OCR
RECOGNISING ACHIEVEMENT

GCSE

Science A

General Certificate of Secondary Education

Unit **A141/02:** Unit 1: Modules B1, C1, P1 (Higher Tier)

Mark Scheme for June 2013

Oxford Cambridge and RSA Examinations

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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	credit alternative wording / or words to that effect
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
	no benefit of doubt
	reject
	correct response
L1 , L2 , L3	indicate level awarded for a question marked by level of response
	information omitted

ADDITIONAL OBJECTS: You **must** assess and annotate the additional objects for each script you mark. Where credit is awarded, appropriate annotation must be used. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU.

For pages with material written by the student: ensure each page has a highlighted area on to show it has been seen.

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.

Eg 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. Marking method for tick boxes:

Always check the additional guidance.

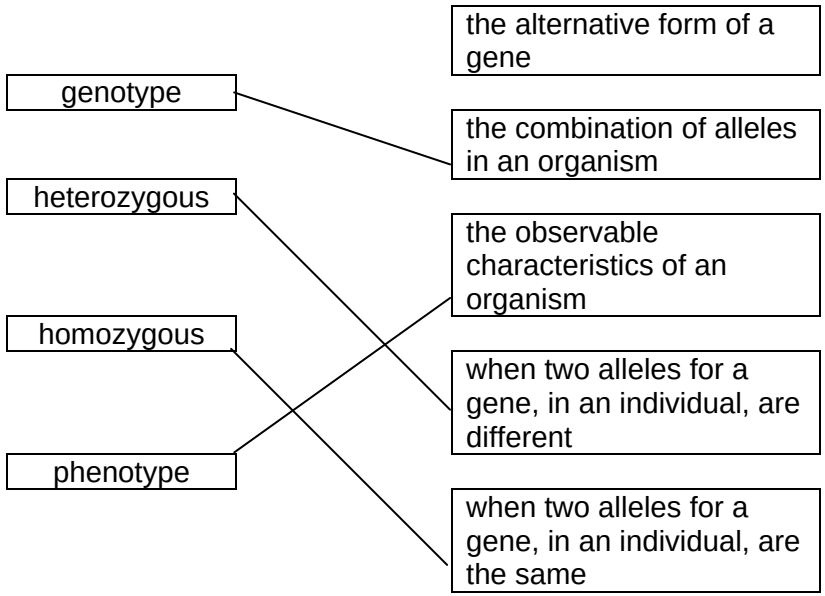
If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg 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.
Eg 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**

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td> 
</td><td>3</td><td>all correct = 3 marks
one mistake = 2 marks
two mistakes = 1 mark

do not allow any box which has more than one line to or from it

count the errors here – loses a mark for every error</td></tr>
<tr><td></td><td>(b)</td><td></td><td>(structural) collagen/keratin/actin/myosin AND
(functional) enzyme/protease/amylase/lipase/haemoglobin (1)</td><td>1</td><td>BOTH needed for the mark.
allow tissue predominantly protein, e.g. ‘muscles’, ‘hair’ or ‘fingernails’, in first space</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>4</td><td></td></tr>
<tr><td>2</td><td>(a)</td><td></td><td>correctly completed Punnett square (1);

probability: 0.5/50%/½ (1)</td><td>2</td><td>accept use of other letters (not x, y)
<table><tr><td></td><td></td><td>mother</td><td></td></tr><tr><td></td><td></td><td>h</td><td>h</td></tr><tr><td rowspan="2">father</td><td>H</td><td>Hh or hH</td><td>Hh or hH</td></tr><tr><td>h</td><td>hh</td><td>hh</td></tr></table>OR<table><tr><td></td><td></td><td>mother</td><td></td></tr><tr><td></td><td></td><td>h</td><td>h</td></tr><tr><td rowspan="2">father</td><td>h</td><td>hh</td><td>hh</td></tr><tr><td>H</td><td>Hh or hH</td><td>Hh or hH</td></tr></table>allow ecf but accept 0.5/50%/½ even if Punnett square does not predict it</td></tr>
</table>

