OCR
RECOGNISING ACHIEVEMENT

SPECIMEN H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B741/02

CHEMISTRY B

Unit B741: Chemistry Modules C1, C2, C3 (Higher Tier)

MARK SCHEME

Duration: 1 hour 15 minutes

MAXIMUM MARK 75

This document consists of 13 pages

Guidance For Examiners

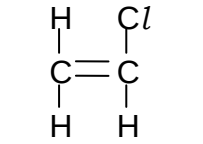
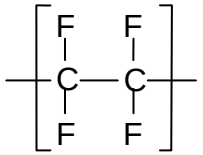
Additional Guidance within any mark scheme takes precedence over the following guidance.

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

Question	Answer	Marks	Guidance
1 a	**A** (1)	1	
b	**B** (1)	1	
c	contains carbon and hydrogen **only** (1)	1	
d	 	2	Cl can be attached to either carbon atom brackets not required
	Total	**5**	

Question	Answer	Marks	Guidance
2 a	highest concentrations at 9am and 5pm (1) lowest concentrations at night (1) idea of peaks correspond to rush hours (1)	3	
b	nitrogen (from air) reacts with oxygen (1) at high temperatures (1)	2	
c	**any two from:** idea that air quality is maintained (1) reduce or prevent harm to humans (1) control or reduce smog (1) protect buildings and/or metals (1)	2	**allow** reduce possibility of asthma or breathing difficulties
	Total	**7**	

Question	Expected answers	Mark	Additional guidance
3	**[Level 3]** Applies information on the graph to evaluate all the polymers for making a rope and identifies polymer **B** providing clear reasons why. All information in 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]** Applies information on the graph to evaluate at least three polymers for making a rope and identifies polymer **B**. 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]** Applies information on the graph to evaluate at least one polymer for making a rope and/or identifies polymer **B** as the best choice. 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:** • idea that polymer A stretches too much and cannot carry 300kg load • idea that polymer C has insufficient stretch and is too weak (cannot carry a load of 300kg) • idea that polymer D is the strong (over 300kg load can be carried) but has insufficient stretch • polymer B is the best choice • polymer B is the best choice as it stretches a little but not too much and is strong (over 300kg load can be carried) **If polymer D selected as it is the strongest and other criteria matched then level 3 can be awarded.**
		6	

Question	Answer	Marks	Guidance
4 a	3.62 (g) (1) dept of health guidelines not exceeded (1)	2	guidelines mark is ecf on total salt content
b	molecule has hydrophobic (water hating or oil loving) tail (1) idea that tail bonds with oil molecules (1) idea that head bonds with water molecules (1)	3	
c	$2NaHCO_3 \rightarrow Na_2CO_3 + CO_2 + H_2O$ formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae **but** **allow** one mark for balanced equation with minor errors of subscripts, superscripts, etc e.g. $2NahCO_3 \rightarrow Na2CO_3 + Co_2 + H_2O$ **not** and or & for + **allow** = instead of → **allow** correct multiples e.g. $4NaHCO_3 \rightarrow 2Na_2CO_3 + 2CO_2 + 2H_2O$
	Total	**7**	

Question	Answer	Marks	Guidance
5 a	oxidation (1)	1	**allow** correct answer ticked underlined or circled if answer line is blank
b	hydrogen is made at the cathode or negative electrode (1) $2H^+ + 2e^- \rightarrow H_2$ (1) NaOH is made as Na^+ and OH^- ions remain (1)	3	
	Total	**4**	

Question	Answer	Marks	Guidance
6 a	granite (1) less hard than diamond but harder than marble and limestone (1)	2	
b	marble or granite (1) reasonably hard so wear resistant (1) diamond too expensive (1)	3	**allow** limestone as it is the cheapest (2) **allow** answers referring to the appearance of granite or marble
c	granite is an igneous rock (1) marble is a metamorphic rock (1) limestone is a sedimentary rock (1)	3	**allow** correct answers involving closeness of particles or descriptions of how the rocks are formed without mentioning the rock types
	Total	**8**	

