



**General Certificate of Secondary Education
June 2013**

Science A (Combined)

SCA1FP

(Specification 4406)

Unit 5

Final

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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Marking Guidance for Examiners GCSE Science Papers

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. Boldening

- 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 boldened. Each of the following lines 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	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

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

Candidate	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, 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, as shown in the column 'answers', 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;

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.

Quality of Written Communication and levels marking

In Question 14(c) 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.

SCA1FP**Question 1**

question	answers	extra information	mark
1(a)	light	must be in correct order allow light waves	1
	sound	allow sound waves	1
	touch		1
1(b)(i)	0.35 in skin column circled	only look at figures in table more than one figure circled negates mark ignore values written in table for mean reaction time for eyes	1
1(b)(ii)	0.25 (seconds)	allow 1 mark for $\frac{0.23 + 0.27 + 0.24 + 0.26}{4}$ or 1 / 4	2
1(b)(iii)	any one from: <ul style="list-style-type: none"> the ears / sound had the shortest reaction time the eyes / light had the longest reaction time ears and skin had similar reaction times 	ignore figures / references to sensitivity allow fastest allow slowest ignore references to anomalies or repeat values	1
Total			7

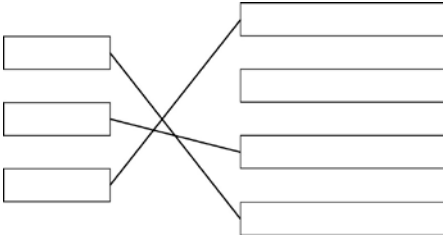
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Question 2

question	answers	extra information	mark
2(a)	not dipped in anything		1
2(b)(i)	5	allow 1 mark for 13 and 8 or evidence that either 13 or 8 read correctly followed by correct subtraction of the figures given	2
2(b)(ii)	A		1
2(b)(iii)	(plant / growth) hormone / auxin		1
Total			5

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Question 3

question	answers	extra information	mark
3		extra lines negate mark(s)	3
Total			3

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Question 4

question	answers	extra information	mark
4(a)(i)	4 / four (years)		1
4(a)(ii)	any one from: <ul style="list-style-type: none"> • animals • (living) cells • (living) tissues 	allow suitable examples eg rats do not allow humans / plants allow human cells do not allow plant cells allow human tissues do not allow plant tissues	1
4(b)(i)	9 (years)	allow 1 mark for 13 – 4 or 2 + 3 + 4	2
4(b)(ii)	see if the drug has side effects		1
4(b)(iii)	neither the volunteers nor the doctors		1
Total			6

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Question 5

question	answers	extra information	mark
5	carbon	must be in correct order ignore C	1
	chlorine	accept Cl	1
	calcium	accept Ca	1
Total			3

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Question 6

question	answers	extra information	mark
6(a)(i)	4 / four	ignore atoms	1
6(a)(ii)	2 / two	ignore atoms	1
6(a)(iii)	a compound		1
6(b)	(proton) +1	must be in correct order	1
	neutron	allow positive / +	1
	electron		1
Total			6

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Question 7

question	answers	extra information	mark
7(a)	(acids) <u>react</u> with calcium carbonate / shells		1
	(so) shells will be (chemically) eroded	do not allow melts allow dissolved / are thinner / worn away / corroded ignore weakened / break down	1
7(b)(i)	calcium carbonate → calcium oxide (+ carbon dioxide)	ignore numbers and symbols	1
7(b)(ii)	22 (g)	mark answer line and ignore working	1
7(b)(iii)	calcium hydroxide / limewater	ignore solution	1
Total			5

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Question 8

question	answers	extra information	mark
8(a)(i)	a mixture		1
8(a)(ii)	distillation		1
8(b)	increases / gets higher	ignore figures ignore gets hotter	1
	increases / gets higher	ignore figures ignore gets hotter	1
8(c)(i)	125(°C)	accept any value in the range 80–135°C	1
8(c)(ii)	C ₈ H ₁₈	allow correct displayed formula	1
Total			6

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Question 9

question	answers	extra information	mark
9(a)(i)	electrical	ignore electricity	1
9(a)(ii)	sound (energy)	allow light ignore heat / noise / thermal / movement allow kinetic energy if qualified (ie of air not hitting hair)	1
9(b)	40(%)	allow 1 mark for correct substitution $\frac{400}{1000} \times 100$ or $\frac{40000}{1000}$ or $\frac{40}{100} \times (100)$ or $\frac{4}{10} \times (100)$ provided no subsequent step shown or allow 1 mark for an answer of 0.4	2
9(c)(i)	increases		1
9(c)(ii)	kinetic		1
9(c)(iii)	decreases		1
Total			7

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Question 10

question	answers	extra information	Mark
10(a)	400(kWh)	65 850 – 65 450 gains 1 mark provided no subsequent step shown	2
10(b)(i)	reflectors		1
10(b)(ii)	insulator		1
10(c)	100 000(J)	correct substitution i.e. $50 \times 1000 \times 2$ gains 1 mark provided no subsequent step shown	2
Total			6

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Question 11

question	answers	extra information	mark
11(a)(i)	absorb		1
11(a)(ii)	more		1
11(b)(i)	conduction		1
11(b)(ii)	colour (of cube)	allow colour (of box)	1
11(b)(iii)	Cube Y Cube X Cube Z	all three in correct order for 2 marks one or two correct for 1 mark allow grey for X allow white for Y allow black for Z	2
11(b)(iv)	results can be compared	accept start temperature affects rate of energy transfer or start temperature affects how quickly the cube cools down ignore fair test / reliability / accuracy / control variable / valid	1
11(b)(v)	control (variable)	allow controls/controlled	1
Total			8

