General Certificate of Secondary Education

Science A 4406

SCA1FP Unit 5

Mark Scheme

2012 examination – June 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.

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MARK SCHEME

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 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	Neptune, Mars, Moon	1
2	Neptune, 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 8 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.

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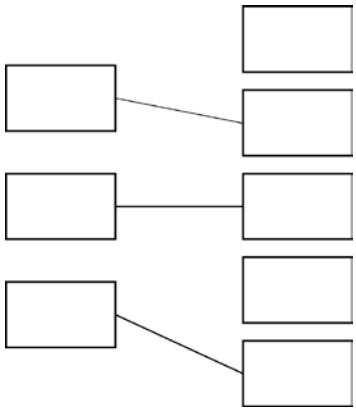
Question 1

question	answers	extra information	mark
1(a)		one mark for each correct line extra line from condition negates mark	 1 1 1
1(b)(i)	phototropism		1
1(b)(ii)	auxin	accept phonetic spelling allow IAA / indoleacetic acid	1
Total			**5**

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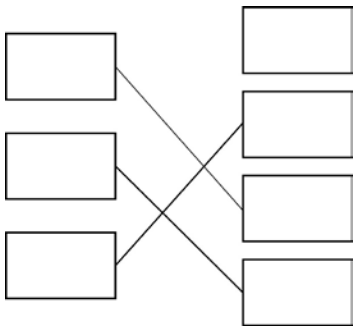
Question 2

question	answers	extra information	mark
2(a)		one mark for each correct line extra line from drug negates mark	1 1 1
2(b)	stop the trial side effects too severe **or** (too) many people had side effects	 second mark scores only if first mark correct allow people might die / get ill / harmed allow use of numbers from table ignore itchy skin	1 1
Total			**5**

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Question 3

question	answers	extra information	mark
3(a)(i)	14000		1
3(a)(ii)	gets heavier	allow ecf from (a)(i) accept increased muscle mass allow gets fat / increase in weight ignore health effects ignore increased BMR / gets bigger	1
3(b)(i)	has a healthy weight		1
3(b)(ii)	carry on as normal	answer must match the response in (b)(i) accept eat more food if is underweight is chosen for (b)(i) do **not** accept do less exercise for any answer	1
Total			**4**

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Question 4

question	answers	extra information	mark
4(a)(i)	urine	ignore urea	1
4(a)(ii)	1.5		1
4(b)(i)	loses more (sodium ions) **or** (mass of sodium ions) increases	allow salt for sodium ions allow values between 1.6–10 g for mass of sodium ions lost ignore sweats more	1
4(b)(ii)	take food / drinks containing sodium ions **or** take salty food / drinks	example must be qualified allow consume sports drink / isotonic drink ignore consume energy drink / brand names allow take salt tablets ignore eat sweets	1

Question 4 continues on the next page

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Question 4 continued

question	answers	extra information	mark
4(b)(iii)	water content of body decreases so needs to drink water / named fluid **or** (blood) sugar / glucose level decreases so needs to eat food **or** temperature of body increases so needs to cool slowly / wrap up in survival blanket **or** lactic acid increases so do cool / warm down exercises or breathe heavier **or** heart rate increases so need to rest / do cool / warm down exercises / breathe heavily	for **2** marks accept become dehydrated allow energy stores for **2** marks accept body gets hot allow drink water allow for **3** marks repay the oxygen debt by cool / warm down exercises or breathing heavier allow pulse rate if just give suggestion of what to do without reference to an internal condition give **1** mark only allow **1** mark for breathing rate increases and allow **1** mark for so need to rest	1 1 1
Total			**7**

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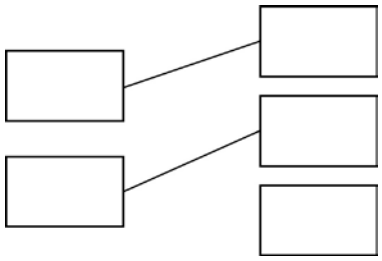
Question 5

question	answers	extra information	mark
5(a)(i)	unreactive		1
5(a)(ii)	atoms		1
5(b)		extra line from particle negates mark	1 1
5(c)(i)	mixture of metals	accept mixture of a metal with other element(s)	1
5(c)(ii)	to make it harder	accept to make it more resistant to wear / corrosion / tarnishing allow keeps it shiny allow makes it stronger ignore bronze won't rust ignore references to reactivity	1
Total			**6**

