



General Certificate of Secondary Education

Science A 4406

SCA2FP Unit 6

Mark Scheme

2012 Examination – January Series

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 meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting 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 the standardisation meeting each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting 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.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2012 AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered schools / colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools / colleges to photocopy any material that is acknowledged to a third party even for internal use within the school / college.

Set and published by the Assessment and Qualifications Alliance.

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. 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 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 students 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)

Student	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)

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

3.2 Use of chemical symbols / formulae

If a student 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 13(b) students 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.

Students 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

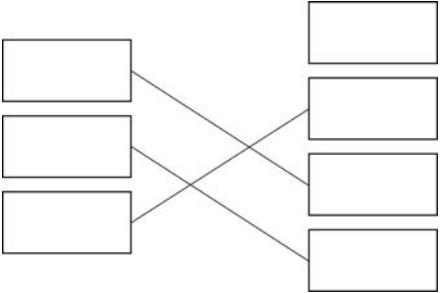
- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some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

SCA2FP

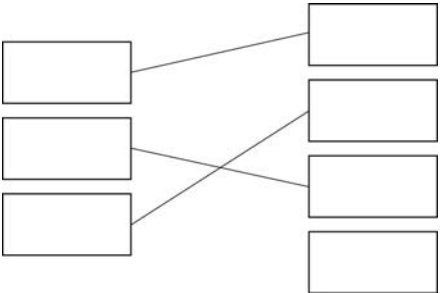
Question 1

question	answers	extra information	mark
<p>1(a) E</p>		<p>extra line from statement cancels the mark</p>	<p>1 1 1</p>
<p>1(b) E</p>	<p>any three from:</p> <ul style="list-style-type: none"> • light • space • water / moisture • mineral salts / ions / nutrients / named 	<p>ignore Sun ignore territory / soil / habitat ignore food ignore gases</p>	<p>3</p>
<p>Total</p>			<p>6</p>

SCA2FP**Question 2**

question	answers	extra information	mark
2(a) A	3 billion		1
2(b) E	mutation selection evolution		1 1 1
2(c)(i) E	crocodile		1
2(c)(ii) E	80 (million years ago)	do not accept 80 years	1
Total			6

SCA2FP**Question 3**

question	answers	extra information	mark
3(a) E	A – nucleus B – chromosome C – gene		1 1 1
3(b) E		extra line from statement cancels the mark	1 1 1
Total			6

SCA2FP**Question 4**

question	answers	extra information	mark
4 E	A – respiration	ignore breathing	1
	B – feeding / eating	allow consumption / ingestion / feeds	1
		ignore nutrition / food	
	C – photosynthesis	do not accept digestion	1
D – combustion / burning		1	
Total			4

SCA2FP**Question 5**

question	answers	extra information	mark
5(a) E	A – core	ignore references to inner and outer throughout	1
	B – atmosphere / lithosphere		1
	C – crust		1
	D – mantle	allow magma	1
5(b) E	carbon dioxide / noble gas / named noble gas	accept CO ₂ for carbon dioxide accept accept correct symbol for noble gases	1
	nitrogen	accept N ₂	1
	oxygen / water vapour	accept O ₂ / H ₂ O	1
Total			7

SCA2FP

Question 6

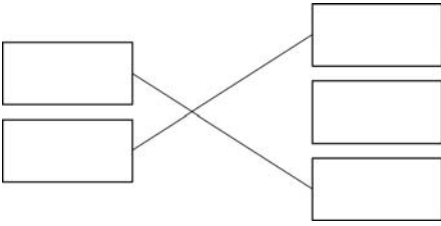
question	answers	extra information	mark
6(a)(i) E	4		1
6(a)(ii) E	25		1
6(a)(iii) E	<p>any two from:</p> <ul style="list-style-type: none"> oil A burned quicker / more of oil A burned oil B releases more energy per g when burned greater temperature rise for oil A 	accept the more oil burned, the greater the temperature rise	2
6(b)(i) E	palm		1
6(b)(ii) E	<p>palm</p> <p>most saturated fat or least unsaturated fat</p>	<p>if incorrect oil chosen the second mark cannot be scored</p> <p>allow more</p> <p>allow less</p>	<p>1</p> <p>1</p>
6(c) E	food cooks at higher temperature	<p>accept higher specific heat</p> <p>ignore water makes food soggy</p>	1
Total			8