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Question 12

question	answers	extra information	mark
12(a)	<p>any two from:</p> <ul style="list-style-type: none"> • overweight / underweight • deficiency disease • (type 2) diabetes 	<p>ignore references to cholesterol ignore malnourished</p> <p>accept effect of being obese / underweight e.g. heart disease, <u>high</u> blood pressure, periods stop in women</p> <p>accept named deficiency disease e.g. scurvy, rickets allow lack energy ignore no energy / tired / weak / unfit ignore description of diet</p> <p>allow less resistant to infection or weakened immune system</p>	2
12(b)	<p>any one from:</p> <ul style="list-style-type: none"> • inherited factors / genes • statins • age • gender • exercise • stress • smoking 	<p>ignore references to food e.g. dieting</p> <p>accept <u>liver function</u> allow (medicinal) drugs / hormones</p> <p>allow alcohol but ignore other recreational drugs</p>	1
12(c)	exercise	<p>allow suitable example allow avoid smoking / drugs / alcohol etc.</p> <p>ignore diet / drink water</p>	1
Total			4

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Question 13

question	answers	extra information	mark
13(a)	more (mothers) died if doctors delivered their babies (rather than midwives)	answer must be comparative allow more deaths on Ward 1 ignore descriptions of trends	1
	doctors spread bacteria / viruses / pathogens / microbes from dead bodies / other patients	allow disease / infection childbed fever ignore germs allow doctors did not wash their hands / midwives washed their hands	1
13(b)(i)	hand-washing		1
	before / after examining patients or between patients or after examining dead bodies	ignore between wards	1
13(b)(ii)	removed / killed bacteria / viruses / pathogens / microbes (from hands) or reduced transfer of bacteria / viruses / pathogens / microbes (from hands)	ignore disease / infection / germs / childbed fever	1
Total			5

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Question 14

question	answers	extra information	mark
14(a)	transition (elements / metals)	accept d block (elements / metals)	1
14(b)	<p>any three from:</p> <ul style="list-style-type: none">• (good) conductor (of heat)• can be bent / shaped• does not react with water• strong• hard enough to make pipes or tanks• high melting point	<p>ignore references to cost</p> <p>ignore references to electricity</p> <p>accept malleable ignore moulded</p> <p>allow does not rust allow not very reactive</p> <p>allow durable ignore tough</p> <p>allow ductile</p>	3
14(c)			6
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 4 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 information	At least one advantage or disadvantage of either method is given.	At least one advantage and one disadvantage is given. or At least one advantage of both methods is given or At least one disadvantage of both methods is given.	Advantages and disadvantages of both methods are given. For 6 marks a reasonable attempt at a conclusion is made.

Question 14 continues on the next page

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Question 14 continued

<p>examples of the points made in the response</p> <p>Advantages of smelting:</p> <ul style="list-style-type: none">• quicker• extracts more copper• more economically viable <p>Disadvantages of smelting:</p> <ul style="list-style-type: none">• supply of copper rich ores is limited• (mining causes) dust / noise pollution• destruction of landscape or visual pollution• destruction of habitats• smelting uses non-renewable fuel• smelting uses more energy / electricity• large amounts of waste rock• (mining / smelting) releases (more) carbon dioxide / causes global warming• (smelting) releases sulfur dioxide / causes acid rain <p>Advantages of phytomining:</p> <ul style="list-style-type: none">• extracts copper from low grade ores• conserves copper rich ores• does not destroy landscape or less visual pollution <p>Disadvantages of phytomining:</p> <ul style="list-style-type: none">• produces smaller amount of copper (per unit mass)• takes up a lot of space• takes a long time (to grow plants)• produces carbon dioxide when plants burnt• land cannot be used to grow food crops <p>Electrolysis</p> <ul style="list-style-type: none">• Used in <u>both</u> methods (so neither an advantage or disadvantage) <p>Conclusion supported by comparisons made</p>	<p>extra information</p> <p>ignore references to cost unless qualified.</p> <p>ignore jobs / transport</p> <p>allow involves fewer stages</p> <p>ignore pollution unqualified</p> <p>allow (more) greenhouse gases</p> <p>allow does not destroy habitats</p> <p>allow carbon neutral</p>		
Total			10

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Question 15

question	answers	extra information	mark
15(a)(i)	categoric		1
15(a)(ii)	(materials with low U-values are) better insulators	allow transfer / lose / waste less energy allow heat instead of energy allow good insulators / poor conductors ignore more efficient ignore references to cost in terms of materials	1
15(b)	identification of 5.6 <u>and</u> 3.0 from the bar chart		1
	(so) U-value of single glazing is not double the U-value of double glazing	accept for 2 marks 5.6 is not double 3.0 or double 3.0 or 6.0 is not equal to 5.6 or half of 5.6 or 2.8 is not equal to 3.0 if no other marks gained allow for 1 mark: half of 5.6 equals 2.8 or double 3.0 equals 6.0	1
15(c)	area (in m ²)	allow size (of roof / walls / windows / room)	1
	U-value	allow which part transfers most energy / 'heat'	1
	payback time / cost effectiveness	allow cost (of installation / insulation)	1

Question 15 continues on the next page

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Question 15 continued

question	answers	extra information	mark
15(d)	<u>molecules</u> / <u>particles</u> spread out	ignore particles move faster allow the air / gas / fluid expands do not allow particles expand	1
	(so) <u>air</u> / <u>gas</u> / <u>fluid</u> becomes less dense	allow ' <u>it</u> becomes less dense' as long as no mention of particles/molecules do not allow particles become less dense if no other marks gained allow 1 mark for convection	1
Total			9

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