

# **Additional Applied Science**

General Certificate of Secondary Education

Unit **A191/02**: Science in Society (Higher Tier)

## **Mark Scheme for June 2013**

---

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.

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.

© OCR 2013

**Marking Instructions**

For answers marked by levels of response:

- a. **Read through the whole answer from start to finish**
- b. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor
- c. **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

- d. 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.

**Annotations**

Used in the detailed Mark Scheme:

<b>Annotation</b>	<b>Meaning</b>
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
<b>not/reject</b>	answers which are not worthy of credit
<b>ignore</b>	statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	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	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt
	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

Question			Answer	Marks	Guidance
1	(a)	(i)	<b>any 2 from:</b> checking food is safe / suitable (to eat); checking food ingredients match label; identifying allergens in food; testing for contamination/food poisoning	2	<b>accept</b> any correct examples <b>ignore</b> if referring to food quality / standard of food /healthy food
		(ii)	<b>any 2 from:</b> collect / analyse samples or data monitoring industrial sites; checking water quality; identifying flood risks; monitoring air quality; protection of wildlife	2	<b>accept</b> any correct examples <b>allow</b> monitor pollution for 1 mark
		(iii)	<b>any 2 from:</b> searching for evidence; collection of evidence; recording evidence / crime scene; preserving or labelling evidence / crime scene; providing evidence in court	2	<b>accept</b> any correct examples
	(b)	(i)	B because close together / no outliers and near to 10/actual mass; not A because measurements are (precise but) not accurate; not C because measurements are (accurate but) not precise	3	B because all within range 9.9 to 10.0g/all $\pm 0.1$ of 10g' = 1 mark <b>allow</b> 'not A because measurements not near to 10' <b>allow</b> 'not C because measurements not close together/has outliers'
		(ii)	systematic; balance was inaccurate	2	<b>allow</b> equipment errors/all higher than actual mass
		(iii)	repeatability cannot be measured because each student only takes one reading; reproducibility is close, ie, within $10 \pm 0.1$ g;	2	
<b>Total</b>				<b>13</b>	

Question	Answer	Marks	Guidance
2	<p><b>Level 3 (5–6 marks)</b> Method includes all key points. Detailed comparison of graphs including correlation / non correlation. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Method contains most detail. Comparison of graphs with some explanation. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Brief vague account of method with little detail. Some reference to graphs with little or no explanation / comparison. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to A</b></p> <p><b>Relevant points include:</b></p> <p><b>General</b></p> <ul style="list-style-type: none"> <li>• good account should explain the method in logical sequence and what the graphs show.</li> </ul> <p><b>method</b></p> <ul style="list-style-type: none"> <li>• take water sample</li> <li>• place measuring cylinder over paper with black X</li> <li>• pour in sample</li> <li>• continue until X disappears when looking down through sample</li> <li>• record depth</li> <li>• explanation ie. the greater the turbidity the shallower the depth</li> </ul> <p><b>OR</b> method based on Secchi disc</p> <p><b>graphs show</b></p> <ul style="list-style-type: none"> <li>• more suspended solid gives higher turbidity</li> <li>• both go up and down with similar pattern</li> <li>• go up and down because amounts vary with time</li> <li>• good correlation between suspended solids and turbidity but not exact match</li> <li>• identify places (eg dates) where the graphs correlate</li> <li>• identify places (eg dates) where the graphs do not correlate</li> </ul>
	<b>Total</b>	<b>6</b>	

