OCR
RECOGNISING ACHIEVEMENT

SPECIMEN **F**

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

CHEMISTRY A **A172/01**

Unit A172: Modules C4, C5, C6 (Foundation Tier)

MARK SCHEME

MAXIMUM MARK 60

This document consists of 16 pages

Guidance for Examiners

Additional guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, eg mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

   / = alternative and acceptable answers for the same marking point
   (1) = separates marking points
   not/reject = answers which are not worthy of credit
   ignore = statements which are irrelevant - applies to neutral answers
   allow/accept = answers that can be accepted
   (words) = words which are not essential to gain credit
   <u>words</u> = underlined words must be present in answer to score a mark
   ecf = error carried forward
   AW/owtte = alternative wording
   ORA = or reverse argument

   Eg mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)
   work done = 0 marks
   work done lifting = 1 mark
   change in potential energy = 0 marks
   gravitational potential energy = 1 mark

5. Annotations:
   The following annotations are available on SCORIS.

   ✓ = correct response
   ✖ = incorrect response
   bod = benefit of the doubt
   nbod = benefit of the doubt **<u>not</u>** given
   ECF = error carried forward
   ^ = information omitted
   I = ignore
   R = reject

6. If a candidate alters his/her response, examiners should accept the alteration.

7. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

   Eg
   For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	✓
☐	☐	✓
✓	✓	☐
✓	✓	☐
☐	☐	☐
This would be worth 0 marks.	This would be worth one mark.	This would be worth one mark.

8. The list principle:
   If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

9. Marking method for tick boxes:

   Always check the additional guidance.

   If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
   If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.
   Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

   Eg If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

   the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

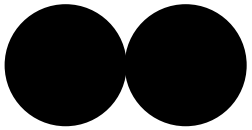
10. Three questions in this paper are marked using a Level of Response (LoR) mark scheme with embedded assessment of the Quality of Written Communication (QWC). When marking with a Level of Response mark scheme:

- Read the question in the question paper, and then the list of relevant points in the 'Additional guidance' column of the mark scheme, to familiarise yourself with the expected science. The relevant points are not to be taken as marking points, but as a summary of the relevant science from the specification.
- Read the level descriptors in the 'Expected answers' column of the mark scheme, starting with Level 3 and working down, to familiarise yourself with the expected levels of response.
- *For a general correlation between quality of science and QWC*: determine the level based upon which level descriptor best describes the answer; you may award either the higher or lower mark within the level depending on the quality of the science and/or the QWC.
- *For high-level science but very poor QWC*: the candidate will be limited to Level 2 by the bad QWC no matter how good the science is; if the QWC is so bad that it prevents communication of the science the candidate cannot score above Level 1.
- *For very poor or totally irrelevant science but perfect QWC*: credit cannot be awarded for QWC alone, no matter how perfect it is; if the science is very poor the candidate will be limited to Level 1; if there is insufficient or no relevant science the answer will be Level 0.

Question			Expected answers	Mark	Additional guidance
1	(a)		melting point decreases down the group	[1]	
	(b)		63°C	[1]	
	(c)		Websites are always wrong. ☐ We can never be sure that any measurement tells us the true value. ✓ The apparatus used to take the measurements must have been faulty. ☐ If we make several measurements of any quantity, these are likely to vary. ✓	[2]	
			Total	[4]	

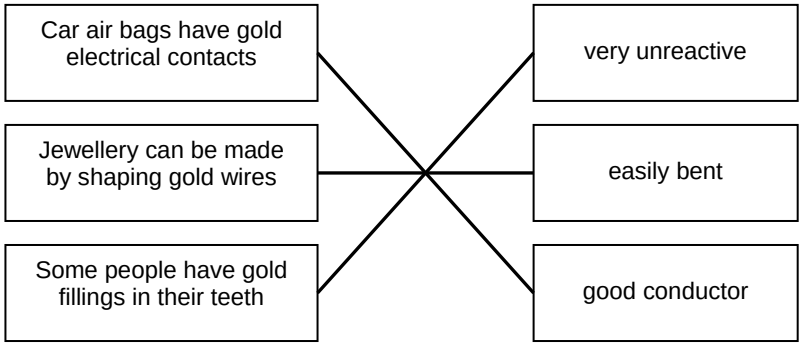
Question			Expected answers	Mark	Additional guidance
2			the similarity is that they will both have lines the difference is that the lines will be different colours / the lines will be in different places / the lines will be in a different pattern	[2]	
			Total	[2]	