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Question 6

question	answers	extra information	mark
6(a)(i)	any **one** from: • increases jobs • more money in local economy • increase in local trade • more shops / businesses • improved transport links	ignore uses of limestone	1
6(a)(ii)	any **one** from: • dust (pollution) • noise (pollution) • scar on landscape • destroys habitats • extra traffic • more heavy vehicles	ignore pollution unqualified ignore smell allow named respiratory problem allow reduction in tourism ignore takes up space	1
6(b)(i)	$CaCO_3$		1
6(b)(ii)	carbon dioxide		1
6(b)(iii)	decomposition		1
Total			**5**

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Question 7

question	answers	extra information	mark
7(a)	They are made from plants They are renewable resources		1 1
7(b)	oxygen = 1 hydrogen = 6		1 1
7(c)(i)	bar correctly drawn at 30	+/- ½ a square ignore width of bar	1
7(c)(ii)	**advantage** raw materials readily available **disadvantage** gives out less energy (than other oils)	 allow converse for soya and sunflower accept low transport costs ignore widely grown / lots of it unless qualified allow gives out a small amount of energy ignore colour of oil	 1 1
7(d)	(petroleum diesel) more unburnt fuels emitted more soot emitted more sulfur dioxide emitted / more acid rain	maximum of **2** marks if incorrect fuel given allow contains more sulfur	 1 1 1
Total			**10**

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Question 8

question	answers	extra information	mark
8(a)	chemical electrical kinetic	must be in correct order	1 1 1
8(b)(i)	70(%)	allow 0.7 allow $\frac{7}{10}$ **or** $\frac{70}{100}$ ignore units	1
8(b)(ii)	increase		1
Total			**5**

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Question 9

question	answers	extra information	mark
9(a)	liquid(s) gas(es)	any order if no other answer given allow **1** mark for fluids	1 1
9(b)	(B) E C D (A)	3 correct for **2** marks 1 or 2 correct for **1** mark	2
Total			**4**

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Question 10

question	answers	extra information	mark
10(a)	(shape) C (shape) A (shape) B	all three correct gains **2** marks one or two correct gains **1** mark	2
10(b)(i)	0–2 minutes		1
10(b)(ii)	There is a big temperature difference between the shapes and the surroundings		1
10(c)	any **two** from: • paint the shape black • put the shape on a colder surface / in a colder place • put the shape on a metal surface • increase the temperature of shape C • blow air across it	ignore references to surface area / size / changing shape or material shape is made from ignore more heat	2
Total			**6**

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Question 11

question	answers	extra information	mark
11(a)(i)	any **one** from: • size / area of panel • same panel • time left / 1 hour • same volume / mass of water	accept time of day investigation done accept weather conditions accept ambient temperature accept starting temperature of water (in the pipes) ignore direction of (radiation from) the Sun	1
11(a)(ii)	(black) absorbs infrared / (infrared) radiation / IR / energy	allow heat do **not** accept attracts heat ignore absorbs light / Sun	1
11(b)(i)	as angle increases, temperature (rise) decreases little / no change to temperature rise between 0 and 20°	accept converse	1 1
11(b)(ii)	fit solar panel between 0 and 20° / a (stated) value between 0 and 20°gains **2** marks	point the solar panel towards the Sun / choose a small angle gains **1** mark	2
Total			**6**

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Question 12

question	answers	extra information	mark
12	A – receptor	ignore organ / nerve	1
	B – sensory	allow sensor	1
	C – CNS / central nervous system	accept spinal cord allow coordinator ignore brain do **not** accept spine	1
	D – motor		1
	E – effector		1
Total			**5**

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Question 13

question	answers	extra information	mark
13		only accept explanation if attempt at description made	
	sterilise Petri dish / agar / loop	accept description of sterilisation method ignore clean or disinfect Petri dish / agar / loop allow wash / clean / disinfect hands **or** do not touch agar / loop / milk with hands allow sterile gloves	1
	to kill / prevent transfer of bacteria / microorganisms	allow so no bacteria on allow fungi ignore viruses / germs	1
	tape the Petri dish lid **or** do not open the lid too far / too long	allow keep the lid on / Petri dish closed	1
	(so) less chance of bacteria / microorganisms getting in **or** less contamination from air	ignore to stop bacteria / microorganisms getting out ignore so air / oxygen does not get in	1
Total			**4**

