
Level 3	5–6	Additional Guidance	Gives a more detailed plan **and** the test to show the water is neutral. e.g. heat the solution, the water will evaporate and move to the condenser where it will cool and turn back to a liquid. Test the water neutral litmus paper (5) Use distillation, heat the solution in a flask, the water vapour moves to the condenser where it cools and turns back to a liquid. The water can be tested with a pH meter the reading should be pH 7 (6)

(**Q06d 1SC0/1CF, Nov 2021**)

Q14.

Question Number	Answer	Additional guidance	Mark
(i)	An explanation linking • water {boils / evaporates} (to form steam / water vapour / leaving salt behind) (1) • (steam / water vapour) condenses (to form pure water) (1) allow alternative wording for evaporate and condense	 ignore sea water evaporates sea water evaporates and condenses scores 1 overall mark independently	**(2)** AO 1 1

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation linking • use a (Liebig) condenser / surround test tube with (beaker of) {iced/cold} water / wrap delivery tube with cold cloth (1) • to increase effectiveness of cooling / amount of condensation / remove the heat energy more effectively / ensure all the water vapour condenses (1)	ignore anti bumping granules / fractionating column allow alternative suitably described methods / prevent water vapour escaping / cools water vapour faster ignore sea water vapours a closed system scores 0 overall mark independently	(2) AO 3 3b

(**Q09 1SC0/1CH, June 2018**)

Q15.

Question number	Answer	Additional guidance	Mark
(i)	(delivery) tube	allow {glass / rubber / plastic} tube	(1) AO2-1

Question number	Answer	Additional guidance	Mark
(ii)	an explanation linking: add bung / cork (to top of flask) (1) (so) {water / vapour / gas / steam} cannot escape (from top of flask) / will go into {(delivery) tube/ X} (1)	 ignore seal / block / lid / cover etc allow stopper allow incorrect naming of flask ignore 'so water is collected' allow incorrect naming of delivery tube mark independently for max 1 allow replacement of X with a (Liebig) condenser / cooling of delivery tube / ice bath around test tube (1)	(2) AO3-3b

(**Q02b 1SC0/1CF, June 2022**)

Q16.

Question Number	Answer	Mark
(i)	Diagram to show • filter funnel and filter paper (1) • collecting vessel / beaker / conical flask (1)	(2)

Question Number	Answer	Mark
(ii)	An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (1 mark) • to react all the (nitric) acid in the solution (1) • so that the calcium nitrate solution is pure (1)	(2)

Question Number	Answer	Mark
(iii)	$CaCO_3 + 2HNO_3 \rightarrow Ca(NO_3)_2 + H_2O + CO_2$ (3) left hand side formulae (1) right hand side formulae (1) balancing correct formulae (1)	(3)

(**Q05a 1SC0/1CF, SAM**)

Q17.

Question number	Indicative content	Mark
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. Do not credit separation techniques other than distillation (e.g. crystallisation/ simply evaporating off the water) or additional steps to distillation that would not work. Allow distil off (some) water and then crystallise the remaining (concentrated) sodium chloride solution. Allow fractional distillation. AO1 (6 marks) **SODIUM CHLORIDE** • ionic compound • giant lattice • positive (sodium) ions and negative (chloride) ions • strong electrostatic attraction between ions • lots of energy to overcome attraction/ bonds **WATER** • simple covalent/ molecular • strong covalent bonds between atoms in a molecule • weak forces between molecules • little energy needed to overcome the intermolecular forces **SEPARATION** • use distillation – with condenser or simple apparatus: delivery tube into test tube in ice water • water has much lower boiling point • water will distil but sodium chloride will not • water collected after being condensed • sodium chloride remains in flask	**(6)** **AO1 1** **AO1 2**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3–4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5–6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then:
Level 1	1–2	Additional Guidance a basic description of one of the types of bonding or the separation technique	Possible candidate response sodium chloride is ionic (1) use distillation (1) sodium chloride has ionic bonding and water has covalent bonding (2) sodium chloride has strong ionic bonds which take a lot of energy to break (2) heat the mixture and condense the water (2)
Level 2	3–4	Additional Guidance a description of two of the aspects: bonding in NaCl/ intermolecular forces in water/ distillation	Possible candidate response water is a simple molecular covalent compound, there are weak intermolecular forces which take little energy to break but sodium chloride is ionic (3) sodium chloride has ionic bonding, there are strong electrostatic forces of attraction between oppositely charged ions, which take a lot of energy to break and the solution is separated by distillation (3) use distillation because water has a lower boiling point than sodium chloride so water will distil but sodium chloride will not, water can be collected after it has been condensed and the sodium chloride will remain in the flask. This is because sodium chloride is ionic with strong bonds. (4)
Level 3	5–6	Additional Guidance An explanation of **both** of the types of bonding **and** of the separation technique	sodium chloride has strong ionic bonds which take a lot of energy to break whereas water has intermolecular forces which does not take a lot of energy to break. Heat the mixture and condense the water, sodium chloride is left in the flask (5) Sodium chloride is ionic, the electrostatic attractions between ions take a lot of energy to break. Water is covalent, not a lot of energy is used to overcome the intermolecular forces. Use distillation because water has a lower boiling point than sodium chloride so water will distil but sodium chloride will not, water can be collected after it has been condensed and the sodium chloride will remain in the flask. (6)