Question			Answer	Marks	Guidance
2	(b)	(i)	**Level 3 (5–6 marks)** Answer considers implications to Heather and her family using examples across different areas to develop the consequences. Quality of written communication does not impede communication of science at this level. **Level 2 (3–4 marks)** Answer considers implications to Heather and to her family using an example to develop the consequences. Quality of written communication partly impedes communication of science at this level. **Level 1 (1–2 marks)** Answer considers an implication to Heather or her family. Quality of written communication impedes communication of science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** family = principally Heather's partner and children in this context, but allow siblings and mother ignore use of the term 'carrier' to mean 'having the affected allele' **Indicative scientific points may include:** • will know if she has the disease • will enable her to prepare • will enable her to plan treatment • will allow her to plan a family • results may not be accurate (false positives/negatives) • may not want her family to know • may not want to know herself • could cause stress or anxiety • employer could obtain information • might mean less chance of promotion • might mean more chance of losing job • could increase insurance premiums **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	(b)	(ii)	people reproduce before they know that they have Huntingdon's disease (1); condition/gene/it gets passed on/does not disappear (1); higher mutation rate (1)	2	2nd marking point can be implied or reverse argument e.g. 'people with other genetic diseases may decide not to have children because they know what they may get'
			Total	**10**	

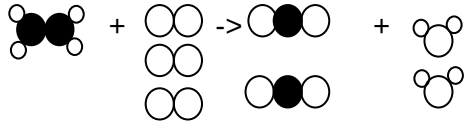
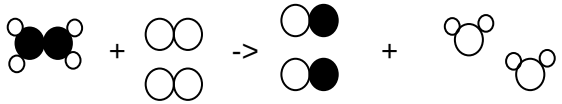
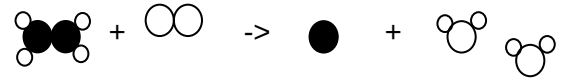
Question			Answer	Marks	Guidance
3	(a)		as the birth weight of the mother increases, so does the birth weight of the baby (1)	1	**allow** 'positive correlation' (NOT just 'correlation') only if variables are clear.
	(b)	(i)	point plotted in correct place (1)	1	
	(b)	(ii)	*any two from:* this baby was born early (1); mother is a smoker (1); mother drinks alcohol / takes drugs (1); mother has a disease (1); baby has a disease (1); mother has a poor diet / baby malnourished in womb (1); father could be much smaller / father passes on genes to make baby smaller (1): grandmother's pregnancy resulted in mother overweight at birth (1)	2	NOT 'it's an outlier' if (b)(i) incorrectly plotted, then answer to this part can use ecf, e.g. if point were above the distribution then an answer in terms of explaining a too-heavy baby would be appropriate; if point were in the midst of the others, then allow one mark max for stating that it is clearly not an outlier and so should be plotted
		(iii)	*agree with Leila:* it was measured accurately***/*** there is no reason to doubt its accuracy so it should be retained (1); these data points cannot be repeated/checked (1); huge variation in birth weight / this reading is not far from the others (1)	2	
			Total	**6**	