Question		Answer	Marks	Guidance	
3	(a)	(i)	102 / 1.78 <sup>2</sup> OR 1.78 x 1.78 = 3.1684; 102 / 3.1684; 32	3	<b>Max 2</b> marks if not whole number. <b>accept</b> 32 (3) <b>accept</b> 32.19 for 2 marks <b>ignore</b> units
		(ii)	29;	1	<b>accept</b> 29 only
		(iii)	(changes from obese to) overweight / lower category	1	<b>ECF</b> from above
		(iv)	(to continue the) diet; exercise	2	<b>allow</b> 1 mark for “keep doing what you are doing” <b>ignore</b> smoking <b>accept</b> reduce alcohol
	(b)	(i)	total pulse rate x 2 = 622; 30000/622; 48.2	3	48.23 / 48 = max 2  <b>allow</b> 1 mark for answer to 3 sf provided that it matches the evaluation of any given calculation
		(ii)	poor	1	<b>allow</b> answer consequential to (b)(i)
		(iii)	Neil is fitter/above average; aerobic training / cardiovascular training / example; detail of aerobic fitness eg better circulation/more powerful heart beat/slower heart rate/bigger lung capacity	3	<b>ignore</b> stamina / endurance <b>ignore</b> weight training
<b>Total</b>			<b>14</b>		

Question	Answer	Marks	Guidance
4	<p><b>Level 3 (5–6 marks)</b> A detailed description of electrophoresis, including some explanation of the process, with some idea of comparison of samples. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Incomplete description of electrophoresis with some idea of comparison of samples OR a good idea of comparison of samples with a reference to use of electrophoresis. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Recognition that DNA testing or electrophoresis is used with some idea of comparison of samples. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to A/A*</b></p> <p><b>Indicative scientific points at Level 3 may include:</b></p> <ul style="list-style-type: none"> <li>• fragments charged</li> <li>• use of pd/electrodes</li> <li>• positive charges move to negative electrode and visa versa</li> <li>• the bigger the charge the faster they move</li> <li>• the smaller the particle the faster it moves</li> <li>• fragments move at different speeds</li> <li>• unique pattern of fragments</li> </ul> <p><b>Indicative scientific points at Level 2 may include:</b></p> <ul style="list-style-type: none"> <li>• use of gel</li> <li>• DNA fragments</li> <li>• can be used on small samples</li> <li>• match results against data base</li> </ul> <p><b>Indicative scientific points at Level 1 may include:</b></p> <ul style="list-style-type: none"> <li>• understand that electrophoresis is used.</li> <li>• useful for separating biological molecules eg DNA</li> <li>• compare results with sample from attacker</li> </ul>
	<b>Total</b>	<b>6</b>	

Question		Answer	Marks	Guidance
5	(a)	Litmus is qualitative; Universal indicator is semi quantitative	2	
	(b)	Qualitative – a test that determines the presence or absence of a substance; Quantitative – a test that determines the amount of a substance present	2	<b>allow</b> gives a 'yes/no' answer <b>allow</b> 'gives a number'
	(c)	pH/acidity/alkalinity	1	
		<b>Total</b>	<b>5</b>	

Question	Answer	Marks	Guidance
6	<p><b>Level 3 (5–6 marks)</b> Some description and explanation of method including a comparison. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Description of chromatography but may lack detail. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Description of a method with no explanation. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades C and D</b></p> <p><b>Relevant points include:</b></p> <p><b>Explanation</b></p> <ul style="list-style-type: none"> <li>• idea of reference sample from school wall – for comparison</li> <li>• idea of unknown sample from paint can – for comparison</li> <li>• different dyes move at different speeds / same dyes travel at same speed/distance</li> <li>• compare dyes that have separated with R<sub>f</sub> value and colour.</li> </ul> <p><b>Description</b></p> <ul style="list-style-type: none"> <li>• paint spotted onto chromatogram on start line.</li> <li>• placed in solvent so paint above solvent surface</li> <li>• enclosed</li> <li>• leave to develop until solvent front is near top of paper</li> </ul> <p><b>Indicative of lower L1</b></p> <ul style="list-style-type: none"> <li>• take a sample of <b>both</b> paints, and do something with them.</li> </ul> <p><b>Indicative of higher L1</b></p> <ul style="list-style-type: none"> <li>• take a sample of <b>both</b> paints, and do something with them and compare them.</li> </ul> <p>assume water soluble unless otherwise stated</p> <p><b>Level 3 does not require ideas such as movement between phases.</b></p>
	<b>Total</b>	<b>6</b>	
	<b>Paper Total</b>	<b>50</b>	

**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](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://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**

© OCR 2013