SCA2FP**Question 7**

question	answers	extra information	mark
7(a) E	fuels		1
	alkanes		1
	polymers		1
	monomers		1
7(b) E	catalyst		1
	octane	accept C ₈ H ₁₈	1
	ethene	accept C ₂ H ₄	1
Total			7

SCA2FP

Question 8

question	answers	extra information	mark
8(a) A	(light waves) are transverse (sound waves) are longitudinal		1 1
8(b) E		extra line from property cancels the mark	1 1
8(c)(i) A	B		1
8(c)(ii) A	D		1
Total			6

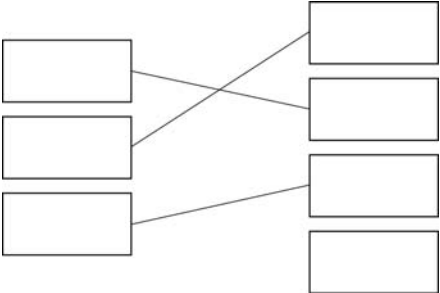
SCA2FP

Question 9

question	answers	extra information	mark
9(a) A	2 cm		1
9(b) E	5 (hertz)	ignore incorrect units	1
9(c) E	10 (cm/s)	$v = f \times \lambda$ allow correct substitution for 1 mark (20×0.5) or (2×5)	2
9(d)(i) E clip with 9(d)(ii) & 9(d)(iii)	point at 6 cm on x-axis should be circled		1
9(d)(ii) E clip with 9(d)(i) & 9(d)(iii)	line of best fit drawn through points ignoring anomalous point at 6 cm	line should be a curve through every point (including 0) except anomalous point tolerance ± 1 square at each cross ignore line after 16 cm do not accept straight lines joining crosses	1
9(d)(iii) E clip with 9(d)(i) & 9(d)(ii)	3.5 (cm/s)	tolerance \pm half a square from students line allow ecf from (d)(ii) if no extrapolation accept 3.5	1
Total			7

SCA2FP

Question 10

question	answers	extra information	mark
<p>10(a) E</p>	<p>gamma (rays)</p> <p>(visible) light</p>	<p>correct order only</p> <p>allow waves</p>	<p>1</p> <p>1</p>
<p>10(b) E</p>		<p>extra line from statement cancels the mark</p>	<p>1</p> <p>1</p> <p>1</p>
<p>Total</p>			<p>5</p>

SCA2FP

Question 11

question	answers	extra information	mark
11(a) E	the longer the time you spend using a mobile phone the less sperm cells you have	allow negative correlation between time using mobile phone and number of sperm cells do not accept just affects numbers of sperm ignore figures	1
11(b) E	any two from: <ul style="list-style-type: none"> • use a larger sample of people • check to see if other scientists get the same results • use a sample of men who were not visiting fertility clinics • use same type of (mobile) phone • use men of similar age / health 	ignore more hours unqualified	2
Total			3

SCA2FP

Question 12

question	answers	extra information	mark
12(a) E	36 (%)	36 (%) gains two marks accept answers in range 32 (%)–42 (%) if answer incorrect give 1 mark for evidence of estimating number of squares as being 8–10.5	2
12(b)(i) E clip with 12(b)(ii)	Greater plantain most abundant on path / walked area Ribwort plantain most abundant away from path / on the field / grass / on area not walked on	for 2 marks a correct statement must be made for each plant. accept answers in terms of quadrat number / start and finish accept for 1 mark where number of one plant high, number of other plant low ignore figures	1 1

Question 12 continues on the next page . . .

