

Cambridge National

Science

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

Level 2

Mark Scheme for January 2017

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 2017

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

Annotation	Meaning of annotation
	indicate uncertainty or ambiguity
	Benefit of doubt
	Contradiction
	Cross
	error carried forward
	Extendable ellipse
	Extendable horizontal line
	Development

	Benefit of doubt not given
	Reject
	Tick
	Extendable vertical wavy line
	Omission mark

1. Here are the subject specific instructions for this question paper
 - 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 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.

2. Here is the Mark scheme for this question paper.

Question		Answer	Marks	Guidance															
1	(a)	(nuclein) contains phosphorus; does not contain sulfur;	2	ORA Accept 'contains different elements' (1)															
	(b)	(To extract) white blood cells; (needed a lot) to provide enough material	2	Ignore fair test															
	(c)	<table border="1"> <thead> <tr> <th></th> <th>T</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>Carbon</td> <td></td> <td></td> </tr> <tr> <td>Hydrogen</td> <td></td> <td>5</td> </tr> <tr> <td>Oxygen</td> <td></td> <td>1</td> </tr> <tr> <td>Nitrogen</td> <td></td> <td>3</td> </tr> </tbody> </table>		T	C	Carbon			Hydrogen		5	Oxygen		1	Nitrogen		3	1	
	T	C																	
Carbon																			
Hydrogen		5																	
Oxygen		1																	
Nitrogen		3																	
	(d)	DNA is the same <input type="checkbox"/> different DNA <input checked="" type="checkbox"/> Guanine < Thymine <input checked="" type="checkbox"/> Adenine = Thymine <input type="checkbox"/> Guanine lowest percentage <input type="checkbox"/> Adenine highest percentage <input type="checkbox"/>	2																
	(e) (i)	diffraction / scattering / bouncing off ;	1																
	(ii)	poor picture / difficult to obtain pure crystals / to increase confidence in the result	1	Accept to increase reliability / make sure of her results															
	(f) (i)	not enough combinations / only 16 possible codes	1																
	(ii)	1200	1	Accept 1203 / 1206 to allow for "start" & "stop" codons															

Question			Answer	Marks	Guidance
(g)	(i)		Triplet code	Amino acid	2 three correct – 2 marks 2 correct – 1 mark
			CAT	His	
			TCA	Ser	
			CAC	His	
			GTA	Val	
			ATG	Met	
	(ii)	the same; CAT and CAC both code for “His” / same amino acid.		2	
			Total	15	

Question	Answer	Marks	Guidance
2	<p>[Level 3] Good description of selective breeding AND Natural selection AND a comparison. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Good description of selective breeding AND Natural selection. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Good description of selective breeding OR Natural selection OR a limited description of both. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to D</p> <p>Indicative scientific points may include:</p> <p>Selective breeding</p> <ul style="list-style-type: none"> • Variety in population • Choose largest individuals • Breed large individuals • Select largest offspring • Repeat selection & breeding • Over many generations <p>Natural selection</p> <ul style="list-style-type: none"> • Variety in population • Some individuals better fitted to environment • These breed more successfully • Over many generations <p>Comparison</p> <ul style="list-style-type: none"> • Slow change in characteristics • As a result of external pressure • Population changes over time <p>Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</p>
	Total	6	

Question			Answer	Marks	Guidance					
3	(a)	(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>[E]</td> <td>B</td> <td>A</td> <td>D</td> <td>[C]</td> </tr> </table>	[E]	B	A	D	[C]	2	B before A; A before D;
[E]	B	A	D	[C]						
		(ii)	Reduce (effect of) change / restores original state	1						
	(b)	(i)	<p>Idea of being convenient for player (1) Eg no need to stop playing (for a reading) / Will not get in the way/ restrict movement</p> <p>Idea of being convenient for trainer (1) Eg continuous / frequent readings / automatically recorded / Accurate reading / no human interpretation</p>	2	Ignore other measurements (eg pulse)					
		(ii)	blood vessels widen / allow more blood near skin; to increase heat loss;	2	Reject: any movement of blood vessels					
		(iii)	Produce sweat / perspiration; which evaporates / removes heat	2	Allow: Cools down / returns to normal temperature					
			Total	9						

Question		Answer	Marks	Guidance
4	(a)	visible light <i>infra-red</i> microwaves radio waves	2	All three correct for 2 marks If wrong allow 1 for light shortest OR radio wave longest
	(b)	eye.....light (1); aerial.....microwaves (1); receiver.....radio waves (1)	3	
		Total	5	

Question	Answer	Marks	Guidance
5	<p>[Level 3] Gives most features of Copernicus's model and states how Newton's work supports model. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Gives most features of Copernicus's model. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Gives at least two features of Copernicus model. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to D</p> <p>Indicative scientific points may include:</p> <p>Copernicus's model:</p> <ul style="list-style-type: none"> • Sun at centre • Earth orbits Sun • Moon orbits Earth as well as Sun • Planets orbit Sun • Planets have no small orbits • Fixed stars around <p>Newton:</p> <ul style="list-style-type: none"> • Maths used to determine orbits • Gravity keeps planets in orbit <p>Look for features of model on labelled diagram Ignore descriptions of ancient model (in question stem)</p> <p>Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</p>
	Total	6	

Question		Answer	Marks	Guidance
6	(a)	all straight lines (1); reflection correct (1)	2	allow free hand drawing
	(b)	high data transfer rate / rapid communication of large quantities of data; no data loss / less interference idea ;	2	do not allow just faster unless answer shows it's the data rate
	(c)	correct substitution: film size/rate (1); correct interpretation of unit prefix: 5×10^9 and 40×10^6 (1); 125 (1)	3	allow 5/40 for this mark allow 5 with 9 noughts and 40 with 6 noughts correct answer without working gets 3 marks answer 0.125 gets max 1 (for correct substitution)
		Total	7	

Question		Answer	Marks	Guidance
7	(a)	Any TWO from: jig-saw fit of continents; same (animal/plant) fossils; similar rock strata/layers	2	Ignore: same animals/plants
	(b)	theory did not account for force to move continents / could not detect movement of continents	1	Ignore: Meteorologist/not a geologist
Total			3	

Question			Answer	Marks	Guidance
8	(a)	(i)	straight line / linear (1); through origin (1)	2	
		(ii)	further galaxies moving away faster (1); every galaxy moving away from every other galaxy (1)	2	
	(b)	(i)	can now detect galaxies further away (1); more powerful telescopes/detectors (1)	2	do not allow just detect more galaxies allow better equipment/techniques/technology
		(ii)	correct rearrangement: $h_0 = v/d$ (1); correct substitution: eg 70000/1000 (1); 70 (1)	3	must be data from graph 2 and must be seen Accept 69-72 / ecf from misread graph correct answer without showing data gets 2
Total				9	

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

© OCR 2017