(**QU06c 1SC0/1CH, June 2023**)

Q18.

Question number	Answer	Additional guidance	Mark
(i)	An explanation linking • pure water contains {only water (molecules)/ only one substance} / impure water contains more than one substances (1) • identification <u>from label</u> of impurity: dissolved solids/ calcium (ions) / sodium (ions) / hydrogencarbonate (ion) / ions	ignore all references to pH	(2) AO3

Question number	Answer	Mark
(ii)	pH (=7)	(1) AO2

Question number	Answer	Mark
(iii)	15 mg with or without working scores 2 • 250/1000 (1) (=0.250) • 60 x 250/1000 (1) (=15) OR • 1000/250 (1) = 4 • 60/4 (1) (=15)	(2) AO2

(**Q01b 1SC0/1CF, Nov 2021**)

Q19.

	Answer	Acceptable answers	Mark
(a)(i)	fractional distillation		(1)
(a)(ii)	to make it liquid	liquefy/condense to remove water (vapour) to remove carbon dioxide	(1)
(b)	D weak forces of attraction between the oxygen molecules		(1)
(c)(i)	An description including • shared (electrons) (1) • pair(s) of electrons (between atoms) (1)	Ignore reference to complete/full shells Ignore reference to between two metals Ignore reference to between metal and non-metal Ignore reference to between molecules Any reference to between ions scores 0	(2)
(c)(ii)	2.4		(1)

(c)(iii)	diagram showing • any shared pair of electrons between a carbon and oxygen atom in CO_2 molecule (1) • rest of molecule correct (1)	Must have O C O arrangement If any atom labelled must be correct Ignore inner electrons even if wrong electrons can be on/in ring or no ring Ignore intersecting circles Accept all permutations of dots and crosses	**(2)**

(**Q12 1SC0/1CH, June 2013**)

Q20.

Question Number	Answer	Additional guidance	Mark
(i)	to measure the temperature of the {water vapour / steam / gas} passing into the condenser	to measure the boiling point of the water / the vapour should be at 100 °C when collected allow does not measure accurate boiling point where thermometer is on the diagram (or words to that effect)	**(1)**

Question Number	Answer	Additional guidance	Mark
(ii)	beaker not under condenser exit / water entering condenser in wrong place / water flow in condenser wrong way round	ignore references to no Bunsen burner / clamps shown allow beaker not under where (condensed) water comes out / no {anti-bumping granules / chips} allow beaker {is too far away (from the condenser exit)/ too far to the right / is not in the right place / needs to be closer} reject water out (without reference to end of condenser)	**(1)**

(**Q02b 1SC0/1CF, June 2019**)

Q21.

Question number	Answer	Mark
	D	(1)

(**Q05a 1SC0/1CF, SAM 2016**)

Q22.

Question Number	Answer	Mark
(i)	A tap water	(1)

Question Number	Answer	Mark
(ii)	white solid: sodium chloride (1) colourless liquid: water (1)	(2)

(**Q03a 1SC0/1CF, SAM**)

Q23.

