OCR
Oxford Cambridge and RSA

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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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.

Question	Answer	Marks	Guidance
1 a	hexane / C_6H_{14} (1)	1	**allow** C^6H^{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

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_6H_{14}, O_2, C, H_2O and CO **allow** idea that energy (in fuel) is wasted
	Total	**10**	

Question	Answer	Marks	Guidance
2 a	poly(propenenitrile) (1)	1	**allow** polypropenenitile
b	nine (1)	1	**more than one tick scores 0**
c	**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) **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) **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) Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	This question is targeted at grades up to C Indicative scientific points may include: **Definition of biodegradable** • does rot • does decay • does break down (naturally) • does break up (naturally) • is attacked by bacteria • will decompose **ignore** corrode / will not be around for ever **Evaluation** • 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 **ignore** references to strength and flexibility Use the L1, L2, L3 annotations in Scoris, do not use ticks
	Total	**8**	

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

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	**any two from:** landscape destroyed / landscape has to be reconstructed when mining or quarrying has finished (1) habitats destroyed (1) (increased) noise (1) (increased) traffic (1) (increased) dust (1) idea of eyesore / visual pollution (1)	2	**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) **allow** idea of killing animals living in the area (1) **ignore** just killing animals or plants **allow** (increased) **air** pollution (1) **ignore** just pollution
b i	strong**est** (1) **and any one from:** resistant to corrosion (1) easily shaped (1)	2	
b ii	a mixture containing a metal (1)	1	**allow** contains two metals / mixture containing a metal and a non-metal (1) **allow** a metal made from other metals (1) (limit of acceptability) **not** metals joined or metals combined or metals bonded **not** metal mixed with a compound
	Total	**6**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5 a</td><td>preservative / flavouring (1)</td><td>1</td><td>allow road salt / gritting roads / table salt / used to make chlorine / making sodium hydroxide / making hydrogen

in food is not sufficient</td></tr>
<tr><td>b</td><td>mining / dug out of the ground / solution mining / (drill into the salt layer and) pump water down (1)</td><td>1</td><td>accept dissolve the salt in water</td></tr>
<tr><td>c</td><td><table><tr><th>Ions</th><th>Molecules</th></tr><tr><td>(OH^-)</td><td>(H_2)</td></tr><tr><td>Cl^-</td><td>Cl_2</td></tr><tr><td>H^+</td><td>H_2O</td></tr><tr><td>Na^+</td><td></td></tr><tr><td></td><td></td></tr></table>
all five correct scores (2)
three or four correct scores (1)
two or less correct scores (0)</td><td>2</td><td>ignore case in formulae

ignore extra entries of OH^- and H_2</td></tr>
<tr><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

Question	Answer	Marks	Guidance
6 a	yes because none of the metals corrode in nitrogen / none of the metals corrode in the absence of oxygen or air (1) **all** of the metals show more change in acidic air (than moist clean air) (1)	2	**If no then 0 marks for the question** **marks are for explanation rather than yes on its own** **allow** for any given metal **allow** stays shiny instead of does not corrode **allow** no change instead of no corrosion **allow** for any given metal more corrosion is **not** sufficient for a mark
b	$2Cu + O_2 \rightarrow 2CuO$ formulae (1) balancing (1)	2	balancing mark is conditional on correct formulae **allow** any correct multiple e.g. $4Cu + 2O_2 \rightarrow 4CuO$ **allow** = or $\rightleftharpoons$ 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. 2Cu + O2 → 2Cuo (1)
	Total	**4**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>7 a</td><td>(through their) roots (1)</td><td>1</td><td>not shoots / stems

ignore leaves</td></tr>
<tr><td>b i</td><td><table><tr><th>Atom</th><th>Number</th></tr><tr><td>N</td><td>3</td></tr><tr><td>H</td><td>12</td></tr><tr><td>P</td><td>1</td></tr><tr><td>O</td><td>4</td></tr></table>
all four correct scores (2)
two or three correct scores (1)
one correct scores (0)</td><td>2</td><td></td></tr>
<tr><td>b ii</td><td>nitrogen (1)

phosphorus (1)</td><td>2</td><td>allow N
not N_2

allow P</td></tr>
</table>

Question	Answer	Marks	Guidance
c	**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. **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. **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. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** • acid needed is phosphoric acid / H_3PO_4 • alkali needed is ammonia / ammonium hydroxide / NH_3 / NH_4OH **To check the pH of the solution** • add universal (indicator) / pH paper / full range indicator **ignore** litmus / phenolphthalein / methyl orange • compare colour obtained against colour chart **allow** its colour tells you the pH **but** to see what colour it goes is **not** sufficient **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 **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
	Total	**11**	

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	$H_2 + O_2 \rightarrow H_2O_2$ (1)	1	**allow** = or ⇌ 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** $\frac{actual}{predicted} \times 100$ **or** $\frac{am}{pm} \times 100$ (1)

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

Question	Answer	Marks	Guidance
9 a	**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) **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) **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) **Level 0** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** **Evaluation** • 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 **Reacting particle model** • 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) **allow** ora i.e. as the concentration gets lower **Use the L1, L2, L3 annotations in Scoris, do not use ticks**

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**	

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**	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553