



GCSE

Chemistry B

Unit **B741/01**: Modules C1, C2, C3 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2015

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Annotation	Meaning
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt not given
ECF	error carried forward
	information omitted
I	ignore
R	reject
CON	contradiction
L1	Level 1
L2	Level 2
L3	Level 3

Subject-specific Marking Instructions

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
allow	=	answers that can be accepted
not	=	answers which are not worthy of credit
reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant
()	=	words which are not essential to gain credit
—	=	underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
ecf	=	error carried forward
AW	=	alternative wording
ora	=	or reverse argument

Mark each blank page and the periodic table with the 'seen' annotation.

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Question	Answer	Marks	Guidance
1 a	hexane / C ₆ H ₁₄ (1)	1	allow C ⁶ H ¹⁴ / C6H14
b	contains carbon and hydrogen (1) only / aw (1)	2	allow (formula) has only (1) C and H (1) the only is not an independent mark and must be linked to the carbon and hydrogen not contains carbon and hydrogen molecules = 0 marks for the question not contains a mixture of carbon and hydrogen = 0 marks for the question not an element containing carbon and hydrogen = 0 marks for the question not hydro atoms
c	density increases / gets bigger / gets larger (1) any value between 0.77 and 0.84 (1)	2	ignore density gets heavier allow ORA if the trend is fully described
d	fractional distillation (1) compounds have different boiling points (1)	2	allow any other way of indicating the correct answer such as a tick or a circle but answer line takes precedence this marking point is dependent on the correct method of separation allow lower boiling point gets to top allow according to its boiling point allow any reference that indicates different boiling points
e i	oxygen / O ₂ (1)	1	ignore O

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Question	Answer	Marks	Guidance
ii	hexane + oxygen → carbon + water or hexane + oxygen → carbon monoxide + water or hexane + oxygen → carbon + carbon monoxide + water (1) AND carbon monoxide (made is a dangerous gas) / makes a poisonous gas / makes a toxic gas / makes black smoke / makes soot / dirty flame / less energy produced (1)	2	ignore carbon dioxide as an extra product allow correct formula instead of names C ₆ H ₁₄ , O ₂ , C, H ₂ O and CO allow idea that energy (in fuel) is wasted
Total		10	

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Question	Answer	Marks	Guidance
2 a	poly(propenenitrile) (1)	1	allow polypropenenitrile
b	nine (1)	1	more than one tick scores 0
 c	<p>Level 3 Defines biodegradable AND Evaluates the use of the polymer giving an advantage and a disadvantage Quality of communication does not impede communication of science at this level. (5 – 6 marks)</p> <p>Level 2 EITHER Defines biodegradable AND evaluates the use of the polymer giving either an advantage or a disadvantage OR Evaluates the use of the polymer giving an advantage AND a disadvantage Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 EITHER Defines biodegradable OR Evaluates the use of the polymer giving either an advantage or a disadvantage Quality of communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <p>Definition of biodegradable</p> <ul style="list-style-type: none"> • does rot • does decay • does break down (naturally) • does break up (naturally) • is attacked by bacteria • will decompose <p>ignore corrode / will not be around for ever</p> <p>Evaluation</p> <ul style="list-style-type: none"> • advantage – when disposed of will not contribute to (long term) litter or pollution • advantage – no need to burn plastic in order to dispose of it / no need to use a disposal method that contributes to global warming • advantage – will not fill up land-fill sites • disadvantage – idea that it cannot have a long storage life • disadvantage – idea that it may start to degrade when still in use • disadvantage – not recyclable • disadvantage – polymer has a use by date <p>ignore references to strength and flexibility</p> <p>Use the L1, L2, L3 annotations in Scoris, do not use ticks</p>
Total		8	

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Question	Answer	Marks	Guidance
3 a	<p>any one from each additive and job:</p> <p>Antioxidant (1) stops food reacting with oxygen (1)</p> <p>Preservative (1) stops food going off (1)</p> <p>Food colour (1) makes food more attractive / makes food more appealing (1)</p> <p>Sweeteners (1) to lower calorific value (1)</p>	2	<p>mark the additive first – the job must match the additive</p> <p>allow named additive e.g. salt as a preservative, sorbitol as an artificial sweetener or ester to provide a pleasant aroma (to the food)</p>
b	<p>C (1)</p> <p>any two from:</p> <p>not poisonous (1)</p> <p>no smell (1)</p> <p>cheapest (1)</p>	3	<p>allow one mark for D since it is not poisonous</p> <p>not any marks for answers when A and B are given</p> <p>if no letter given allow correct reasons</p> <p>cheap is not sufficient</p>
c	<p>(bubble through) lime-water / calcium hydroxide (solution) (1)</p> <p>goes milky / goes cloudy / white precipitate / goes white (1)</p>	2	<p>ignore method focus on reagent</p> <p>second marking point is dependent on correct reagent</p>
	Total	7	

