AQA

GCSE

Science A

SCA1FP

Mark scheme

4406

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Version 1.0: Final

Mark schemes are prepared by the Lead Assessment Writer 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 associates 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 associate understands and applies it in the same correct way. As preparation for standardisation each associate 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, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

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 from aqa.org.uk

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 Assessment Objectives and specification content that each question is intended to cover.

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.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

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 errors / 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	green, 5	0
2	red*, 5	1
3	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, 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 is 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 Accept / allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

3.9 Ignore / Insufficient / Do <u>not</u> allow

Ignore of 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 Communication and levels marking

In Question **15** students are required to produce extended written material in English, and will be assessed on the quality of their 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.

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>1(a)</td><td>receptors</td><td></td><td>1</td><td>AO1
B1.2.1b</td></tr>
<tr><td>1(b)</td><td><table><tr><th>Sense organ</th><th>Stimulus the sense organ detects</th><th>What the sense organ allows humans to do</th></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td>sound</td><td></td></tr><tr><td></td><td></td><td>to see</td></tr><tr><td>nose</td><td></td><td></td></tr></table></td><td>allow noise / vibrations</td><td>1
1
1</td><td>AO1, AO2
B1.2.1b</td></tr>
<tr><td>Total</td><td></td><td></td><td>4</td><td></td></tr>
</table>

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>2(a)(i)</td><td>the type of fruit juice</td><td></td><td>1</td><td>AO2
B1.1.1a</td></tr>
<tr><td>2(a)(ii)</td><td>lemon (juice)</td><td></td><td>1</td><td>AO3
B1.1.1a</td></tr>
<tr><td>2(b)</td><td>200 (cm^3)</td><td></td><td>1</td><td>AO2
B1.1.1a</td></tr>
<tr><td>2(c)</td><td>any two from:
• carbohydrates
• fats
• proteins
• minerals</td><td>

allow lipids / oils

allow water
allow fibre
ignore vitamins</td><td>2</td><td>AO1
B1.1.1a</td></tr>
<tr><td>Total</td><td></td><td></td><td>5</td><td></td></tr>
</table>

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	sperm (cells)	ignore sex cell / gamete do **not** allow egg (cell)	1	AO1 B1.2.2e
3(b)	fertilisation an embryo uterus		1 1 1	AO1, AO2 B1.2.2e
Total			**4**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	slows down speeds up	answers must be in this order	1 1	AO1, AO2 B1.2.3a,b, c
4(b)	any **one** from: • light • moisture	allow water allow temperature (change) accept touch	1	AO1 B1.2.3a
Total			**3**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	antibiotics do not kill viruses **or** antibiotics are not effective against viruses	allow antibiotics only kill bacteria allow flu is not caused by a bacterium allow antibiotics cannot reach viruses inside cells	1	AO1 B1.1.2h
5(b)	Inactive viruses		1	AO1 B1.1.2l
5(c)	Conclusion: people 65 years and older had the highest percentage vaccinated Reason: more worried about becoming ill **or** had more time to go to the doctor **OR** Conclusion: children aged 3-years had the lowest percentage vaccinated Reason: parents didn't have time to take them to the doctor **or** they had been vaccinated when 2-years old	ignore references to figures unless qualified	1 1	AO3 B1.1.2l
Total			**4**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)	*(advantages of titanium)* less dense stronger *(disadvantage of titanium)* more expensive	ignore references to figures allow lighter ignore references to corrosion	 1 1 1	AO2, AO3 C1.3.2b C1.3.3a,c
6(a)(ii)	high resistance to corrosion		1	AO1 C1.3.3c
6(b)	**Metal** **Method of extraction** Gold → Mined as the pure metal from the ground Iron → Reduction of metal oxide with carbon Electrolysis of molten compound	extra line from any metal negates mark	 1 1	AO1 C1.3.1c,d
6(c)	silver	ignore chemical symbols	1	AO2 C1.1.1a,b
6(d)(i)	mixture		1	AO1 C1.3.2c
6(d)(ii)	12 (%)		1	AO2 C1.3.2c
6(d)(iii)	plants		1	AO1 C1.3.1g
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	any **four** from: • 3 protons • 4 neutrons • 3 electrons • protons **and** neutrons in nucleus • electrons in energy levels / shells	wrong number for any particle **max 3** references to charges must be correct allow electronic configuration is 2.1	4	AO1, AO2 C1.1.1c,e, h
7(b)	sodium		1	AO2 C1.1.1a C1.1.2a
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)(i)	calcium oxide	allow quicklime	1	AO2 C1.1.3b C1.2.1b
8(a)(ii)	220 kg		1	AO2 C1.1.3b/c
8(b)	mortar		1	AO1 C1.2.1g
8(c)(i)	the greater the mass of cement the stronger the block / concrete (initially) above 700 g an increase in mass of cement has no extra effect on the strength of the block / concrete	allow the greater the mass of cement, the greater the mass needed to break the block / concrete (initially) allow above 700 g the mass needed to break the block / concrete remains the same accept for **2** marks as mass of cement increases, the (rate of) increase in strength of the block / concrete decreases **or** increase in mass needed to break block / concrete decreases as mass of cement increases	1 1	AO3 C1.2.1g
8(c)(ii)	any **one** from: • repeat the investigation **and** calculate a mean • use smaller intervals	ignore references to accuracy, precision, range allow average for mean	1	AO3 C1.2.1g
Total			**6**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(a)(i)	electrical kinetic	answers must be in the correct order	1 1	AO1 P1.3.1a
9(a)(ii)	any **one** from: • thermal (energy) • sound (energy)	allow "heat" (energy)	1	AO1 P1.2.1b
9(a)(iii)	The wasted energy is transferred to the surroundings		1	AO1 P1.2.1c
9(b)(i)	*advantage of A*: any **one** from: • bigger wash load • uses less energy • uses less water *disadvantage of A*: higher cost (to buy)	answers must be comparative allow uses less electricity	1 1	AO3 P1.3
9(b)(ii)	90 (p)	allow **£** 0.9(0) allow for **1** mark 1.2 x 5 = 6 (kWh) **or** 18p ***or*** correct calculation of 15 x incorrect value for <u>1.2 x 5</u>	2	AO2 P1.3.1d
Total			**8**	

