OCR
RECOGNISING ACHIEVEMENT

GCSE

Science A

General Certificate of Secondary Education

Unit **A142/02:** Unit 2: Modules B2, C2, P2 (Higher Tier)

Mark Scheme for January 2013

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 candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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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

Used in the detailed Mark Scheme:

Annotation	Meaning
/	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	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	indicate uncertainty or ambiguity
BOD	benefit of doubt
CON	contradiction
	incorrect response
ECF	error carried forward
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt

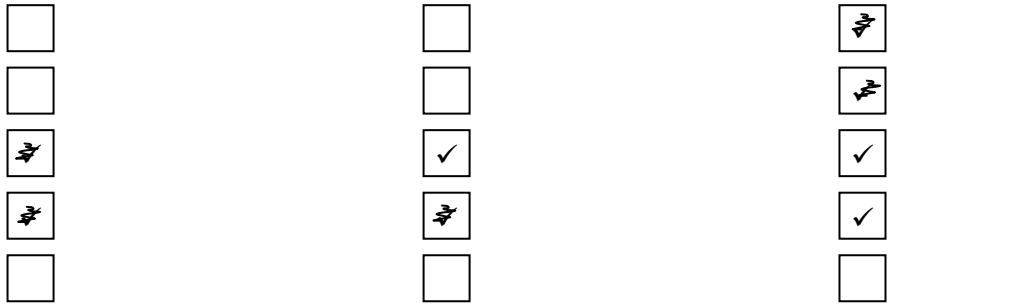
R	reject
✓	correct response
L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted

Subject-specific Marking Instructions

a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).

b. 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.

e.g. for a one-mark question where ticks in the third and fourth boxes are required for the mark:



This would be worth 1 mark.

This would be worth 0 marks.

This would be worth 1 mark.

c. 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, e.g. 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.

d. Marking method for tick-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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.

e.g. if a question requires candidates to identify cities in England:

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**

e. For answers marked by levels of response:

i. **Read through the whole answer from start to finish**
ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor
iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question			Answer	Marks	Guidance
1	(a)		rings around 10 and 50	1	**both** answers needed for 1 mark
	(b)		Any **two** from: larger surface area in particles than in lump/larger area to volume in particles; (1) so it works better/ faster; (1) spread out better; (1)	2	
	(c)		The effects of nanoparticles have not been fully investigated. ✓	1	tick in any other box = 0
			Total	**4**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>2</td><td>(a)</td><td></td><td>any two from:
<table><tr><th>factor (1)</th><th>explanation (1)</th></tr><tr><td>size / shape</td><td>more area, more water absorbed</td></tr><tr><td>temperature</td><td>higher temp more evaporation</td></tr><tr><td>movement of air</td><td>more movement more evaporation</td></tr><tr><td>time immersed in water</td><td>more time more water absorbed</td></tr><tr><td>volume/mass/amount of water</td><td>water may not reach all parts of the material less water absorbed</td></tr><tr><td>shape of containers</td><td>water may not reach all parts of the material less water absorbed</td></tr></table></td><td>2</td><td>1 mark for a correct factor and 1 mark for the correct explanation for that factor</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>(92 + 102 + 95 + 98 + 103)/5 (1)
= 98 (1)</td><td>2</td><td>any attempt to work out a mean eg 4/3 numbers added together divided by 4/3 = 1 mark

correct answer alone give 2 marks</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Maximum of 2 marks for:

no real difference/cannot tell if there is a real difference because:
ranges overlap; (1)
difference in means is 9, which is not very large; (1)

mean of X is outside range of Y, but mean of Y is not outside range of X; (2)</td><td>2</td><td>allow 98 is not very different from 107</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

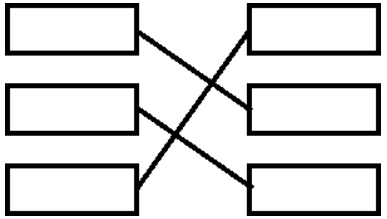
Question			Answer	Marks	Guidance
3	(a)	(i)	B	1	
		(ii)	A	1	
		(iii)	C	1	
	(b)		polymerisation	1	

Question			Answer	Marks	Guidance
	(c)		**[Level 3]** Two correct modifications given with detail on the forces between molecules and how this makes a difference to flexibility strength and melting point. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Two correct modifications linked to a change in property with a correct statement about intermolecular forces. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** One correct modification linked to a change in property or a comment about intermolecular forces linked to a change in property without mention of a modification. Quality of written 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 A/A*** **Indicative scientific points may include:** **Modifications are:** • increasing chain length • cross-linking • adding plasticizers • increasing crystallinity **Intermolecular forces :** • increase with increasing chain length • increase a lot with cross-linking • decrease when plasticizers added • increase with increasing crystallinity **How changing intermolecular forces affects properties** • stronger intermolecular forces make it more difficult to break molecules apart from each other so stronger • stronger intermolecular forces mean more energy needed to break molecules from their solid structure so melting point higher • weaker intermolecular forces allow polymer molecules to slide past each other so more flexibility **allow** vulcanisation for cross-linking **ignore** any mention of boiling point
			Total	**10**	

