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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 January 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.

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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
BOD	benefit of doubt
CON	contradiction
	incorrect response
ECF	error carried forward
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt
R	reject
	correct response

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L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted

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 and 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.

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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 <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**

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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.

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<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>
<table>
<tr><th>power st</th><th>reactor</th><th>boiler</th><th>turbine</th><th>generator</th><th>Transformer</th></tr>
<tr><td>coal</td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>hydro</td><td></td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>nuclear</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table>
</td><td>3</td><td>one mark for each correct row.</td></tr>
<tr><td></td><td>(b)</td><td></td><td>advantage (1)
renewable;
no greenhouse gases / CO_2 / emissions;
low operational costs;

disadvantage (1)
no waves = no electricity;
hazard to boats;
eyesore;
damage to sea life;</td><td>2</td><td>ignore:
• efficiency
• tides
• set up costs
• emissions during manufacture
• no pollution
reference to sustainability needs further qualification</td></tr>
<tr><td></td><td>(c)</td><td></td><td>radioactive material enters sea organisms (1);

people eat the radioactive organisms (1);

increased risk of cell damage / cancer (1);</td><td>3</td><td>

allow clear understanding that contamination requires consumption for 1 mark</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>8</td><td></td></tr>
</table>

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Question			Answer	Marks	Guidance
2	(a)	(i)	microwave oven (1);	1	
	(a)	(ii)	vacuum cleaner (1)	1	
	(b)		2000 × 20 × 12 = 480 000 p for (1); 2 × 20 × 12 = 480 p for (2); 2 × 0.33 × 12 = 8 p for (3)	3	ignore units accept 7.92 or 7.2.
	(c)		need longer time; to deliver same amount of energy	1	
			Total	**6**	

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Question			Answer	Marks	Guidance
3			**[Level 3]** Answer includes correct comparison of data **and** mathematically manipulates data between row(s) to justify choice of bulb e.g. calculation of effective light output. Quality of written communication does not impede communication of the science at this level. (5–6 marks) **[Level 2]** Answer includes correct comparison of data **and** correct mathematical manipulation of data within row(s) to justify choice of bulb. Quality of written communication partially impedes communication of the science at this level. (3–4 marks) **[Level 1]** Answer includes correct comparison of data to justify choice of bulb. 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 may include:** • capital cost per hour of use: LED = LE < QH • effective light output: 5.5 W (LE), 5W (QH) & 3.8 W (LED) • any mathematical comparison (eg LED costs 4 times more than LE but lasts 4 times as long) • input power / relative cost to run: LED < LE < QH • cost outlay: QH < LE < LED • blue-white light can appear hard. • economic consideration • heat produced by QH can be uncomfortable • time to reach full brightness
			Total	**6**	

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Question			Answer	Marks	Guidance
4	(a)		<table><tr><th></th><th>True</th><th>False</th></tr><tr><td>…may live in the same habitat.</td><td>✓</td><td></td></tr><tr><td>…can breed together.</td><td>✓</td><td></td></tr><tr><td>…reproduce to make fertile offspring.</td><td>✓</td><td></td></tr><tr><td>…are all identical genetically to another.</td><td></td><td>✓</td></tr><tr><td>…may compete with each other.</td><td>✓</td><td></td></tr></table>	1	
	(b)		<table><tr><td></td></tr><tr><td></td></tr><tr><td>Conifer trees produce a dense shade. ✓</td></tr><tr><td>Ground plants can not photosynthesise as well. ✓</td></tr><tr><td></td></tr><tr><td></td></tr></table>	1	**both** needed for the mark
	(c)		**description of sustainability:** meeting the needs of people today; not harming the Earth for future generations /not affecting future needs; planting trees to replace those chopped down; maintaining/increasing habitats / biodiversity; greater biodiversity improves sustainability ;	3	any three
	(d)	(i)	11.8%	1	
		(ii)	idea of lower percentage/amount (of UK) is forest/trees (compared to the rest of the world)	1	must have comparative statement Accept reverse argument