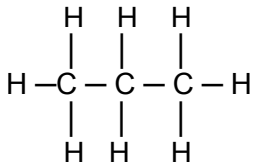
Question	Answers	Extra information	Mark	AO / Spec. Ref.
10(a)(i)	infrared radiation		1	AO1 P1.1.1c
10(a)(ii)	absorbed		1	AO1 P1.1.3c
10(b)	France has more hours of sunlight (all year round) **or** France has more hours of sunlight in every month of the year	accept the converse allow France is sunnier	1	AO2 P1.1.4c
	(so) there will be more energy to heat the water **or** (so) more energy can be absorbed / transferred	allow (so) more water can be heated allow 'heat' for energy	1	AO3 P1.1.4c
10(c)	42 000 000	allow 4.2×10^7 allow for **1** mark correct substitution 200 x 4200 x 50 provided no subsequent step shown ***or*** 42 000	2	AO2, AO1 P1.1.4d
	joules	42 000 kJ = **3** marks	1	
Total			**7**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
11(a)	any **one** from: • starting temperature • volume of beaker • surface area (of beaker) • volume of water • type of insulation	 allow size / shape / material of beaker allow mass / amount of water	1	AO3 P1.1.3c
11(b)	the more layers of insulation the slower the temperature fell **or** the more layers of insulation the smaller the temperature drop	accept the converse answer must be a comparison allow 'heat' for energy accept when more layers are added less energy is lost accept the more layers (of insulation) the slower the energy loss	1	AO3 P1.1.3c
11(c)(i)	point at 7 minutes for 5 layers of insulation circled		1	AO3 P1.1.3c
11(c)(ii)	any **one** from: • misread the thermometer • took the temperature at the wrong time • lifted the thermometer out of the water (when reading it) • misplotted the point	human / recording error needs to be qualified	1	AO3 P1.1.3c
11(d)(i)	conduction.		1	AO1 P1.1.3a
11(d)(ii)	insulating.		1	AO1 P1.1.4a
Total			**6**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
12(a)(i)	nicotine **and** alcohol	both drugs needed for **1** mark	1	AO1 B1.3.1e
12(a)(ii)	nicotine / alcohol has a greater risk of harming the body (than some illegal drugs) **or** nicotine / alcohol has a higher risk of addiction (than some illegal drugs)	allow cannabis / ecstasy has less risk of harming the body (than some legal drug) **or** allow cannabis / ecstasy has less risk of addiction (than some legal drug) allow alcohol causes liver damage allow nicotine causes heart / circulatory disease	1	AO1, AO2 B1.3.1g
	more people use legal drugs (than illegal drugs)		1	
12(b)(i)	any **one** from: • cocaine / heroin has a high risk of addiction **and** a high risk of harm to the body • cocaine / heroin / ecstasy lie on / near the trend line • (trend line shows a) positive correlation	ignore reference to figures allow follow the pattern **or** are on the line of best fit	1	AO3 B1.3.1 e,h