Question			Answer	Marks	Guidance
4	(a)		as speed increases/rises/goes up/gets bigger (1); fuel consumption increases/rises/goes up/gets bigger (1)	1	**allow** 'positive correlation' (NOT just 'correlation') only if variables are clear. NB 'fuel consumption increases' refers to the column heading, NOT to the amount of fuel burnt per mile or per hour, both of which decrease with increasing speed over this speed range so 'more fuel used' is not acceptable
	(b)		any three from: (from graph) fewer miles/gallon at 80mph than 70mph/ mpg goes down after 53 mpg/48 mph (1); so more fuel burnt (for a given trip) (1); burning fuel makes pollutants/the more fuel burned the more pollutants released (1); so more pollution with speed increased (1)	3	for maximum marks ideas must be linked Ignore any reference to Jo or Anne and look for marking points on the left. 'the faster you go, the more fuel burnt' earns the first two marks as this answer clearly interprets decrease in miles/gal
			Total	**4**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td></td><td>B,E,A,D
C missed out (1);
B and D in correct places (1);
E and A in correct places (1)</td><td>3</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><th>factor</th><th>effect if factor increased</th></tr><tr><td>amount of coal
type of coal</td><td rowspan="5">would all result in different amount of coal burning so different amount of sulfur dioxide made</td></tr><tr><td>amount of air</td></tr><tr><td>temperature</td></tr><tr><td>duration of measurement</td></tr><tr><td>amount of alkaline slurry</td></tr></table></td><td>3</td><td>each factor given = 1 mark (Max 2)
each explanation given = 1 mark</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>150 000 x 0.4/1000 =</td><td>1</td><td>mark is for the correct calculation and NOT the answer
scaling from mg to g must be clear</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>60 – (0.02 x 150 000/1000)
or
(0.4 – 0.02) x 150 000/1000

= 57 g</td><td>2</td><td>either calculation method for mark

do not assume candidate works from upper left to bottom right (general marking instructions 10); give credit if the calculation has been done somewhere, possibly in stages
2 marks for correct answer without working</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>9</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
6	(a)		carbon and hydrogen **only**	1	'only' can be implied e.g. 'molecule containing atoms of carbon and hydrogen' is enough **reject** 'mixture'
	(b)		**Level 3 (5–6 marks)** Links the amount of oxygen available to the products of complete oxidation (carbon dioxide and water) or incomplete oxidation (either carbon monoxide or particulate carbon, and water) and gives correctly balanced diagrammatic/symbol representations for these two reactions. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Mentions products of complete combustion (carbon dioxide and water) and incomplete combustion (either carbon monoxide or particulate carbon, and water) and relates one reaction to the molecular formulae/diagrams concerned, possibly with a diagrammatic representation of the reaction which may not be correctly balanced. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Description of different products formed in complete or incomplete combustion. May give word equations. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to A*** **Relevant points include:** • carbon atoms combine with plenty of oxygen to make carbon dioxide, this is complete combustion/burning • when there is less oxygen, incomplete combustion/ burning happens, this makes carbon monoxide and particulate carbon/soot (responses may be about either incomplete combustion reaction) •  •  ***OR*** •  **accept** any correctly balanced diagrammatic representation including symbol equations. products must be CO_2 , CO and/or C, and H_2O **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**7**	

Question			Answer	Marks	Guidance
7	(a)		Betelgeuse closer (to Earth) than Rigel (1); further stars appear/look/seem dimmer /closer stars appear/look/seem brighter (than they actually are)(1)	2	2nd mark is for an explanation – should have the generalisation that closer things look brighter than they really are : accept eye is more sensitive to red light/red light is less absorbed by atmosphere owtte **ignore** reference to redshift **allow** light spreads out with distance
	(b)		mention of parallax / full description of lab demonstration of parallax(1); star appears in a different position/angle (1); compared with distant star (1); can calculate distance from distance H has moved (1); the further away the star is, the less it appears to move. (1)	2	full description e.g. viewing thumb from alternate eyes compared with distant part of the room any two
			Total	**4**	

