OCR
Oxford Cambridge and RSA

Cambridge National

Science

Unit **R072/02:** How Scientific Ideas Have Developed

Level 2

Mark Scheme for June 2014

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.

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	alternative wording
ORA	or reverse argument

Available in scoris to annotate scripts

BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	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
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt

R	reject
✓	correct response
	draw attention to particular part of candidate's response
^	information omitted

Subject-specific Marking Instructions

a. If a candidate alters his/her response, examiners should accept the alteration.
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 boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

☐
☐
☒
☒
☐

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

☐
☐
✓
☒
☐

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

☒
☒
✓
✓
☐

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 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, e.g. 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.

E.g. 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**

MARK SCHEME:

Question			Answer	Mark	Guidance
1	a	i	<table><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>Without thinking</td><td>✓</td></tr><tr><td></td><td></td></tr></table>	[1]	
		ii	<table><tr><td>(D)</td><td>A</td><td>E</td><td>B</td><td>(C)</td></tr></table>	[1]	
	b	i	<table><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>Simple</td><td>✓</td></tr></table>	[1]	
		ii	some are **faster** than average; so some must **be slower** than average;	[2]	Ignore yes/no Allow: close to the mean/average/above below Needs a comparison of both higher and lower for 2 marks
		iii`	**any 2 from** Repeat test (more times); getting more good/below average times; compare his times with others	[2]	 Allow: To obtain a range of reaction times
	c		<table><tr><td></td><td></td></tr><tr><td>Auditory faster than visual</td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	[1]	
	d		12 years	[1]	
	e	i	Control / for comparison	[1]	**ignore** to make it a fair test Idea of control/ comparison
		ii	Slower reactions / longer response time More likely to make errors/mistakes;	[2]	Allow slower response time Allow more likely to have an accident
	f	i	(45+40+40+35+40) ÷ 5 / 200 ÷ 5 ; 40 cm;	[2]	Correct answer alone = 2 marks
		ii	286 ms	[1]	270-295 inclusive Allow ecf from part (i)
			Total	**[15]**	

Question			Answer	Mark	Guidance
2	a		Geocentric ✓ Heliocentric ✓ ✓ ✓ ✓ Gravity ✓ ✓ Expanding ✓	[4]	Mark each row separately
	b		Telescopes ✓ Satellites ✓	[2]	
	c	i	Distance too short (for a measurable time); reactions not fast enough/are different	[2]	allow: light travels too fast allow idea of testing reaction times
		ii	**Any two from:** Could not measure/know the distance to Jupiter; refer to speed = distance / time; distance underestimated;	[2]	Allow Jupiter was further away than thought
		iii	300,000	[1]	
	d		Improved/better/modern equipment/technology available; easier to look for/find evidence after prediction	[2]	Allow more instruments
	e		Straight lines ✓ carry data ✓	[2]	
			Total	**[15]**	

Question			Answer	Mark	Guidance
3	a		**[Level 3]** Correctly explains working of dominant and recessive allele, or explains how dominant flower may contain recessive gene but not vice versa. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Describes idea that a gene comes from each parent or may bring different characteristics. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Recognises existence of genes or a mechanism for handing down characteristics to next generation. 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 Level one Distinction** **Indicative scientific points may include:** **Indicative scientific points at Level 3 may include:** • Dominant allele is always expressed as a characteristic • Recessive allele may not be expressed as a characteristic • Purple flower may have white allele (as well as purple) • White flower has only white alleles. • Each allele may be associated with a specific characteristic • Both alleles the same means one characteristic only in offspring • Two different alleles means either characteristic is possible **Indicative scientific points at Level 2 may include:** • Seed has two copies of each gene, one from each parent • Each gene associated with a characteristic (eg flower colour) **Indicative scientific points at Level 1 may include:** • Characteristics are passed on in genes/DNA Candidates may draw a Punnett Square &/or offer estimates of ratio of purple: white flowers to explain the required points for a level three answer. However this is a Level 2 spec statement, so cannot be required. **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>3</td><td>b</td><td></td><td>
<table>
<tr><td></td><td></td></tr>
<tr><td>Repeat experiments</td><td>✓</td></tr>
<tr><td>Check results</td><td>✓</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table>
</td><td>[2]</td><td></td></tr>
<tr><td></td><td>c</td><td></td><td>Any 2 from
More ideas;
share workload;
check each other’s work;
more experiments done / more results/data;
quicker</td><td>[2]</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[10]</td><td></td></tr>
</table>

<table>
<tr><td>4</td><td>a</td><td></td><td>Increases/more concentrated;

Idea of increasing rate / faster/bigger each (10)each years</td><td>[2]</td><td>rises from 316 to 388 gets 1 mark
Allow calculations to show this
Increases by 72 gets 1 mark
But Increases more every (10) years gets 2 marks</td></tr>
<tr><td></td><td>b</td><td></td><td>Any two from
fossil fuels/coal/oil/natural gas;
named example of use (eg.cars,factories)
deforestation</td><td>[2]</td><td>
do NOT allow two marks for two forms of fuel
do NOT allow two marks for two named examples

allow increased population</td></tr>
<tr><td></td><td>c</td><td>i</td><td>23%</td><td>[1]</td><td></td></tr>
<tr><td></td><td>c</td><td>ii</td><td><table><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>Increased over 40 years</td><td>✓</td></tr><tr><td></td><td></td></tr></table></td><td>[1]</td><td></td></tr>
<tr><td></td><td>d</td><td></td><td>[Level 3]
Explains the warming mechanism and gives at least 2 ways in which it could impact on the Earth.
Quality of written communication does not impede communication of the science at this level.
(5 – 6 marks)

[Level 2]
Describes warming mechanism and an effect of warming on the Earth.
Quality of written communication partly impedes communication of the science at this level.
(3 – 4 marks)

[Level 1]
Outlines how warming may happen or gives an effect of warming on the Earth.</td><td>[6]</td><td>This question is targeted at grades up to Level one Distinction

Indicative scientific points may include:

Mechanism for warming:
• The Sun radiates heat to the Earth
• Earth radiates (IR) energy
• CO_2 can absorb this energy
• Less heat lost (than gained)
• Overall temperature rises
• The Greenhouse effect

ignore ref to ozone layer

Effects of warming:
• Ice caps melt
• Rising sea levels</td></tr>
</table>

			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)		• Increased risk of extreme weather • Increased risk of flooding • increased risk of drought/desertification **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**[12]**	

5	a		**Any three from:** Fossils; Found in (sedimentary) rocks; (Skeleton) reassembled; Computer generated image	[3]	 Allow bones/remains of skeleton Ignore DNA Allow visit museum / look on internet/book Ignore carbon dating
	b		Comparison with other fossils in same strata/rocks	[1]	Allow (radio) carbon dating
	c		Select (two) horses which can run fast/(have a named sensible characteristic); Allow them to breed/produce offspring; (Repeat by) selecting fastest offspring; QWC clear answer in a logical sequence	[4]	 Allow selective breeding (1)
			Total	**[8]**	
			Overall Total	**[60]**	

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

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