SCA2FP

Question 12 continued . . .

question	answers	extra information	mark
12(b)(ii) E clip with 12(b)(i)	<p>for Greater plantain numbers higher on path</p> <p>Greater plantain grows flatter / lower to ground / is shorter</p> <p>(so) will be damaged less by trampling /will not be pulled out</p> <p>or</p> <p>for Ribwort plantain numbers higher in field</p> <p>Ribwort plantain has tall leaves or is taller</p> <p>to obtain more light or for photosynthesis</p>	<p>if no position given max 1 mark</p> <p>accept converse statements</p> <p>ignore surface area</p> <p>allow tall stems</p> <p>ignore Sun</p> <p>ignore references to nutrients</p> <p>ignore competition unless qualified</p>	<p>1</p> <p>1</p>
12(c) E	<p>Greater plantain would grow better on football pitch / area 1</p> <p>(since) more trampling on pitch</p>	<p>answers must refer to named plantain(s) to gain credit</p> <p>accept converse argument</p> <p>if no other marks gained, allow 1 mark for more plantains in area 2 <u>because</u> they will not be affected by human activity / example</p>	<p>1</p> <p>1</p>
Total			8

SCA2FP

Question 13

question	answers	extra information	mark
13(a)(i) E	the Earth cooled or <u>crust</u> shrank / wrinkled / shrivelled / crinkled		1
13(a)(ii) E	insufficient / no evidence for new theory / tectonic theory or no evidence against or they were not aware of plates / movements or no other theory made sense	allow had evidence for old theory ignore no other theories	1

Question 13 continues on the next page . . .

SCA2FP

Question 13 continued . . .

question	answers	extra information	mark
13(b) E			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	There is a statement about change or an attempt at an explanation of the tectonic theory	There is a statement about change and an incomplete explanation of the tectonic theory	There is a statement about change and a clear scientific explanation of the tectonic theory
<p>examples of chemistry points made in the response</p> <p>descriptive points:</p> <ul style="list-style-type: none"> • continents have moved apart / together • or • continental drift • move slowly / a few centimetres a year • now separated by expanses of oceans • example of movement of one continent <p>explanation points:</p> <ul style="list-style-type: none"> • the (Earth's crust) is made up of (tectonic) plates • mantle can move (slowly) • convection currents • within the mantle • driven by energy (allow heat) • released by radioactive processes • in the core • cause the plates to move 			
Total			8

SCA2FP

Question 14

question	answers	extra information	mark
14(a) E	uranium / plutonium		1
14(b) E	A – boiler / heat exchanger / water heater B – turbine C – generator	allow steam ignore water on its own	1 1 1
14(c)(i) E	step-up		1
14(c)(ii) E	increases voltage / decreases current decreased energy loss from power cables / wires	ignore changes to power ignore resistance allow step-up for increasing allow heat for energy ignore electricity / power loss do not accept <u>no</u> energy loss	1 1

Question 14 continues on the next page . . .

SCA2FP

Question 14 continued . . .

question	answers	extra information	mark
14(d) E	any two factors from: <ul style="list-style-type: none"> • cost of electricity • amount of electricity / power produced • disposal of waste (radioactive / fossil fuel) or radioactive waste has long half-life • cost of commissioning • cost of decommissioning • <u>availability</u> of uranium / plutonium / nuclear fuel / fossil fuels • availability of sites to build nuclear power stations • security hazard qualified / safety issue qualified • carbon emissions / global warming • start-up time 	ignore cost of fuel ignore pollution unqualified accept waste could be be toxic ignore radiation unqualified ignore demolishing ignore non-renewable / will run out ignore dangerous unqualified if no marks are given allow 1 mark for cost unqualified	2
Total			9

UMS Conversion Calculator
<http://web.aqa.org.uk/UMS/index.php>