Question			Expected answers	Mark	Additional guidance
3	(a)		1	[1]	
	(b)	(i)	7	[1]	
		(ii)	the group number and the number of electrons in the outer shell of an atom are the same	[1]	
			Total	[3]	

Question			Expected answers	Mark	Additional guidance
4	(a)			[1]	
	(b)	(i)	**sodium + chlorine → sodium chloride** equation shown fully correct	[1]	
		(ii)	orange gas at start and white solid at end reaction takes 8-12 s / slower than iodine but faster than chlorine	[2]	

Question			Expected answers	Mark	Additional guidance
4	(c)		**[Level 3]** Answer clearly compares all relevant properties of the two chemicals and how these properties impact on safe use, and indicates a clear choice logically linked to this comparison. All information in the answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5-6 marks) **[Level 2]** Answer compares some of the properties of the two chemicals and how these properties impact on safe use, and indicates a choice. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3-4 marks) **[Level 1]** Answer compares one property of the chemicals and indicates a choice OR answer compares one or more of the properties but does not reach a conclusion. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1-2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	[6]	**relevant points include:** *Comparison of states/boiling points:* • chlorine will be a gas (at room temperature/pressure) • so chlorine may be (more) difficult to contain/use need to used in a fume cupboard escape/be inhaled • bromine , will be a liquid (at room temperature/pressure) / has a higher boiling point • so bromine may be easier to contain/use be used without a fume cupboard be spilt on skin/clothes *Comparison of hazards:* • both are toxic • bromine is also corrosive *Comparison of reactivity:* • bromine is less reactive **ignore** references to both of the chemicals being halogens
			Total	**[10]**	

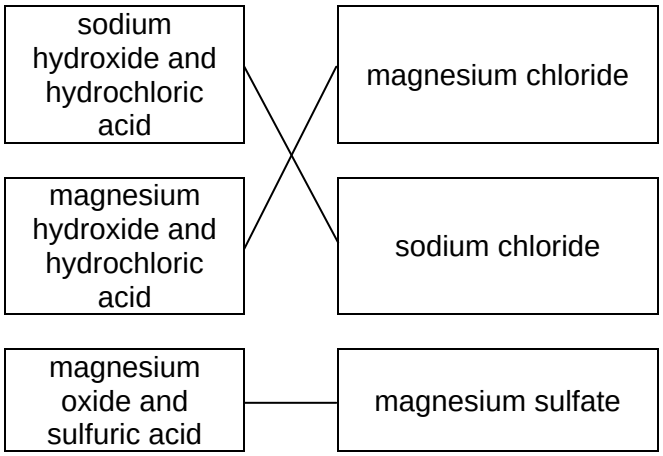
Question			Expected answers	Mark	Additional guidance
5	(a)		**[Level 3]** Chooses aluminium and uses its properties to explain suitability. Uses properties of other metals to explain their lack of suitability. Refers to compromise of properties for purpose. All information in the answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5-6 marks) **[Level 2]** Chooses aluminium and uses its properties to explain suitability. Makes some reference to properties of other metals but does not explain their lack of suitability. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3-4 marks) **[Level 1]** Chooses a metal other than aluminium. Makes some relevant comments about its suitability. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1-2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	[6]	**relevant points include:** • aluminium has lowest density so cable can span long distances • aluminium has good resistance to corrosion so cables will last a long time • aluminium has reasonable conductivity but this is a compromise • aluminium is quite cheap so lots of cables can be used for reasonable cost • gold has very good conductivity but is too heavy and is too expensive • iron is cheap but is too heavy and corrodes too easily • copper has good conductivity but is too heavy and too expensive

Question			Expected answers	Mark	Additional guidance
	(b)			[2]	All correct = 2 1 correct = 1
			Total	**[8]**	