Question			Answer	Marks	Guidance
8			**Level 3 (5–6 marks)** Refers to data from speech bubble. May introduce other factors supporting Darwin's theory. Justifies scientific reluctance to accept findings, including evaluation of Darwin's method. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Quotes relevant data from speech bubble to support Darwin's conclusion. Simple suggestion for scientific reluctance to accept Darwin's result. Quality of written communication partially impedes communication of the science at this level. **Level 1 (1–2 marks)** Either refers to data given or suggests a reason for reluctance to accept Darwin's conclusions (probably based on authority). Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to A*** For **level 3**, look for evaluation of Darwin's estimate and a scientific reason for rejection of his method. **Level 2** will typically state Darwin's conclusion as a fact and give a simple reason for its rejection by the scientific community. **Level 1** will focus either on Darwin's estimate or on the reaction of the scientific community. **Points for Darwin's estimate may include:** • A value of 36 km/ 1 cm = 360 000 (centuries) indicates a correct calculation • scaling 360 000 centuries = 36 000 000 years which is greater than 20 000 000 years • newer methods e.g. fossils, radiocarbon dating, geomagnetism confirm an old Earth **Points relevant to scientific reluctance may include:** • previous theories worked well • age seemed unreasonably long • approach too new • Darwin's approach too simplistic • Darwin assumed similarities between sea & river that were unjustified **accept** Scriptural authority **accept** Darwin a biologist, not a geologist (even though he was) **accept** theory of evolution not believed so this was lumped in along with it (halo effect) **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>9</td><td>(a)</td><td></td><td><table><tr><th>for</th><th>against</th><th>neither</th></tr><tr><td></td><td></td><td>✓</td></tr><tr><td>✓</td><td></td><td></td></tr><tr><td></td><td></td><td>✓</td></tr><tr><td>✓</td><td></td><td></td></tr><tr><td></td><td>✓</td><td></td></tr></table></td><td>3</td><td>all 5 rows correct = 3
one error (4 rows correct) = 2
2 errors (3 rows correct) = 1

count the errors here – loses a mark for every error</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>S-waves are transverse waves and cannot travel through the Earth’s liquid core. ✓ (1)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>10 seconds after the earthquake, the S-waves and P-waves will be 30 km apart. ✓ (1)
The P-waves have a longer wavelength than the S-waves. ✓ (1)</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>10</td><td>(a)</td><td></td><td>best fit curve plotted (1);
Ceres correctly interpolated and read (1)</td><td>2</td><td>judge by eye: not dot-to-dot
must be a smooth curve, not a straight line, and not doubling back on itself. Ignore multiple lines if it can be deduced which is the ‘final’ one
read from Candidate’s ‘curve’ at T =4.6 years; allow ± 0.1
look first at the Candidate’s answer for the distance: if it seems reasonable, look up from that value on the x-axis to see if it hits the curve at T = 4.6 years</td></tr>
<tr><td></td><td>(b)</td><td></td><td>correct values in table: 5.2 AU 11.8 years 1.01 (1);

all the values in the table are about the same/
yes, <u>because</u> the value for Jupiter in last column is the same as all the others (1)</td><td>2</td><td>acceptable values:

<table>
<tr><th>d/AU</th><th>T/years</th><th>d^3/T^2</th></tr>
<tr><td>5.2</td><td>11.8</td><td>1.0098</td></tr>
<tr><td>5.2</td><td>11.81</td><td>1.0081</td></tr>
<tr><td>5.2</td><td>11.82</td><td>1.0064</td></tr>
<tr><td>5.2</td><td>11.83</td><td>1.0047</td></tr>
<tr><td>5.2</td><td>11.84</td><td>1.0030</td></tr>
<tr><td>5.2</td><td>11.85</td><td>1.0013</td></tr>
<tr><td>5.2</td><td>11.86</td><td>0.9996</td></tr>
<tr><td>5.2</td><td>11.87</td><td>0.9979</td></tr>
<tr><td>5.2</td><td>11.88</td><td>0.9963</td></tr>
<tr><td>5.2</td><td>11.89</td><td>0.9946</td></tr>
<tr><td>5.2</td><td>11.9</td><td>0.9929</td></tr>
</table>

ignore reasonable rounding/truncation
e.c.f. own value for Jupiter but this mark cannot be awarded if the table is incomplete</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>4</td><td></td></tr>
</table>

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