OCR
Oxford Cambridge and RSA

Cambridge National

Science

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

Level 2

Mark Scheme for June 2015

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.

1. **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

	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

2. 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		(air molecules) move forward **and** back / closer together **and** further apart	1	
	b	i	(0.40 + 0.38 + 0.44 + 0.36 + 0.37) = 1.95 / 5; = 0.39 (s)	2	Correct answer with no working gets both marks
		ii	Reaction time is less significant / smaller error in measuring larger number;	1	**Ignore:** longer time.
		iii	100/0.29 = 344.8 or 345 (m/s)	1	
	c	i	**Any two from:** To share knowledge / ideas / explanations; To allow others to repeat / check / compare work; To allow others to extend work / collect more data / to facilitate further discoveries;	2	**Accept:** to obtain recognition / credit **Ignore:** Peer review
		ii	Light travels at 300,000 km/s / same speed	1	**Accept:** idea of travelling through space
	d		Allowed “over the horizon” communications	1	
	e		(Wavelength of UV is) shorter (than visible light) / less than 0.00004 cm ORA	1	**Accept:** shortest (of those considered)
	f		**Any 2 from** different / distinct signal / wave sent; (different) wavelength; (different) frequency; so no interference / crosstalk	2	**Ignore:** same base station; **ignore:** satellites
	g		(wave can be) Reflected (from ceiling)	1	**Accept:** bounce off
	h		do not spread out / escape; do not lose (much) energy;	2	**Accept:** Reflect off the sides of the fibre
			Total	**[15]**	

Question			Answer	Mark	Guidance
2	a		idea of control group; for comparison;	2	
	b		**Any two from:** dipstick is quantitative / gives a numerical measurement; dipstick is precise / accurate; dipstick is reliable / taste is subjective;	2	**Accept:** reverse arguments. **DO NOT ALLOW** no need to taste urine **Ignore:** faster, easier etc
	c		**Any three from:** 15 is within **his** "normal" range"; although at the lower end; need to repeat experiments; and repeat without seeds for comparison; QWC Answer addresses the question and is clear	4	
			Total	**[8]**	

Question			Answer	Mark	Guidance
3	a		Binomial; Taxus / taxus; Baccata / baccata;	3	
	b		Same genetics / clipping is an acquired characteristic / not passed on to offspring	1	**Accept:** He can shape it later
	c	i	Chimpanzee	1	
		ii	**any 2 from** idea of branching features developed 'below' gorilla branch are the same; features developed 'after' gorilla branch are different; idea that there are more stages in the evolution of humans;	2	
		iii	DNA can show evidence (of relationships); (may be) different to visible characteristics;	2	
			Total	**[9]**	

Question			Answer	Marks	Guidance
4	a		**[Level 3]** Describes continental drift AND gives detailed supporting evidence AND reasons for rejection of Wegener's ideas. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Gives pieces of evidence to support continental drift AND reasons for rejection of Wegener's ideas. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Gives pieces of evidence to support continental drift OR reasons to reject it OR a piece of evidence and a reason. 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 two Distinction** **Indicative scientific points may include:** **Reason for rejection** • he was not a geologist • continents could not be seen to move / idea of moving continents too extreme at the time • lack of evidence • no measurements of movement could be made • no mechanism idea **Evidence for Wegener's theory** • " Jig-saw" fit of continents • Continuity of fossils/same fossils • Continuity of rock strata / same rocks • mountains along edges of continents • Earthquakes along edges of continents • Volcanoes along edges of continents **Continental drift:** • continents all once formed one supercontinent (Pangaea) / continents once all together • continents moved away from each other / continents change position / spread out **Ignore**: ideas or evidence later than Wegener e.g. tectonics, mid ocean ridges, magnetised rock **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>4</td><td>b</td><td>i</td><td>
<table>
<tr><td></td><td>T</td><td>F</td><td>?</td></tr>
<tr><td>10x as fast</td><td>✓</td><td></td><td></td></tr>
<tr><td>Faster</td><td></td><td>✓</td><td></td></tr>
<tr><td>Thicker</td><td></td><td>✓</td><td></td></tr>
<tr><td>Not moving</td><td></td><td></td><td>✓</td></tr>
<tr><td>More slowly</td><td></td><td></td><td>✓</td></tr>
</table>
</td><td>4</td><td>5 correct : 4 marks
4 correct: 3 marks
3 correct: 2 marks
2 correct: 1 mark</td></tr>
<tr><td></td><td>b</td><td>ii</td><td>Measurements had not been made at that time/
movement was too slow for existing equipment;</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[11]</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
5	a		**Any four from:** DNA is two long chains (diagram 1 and 2); joined together idea (diagram 1); Double helix (diagram 1); Base pairs (diagram 2); idea of complementary bases (diagram 2); idea of shapes fitting of bases (diagram 2); A-T & C-G (diagram 2);	4	At least one idea for each diagram

Question			Answer	Marks	Guidance
	b		**[Level 3]** Describes what is happening in the diagram using ideas about base pairing and adds additional information about the next stages in the process. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Describes what is happening in the diagram using ideas about base pairing. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes simple features of protein synthesis shown on the diagram. 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 two Distinction*** **Indicative scientific points may include:** **Simple features from the diagram** • idea that the structure of mRNA depends on the DNA/ idea of blueprint /Allow idea of information 'copied'. • recognises that the letters refer to bases on DNA and mRNA • bases have different shapes / letters • DNA strands "unzip" / separate • idea of transcription • DNA strands re-join. **Ideas about base pairing** • base on mRNA is determined by DNA • Idea that each base only pairs to one other • C-G (allow A-T) • recognises that T does not feature in mRNA • U is in mRNA but not DNA • idea that sequence of bases determined by DNA **Other stages of the process** • RNA moves out of nucleus • to ribosome • Protein built up at ribosome • From code in RNA molecule • Uses amino acids to make proteins • Idea of translation **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**[10]**	

Question			Answer	Mark	Guidance
6	a		Vasodilation / expand blood vessels (near skin); blood flows nearer the surface; Allowing heat to be lost (from skin);	3	**Ignore:** Sweating, skin hair etc.
	b		idea of reversal / opposing; to the normal;	2	**Accept:** Homeostasis
	c		Cannot design a test / not repeatable; No proof /evidence;	2	**Accept:** Matter of belief
			Total	**[7]**	
			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

PART OF THE CAMBRIDGE ASSESSMENT GROUP

LLOYD'S REGISTER QUALITY ASSURANCE · ISO9001 · UKAS MANAGEMENT SYSTEMS 001