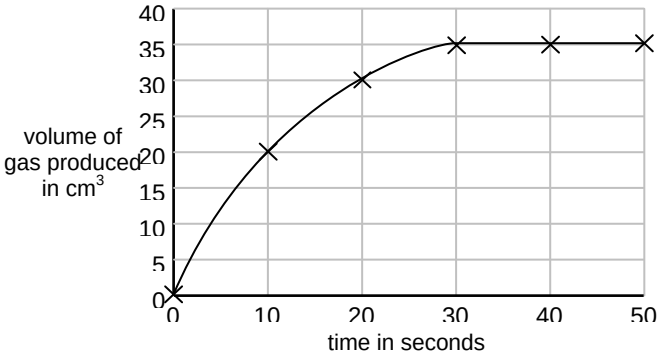
Question			Expected answers	Mark	Additional guidance
6	(a)		4	[1]	
	(b)		Formula mass of Cu_2O = 63.5 + 63.5 + 16 = 143 $\frac{63.5 + 63.5}{143} \times 100 = 88.8$	[2]	**accept** any answer correctly rounded from 88.81118881
	(c)		the mined rock will contain other minerals/impurities	[1]	**reject** suggestions that the extraction or mining procedure will not recover all of the copper
	(d)		heat the cuprite with carbon	[1]	**accept** 'reduce the cuprite' without practical details
			Total	[5]	

Question			Expected answers	Mark	Additional guidance
7	(a)		**D**	**[1]**	
	(b)		…conducts electricity when it is a solid. ☐ ☐ ✓ ☐	**[1]**	
	(c)		**B**	**[1]**	
			Total	**[3]**	

Question			Expected answers	Mark	Additional guidance
8	(a)		diamond has a giant covalent structure with no free moving electrons but graphite has layers with mobile electrons between them	**[2]**	for full marks the type of bond must be linked to the availability of electrons
	(b)		graphite is soft so leaves marks on paper	**[1]**	
			Total	**[3]**	

Question			Expected answers	Marks	Additional guidance
9	(a)			[2]	3 lines correct = 2 1 or 2 lines correct = 1
	(b)		filter the contents of the flask / pour through filter paper then crystallise the salt by evaporating the water and finally dry the crystals in an oven/desiccator	[3]	for full marks the explanation must be expressed in a logical and coherent order
			Total	[5]	

Question			Expected answers	Marks	Additional guidance
10	(a)		**citric acid**	**[1]**	
	(b)		lets the acid dissolve and produce H^+ (aq) ions. ✓	**[1]**	
			Total	**[2]**	

Question			Expected answers	Marks	Additional guidance
11	(a)		he should use the 50 cm^3 measuring cylinder because it is big enough to hold 35 cm^3 of gas but will be more accurate than the 100 cm^3 cylinder and all of the beakers	[2]	for full marks the explanation must link the choice of apparatus to accuracy of measurement
	(b)	(i)		[1]	the line of best fit should be a smooth curve that passes within 2 mm of each point **reject** straight lines drawn between points before 30 seconds
		(ii)	rate between 0 and 10 s = 20 ÷ 10 = 2 cm^3/s rate between 10 and 20 s = 10 ÷ 10 = 1 cm^3/s rate between 20 and 30 s = 5 ÷ 10 = 0.5 cm^3/s rate between 30 and 50 s = 0	[2]	units are not required for the marks, but if units are given they must be correct if no calculations are shown, **credit** "the line is steepest between 0 and 10 s" for 1 mark max.
	(c)		experiment **A** because a larger mass of magnesium pieces will give a higher rate of reaction, so more gas will have been produced by 10s and a larger mass of reactant will produce a greater volume of product/gas/hydrogen	[3]	for full marks the explanation must be expressed in a logical and coherent order
			Total	[8]	

Question			Expected answers	Marks	Additional guidance
12	(a)		**[Level 3]** Discusses all the major stages in the titration, including the measurements to be taken. All information in the answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5-6 marks) **[Level 2]** Aspects are missing, but the candidate is clearly familiar with titration as a procedure and raises at least one aspect which affects the accuracy. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3-4 marks) **[Level 1]** There is some evidence that the candidate recognises a titration as a procedure. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1-2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	**[6]**	**relevant points include:** • put the acid in the burette • add an indicator to the alkali in the flask • take the burette reading before you start adding the acid • add the acid in small amounts at a time • as you approach the rough titration add the acid more slowly and swirl the flask between each addition • stop adding the acid when you see the first permanent colour change • take the burette reading at the end
	(b)		**exothermic**	**[1]**	
			Total	**[7]**	