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Question	Answer	Marks	Guidance
4 a i	granite	1	allow correct answer ticked, circled or underlined in list if answer line is blank
a ii	<p>any two from:</p> <p>landscape destroyed / landscape has to be reconstructed when mining or quarrying has finished (1)</p> <p>habitats destroyed (1)</p> <p>(increased) noise (1)</p> <p>(increased) traffic (1)</p> <p>(increased) dust (1)</p> <p>idea of eyesore / visual pollution (1)</p>	2	<p>allow a problem (1) and an explanation of why it is a problem (1) e.g. (increased) noise (1) means people not able to relax / sleep (1)</p> <p>allow idea of killing animals living in the area (1) ignore just killing animals or plants</p> <p>allow (increased) air pollution (1) ignore just pollution</p>
b i	<p>strongest (1)</p> <p>and any one from: resistant to corrosion (1) easily shaped (1)</p>	2	
b ii	a mixture containing a metal (1)	1	<p>allow contains two metals / mixture containing a metal and a non-metal (1) allow a metal made from other metals (1) (limit of acceptability)</p> <p>not metals joined or metals combined or metals bonded not metal mixed with a compound</p>
	Total	6	

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Question	Answer	Marks	Guidance												
5 a	preservative / flavouring (1)	1	allow road salt / gritting roads / table salt / used to make chlorine / making sodium hydroxide / making hydrogen in food is not sufficient												
b	mining / dug out of the ground / solution mining / (drill into the salt layer and) pump water down (1)	1	accept dissolve the salt in water												
c	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Ions</th> <th>Molecules</th> </tr> </thead> <tbody> <tr> <td>(OH⁻)</td> <td>(H₂)</td> </tr> <tr> <td>Cl⁻</td> <td>Cl₂</td> </tr> <tr> <td>H⁺</td> <td>H₂O</td> </tr> <tr> <td>Na⁺</td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table> <p>all five correct scores (2) three or four correct scores (1) two or less correct scores (0)</p>	Ions	Molecules	(OH ⁻)	(H ₂)	Cl ⁻	Cl ₂	H ⁺	H ₂ O	Na ⁺				2	ignore case in formulae ignore extra entries of OH ⁻ and H ₂
Ions	Molecules														
(OH ⁻)	(H ₂)														
Cl ⁻	Cl ₂														
H ⁺	H ₂ O														
Na ⁺															
Total		4													

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Question	Answer	Marks	Guidance
6 a	<p>yes because</p> <p>none of the metals corrode in nitrogen / none of the metals corrode in the absence of oxygen or air (1)</p> <p>all of the metals show more change in acidic air (than moist clean air) (1)</p>	2	<p>If no then 0 marks for the question</p> <p>marks are for explanation rather than yes on its own</p> <p>allow for any given metal allow stays shiny instead of does not corrode allow no change instead of no corrosion</p> <p>allow for any given metal more corrosion is not sufficient for a mark</p>
b	<p>$2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$</p> <p>formulae (1) balancing (1)</p>	2	<p>balancing mark is conditional on correct formulae allow any correct multiple e.g. $4\text{Cu} + 2\text{O}_2 \rightarrow 4\text{CuO}$ allow = or \Rightarrow for arrow not 'and' or & for + allow one mark for correct balanced equation with incorrect use of upper case, lower case and subscript e.g. $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$ (1)</p>
Total		4	

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Question	Answer	Marks	Guidance										
7 a	(through their) roots (1)	1	not shoots / stems ignore leaves										
b i	<table border="1" data-bbox="405 379 934 616"> <thead> <tr> <th data-bbox="405 379 672 424">Atom</th> <th data-bbox="672 379 934 424">Number</th> </tr> </thead> <tbody> <tr> <td data-bbox="405 424 672 472">N</td> <td data-bbox="672 424 934 472">3</td> </tr> <tr> <td data-bbox="405 472 672 520">H</td> <td data-bbox="672 472 934 520">12</td> </tr> <tr> <td data-bbox="405 520 672 568">P</td> <td data-bbox="672 520 934 568">1</td> </tr> <tr> <td data-bbox="405 568 672 616">O</td> <td data-bbox="672 568 934 616">4</td> </tr> </tbody> </table> <p data-bbox="315 651 719 751"> all four correct scores (2) two or three correct scores (1) one correct scores (0) </p>	Atom	Number	N	3	H	12	P	1	O	4	2	
Atom	Number												
N	3												
H	12												
P	1												
O	4												
b ii	nitrogen (1) phosphorus (1)	2	allow N not N ₂ allow P										

