

Cambridge National

Science

Unit **R072/01**: How Scientific Ideas Have Developed

Level 1

Mark Scheme for January 2016

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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.

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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 should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

MARK SCHEME:

Question			Answer	Mark	Guidance												
1	a	i	Phylum	1													
		ii	Genus; Species	2	Either order												
	b		<table border="1"> <thead> <tr> <th></th> <th>Animal</th> <th>Plant</th> <th>Mineral</th> </tr> </thead> <tbody> <tr> <td><i>Homo sapiens</i></td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td><i>Lycopersicon....</i></td> <td></td> <td>✓</td> <td></td> </tr> </tbody> </table>		Animal	Plant	Mineral	<i>Homo sapiens</i>	✓			<i>Lycopersicon....</i>		✓		2	
	Animal	Plant	Mineral														
<i>Homo sapiens</i>	✓																
<i>Lycopersicon....</i>		✓															
	c	i	too much data (to be classified)	1	Accept too many more new species												
		ii	Working in teams / specialising / sharing information / use of computers	1	Ignore have the technology												
	d	i	Stamens / male parts; female parts / pistil / carpel / stigma / style / ovary;	2	Allow sexual characteristics (1)												
		ii	Idea that it/DNA was not known / had not been discovered	1													
	e	i	feet & beaks	1	both required												
		ii	(both have) webbed feet; pelican has a larger beak (ORA)	2	Allow have same type/similar feet Ignore both have feet and beak / same beak Allow different size beaks												
	f		Any two from: Biodiversity / variety / many species; species adapt; species become extinct	2													
			Total	[15]													

Question		Answer	Mark	Guidance
2	a	All offspring were the same /tall	1	
	b	increase confidence / more reliable	1	Accept reproducible / check results / similar results Do not accept accurate
	c	<p>[Level 3] Describes results of both experiments AND identifies a genotype Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Describes results of both experiments OR Tall gene is dominant / short gene is recessive OR identifies a genotype Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Describes results of one experiments OR existence of dominant or recessive feature OR idea of inheritance of genes. 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 Level 1 Distinction.</p> <p>Indicative scientific points may include:</p> <p>Genotype: True breeding plants are homozygous True breeding Tall plants have two Tall alleles True breeding Short plants have two Short genes F1 generation have one Tall and one Short genes F1 generation is heterozygous.</p> <p>Height of plant is determined by genes Tall gene is dominant / short is recessive Tall gene is expressed Genes passed on</p> <p>Results: Experiment 1 F1 offspring are all tall Experiment 2 F2 offspring are mixed / some are small</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p> <p>Accept use of Punnett Squares</p>
		Total	[8]	

Question			Answer				Mark	Guidance
3				Ancient Greeks	Copernicus	Newton	4	
			The Earth orbits the Sun.		Y			
			The Sun orbits the Earth.	Y				
			The Moon orbits the Earth.	Y	Y			
			The planets orbit the Earth.	Y				
Total						[4]		

4	a	i	C / 280 (ms)	1	
		ii	$(310 + 320 + 280 + 290) / 4$ or $1200 / 4$; = 300 (ms)	2	Correct answer scores 2.
	b	i	Three/most times are lower (than previous experiment)	1	Accept any two from F, G and H. Accept 350 is outlier
		ii	not enough data	1	Accept E is higher Accept mean is unchanged
		iii	Any two from: Repeat experiment (on himself); Collect data on other people; Extend study; Literature search	2	
Total				[7]	

Question		Answer	Mark	Guidance												
5	a	(A) D B C	2	D before B (1) B before C (1) All three correct (2)												
	b	i	1	Newton												
		ii	1	Gravity												
	c	Any two from: too far away (for naked eye); didn't use a telescope/binoculars; too much light pollution;	2													
	d	i	2	Any two from: making it widely known / promote discussion / share ideas; (allowing others) to repeat work; (allowing others) to check data / conclusions; (allowing others) to do further research / extend work; ensure he gets the credit;												
		ii	2	<table border="1"> <tr> <td>...older than the universe</td> <td></td> </tr> <tr> <td>wrong value</td> <td>✓</td> </tr> <tr> <td>better data</td> <td>✓</td> </tr> <tr> <td>Individual scientists</td> <td></td> </tr> <tr> <td>universe is getting smaller</td> <td></td> </tr> <tr> <td>Earth is the centre of the universe</td> <td></td> </tr> </table>	...older than the universe		wrong value	✓	better data	✓	Individual scientists		universe is getting smaller		Earth is the centre of the universe	
...older than the universe																
wrong value	✓															
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	e	i	1	D Accept D indicated on diagram												
		ii	1	<table border="1"> <tr> <td>A has the lowest mean</td> <td></td> </tr> <tr> <td>A has the smallest range</td> <td>✓</td> </tr> <tr> <td>B has the largest range</td> <td></td> </tr> <tr> <td>A and B similar mean values</td> <td></td> </tr> </table>	A has the lowest mean		A has the smallest range	✓	B has the largest range		A and B similar mean values					
A has the lowest mean																
A has the smallest range	✓															
B has the largest range																
A and B similar mean values																

Question		Answer	Mark	Guidance
	f	Any 3: (smallest) gamma (γ), X-rays, ultraviolet (UV), Infra-red, microwave, radio (largest)	2	Correctly names 3 parts of the electromagnetic spectrum other than light (1) correct order from smallest wavelength to largest (1) Accept 2 correct named parts in the correct order for 1 mark
Total			[14]	

Question		Answer	Mark	Guidance
6	a	increases; (then) becomes constant	2	Accept gets hotter / warm
	b	<p>[Level 3] Explains why body temperature rises AND a response AND a mechanism. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Explains why body temperature rises & a response OR why body temperature rises & a mechanism OR a response & a mechanism. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Explains why body temperature rises OR a response OR a mechanism Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p>	6	<p>This question is targeted at grades up to Level 1 Distinction.</p> <p>Indicative scientific points may include:</p> <p>Why does temperature rise? Muscle cells respire / release energy muscles work / generate heat making body temperature rise</p> <p>Response: promoting sweating Allow vasodilation (not required at this level).</p> <p>Mechanism: Homeostasis receptor in brain processor in brain evaporation removes excess heat</p>

Question			Answer	Mark	Guidance
			[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)		Use the L1, L2, L3 annotations in Scoris; do not use ticks.
	c	i	Any two from: Body is losing heat / blanket prevents heat loss; Sweating cools body down; No longer generating as much heat;	2	Accept not losing body heat / keeping body heat in
		ii	Need glucose / carbohydrates / sugar; in the blood;	2	Accept sugar used up during the race
			Total	[12]	
			Total	[60]	

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