Question number	Answer		Mark
	sedimentation → filtration → chlorination (2) first or last step correct (1)		(2) AO 1-1

(**Q02a 1SC0/1CF, June 2024**)

Q24.

Question Number		
	A air The only correct answer is **A**. **B** is incorrect since carbon dioxide is a compound and not a mixture. **C** and **D** are incorrect because gold and titanium are both metallic elements and not mixtures.	**(1)**

(**Q02a 1SC0/1CF, June 2019**)

Q25.

Question number	Answer	Mark
	C the impurities are harmless **C** is the only correct answer. **A**, **B** and **D** are incorrect as the properties are not relevant	**(1)** AO2

(**Q06a 1SC0/1CF, Nov 2021**)

Q26.

Question number	Answer	Mark
	C the impurities are harmless **C** is the only correct answer. A, B and D are incorrect as the properties are not relevant	**(1)** AO2

(**Q02a 1SC0/1CH, Nov 2021**)

Q27.

Question number	Answer	Mark
(i)	B	(1)

Question number	Answer	Mark
(ii)	use a different solvent.	(1)

Question number	Answer	Mark
(iii)	an explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • mixture S (1) • because it gives the greatest number of spots/gives four spots (1)	(2)

(**Q05d 1SC0/1CF, SAM 2016**)

Q28.

Question number	Answer	Mark
(i)	B	(1)

Question number	Answer	Mark
(ii)	use a different solvent.	(1)

Question number	Answer	Mark
(iii)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • mixture S (1) • because it gives the greatest number of spots/gives four spots (1)	(2)

(**Q01b 1SC0/1CH, SAM 2016**)

Q29.

Question Number	Answer	Additional guidance	Mark
(i)	(white/colourless) solid/crystals	ignore reference to colourless solution	(1)

Question Number	Answer	Mark
(ii)	filtration	(1)

(**Q01d 1SC0/1CF, SAM**)

Q30.

Question Number	Answer	Additional guidance	Mark
(i)	**(2) (3) 6 4 1 5** (2) any **two** in the correct order and adjacent to each other max (1)	64 / 15 / 41 next to each other in this order in any position (1)	**(2)**

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation linking • mixture **T** (1) • because it gives {the greatest number / 5} spots (1)	 allow dots or other suitable descriptor allow more {spots / separated (coloured) substances} ignore coloured substances (alone) / colours / references to spots moving further up the paper	**(2)**

Question Number	Answer	Additional guidance	Mark
(iii)	0.29 with or without working scores 2 $R_f = \frac{2.30}{8.00}$ (= 0.2875) (1) = 0.29 (1)	 allow $\frac{8.00}{2.30}$ = 3.5 (1) (other way round for 1 mark) 8.00 + 2.30 = 10 (1) 8.00 – 2.30 = 5.7 (1) (2 sf) 8.00 x 2.3 (= 18) (2 sf)	**(2)**

(**Q02c 1SC0/1CF, June 2019**)

Q31.

Question number	Answer	Additional guidance	Mark
(i)	(Liebig) condenser	allow water condenser, condenser tube reject condensation tube	**(1)** **AO2-1**

Question number	Answer	Additional guidance	Mark
(ii)	An explanation linking any **two** from: • thermometer (1) • to show **temperature** (1) • so it identifies the {fraction / substance / gas} (being condensed) (1)	 allow record, find etc allow to show boiling point / 78°C / 100°C reject 'measure heat' allow so that only {one gas / ethanol} goes to condenser / both gases do not enter condenser	**(2)** **AO2-1**

(**QU02b 1SC0/1CF, June 2025**)

Q32.

	Answer	Acceptable answers	Mark
(i)	fractional distillation		**(1)**
(ii)	to make it liquid	liquefy/condense to remove water (vapour) to remove carbon dioxide	**(1)**

(**Q18 1SC0/1CH, June 2013**)

Q33.

