OCR
Oxford Cambridge and RSA

Cambridge National

Science

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

Level 2

Mark Scheme for January 2014

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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

Annotation	Meaning
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt **not** given
ECF	error carried forward
^	information omitted
I	ignore
R	reject
CON	contradiction
L1	Level 1
L2	Level 2
L3	Level 3

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
allow	=	answers that can be accepted
not	=	answers which are not worthy of credit
reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant
( )	=	words which are not essential to gain credit
__	=	underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
ecf	=	error carried forward
AW	=	alternative wording
ora	=	or reverse argument

Question			Answer	Mark	Guidance
1	a		**Any two from:** goes up and down; up after meals; doesn't change much/not too high/low;	2	**Ignore** comparisons with non-diabetic graph
	b		(Using glucose for) exercise / respiration etc; excreted / not replaced from store	2	**accept** may have injected insulin
	c		**Any two from:** (mean gives) reliable results; Shows more data; eliminates outliers / individual variations;	2	**Ignore**: more accurate
	d		Ayo; Roshanee	2	either order
	e	i	CAGGTC	1	
	e	ii	use of 3 and 51; =153	2	answer of 153 is worth 2 marks
	e	iii	**Any two from:** Risk / social unacceptability of working on embryos / humans; humans are multicellular / bacteria unicellular; bacterial generation shorter; human diabetes is not necessarily genetic therefore interfering with genes may not have any affect	2	**Ignore** "easier"
	f		**Any two from:** Bovine insulin is almost identical / similar effect as human insulin; human pancreas / bodies / insulin not available / bovine insulin readily available; no genetic modification / knowledge of DNA;	2	
			Total	**15**	

Question			Answer	Mark	Guidance
2	a	i	continents had moved / drifted / fitted together	1	**Ignore** continents were connected
		ii	same fossils found on different continents	1	or examples
	b		**Any three from:** Radioactive/nuclear decay (in core); (causes) heating; convection currents in the mantle; which can move continents; clear and well expressed answer (1)	4	
			Total	**6**	

Question			Answer	Mark	Guidance
3	a		slug; only has one feature / idea of slug being the most simple animal;	2	
	b		**[Level 3]** Justifies the position of most animals and explains why frogs and lizards are present on the same 'branch' of the diagram. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Gives an explanation to justify the position of animals on the diagram either in terms of their features and / or their stage of evolution. uses count/progression of named features Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Explains that complexity of animals increase but may not refer to the features of the animals. refers to number of ticks / features without being specific 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 2 Distinction** **Indicative scientific points may include:** • the diagram increases in complexity of animals from the bottom to the top. • the stages in the diagram show how each animal has evolved a new feature • slugs are the simplest and so must be placed at the bottom • humans are most complex and so must go at the top • humans are the most complex because they have most features/ slugs are simplest as they have only one • animals are arranged depending on the number of features they have. • frogs and lizards are placed on an equal branch • frogs and lizards have the same (number of) features • humans/animals higher up the diagram have features that animals below them do not have • each animal at a higher level on the diagram shares all the features of those below (with some additional features)

Question			Answer	Mark	Guidance
	c		<table><tr><td></td><td></td></tr><tr><td>analyse DNA</td><td>✓</td></tr><tr><td>computer technology</td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	2	box 2; box 3;
			Total	**10**	

Question			Answer	Mark	Guidance
4	a		131 (ms)	1	
	b		**[Level 3]** Discusses how evidence clearly links to both ideas, identifying data points to support each idea and any weaknesses in that support. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Identifies evidence to support both ideas but does not necessarily link the evidence clearly to the idea or clearly links evidence to one person's theory. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Identifies evidence to support Ken OR Eve's idea but does not necessarily link the evidence clearly to the idea. 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 2 Distinction*** **Indicative scientific points may include:** **Ken's idea** • reaction times get longer • reaction times get longer in every test / with increased driving time • when Ken has been driving for a longer time/is more tired reaction times are longer. • Within one session times (generally) get longer • Longer times correspond to more tired • Last test each day is slowest • Day one gets faster then slower **Eve's Idea** • reaction times get shorter for the first few readings. • each day the reaction times are (generally) shorter than the previous • Ken has more practice as the test continues • Ken has more practice the more days he does the test / learns how to do it • Day two is slower than day one • identifies 'wrong' or 'unexpected results
	c		new line of investigation idea / more tests / idea that sucking peppermints might shorten reaction time;	1	
	d		sensory neurone central nervous system (CNS) motor neurone	2	All 3 correct (2) 2 correct (1) 1 correct (0)

Question			Answer	Mark	Guidance
	e		**Any two from:** idea that can't design tests / methods; cannot go back to previous life / back in time; so no data /evidence is available;	2	**Ignore** Past life may/does not exist.
			Total	**12**	

Question			Answer	Mark	Guidance
5	a	i	Arrow between the same place in two successive waves	1	
		ii	Radio (waves)	1	
	b	i	Equipment not invented yet (owtte) / too fast	1	**Ignore** cannot be seen
		ii	300,000 km/s	1	**Accept** 300,000,000 m/s
	c	i	refracted; by ionosphere	2	**Accept** reflected; bent / bounced back by a layer of the atmosphere;
		ii	Morse	1	**Accept** phonetic spelling
			Total	**7**	

Question			Answer	Mark	Guidance
6	a		better magnification / resolution / clearer image; can tell difference between stars and galaxies / can identify galaxies / see shape of galaxies;	2	
	b		**Any two from:** Newspapers tell the public / many people idea; scientific conference – other scientist check data/ see if they agree etc; getting credit / acknowledgements;	2	
	c		red shift ✓	1	box 3
			Total	**5**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>7</td><td>a</td><td></td><td>
<table>
<tr><td></td><td>Lamarck</td><td>Darwin</td><td>Both</td></tr>
<tr><td>…over time.</td><td></td><td></td><td>✓</td></tr>
<tr><td>…stretches…</td><td>✓</td><td></td><td></td></tr>
<tr><td>…inherit…</td><td></td><td></td><td>✓</td></tr>
<tr><td>…die out.</td><td></td><td>✓</td><td></td></tr>
</table>
</td><td>2</td><td>All correct = 2
2/3 correct = 1
1 correct = 0</td></tr>
<tr><td></td><td>b</td><td></td><td>choose greyhounds with longer necks;
breed them together;
repeat for several generations</td><td>3</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>5</td><td></td></tr>
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