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General Certificate of Secondary Education
March 2012

Science B SCB3HP

(Specification 4500)

Unit 3: Making My World a Better Place

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore of insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

4. Quality of Written Communication and levels marking

In Question 4(a) candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:
- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic
- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear
- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed
- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

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question	answer	extra information	mark
1(a)	**two** from: • slows down reactions • loss of self-control • long-term damage to liver • long-term damage to brain	accept 'damage to the heart'	2
1(b)	withdrawal (symptoms)		1
Total			**3**

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question	answer	extra information	mark
2(a)	(through) wounds / open cuts in the skin		1
	(breathed in through the) respiratory system	**not** respiration	1
	through the digestive system (on infected food)		1
	by sexual contact (with infected person)		1
2(b)(i)	any **three** from: • amount of antibody rises after first injection and then decreases • amount of antibody rises rapidly after second injection • to a much higher level (than the first injection) • and falls slowly		3
2(b)(ii)	(antibiotics) kill / destroy the non-resistant strains		1
	(individuals of) resistant strain survive and reproduce		1
Total			**9**

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question	answer	extra information	mark
3(a)(i)	three or four points plotted correctly curve of best fit	allow ± ½ square 1 or 2 points plotted correctly gains **1** mark	2 1
3(a)(ii)	decrease in methane production after 2003 the rate of decline has decreased **or** the line is not as steep **or** the rate of decrease is slowing	 accept after 2005 / 2007	1 1
3(b)(i)	2348 – 1220 = 1128 (1128 / 2348) x 100 = 48%	 ecf correct answer with or without working gains **2** marks	1 1
3(b)(ii)	reductions in methane emissions from non-agricultural sources have been more successful than from agricultural sources (%) reduction is over three times better	 carry forward error – if answer to 3(b)(i) is incorrect allow comparison with calculated reduction	1 1
3(c)(i)	nitrous oxide(s) / fluorinated gases		1
3(c)(ii)	**one** from: • nitrous oxides are released from vehicle exhausts / power stations • nitrous oxide is released from nitrogen-based fertilisers / from the soil		1
Total			**11**

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question	answer	extra information	mark

4(a)

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	There is a brief account which misses out key terminology. The account may recognise that the ring and the bar become electrodes.	There is an account which may have some minor omissions, eg the need for an aqueous solution or the silver bar. The account recognises that the ring becomes plated.	There is a clear and detailed account which is in a logical order, uses terminology correctly and is correct in virtually every detail, including the movement of ions from the cathode to the anode.

examples of the points made in the response

- The ring (article to be plated) is attached to the negative battery terminal
- This becomes the cathode
- A bar of silver is attached to the positive battery terminal
- This becomes the anode
- Electrodes are both metals
- During electrolysis silver from the anode / positive electrode goes into the solution.
- The silver ions move and attach to the cathode / negative electrode
- Resulting in a thin layer of silver on the ring.

extra information

4(b)	for decoration to prevent allergies		1 1
4(c)	$2e^-$ Zn^{2+}		1 1
Total			**10**

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question	answer	extra information	mark
5(a)	alpha, beta and gamma (radiation) can pass through the open window and affect the (photographic) film	reference must be made at least once to affecting the film for full marks	1
	only gamma radiation will pass through the aluminium (window) (and affect the film)	reference must be made to all three types of radiation for full marks	1
	most of the gamma radiation will pass through the lead window (and affect the film)		1
5(b)	X-rays can pass through the skin and body/soft tissues		1
	but they cannot pass through the bones		1
	the X-rays affect the film and create an image		1
Total			**6**

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question	answer	extra information	mark
6(a)	loss of productive land for landfill (partial) breakdown releases toxic materials	allow waste of a resource allow harm to wildlife ignore litter	1 1
6(b)	photodegradable breaks down after exposure to sunlight oxo-degradable additive helps break down (the plastic), allowing access by microbes		1 1 1 1
Total			**6**

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question	answer	extra information	mark
7(a)(i)	measure of the rate of heat loss (through a material)		1
7(a)(ii)	triple-glazing is twice as efficient because the U-value / rate of heat loss is <u>halved</u>	accept converse for single glazing	1 1
7(b)(i)	3000 / 60 =50 (years)	correct values from table correct sum correct answer with or without working gains **2** marks	1 1
7(b)(ii)	payback time for loft insulation is only 4 years so John will save £50 while he is still living in the house (but whilst he has saved £30 in 5 years for double glazing) he has lost £2700 of his money		1 1 1
Total			**8**

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question	answer	extra information	mark
8(a)	(insulin) gene is removed from human cell using a (restriction) enzyme remove plasmid from bacterium plasmid (from bacterium) is cut open using a (restriction) enzyme and insulin gene inserted into plasmid plasmid put into bacterium when bacteria reproduce they all have the human gene	use of enzyme **must** be used at least once to get full marks accept DNA / genes	1 1 1 1 1
8(b)	**two** from: • concern about the effect on (health) of cow • concern about the effects on human (health) • concern about the effect (of the modified rye) on the food chain / other organisms • effect on the gene pool (of grass)	ignore not natural or cost ignore ethical/religious arguments if no other marks awarded 'we don't know the long term effects' gains **1** mark	2
Total			**7**

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