OCR
RECOGNISING ACHIEVEMENT

GCSE

Science A

General Certificate of Secondary Education

Unit **A143/02:** Unit 3: Modules B3, C3, P3 (Higher Tier)

Mark Scheme for June 2013

Oxford Cambridge and RSA Examinations

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.

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	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	correct response
	incorrect response
BOD	benefit of doubt
NBOD	no benefit of doubt
ECF	error carried forward
0 , L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted
CON	contradiction
R	reject

	indicate uncertainty or ambiguity
	draw attention to particular part of candidate's response

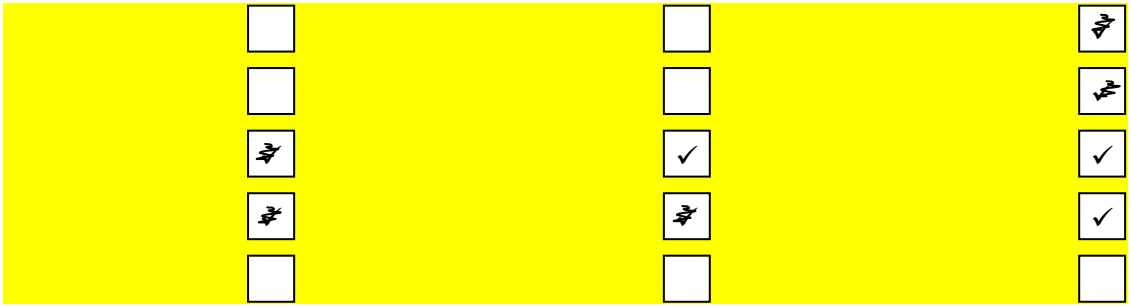
2. **ADDITIONAL OBJECTS:** You **must** assess and annotate the additional objects for each script you mark. Where credit is awarded, appropriate annotation must be used. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU.

3. Subject-specific Marking Instructions

a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).

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 the third <u>and</u> fourth boxes are required for the mark:



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-box questions:

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 and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. 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 cities in England:

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	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

e. For answers marked by levels of response:

i. **Read through the whole answer from start to finish**

ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor

iii. **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

iv. 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.

<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>☐ furnace ☐ turbine ☐ generator</td><td>2</td><td>all 3 correct = (2); two correct = (1).
allow descriptions of action eg
furnace = ‘burns coal’ /idea of combustion ignore reactor
generator – allow dynamo</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><th>wind</th><th>coal</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 correct = (3);
4 correct = (2);
3 correct = (1)

2 ticks in same row = con - no mark for that row</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>5</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
2			**Level 3 (5–6 marks)** Correctly compares across two rows AND Realises that increased fuel costs will make insulation more worthwhile. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Compares across two rows. Reference to fuel costs missing or incorrect OR compares across 1 row and reference to fuel costs correct. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Discusses one row only OR discusses a column OR discusses fuel costs. Any mention of fuel costs or payback time is probably incorrect. 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 C.** **Indicative scientific points at level 3 may include:** • realises that a rise in fuel cost will make savings, but may have difficulty in articulating this idea. • explanation of effect of insulation in terms of reduced heat loss so less fuel use/cost savings **Indicative scientific points at level 2 may include:** • may confuse payback time with lifetime • Comparison may have some inaccuracies. **Indicative scientific points at level 1 may include:** • partial use of data, eg just one column, or just one row • discussion of fuel cost and nothing else correct **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a)		time on top and bottom of equation (1);	1	eg The power is energy per time so the time will cancel out and leave just useful energy out/total energy in **ignore** just power = energy/time
	(b)		input power = voltage × current = 230 V × 7.7 A (1); = 1771 W (1); efficiency = (1750 W/1771 W × 100%) = 98.8% (1)	3	98.8% (**accept** 98.814 or 99%) without working scores 3 marks. **accept** 98% for 2 marks **allow** ecf from using 110V - 847W, for 2nd marking point (the only wrong voltage acceptable is 110) (NB likely to be there if final answer is 48.4%) then **allow** 1750/847 x 100 = 207% for 3rd marking point so 207% on its own scores 2 marks
	(c)		less energy reaches **the saw** **AND** so it will not work (as well) AW OR the **transformer** will waste (most of the/a lot of/more) energy **AND** so (the transformer) gets hot and melts/ the saw won't work as well	1	**accept** power instead of energy **ignore** less powerful (the saw) **ignore** ref to current/amps unless current is calculated and used in explanation **ignore** blow up/explode
			Total	**5**	