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Question			Answer	Marks	Guidance
	(e)		Bob correct because: seems to be an increase occurring currently (1); increase between 2010 and 2011 is the biggest single increase (1); Stu correct because: there have been increases in the past (1) you can't judge on a single year of data (1) Either Bob or Stu general pattern shows a decline (1);	3	any three, 2 marks maximum if only one person's ideas considered. ignore "not enough evidence"
			Total	**10**	

Question			Answer	Marks	Guidance
5	(a)		any two idea of interpret evidence differently/creatively (1); Darwin observed living organisms (and Owen didn't) (1); idea of different religious beliefs (1); idea that scientist are reluctant to give up own ideas (1)	2	ignore ethical/moral reference
	(b)		Supports Darwin's idea Idea that the fossil links the reptiles/dinosaurs and birds /one has evolved into the other (1); this suggests that change takes place **over time** (1);	2	ignore answers supporting Owen
			Total	**4**	

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Question			Answer	Marks	Guidance
6			**[Level 3]** Answer clearly describes, using correct specialist terms, processes occurring throughout the cycle in detail Quality of written communication does not impede communication of the science at this level. (5–6 marks) **[Level 2]** Answer describes processes occurring in the cycle. Some details are lacking. OR One process described in detail using correct specialist terms. Quality of written communication partially impedes communication of the science at this level. (3–4 marks) **[Level 1]** Answer correctly describes at least one process occurring in the cycle in basic terms. 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:** • nitrogen fixation by microorganisms • denitrification by microorganisms • conversion of nitrogen compounds to amino acids/protein • correct reference to nitrates **Indicative scientific points at Level 2 may include:** • role of microorganisms • excretion • absorption by roots • refers to nitrogen rather than nitrogen compounds **Indicative scientific points at Level 1 may include:** • decomposition/decay • correct reference to consumption/eating • taken in by roots • reference to waste Credit correct reference to lightening ignore references to photosynthesis/oxygen production/artificial fertilisers/combustion **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**6**	

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Question			Answer	Marks	Guidance
7	(a)	(i)	(100 – (6 + 20 +66)) x 6 000 000/100 (1); = 480 000 tonnes (1)	2	correct answer without working = 2 marks
		(ii)	mined (rock) salt used on roads (1) doesn't need to be pure (1) sand, rock, grit help to stop skids on the roads in winter (1) dissolved in water for electrolysis/ making chemicals (1) dissolved in water gives **pure** salt for food (1)	3	**max 2 marks if only one extraction method discussed**. not "clean" or "dirty"
	(b)		chemical (1); electrolysis (1) sodium hydroxide and hydrogen (1)	3	both products needed for mark in either order.
			Total	**8**	

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Question			Answer	Marks	Guidance
8	(a)	(i)	a correct statement about relative risk of cancer / water borne diseases **in** developing and developed countries OR **between** developed and developing countries (1) in developing countries more worried about risk of water borne diseases (than cancer) (1) in developed countries more worried about risk of cancer (than water borne disease) (1)	3	
		(ii)	<table><tr><td>Filter out organic matter before chlorination.</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>	1	
			Total	**4**	

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Question			Answer	Marks	Guidance
9	(a)		**[Level 3]** Comparisons relating to total energy use and stage(s) of the energy used for PVC and wood **AND** statement**s** about further data Quality of written communication does not impede communication of the science at this level. (5–6 marks) **[Level 2]** A comparison of energy used for PVC and wood **AND** a statement about type of data needed to complete LCA. Quality of written communication partially impedes communication of the science at this level. (3–4 marks) **[Level 1]** A comparison of energy used for PVC and wood **OR** a statement about one type of data needed to complete LCA. 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 C** **Conclusions may include:** • total energy used in life time is more for PVC • PVC 22.3 MJ, wood 20.3MJ • allow comparison of energy of different stages **Further data may include:** • Raw material • sustainability • environmental impact • carbon footprint. • biodegradability/decomposition • disposal • recyclability • lifespan **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**

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Question			Answer	Marks	Guidance
	(b)		Plasticizer chemicals can damage animal cells. ✓ Plasticizers can leak out of PVC. ✓	2	1 mark for each correct tick.
			Total	**8**	

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