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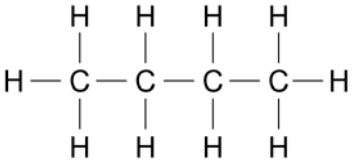
Question 14

question	answers	extra information	mark
14(a)	C_3H_8	allow H_8C_3 C and H must be upper case 3 and 8 should be subscript do **not** accept superscript 3 or 8	1
14(b)		all bonds must be shown all letters must be upper case ignore circles around letters do **not** allow double bonds	1
14(c)	carbon dioxide + water	answers can be in either order accept carbon dioxide as CO_2 and water as H_2O numbers in formulae must be subscript	1
14(d)	(smoke is) carbon (formed by) incomplete combustion	ignore soot accept insufficient oxygen	1 1
Total			**5**

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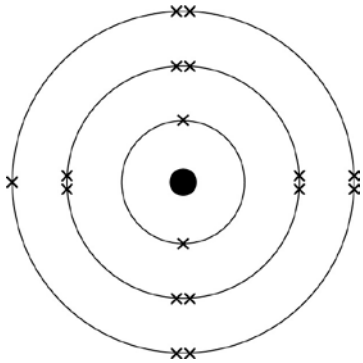
Question 15

question	answers	extra information	mark
15(a)		accept dot / small circle / e instead of any cross electrons need to be arranged as 2, 8, 7 but do not have to be in pairs	1
15(b)		if sharing electrons / covalent bonds mentioned only allow maximum of **2** marks	
	lithium loses electrons	accept for **2** marks lithium has only two electrons left	1
	one electron		1
	to form a positive ion / Li^+ **or** ion has a charge of 1^+	allow lithium (atom) becomes positively charged allow has a complete outer shell / energy level / orbit (of electrons)	1
Total			**4**

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Question 16

question	answers	extra information	mark
16(a)		accept converse statements	
	the lower the temperature the longer the (drying) time	allow a low temperature has a long (drying) time	1
	the higher the humidity the longer the (drying) time	allow a high humidity has a long (drying) time	1
		ignore temperature has a greater effect than humidity	
		if no other marks gained allow **1** mark for comparison of data eg trial 1 is the shortest **and** trial 3 is the longest	
		ignore references to best / worst	
16(b)	any **one** from: • volume / amount of paint (applied) • air flow • type of paint • thickness / viscosity of paint • type of surface painted	ignore number of layers accept thickness of layer accept colour / matt / gloss etc ignore answers in terms of temperature / humidity / (sun)light	1
Total			**3**

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Question 17

question	answers	extra information	mark
17			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 content	There is a basic description which includes either a process involved **or** a suggestion for a method of reducing the rate of energy transfer.	There is a clear description which includes **one** process. It also includes feasible suggestions for reducing the rate of energy transfer from roof **and** windows. There is a reasonable attempt to explain why the rate of energy transfer is reduced for **at least one of the methods** using terms like conduction, convection **or** radiation.	There is a detailed description which includes processes **and** feasible suggestions for reducing the rate of energy transfer from roof **and** windows. There is a correct explanation **for both methods** of why the rate of energy transfer is reduced using terms like conduction, convection and radiation.

Question 17 continues on the next page

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Question 17 continued

examples of the points made in the response	extra information
Roof Process: • convection / hot air rises (within roof space) • conduction through roof • radiation by the roof / tiles	ignore heat / energy rises
Method: • (loft) insulation / fibreglass • shiny / reflective material	allow reduce temperature of house
Explanation: • reduces convection • reduces conduction • reduces radiation • (insulation) traps air	answers must link to process / method
Windows Process: • conduction through glass	
Method: • double glazing • reflective coating on glass	allow curtains allow thicker glass
Explanation: • layer of air **or** a vacuum (between glass) • (air) is a poor conductor / good insulator • (reflective coating) reduces radiation	accept argon / krypton / xenon for air for curtains: trapping air (between curtain and window) for thicker glass: is a better insulator allow reduce temperature inside house and explanation in terms of temperature difference between inside and outside of house - credit only once

Total			**6**

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