OCR
Oxford Cambridge and RSA

Cambridge National

Science

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

Level 2

Mark Scheme for January 2018

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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.

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 RM Assessor 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

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.	Put ticks (✓) in the two correct boxes.	Put ticks (✓) in the two correct boxes.
☐	☐	☒
☐	☐	☒
☒	✓	✓
☒	☒	✓
☐	☐	☐
This would be worth 1 mark.	This would be worth 0 marks.	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**

Question			Answer	Marks	Guidance
1	a		*Any **TWO** from:* Surgeons have images taken previously to work from / idea of being able to see the problem ; Tiny hole compared with need to make larger cuts / <u>only</u> a tiny hole needed ; outcome: less time needed for stitching / blood loss / cutting into the body /less time for healing	**2**	 ORA Accept: Lower chance of infection Ignore “less time to recover” (stem)
	b		(visible) light infra-red microwaves radio (waves)	**3**	Visible before IR (1) IR before microwaves (1) Microwaves before radio (1)
	c		Earth is curved (1); Signals travel in straight lines (1)	**2**	
	d		For the same thickness of wire/fibre/cable (1); optical can carry more data (per second) (1)	**2**	
	e		Ray of light reflects off wall of glass fibre (ignore angle of reflection) (1); correct ray shown reflecting at least twice through the fibre with roughly correct angles (1)	**2**	MP1 is for first reflection
	f	i	Shows 300 000 000 – 200 000 000 (= 100 000 000) (1); (10 0000 000/300 000 000 x100=) 33(.33…..) (1)	**2**	 Correct answer without working gets 2 marks

Question			Answer	Marks	Guidance
		ii	7 000 000 / 200 000 000 (1); 0.035 (1)	**2**	 Correct answer without working gets 2 marks **Allow** 1 mark for use of 300 000 000 leading to answer 0.023(3….) **Allow** 1 mark for 350
			TOTAL	**15**	

Question			Answer	Marks	Guidance
2	a		Idea of peer review / Volta was repeating Galvani's work (1); The results were the same / idea of reinforcing Galvani's work (1)	2	
	b	i	*Any **TWO** from:* Do more experiments / repeat ; Use different animals ; Isolate parts of animals inside the legs and try to identify which part is responsible for movement	2	
		ii	Lack of equipment or technology idea / can't measure (1); Cannot test God idea (1)	2	
		iii	Idea that only animals could produce electricity (1); (Provisional) because he had to change his mind / proved himself wrong (1)	2	
		iv	(made it easier because) could generate electricity / could have supply of electricity / did not have to rub skin to make electricity	1	**Ignore** 'easier' alone
			TOTAL	9	

Question			Answer	Marks	Guidance
3	a	i	*Any **THREE** from:* (convection currents in the) mantle; cause movement ; to push plates apart / plates move apart; new magma rises up; new magma forms ridges; as plates move apart, valley forms;	3	/ carbo
		ii	*Any **TWO** from:* mountains; volcanoes; earthquakes; (rift) valleys ;	2	**Ignore** continental drift (not a feature)
	b		*Any **TWO** from:* continents used to be close together; continents have moved (moved) apart	2	
	c		suggested a mechanism / explained how continental drift happened / gave an explanation for Wegener's ideas	1	
	d		led to other scientists investigating / doing more research (1); to look for a cause / collect more data / find an explanation (1)	2	
			TOTAL	10	

Question			Answer	Marks	Guidance
4	a		Shows 18+14+14+15+11 (=72) (1); To make average distance (72÷5 =) 14.4 (cm) (1); Estimates reaction time 0.160-0.169 s (**allow** any value in this range) (1)	3	 **Allow** ecf from mp1 **Allow** ecf from mp2 **Allow** 0.16 Correct reaction time without working gets 3 marks
	b		**[Level 3]** Makes a statement to compare trends in Joe's and Eve's reaction times and includes one piece of data and suggests explanations. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Makes a statement to compare trends in Joe's and Eve's reaction times and includes one piece of data **OR** Makes a statement to compare trends in Joe's and Eve's reaction times and suggests an explanation. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Makes a statement to compare trends in Joe's and Eve's reaction times. 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 D*D*** **Indicative scientific points may include:** **Compares trends in Joe's and Eve's reaction times** • Both show overall decrease in reaction times • First result for both is (significantly) longer/slower than others. • Joe is faster/shorter reaction time than Eve / Eve is slower/longer reaction time than Joe • Both show an outlier / one time that is than general trend **Data** • Quotes a reasonable reaction time value for one of Eve or Joe's tests • Works out overall average for Eve approx. 0.20s **Explanations** • Need to have a trial run / didn't know what to do on first run • Loses concentration / human error • Get better as you learn how to do it • Suggests possible reason why Joe is faster / males may be faster / might play video games / do sport • Eve may not be concentrating / be ill **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**
			Total	**9**	

Question			Answer	Marks	Guidance
5	a		might be able to develop idea further / do more research / extend study (1); to treat people (1)	2	
	b		change diet / eat seeds/fenugreek (1); reduce sugar / carbohydrate (1)	2	
	c	i	pancreas	1	
		ii	endocrine	1	
	d		*Any **THREE** from:* idea of continuous / all day; people don't have to take blood sample / less danger of infection / no needles ; more accurate / no human error; don't have to do their own insulin injections	3	
			TOTAL	9	

Question			Answer	Marks	Guidance
6	a		**[Level 3]** Explains why the graph shows a correlation and suggests two or more ideas for further work. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Explains why the graph shows a correlation and suggests one idea for further work OR suggests two or more ideas for further work. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Explains why graph shows a correlation OR suggests one idea for further work 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 MM** **Indicative scientific points may include:** **Why it is a correlation** • correlation because the patterns of both graphs follow each other • idea that as Sun's irradiance increases and decreases so does highest daytime temperature **Further Work** • find temperatures from more countries / not just USA • extend study over longer time • look at other indicators of temperature / average temperature / average daytime temperature / average global temperature • investigate (and eliminate) other factors that might affect temperature **Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.**

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6</td><td>b</td><td></td><td>
<table>
<tr><th>Name of gas</th><th>Increases the greenhouse effect</th><th>Does not increase the greenhouse effect</th></tr>
<tr><td>oxygen</td><td></td><td>✓</td></tr>
<tr><td>water vapour</td><td>✓</td><td></td></tr>
<tr><td>carbon dioxide</td><td>✓</td><td></td></tr>
<tr><td>nitrogen</td><td></td><td>✓</td></tr>
<tr><td>methane</td><td>✓</td><td></td></tr>
</table>
</td><td>2</td><td>All correct gets 2 marks
3 or 4 correct gets 1
2, 1 or none gets 0</td></tr>
<tr><td></td><td></td><td></td><td>TOTAL</td><td>8</td><td></td></tr>
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