Question			Answer	Marks	Guidance
4	(a)		all 3 points correctly plotted (1) smooth curve (1)	2	point at 33 should be between lines points at 24 and 18 should be on the lines mark given for smooth curve through all points; ecf slight plotting errors if no points plotted mark for line can be given if it goes through the 3 correct points
	(b)		yes because: checking at least one pair of values (1) repeated with another pair (1)	2	no credit for 'yes' marks for checking values **allow** 6 sheets gives reading of 13-14 for 1 mark
	(c)	(i)	Photons arrive over a larger area around X. ✓ Radiation spreads out as it travels from the source. ✓	2	deduct one mark for each extra tick
		(ii)	**one** from each <u>photon</u> has more energy (visible light) has <u>higher</u> frequency (thanIR)	1	 use of 'it' refers to visible light
			Total	**7**	

Question			Answer	Marks	Guidance
5	(a)	(i)	Amy ☐ Barry ☐ Chris ☐ Donna ✓ Erik ☐	1	
		(ii)	Amy ✓ Barry ☐ Chris ☐ Donna ☐ Erik ✓	1	**both** ticks needed for 1 mark
		(iii)	Amy ✓ Barry ☐ Chris ☐ Donna ☐ Erik ✓	1	**both** ticks needed for 1 mark
		(iv)	Amy ☐ Barry ☐ Chris ☐ Donna ☐ Erik ✓	1	
	(b)	(i)	time calculated for one message type (1); quantitative comparison with other message type (1)	2	text = 1/100 s, photo = 100 s if both calculations are correct comparison mark is given
		(ii)	higher quality/ better images / more pixels / better resolution /each has more information/bytes	1	**ignore** bigger images
			Total	**7**	

Question			Answer	Marks	Guidance
6			**[Level 3]** CO_2 increase linked to human activity. Recognises link to global warming. Either discusses outcomes of global warming or the debate on why CO_2 increasing. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** CO_2 increase linked to human activity. Recognises link to global warming or to an outcome of global warming or there is some comment on the debate. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** CO_2 increase linked to human activity. There is no discussion of global warming, its outcomes or the debate. Quality of written 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 A/A*** **Indicative scientific points may include:** **graph linked to human activity** • CO_2 increasing since start of industrial revolution • CO_2 increasing more since 1950 • increased industrial activity, more power stations, more cars means more fossil fuels burned so more CO_2 • deforestation means less CO_2 used in photosynthesis **global warming** • increasing CO_2 has been linked to increasing temperatures on Earth – global warming. • CO_2 is one of the main greenhouse gases. **outcomes of global warming** • climate change: possibly drought/floods, melting icecaps, agriculture threatened, cities threatened • huge lifestyle changes needed to avert catastrophe • public reluctance (in developed countries) to accept lower standard of life. **debate** • changes in CO_2 are cyclical so current increase is nothing to do with human activity • vested interests in status quo or in scientific community • political/public need for reassurance • media bias eg right-wing press, Fox news. **accept** discussion of need for power in developing countries **accept** discussion of leaked emails from UEA and public confidence
			Total	6	

Question			Answer	Marks	Guidance
7	(a)		chemicals that kill/inhibit bacteria/fungi (1)	1	**allow** viruses/microorganisms / microbes **allow** fight / treat infection **do not allow** diseases
	(b)	(i)	decrease (1); starting at 90% (1)	2	
		(ii)	mutation / not completing course of antibiotics (1); left with only the resistant bacteria so they become a greater proportion of the population as time progresses (1)	2	**allow** natural selection for one mark
		(iii)		1	
		(iv)	antibiotics don't affect viruses (so line would be horizontal on x-axis)	1	**allow** antibiotics don't treat viruses
			Total	**7**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>8</td><td>(a)</td><td></td><td>any three:
chance of curing their cancer (1)

chance of extending the life expectancy (1)

side effects are relatively minor (1)

chance to contribute to research (1)

potentially save lives in the future (1)</td><td>3</td><td>allow
save them
drug works

chance of survival

develop new drugs</td></tr>
<tr><td></td><td>(b)</td><td></td><td>any two from
to be certain of effectiveness; (1)
side effects of drug; (1)
to allow sufficient data to be obtained for reliable results; (1)
make sure drug is safe; (1)</td><td>2</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td><table><tr><th></th><th>doctor only</th><th>patient only</th><th>both doctor and patient</th><th>neither doctor nor patient</th></tr><tr><td>open label</td><td></td><td></td><td>✓</td><td></td></tr><tr><td>blind</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>double-blind</td><td></td><td></td><td></td><td>✓</td></tr></table></td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
9	(a)		as stress increases, risk of heart disease increases (1)	1	**allow** reverse idea/any wording **allow** more cases of stress means more cases of heart disease
	(b)		**[Level 3]** Answer clearly identifies candidate's choice of someone at highest and lowest risk of heart disease. These suggestions are supported by detailed evidence from the table to show why the decision was made. Candidate reviews most factors in the table and justifies the decision either by comparison with another person or by using correct science. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer identifies candidate's choice of someone at highest and lowest risk of heart disease. Both suggestions are supported by some evidence from the table to show why the decision was made. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer identifies candidate's choice of someone at highest and lowest risk of heart disease or identifies **one** of these with some evidence from the table to show why the decision was made. Quality of written 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:** • high risk choice likely to be Norman or Olive • low risk choice likely to be Anne or Polly Highest risk: • male • older • less active • smoker • high fat diet • drinks alcohol Lowest risk: • female • younger • more active • non-smoker • low fat diet • does not drink alcohol • fatty deposits in blood vessels supplying the heart muscle can produce a heart attack
			Total	**7**	

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