



**General Certificate of Secondary Education
June 2013**

Science A (Combined)

SCA1HP

(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. 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 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.

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Question 1

question	answers	extra information	mark
1(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
1(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
1(c)	exercise	<p>allow suitable example allow avoid smoking / drugs / alcohol etc.</p> <p>ignore diet / drink water</p>	1
Total			4

SCA1HP
Question 2

question	answers	extra information	mark
2(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
2(b)(i)	hand-washing		1
	before / after examining patients or between patients or after examining dead bodies	ignore between wards	1
2(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

SCA1HP
Question 3

question	answers	extra information	mark
3(a)	oestrogen	in either order allow phonetic spellings	1
	progesterone	accept progestin / progestogen do not allow proestrogen	1
3(b)	(oestrogen / progesterone) inhibits FSH production	if no hormones mentioned credit any effect listed in mark scheme	1
	(so) no eggs mature	ignore for oestrogen: no eggs mature do not accept oestrogen inhibits ovulation accept (progesterone) thickens mucus around cervix or inhibits maturation / ovulation of egg	1
Total			4

SCA1HP
Question 4

question	answers	extra information	mark
4(a)	transition (elements / metals)	accept d block (elements / metals)	1
4(b)	any three from: <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	ignore references to cost ignore references to electricity accept malleable ignore moulded allow does not rust allow not very reactive allow durable ignore tough allow ductile	3
4(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 4 continues on the next page

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Question 4 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 5

question	answers	extra information	mark
5(a)	aluminium and chlorine	ignore reference to products do not accept chloride	1
	(aluminium) two (atoms) and (chlorine) six (atoms)		1
5(b)(i)	proton +1 (charge)		1
	neutron 0 or no charge or neutral		1
	electron –1 (charge)	allow for 2 marks proton has positive / + (charge), neutron is neutral / 0 / has no charge and electron has negative / – (charge) allow for 1 mark (particles) proton, neutron and electron, if no other marks gained	1
5(b)(ii)	number of protons is equal to the number of electrons	allow amount for number accept has 13 protons and 13 electrons	1
	or equal numbers of positive and negative charges	accept has 13 positive charges and 13 negative charges	
Total			6

SCA1HP
Question 6

question	answers	extra information	mark
6(a)(i)	categoric		1
6(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
6(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
6(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 6 continues on the next page

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Question 6 continued

6(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

SCA1HP
Question 7

question	answers	extra information	mark
7(a)		for full marks an indication of an energy transfer must be given	
	electrical	ignore electricity	1
	(to) kinetic (of air / motor / fan)		1
	(and) sound	ignore noise	1
	(and) energy that heats (the hair / surroundings)	allow heat (energy) allow light with a correct explanation e.g. glowing element, indicator light	1
7(b)	energy cannot be created / destroyed	accept energy is conserved	1
Total			5

SCA1HP
Question 8

question	answers	extra information	mark
8(a)(i)	any one from: <ul style="list-style-type: none"> • same test being repeated • test number not a dependent variable / variable being tested • test number is not a continuous variable 	allow test number is a categoric variable allow data is categoric	1
8(a)(ii)	ignore / repeat anomalous result calculate means (for each sense organ)	allow average	1 1
8(b)	any one from: <ul style="list-style-type: none"> • eyes have longest reaction time • ears have shortest reaction time • ears and skin have similar reaction times 	ignore figures allow slowest allow fastest ignore references to anomalies / repeat values / test numbers	1
Total			4

SCA1HP
Question 10

question	answers	extra information	mark
10(a)	auxin	allow phonetic spelling allows auxins / IAA / indoleacetic acid / gibberellins	1
10(b)(i)	Diagram E		1
10(b)(ii)	<p>auxin stimulates growth / (cell) elongation</p> <p>no / very little auxin on left / light side or (more) auxin on right side</p> <p>because of light (destroying auxin)</p> <p>plastic stopped auxin moving down / reaching right / shaded side of shoot</p>	<p>allow hormone / chemical / ecf from part 10(a) for auxin throughout</p> <p>allow light side for left side and shaded side for right side</p> <p>allow for 2 marks auxin moves away from light or towards shaded side</p> <p>if no marks gained allow 1 mark for phototropism / phototropic response</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
Total			6