Question	Answer	Marks	Guidance
7 **a**	ammonium nitrate (1)	1	**allow** NH_4NO_3
b	sulfuric acid (1)	1	**allow** H_2SO_4
c	8 (1)	1	
d	$2NH_3 + CO_2 \rightarrow CO(NH_2)_2 + H_2O$ correct formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae **but** **allow** one mark for balanced equation with minor errors of subscripts, superscripts, etc e.g. $2NH3 + Co_2 \rightarrow CO(NH_2)_2 + H^2O$ **not** and or & for + **allow** = instead of → **allow** correct multiples e.g. $4NH_3 + 2CO_2 \rightarrow 2CO(NH_2)_2 + 2H_2O$
e	provides nitrogen (1) which builds plant protein (1)	2	
	Total	**7**	

Question			Expected answers	Mark	Additional guidance
8			**[Level 3]** Applies information from the table to evaluate all the materials for making car bodies. A sensible choice is made with good reasoning. All information in 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]** Applies information from the table to evaluate at least two materials for making car bodies and a sensible choice is given with reasons. 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]** Applies information from the table to evaluate at least one material for making car bodies and/or a sensible choice is made. 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:** • iron is strong and malleable but has a high density and rusts quickly • steel is strong, malleable and only rusts slowly but has a high density (and is more expensive than iron) • aluminium has a low density and does not corrode very quickly but is less strong than steel or iron and is expensive • use steel as it is cheap, malleable and strong • use aluminium because it is low density, quite strong and does not corrode
				6	

Question	Answer	Marks	Guidance
9 a	60-90 seconds	1	**allow** other ways of indicating the answer e.g. circling, ticking or underlining but the answer line takes precedence
b i	135-142 (seconds)	1	unit **not** needed
ii	reaction is faster because the particles have more energy / particles are moving faster (1) more collisions (per second) / more successful collisions / more energetic collisions (1)	2	
c	125 g of $ZnCO_3$ makes 44 g of CO_2 (1) so 1.25 g of $ZnCO_3$ makes 4.4 g of CO_2 (1)	2	**allow** full marks for correct answer without any working out **allow** one mark for 0.01 moles of $ZnCO_3$ reacted
	Total	**6**	

Question	Answer	Marks	Guidance
10 a i	atom economy = $\frac{160}{160+18}$ / $\frac{160}{80+98}$ / $\frac{160}{178}$ (1) **but** atom economy = $\frac{160}{160+18}$ × 100 / $\frac{160}{80+98}$ × 100 / $\frac{160}{178}$ × 100 (2)	2	**allow** atom economy formula in words for one mark
ii	percentage yield = = $\frac{17.2}{20}$ (1) **but** atom economy = $\frac{17.2}{20}$ × 100 (2)	2	**allow** percentage yield formula in words for one mark
b i	process **2** because it has the highest percentage yield (1)	1	
ii	process **1** because it has the highest atom economy (1)	1	
	Total	**6**	

Question	Answer	Marks	Guidance
11	**[Level 3]** All properties for both allotropes completely explained using ideas about structure and bonding, with reference to energy required to break bonds and the movement of electrons. All information in 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]** Two properties explained, with some detail, using ideas about structure and bonding. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3 – 4 marks) **[Level 1]** One property explained, with some detail, using ideas about structure and bonding. Answer may be simplistic. Errors of grammar, punctuation and spelling prevent communication of the science (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science such as repeating the question. Answer not worthy of credit. (0 marks)	6	**Relevant points include:** **diamond** • high melting point because it has a giant covalent structure with many strong covalent bonds that need lots of energy to break • does not conduct electricity since there are no free electrons because all electrons are involved in bonding **graphite** • high melting point because it has a giant covalent structure with many strong covalent bonds that need lots of energy to break • conducts electricity because it has a sea of delocalised electrons that are able to move
	Total	**6**	

Question	Answer	Marks	Guidance
12 a	energy transferred increases with mass of fuel used (1) **but** but energy transferred is directly proportional to the mass of fuel used (2)	2	**allow** temperature increase is directly proportional to the mass of fuel used
b	selecting experiment with 1 g (1) energy = 100 × 4.2 × 9 (1) energy = 3780 (J) (1)	3	**allow** full marks for correct answer with no working out **allow** use of other masses of fuel – correct substitution (1) energy released divided by mass used (1) correct answer (1)
c	**any two from:** can suggest further work (1) can get further evidence (1) can evaluate or check results / can repeat the experiment (1)	2	
	Total	**7**	