OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry A

General Certificate of Secondary Education

Unit **A321/02**: Modules C1, C2, C3 (Higher Tier)

Mark Scheme for January 2011

Oxford Cambridge and RSA Examinations

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support which keep pace with the changing needs of today's society.

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.

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

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 <u>lifting</u> / (change in) <u>gravitational</u> 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.

   The example below illustrates how to apply this principle to an objective question.

   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 zero marks.	*This would be worth one mark.*	*This would be worth one mark.*

7. 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.

8. 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**

Question			Expected Answers	Marks	Additional Guidance
1	a		preservatives / antioxidants (1) (artificial) sweeteners (1) help to mix together/keep mixed ingredients/food/substances (1)	[3]	**allow** answer for named examples eg oil and water **allow** 'prevents separating' or 'keep together' for 'keep mixed' do **not** allow ideas of bonding/joining/combining/sticking together
	b		**for one mark:** presents only one valid idea **for two marks:** gives a well reasoned answer but does not cover all ideas **for three marks:** gives a well reasoned answer that covers all of the ideas	[3]	level of response - mark by outcome **answers must be based on how these people are applying the precautionary principle** there are no marks for saying that E number additives may be harmful or that these people may think that they are harmful **ignore** answers based on risk and benefit or ALARA **ideas to look for:** people are not sure whether E number additives are harmful / people think that they may be harmful; people do not have confidence in the testing that has been carried out on these additives; it is better to avoid something that could be a risk / it is better to be safe than sorry;

Question			Expected Answers	Marks	Additional Guidance
1	c		☐ The use of the additive will be … ☑ (1) ☐ ☐ A scientific committee will … ☑ (1)	[2]	
			Total	[8]	

Question			Expected Answers	Marks	Additional Guidance
2*	a		carbon hydrogen oxygen	[2]	all three correct = 2 marks two correct = 1 mark **allow** any order apply list principle
	b		**any two from:** nitrification by bacteria / nitrogen fixing bacteria; absorption by plants from soil; consumption of living organisms / animals eating / animals drinking; decay / decomposition / denitrification; excretion / egestion / manure; respiration / exhalation / inhalation / breathing; photosynthesis;	[2]	**accept** other correct processes **ignore** combustion / lightning
	c		☐ Plants take nitrogen compounds … ☑ (1) ☐ ☐ When crops are harvested … ☑ (1)	[2]	
			Total	[6]	

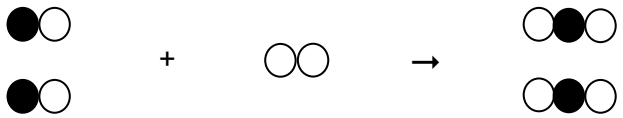
Question			Expected Answers	Marks	Additional Guidance
3	a*		**first mark** for idea that making new paper and making recycled paper involves a difference in energy used/pollution created **plus any two differences between new and recycled paper shown in the diagram, from**: *1 cutting trees* for new paper trees have to be cut but for recycled paper they do not, so jobs involved are different; *2 transport* transporting/collecting waste paper for recycling may be for greater/less distance than transporting cut trees for new paper; *3 de-inking and bleaching* recycled paper has to be de-inked/bleached but not new paper; *4 debarking and chipping* trees have to be debarked/chipped for new paper but not for recycled paper; *5 screening and cleaning* contaminants are different for new and recycled paper (so screening and cleaning is different);	**[3]**	do **not** allow marks for answers that only refer to cutting trees being less sustainable because it reduces number of trees etc / recycled paper being more sustainable since it re-uses material rather than using up resources etc first marking point must refer to energy used or pollution created or environmental impact being different for the two processes for making paper examples of differences between new paper and recycled paper must be from the diagram to score marks **accept** implied differences
	b		idea of books having a longer lifetime/being stored in libraries / idea of newspapers being produced every day/in larger quantities / books need to be bound etc (1) idea related to different pollution/energy issues from manufacture or disposal in landfill/by burning eg newspapers fill more landfill (1)	**[2]**	**ignore** idea that a book uses less paper first mark is for difference in use of books and newspaper second mark is for how this affects energy/pollution second mark must be linked to first

Question			Expected Answers	Marks	Additional Guidance
3	c		China has a higher demand … ☐ ✓ (1) ☐ ☐ ☐ ☐ … would otherwise be empty ... ☐ ✓ (1)	[2]	
			Total	[7]	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>4</td><td>a</td><td></td><td>
<table>
<tr><td></td><td colspan="4">number of atom in all molecules of</td></tr>
<tr><td></td><td>propane</td><td>oxygen</td><td>carbon dioxide</td><td>water</td></tr>
<tr><td>carbon</td><td>3</td><td>0</td><td>3</td><td>0</td></tr>
<tr><td>hydrogen</td><td>8</td><td>0</td><td>0</td><td>8</td></tr>
<tr><td>oxygen</td><td>0</td><td>10</td><td>6</td><td>4</td></tr>
</table>
</td><td>[3]</td><td>one mark for each correct row (left to right)

any box with no number in it means that row does not score</td></tr>
<tr><td></td><td>b</td><td>i*</td><td>make the polymer chains longer ☑ (1)
introduce more cross links ☑ (1)
☐
☐
☐</td><td>[2]</td><td></td></tr>
<tr><td></td><td></td><td>ii</td><td>☐
☐
The polymer chains are closer … ☑ (1)
The forces between the polymer … ☑ (1)
☐</td><td>[2]</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[7]</td><td></td></tr>
</table>

Question			Expected Answers	Marks	Additional Guidance
5	a		as the engine size increases the carbon dioxide increases (1)	[1]	**allow** '... decreases … decreases' **allow** alternatives eg goes up **ignore** positive correlation
	b	i	(160+159+157+156)/4 (2) OR 632/4 (2)	[2]	**DO NOT GIVE A MARK FOR 158 ON ITS OWN** **allow** one mark for (160+168+159+157+156)/5 **allow** one mark for 800/5
		ii	(145-120) x 12 (1) = 300 (1) OR 1740-1440 (1) = 300 (1)	[2]	**allow** both marks for correct answer (300) without working
		iii*	☐ ☐ more people using public transport … ☑ (1) ☐ having emission limits enforced … ☑ (1)	[2]	
			Total	[7]	

Question			Expected Answers	Marks	Additional Guidance
6	a*		sulfur dioxide causes acid rain (1) harms trees/harms fish/harms crops/erosion of buildings (1)	[2]	**allow** sulfur dioxide makes sulfuric acid second mark must link to first statement **allow** carbon dioxide causes greenhouse effect (1) this results in climate change / global warming (1)
	b			[2]	**allow** one mark if three correct formulae shown ie  shading must be as shown if atoms in any formula do not touch - no marks for question if any two formulae touch - no marks for the question for carbon dioxide accept non-linear shape but two white circles must not touch
	c	i	nitrogen monoxide (1)	[1]	allow nitrogen(II) oxide / nitric oxide do not allow nitrogen oxide / NO / NOx
		ii	air (1)	[1]	allow atmosphere
		iii	oxygen **and** water (1)	[1]	**both** required either order no mark if more than two given
			Total	[7]	

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

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