Question			Answer	Marks	Guidance
4	(a)		<table><tr><th>True</th><th>false</th></tr><tr><td>✓</td><td></td></tr><tr><td></td><td>✓</td></tr><tr><td>✓</td><td></td></tr><tr><td>✓</td><td></td></tr><tr><td></td><td>✓</td></tr></table>	2	all 5 correct = 2 3 or 4 correct = 1
	(b)		contamination = taking in/direct contact (with radioactive material) OR irradiation = exposure to radiation from an exterior source (owtte) (1); (contamination more serious) as radiation continues to cause damage over a long **time** (1)	2	**accept** it/contamination/radioactive substance (gets into the body) **ignore** ref to take in/direct contact with **radiation** **ignore digest** **accept** on clothes as direct contact **accept** can walk away from it (irradiation) **accept** reverse argument **ignore** long term effects
			Total	**4**	

Question			Answer	Marks	Guidance
5			**[Level 3]** Answer fully describes more than one reason how and more than one reason why the organisms are put into groups. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **[Level 2]** Answer describes a reason how and a reason why the organisms are put into groups. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **[Level 1]** Answer describes how or why organisms are put into groups. 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 A*.** Key points: How: • classified using similarities/differences • in **physical** features/example • in DNA (**ignore** genes) • idea that there is an order/hierarchy • classified at different levels (e.g. kingdom, phylum, class, order, genus, species) or into named groups • with larger groups with fewer features in common first • then smaller groups with more features in common Why: • makes sense of the enormous diversity • makes communication about organisms easier • allow evolutionary relationships to be found • predict/recognise features from similar organisms within that group **ignore** “to see what species it is” or definition of species **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
6	(a)		Between 1950 and 1970…… ✓ (1) The rate of decline…… ✓ (1)	2	if more than 2 ticks, subtract a mark for each additional tick
	(b)	(i)	*Richard is correct as:* decrease (in bee colony numbers) before mobile phones became popular/1990 (1) was larger/faster/quicker (ORA) (1)	2	**ignore** Richard is wrong **accept** correct comparison before & after 1990/mobile phones using figures for 2 marks more of a decrease before mobile phones became popular/before 1990 = 2 marks
		(ii)	**any two from** monoculture is not sustainable (1) reduction in biodiversity (1) affects natural ecosystems/habitats (1) increased number of pests specific to the monoculture crop (1) **increased** use of pesticides/fertiliser/named example (1) reduced soil nutrients (or named nutrient) (1) more susceptible to environmental conditions/changes (1) fewer natural predators (of pest) (1) more susceptible to disease (1) visual impact (1)	2	**ignore** references to bees **accept** examples of habitats e.g. hedgerow removal **ignore** damages **environment** **accept** reduced soil fertility **ignore** reduced crop yield **ignore** pollution **ignore** reference to allergies
			Total	**6**	

Question			Answer	Marks	Guidance
7	(a)		<table><tr><td>leathery skin…….</td><td>Physical</td><td>✓</td><td></td><td></td></tr><tr><td>strong claws……..</td><td>Physical</td><td>✓</td><td></td><td></td></tr><tr><td>gland produces….</td><td>Both</td><td></td><td></td><td>✓</td></tr><tr><td>streamlined</td><td>Physical</td><td>✓</td><td></td><td></td></tr><tr><td>fluffs up feathers….</td><td>Behavioural</td><td></td><td>✓</td><td></td></tr></table>	3	5 correct = (3) 4 correct = (2) 3 correct = (1) 2 correct = (0)
	(b)		any 2 from: penguin numbers increase; whale numbers decrease; less competition for food / more food/krill available;	2	**ignore** whales hunted/whales dying if incorrect statement made max 1 mark e.g. penguin numbers decrease or whales eat penguins 2 incorrect statements = 0
	(c)	(i)	(Esme is correct) because: idea that offspring must be fertile to be certain they are the same species ORA (1)	1	**ignore** whether Esme or Arthur are correct
		(ii)	any natural change and amplification, where appropriate, as to why they might affect the penguin population (1) e.g. predator increase, disease, competition, food supply, natural disaster, climate change any man-made change and amplification, where appropriate, as to why they might affect the penguin population (1) e.g. pollution, **introduction** of new species, hunting, fishing, habitat destruction, tourism, mining, drilling for oil, climate change	2	some suggestions need little/no amplification – e.g hunting, predators, food supply, habitat destruction others may require explanation – competition, climate change, natural disaster **ignore** reference to polar bears **allow** climate change in either category, if clearly explained
			Total	**8**	