Question Number	Answer	Additional guidance	Mark
(i)	arrows drawn to show water going in the condenser in the bottom and out the condenser at the top	reject arrows drawn coming out of the middle of the condenser	(1) AO 1 2

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation linking • to cool (1) • so (water) {vapour/gas} turns to liquid (1)	allow water for liquid allow steam for vapour if cooling the ink max 1 for first marking point only	(2) AO 1 2

Question Number	Answer	Additional guidance	Mark
(iii)	electric heater / heating mantle	allow spirit burner allow hot plate/heated plate allow blow torch ignore heater alone ignore Bunsen burner ignore hot water bath	(1) AO 2 2

(**Q15 1SC0/1CF, June 2018**)

Q34.

Question Number	Answer	Mark
	A chromatography **The only correct answer is A** ***B*** *is not correct this would not separate colours* ***C*** *is not correct because this would not separate colours* ***D*** *is not correct because this would not separate colours in best way*	(1) AO 1 1

(**Q14 1SC0/1CF, June 2018**)

Q35.

Question number	Answer	Mark
(i)	2 / two (minutes)	**(1)**

Question number	Answer	Additional guidance	Mark
(ii)	6 - 2 (= 4) / 4 / four (minutes)	Any other manipulation of numbers leading to the answer 4 scores 0	**(1)**

(**Q01b 1SC0/1CF, June 2019**)

Q36.

Question number	Answer	Additional guidance	Mark
	Bunsen (burner)	allow spirit burner/ gas burner ignore water bath or any non-laboratory heating methods	**(1)** **AO1-2**

(**QU01b 1SC0/1CF, June 2025**)

Q37.

Question number	Answer	Additional guidance	Mark
(i)	W	reject answers with any additional letter	**(1)** **AO1-2**

Question number	Answer	Additional guidance	Mark
(ii)	distance moved by dye S = 3.8 to 4.0 **AND** distance moved by solvent front = **6.5** (1) $R_f = \frac{\text{3.8 to 4.0}}{\text{6.5}}$ (1) = fraction evaluated and correctly rounded to 2 dp (1)	if no working 0.58 / 0.60 / 0.62 scores 3 if no working 1.63 / 1.67 / 1.71 scores 2 allow $R_f = \frac{\text{2.8 to 5}}{\text{6 to 7}}$ for MP2 MP3 only scores from allowed range for MP2 or inverse 3.8 gives 0.58, 3.9 gives 0.6**0**, 4.0 gives 0.62 ignore recurring dots if fraction inverted, can score MP1 and MP3 (3.8 gives 1.71, 3.9 gives 1.67, 4.0 gives 1.63)	**(3)** **AO3-1**

(**QU02c 1SC0/1CF, June 2025**)

Q38.

Question number	Answer	Additional guidance	Mark
(i)	$C_6H_8N_2SO_2$	Letters can be in any order e.g $C_6N_2H_8O_2S$ (1) must be written as a formula numbers do not have to be subscripts ignore any formula with brackets	**AO2 1 (1)**

Question number	Answer	Additional Guidance	Mark
(ii)	A description including: • B is pure **and** A is impure **and** C is impure (1) • B has a sharp/ single melting point (1) • A **and** C have melting points {over a range / lower than (the sharp melting point of) B} (1)	ignore repeats the stem e.g. melting point is 160-164 ignore suggestions about composition e.g B is an element mark independently (can score MP2 and MP3 even if MP1 incorrect) allow fixed / specific / definite/ one/ exact/ no range ignore accurate/ precise melting point allow the melting points vary /gradual change/ not sharp/ not exact ignore these have two melting points/ different melting points (i.e idea that melts at 160 and at 164) reject boiling point only once in MP2 or MP3	**AO3 1 (3)**

(**QU06a 1SC0/1CH, June 2023**)

Q39.

Question number	Answer	Additional guidance	Mark
	A description to include either • add dilute hydrochloric acid (to solid mixture sample to react with the magnesium to form magnesium chloride solution) (1) • filter the mixture (to remove titanium) / filter off the titanium or • filter the mixture (to remove titanium) / filter off the titanium (1) • wash the titanium (1)		(2) AO3

(**Q05e 1SC0/1CH, Nov 2021**)

Q40.

Question number	Answer	Additional guidance	Mark
	(simple) distillation	allow fractional distillation	(1) AO2

(**Q05c 1SC0/1CH, Nov 2021**)