



**General Certificate of Secondary Education
March 2012**

Science B

SCB3FP

(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 not allow

Ignore or 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 8 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.

COMPONENT NUMBER: SCB3FP

COMPONENT NAME: Making My World a Better Place

SERIES: March 2012

question	answer	extra information	mark
1(a)(i)	gamma rays – thick lead		1
	alpha particle – positive		1
	beta particle – negative		1
1(a)(ii)	medical tracers	allow medical imaging allow sterilising equipment allow cancer treatment allow gamma knife	1
1(b)(i)	A – photographic film		1
	B – aluminium		1
1(b)(ii)	to monitor radiation exposure (received in one month)	allow measure amount of radiation allow type of radiation	1
	to make sure they are within safe limits (owtte)	ignore references to 'health problems' / cancer	1
Total			8

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question	answer	extra information	mark
2(a)(i)	paracetamol – painkiller		1
	penicillin – kills bacteria		1
2(a)(ii)	(increased) antibiotic resistance		1
	(increased) cost to the NHS		1
2(b)(i)	liver damage and brain damage		1
2(b)(ii)	any two conclusions from: <ul style="list-style-type: none"> • increase in cannabis smoking increases depression (%) • greater effect in women • depression linked with but not directly caused by cannabis • not all cannabis smokers get depression 	allow women become more depressed.	2
2(b)(iii)	nicotine / antidepressants / amphetamines / barbiturates / heroin / cocaine	accept reasonable alternatives such as Prozac, diazepam, phenobarbitol, pentobarbital, ketamine do not accept slang street names (eg speed, hash, uppers etc.)	1
Total			8

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SERIES: March 2012

question	answer	extra information	mark
3(a)(i)	driver is not dazzled by (head) lights or automatic, so don't have to adjust		1
3(a)(ii)	more costly (to replace)		1
3(b)	thermochromic spectacle <u>frames</u> or medical stents		1 1
3(c)	(it prevents corrosion) because it is self-healing	allow scratch proof	1
Total			5

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question	answer	extra information	mark
4(a)	conduction		1
	radiation		1
	convection		1
4(b)	any two from: <ul style="list-style-type: none"> • more glazing means lower U-value • lower U-value means less heat loss or greater efficiency • triple glazing is <u>twice</u> as good • not a linear relationship. 		2
4(c)(i)	50 (years)	correct answer with or without working gains 2 marks if answer incorrect, 3000 / 60 gains 1 mark	2
4(c)(ii)	any three from: <ul style="list-style-type: none"> • loft insulation is (much / £2800) cheaper than double glazing • payback time (for loft insulation) is only 4 years or is less than 5 years • so John will save £50 (while he is still living in the house) • but he will still be (£2700) in debt for double glazing 	allow converse accept double glazing would cost more than he would save or would not achieve payback time	3
Total			10

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question	answer	extra information	mark
5(a)(i)	any two from: <ul style="list-style-type: none"> • dust • mould / spores • pollen • smoke • carbon monoxide • <u>fumes</u> from household products 		2
5(a)(ii)	any two from: <ul style="list-style-type: none"> • asthma / wheezing or breathlessness • headaches • tiredness • dizziness • nausea / sickness • itchy nose / itching • sore throat 		2
5(b)(i)	toxic		1

COMPONENT NUMBER: SCB3FP

COMPONENT NAME: Making My World a Better Place

SERIES: March 2012

question	answer	extra information	mark
5(b)(ii)	two risk-minimising measures associated with using product: <ul style="list-style-type: none"> • use in a ventilated area • avoid breathing in • avoid contact with skin / wear gloves / protective clothing • avoid ingestion / swallowing • avoid contact with eyes • read and follow instructions on the bottle 	do not accept keep locked away	2
Total			7

COMPONENT NUMBER: SCB3FP

COMPONENT NAME: Making My World a Better Place

SERIES: March 2012

question	answer	extra information	mark
6(a)(i)	three or four points plotted correctly	allow $\pm \frac{1}{2}$ square	2
	curve of best fit	1 or 2 points plotted correctly gains 1 mark	1
6(a)(ii)	decrease in methane production	accept after 2005 / 2007	1
	after 2003 the rate of decline has decreased or the line is not as steep or rate of decrease is slowing		1
6(b)	Kyoto Protocol		1
Total			6

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COMPONENT NAME: Making My World a Better Place

SERIES: March 2012

question	answer	extra information	mark
7(a)	bacteria		1
	viruses		1
	white blood cells		1
7(b)	(platelets) cause / form a blood clot which creates a barrier (to the bacteria and viruses)	allow scab once	1 1
7(c)(i)	any three from: <ul style="list-style-type: none"> • 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

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COMPONENT NAME: Making My World a Better Place

SERIES: March 2012

question	answer	extra information	mark
7(c)(ii)	<p>two from:</p> <ul style="list-style-type: none"> • vaccinations have helped to reduce certain diseases in many parts of the world • vaccinations are cheaper than treating people if they catch the disease • people are protected against unpleasant and sometimes dangerous diseases • if lots of people are vaccinated the disease becomes rare (even amongst the non-vaccinated) • idea of economic value (eg fewer working days lost through illness) • idea of improved overall health / wellbeing 	<p>accept idea of preventing spread of infection</p> <p>'to prevent disease' is not sufficient</p>	2
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COMPONENT NUMBER: SCB3FP

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SERIES: March 2012

question	answer	extra information	mark
8			
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 <ul style="list-style-type: none"> • 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	
Total			6

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