Question			Answer	Marks	Guidance
8	(a)		**A**= desert, **B**= water **(no mark)** **A** has smooth grains AND B has jagged grains (1) **A** has more erosion/more violent collisions/ no cushioning effect **OR** **B** less erosion/water acts as a cushion/ collisions less violent (1)	2	**accept** comparative statement e.g. a smooth**er** grains for 1 mark **NB** max 1 mark if say A water and B desert

Question			Answer	Marks	Guidance
8	(b)		**[Level 3]** Justifies a valid conclusion about movement of rocks or change in Earth's magnetic field using data. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **[Level 2]** Makes a valid conclusion about movement of rocks or change in Earth's magnetic field. May make **correct** reference to figures. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **[Level 1]** Gives some basic trends/statements from data. 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 A/A*** **Indicative scientific points at Level 3 may include** • Earth's magnetic field is horizontal at the equator and 90^o at the poles • 280 million years ago the rocks that make up Britain formed on the equator • 150 million years ago the rocks that make up Britain formed 30^o above the equator • 60 million years ago rocks formed about where they are now/50^o above equator • mechanism for movement – convection in mantle • uses data to link angle of magnetic crystals to the position on the Earth's surface where the rock was formed. **Indicative scientific points at Level 2 may include** • Britain has moved North/away from equator • Some of the rocks that make up Britain formed on the equator/0^o • scientists can determine latitude rock at when it cooled from this data • Earth's magnetic field is horizontal at the equator • rocks formed in Britain in different places on Earth • magnetic field may have changed (**ignore** increased/decreased) **Indicative scientific points at Level 1 may include** • the older rocks has a smaller angle • negative correlation **NB: simply quoting numbers from table is insufficient** **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**

Question			Answer	Marks	Guidance
			Total	**8**	
9	**(a)**	**(i)**	25 | 2 (1)	1	
		(ii)	1000 | 160 (1)	1	**allow** ecf from mis-reading of graph in part (i) - answer in left hand column should be 40 x [answer to (i)] - answer in right hand column should be 80 x [answer to (i)]
		(iii)	Results could be misleading… ✓ (1) A fair comparison can be made ✓ (1)	2	if more than 2 ticks, subtract a mark for each additional tick
	(b)		**any two from:** disease can be passed on in other ways/other sources of infection; people used well water/other sources/non-chlorinated water; early equipment less effective; time to remove the disease pool (of people) /carriers to die off mains/chlorinated water not (immediately) installed in all houses; people refused to drink chlorinated water/did not think it was safe;	2	**ignore** ref to dose **ignore** comments about how effective chlorine is at killing bacteria (e.g. takes time to kill bacteria or does not kill all the bacteria) **accept** only available to the rich/people could not afford it

Question			Answer	Marks	Guidance
9	(c)		The risk from the harmful chemicals is small. ✓ (1) Chlorine kills bacteria in the water supply. ✓ (1)	2	if more than 2 ticks, subtract a mark for each additional tick
			Total	**8**	

Question			Answer	Marks	Guidance
10	(a)		coal (found locally); (1) limestone (found locally); (1) low costs/ease of transportation/ease of export; (1)	2	**ignore** reference to salt **ignore** reference to the coast (as source of salt) **ignore** minerals or other named mineral **accept** access to port
	(b)		dissolving; electrolysis; sodium hydroxide;	2	3 correct = 2 marks 2 or 1 correct = 1 mark.
			Total	**4**	

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