SCA1HP
Question 11

question	answers	extra information	mark
11(a)(i)	(as number of carbon atoms increase)	ignore figures	
	the boiling point increases	accept converse statement	
	(the fuels) ignite at higher temperatures	do not allow the boiling point range increases	1
		accept flammability decreases allow flash point increases allow harder to catch fire	1
11(a)(ii)	diesel	no marks awarded if incorrect fuel given	1
	as viscosity increases with increasing size of molecules	allow has largest molecules / longest (hydrocarbon) chain	1
		allow has most carbon atoms	
11(b)(i)	$(2C_8H_{18}) + 25(O_2)$	accept correct multiples when applied throughout the equation	1
	$16(CO_2) + 18(H_2O)$	if no other marks obtained allow for 1 mark either $16CO_2$ or $18H_2O$	1
11(b)(ii)	(because octane) contains <u>only</u> hydrogen and carbon atoms	do not allow a mixture	1
	(and) formula fits the general formula for alkanes / C_nH_{2n+2}	ignore references to bonding and saturation	1
Total			8

SCA1HP
Question 12

question	answers	extra information	mark
12(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
12(b)(i)	mass of products should equal mass of reactants	allow loss in mass or 4.4 g lost	1
	(there is a difference because the) gas <u>escapes</u>	ignore gas produced / evaporated	1
12(b)(ii)	$(\text{Ca}(\text{OH})_2) + \text{CO}_2$	ignore attempts at balancing	1
	$\text{CaCO}_3 + \text{H}_2\text{O}$	formulae can be in either order	1
Total			6

SCA1HP
Question 13

question	answers	extra information	mark
13(a)(i)	3.84 (kWh)	allow 3.8 correct substitution ($E = P \times t$) 0.16×24 gains 1 mark provided no subsequent step shown or an answer of 3840 or 3800 gains 1 mark	2
13(a)(ii)	kettle	allow ecf from 13(a)(i)	1
13(b)	(saving =) 35 p or £0.35 (per day)	for full marks the correct unit must be given correct calculation of cost of gas or electricity is worth 1 mark for each calculation electric = ($5 \text{ kWh} \times 12$ =) 60 (p) accept £0.60 gas = ($5 \text{ kWh} \times 5$ =) 25 (p) accept £0.25 calculation of saving per kWh ($12 - 5$ =) 7 (p) is worth 1 mark	3

Question 13 continues on the next page

SCA1HP

Question 13 continued

question	answers	extra information	mark
13(c)	6 (°C)	<p>allow max 2 marks for calculation of temperature rise per second 0.1 (°C)</p> <p>allow correct substitution for 1 mark provided no subsequent step shown</p> <p>i.e. $8400 = 20 \times 4200 \times \theta$</p> <p>or</p> <p>$8400 \times 60 = 20 \times 4200 \times \theta$</p> <p>or</p> <p>$8400 = 84000 \times \theta$</p> <p>or</p> <p>$\theta = \frac{8400}{20 \times 4200}$</p> <p>or</p> <p>$\theta = \frac{8400 \times 60}{20 \times 4200}$</p> <p>or</p> <p>$\theta = \frac{8400}{84000}$</p>	3
Total			9

SCA1HP
Question 14

question	answers	extra information	mark
14(a)	energy transferred from athlete / skin / body to water / sweat	allow water / sweat heated by athlete	1
	(so) more energetic (water / sweat) particles escape (from the liquid)	accept particles with higher speeds escape (from the liquid)	1
	water / sweat <u>evaporates</u>	accept particles escape from the (surface of the) liquid	1
	(which) lowers the <u>average</u> energy of (remaining) water / sweat particles	allow reference to the total energy of the liquid reducing allow lowers the athlete's <u>temperature</u> ignore cool down	1
14(b)	any three from: <ul style="list-style-type: none"> the blanket traps air air is an insulator space blanket reflects infrared radiation (back to the body) space blanket is a poor emitter / radiator of infrared radiation 	accept IR / radiation / heat / infrared / energy throughout <div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 2em; line-height: 1;">}</div> <div style="display: inline-block; vertical-align: middle; padding-left: 5px;"> accept for 2 marks trapped air reduces conduction / convection </div> </div> ignore incident solar radiation ignore reflects light ignore bounces off do not accept does not emit infrared radiation	3
Total			7

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