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Question	Answer	Marks	Guidance
c	<p>Level 3 (5 – 6 marks) States the name of the acid <u>and</u> the alkali needed to make ammonium phosphate AND fully describes how an indicator can be used to check the pH of the solution made. Quality of written communication does not impede communication of the science at this level.</p> <p>Level 2 (3 – 4 marks) EITHER States the name of the acid <u>and</u> the alkali needed to make ammonium phosphate OR fully describes how an indicator can be used to check the pH of the solution made. Quality of written communication partly impedes communication of the science at this level.</p> <p>Level 1 (1 – 2 marks) EITHER States the name of the acid needed to make ammonium phosphate OR states the name of the alkali needed to make ammonium phosphate OR attempts to describe how an indicator can be used to check the pH of the solution made. Quality of written communication impedes communication of the science at this level.</p> <p>Level 0 (0 marks) Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <ul style="list-style-type: none"> • acid needed is phosphoric acid / H_3PO_4 • alkali needed is ammonia / ammonium hydroxide / NH_3 / NH_4OH <p>To check the pH of the solution</p> <ul style="list-style-type: none"> • add universal (indicator) / pH paper / full range indicator <p>ignore litmus / phenolphthalein / methyl orange</p> <ul style="list-style-type: none"> • compare colour obtained against colour chart <p>allow its colour tells you the pH but to see what colour it goes is not sufficient</p> <p>allow examples of colour matching with pH e.g. if it is green then it is pH 7 - the colour stated must match the pH, i.e. red, yellow, orange for a pH below 7 and blue-green, blue or purple for pH above 7</p> <p>Use the L1, L2, L3 annotations in Scoris. Do not use ticks.</p>
Total		11	

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Question	Answer	Marks	Guidance
8 a	has two different symbols / has two elements (1)	1	allow more than one type of atom allow more than one element / made from hydrogen and oxygen / made from H and O not a mixture
b i	$\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}_2$ (1)	1	allow = or \Rightarrow for arrow allow correct multiples
ii	no unwanted products / no waste products / all atoms in reactants end up in the product (1)	1	allow only one product ignore has the same number of atoms on both sides of the equation
iii	idea that 100 g is 20 x 5 g (1) So mass is 85 x 20 (1)	2	allow 1 g of H_2 makes 17 g of H_2O_2 allow 100 g of H_2 makes 17 x 100 g of H_2O_2
iv	LOOK FOR ANSWER FIRST OF ALL IF percentage yield = 90 AWARD 2 MARKS $\frac{1530}{1700} \times 100$ (1) 90 (1)	2	allow $\frac{\text{actual}}{\text{predicted}} \times 100$ or $\frac{\text{am}}{\text{pm}} \times 100$ (1)

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Question	Answer	Marks	Guidance
c i	98 (1)	1	
ii	<p>LOOK FOR ANSWER FIRST OF ALL IF atom economy = 12.7(34) OR 13 AWARD 2 MARKS</p> <p>$\frac{34}{169 + 98} \times 100$ or $\frac{34}{267} \times 100$ or $\frac{34}{34 + 233} \times 100$ (1)</p> <p>12.7 (1)</p>	2	<p>allow $\frac{M_r \text{ of desired product}}{\text{sum of } M_r \text{ of all products}} \times 100$ (1)</p>
Total		10	

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Question	Answer	Marks	Guidance
<p>9 a</p> 	<p>Level 3 Complete evaluation including some use of data from graph AND Explanation using reacting-particle model that must mention the idea of collisions Quality of communication does not impede communication of science at this level. (5-6 marks)</p> <p>Level 2 EITHER Partial evaluation including some use of data from graph AND partial explanation using reacting particle model OR Explanation using reacting-particle model that must mention the idea of collisions OR Complete evaluation including some use of data from graph Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 EITHER Partial evaluation including some use of data from graph OR Partial explanation using reacting-particle model Quality of communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <p>Evaluation</p> <ul style="list-style-type: none"> • results support the conclusion • a reference to the data in the graph to justify the answer e.g. at low concentration high reaction time which is smaller as you go the right of the graph, or the graph has a negative slope <p>Reacting particle model</p> <ul style="list-style-type: none"> • idea that as reaction time decreases the rate of reaction increases • idea that the rate of reaction increases with concentration • as acid is more concentrated particles (of acid) are more crowded • as acid is more concentrated particles (of acid) are closer together • as acid is more concentrated there are more collisions (per second) <p>allow ora i.e. as the concentration gets lower</p> <p>Use the L1, L2, L3 annotations in Scoris, do not use ticks</p>

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Question	Answer	Marks	Guidance
9 b i	As temperature increases the reaction time decreases.	1	allow ORA allow reaction time is shorter as reaction gets hotter not faster, quicker or slower times
ii	Any time between 100 and 160 seconds	1	
Total		8	

Question	Answer	Marks	Guidance
10 a	any three from: research and testing (1) energy costs / heat / electricity (1) labour costs (1) (raw) materials / (starting) materials (1) time taken for development / time taken to make the drug (1) marketing / packaging (1) plant costs / costs of the machines (1)	3	allow how much is made
b i	Idea that impurities may be dangerous or toxic / if not pure difficult to measure the exact dose	1	allow so only safe chemicals are included / no other ingredients can damage the body / avoid side-effects (from impurities)
ii	chromatography / melting point / boiling point (1)	1	allow any form of chromatography allow any form of spectroscopy allow titration / volumetric analysis
Total		5	

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Question	Answer	Marks	Guidance
11	any two from high melting point (1) high boiling point (1) does not conduct electricity (1) does not dissolve in water (1) colourless (1) good thermal conductor (1) hard / does not scratch easily (1)	2	allow clear / transparent ignore does not corrode ignore strong / tough
	Total	2	

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