12(b)(ii)	any **one** from: • nicotine / alcohol / cannabis has a high(er) risk of addiction but low(er) risk of harm (compared to other drugs) • anabolic steroids have a low(er) risk of addiction but a high(er) risk of harm (compared to any other drug)	ignore reference to figures allow the point for anabolic steroids and / or nicotine is an anomaly	1	AO3 B1.3.1e,h
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
13(a)(i)	reduces the (risk of) growth of pathogens	allow named pathogen allow for pathogens harmful bacteria / fungi / microorganisms ignore virus ignore stops growth of pathogens allow reduces risk of infection ignore disease	1	AO1 B1.1.2n
13(a)(ii)	microorganisms grow faster	allow growth will be faster allow more microorganisms produced in a given time allow provides optimum conditions (for growth)	1	AO1 B1.1.2o
13(b)(i)	7.8 to 22.2 **or** 7.8 – 22.2	allow converse statements allow 14.4 ignore incorrect subtraction unless 53 or 13.25 is given and then apply the list principle	1	AO2 B1.1.2m,n
13(b)(ii)	gym exercise mat is the surface with the most bacteria reason: (sweaty) people lay on it **or** it is used on a dirty floor **OR** canteen service area has the least bacteria reason: it gets cleaned / disinfected regularly	allow dirtiest allow most contaminated allow has (traces of) sweat on it allow it does not get washed allow cleanest allow for **2** marks: laboratory bench has few bacteria because it gets cleaned (regularly)	1 1	AO2, AO3 B1.1.2 B1.1.2m,n
Total			**5**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
14(a)(i)	any **three** from: • (crude) oil is heated • (crude) oil evaporates • vapour condenses • at different temperatures	 allow fractions condense allow the fractions have different boiling points	3	AO1 C1.4.1a,b C1.4.2b
14(a)(ii)	(as number of carbon atoms increases) (Boiling point) increases (Viscosity) increases		 1 1	AO1 C1.4.2c
14(b)(i)			1	AO2 C1.4.2a

14(b)(ii)	any **two** from: • carbon dioxide • water • carbon monoxide • carbon	 allow CO_2 allow H_2O allow water vapour allow CO allow soot	2	AO1 C1.4.3a,b
14(b)(iii)	any **one** from: • lack of availability of LPG • cars need to be modified	 allow LPG cars are more expensive	1	AO3 C1.4
Total			**9**	

QWC Mark Scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.

15

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.

AO1, AO2

P1.1.2a,b

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No creditworthy response	At least **one** relevant statement is made	Relevant statements are made about two of the states **or** a relevant statement is made about each state	Relevant statements are made about each of the three states

Examples of the Physics points made in the response:	Extra information
	ignore statements about the states of matter a description without mention of particles, but clearly about particles, can gain **max** 4 marks
solids:	
• arranged in a regular pattern	allow closely / tightly packed / compact
• particles vibrate about fixed points	allow cannot move freely / around
• particles have low energy	
liquids:	
• pattern is irregular	allow close together
• particles are not fixed in place **or** can move freely / around	
• particles have more energy than solids and / or less energy than gases	
gases:	
• particles are in a random pattern	allow far apart
• particles move (about) freely / randomly	allow move fast(er)
• particles have high energy	

Total		6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
16(a)	condensation		1	AO1 P1.1.3b
16(b)	larger (exposed) surface area (so) water can evaporate faster **or** (so) more water (molecules) can escape	 allow more water can evaporate	1 1	AO2 P1.1.3b
Total			**3**	