SPECIMEN MATERIAL

GCSE
COMBINED SCIENCE: SYNERGY

PAPER 2F

Mark scheme

Specimen 2018

Version 1.0

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. The final mark scheme will include any amendments made at the standardisation events which all examiners participate in and is the scheme which is 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 that 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.

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 and underlining

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 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	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

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working.

Full marks can, however, be given for a correct numerical answer, without any working shown.

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

Ignore or insufficient are 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 as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes. Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

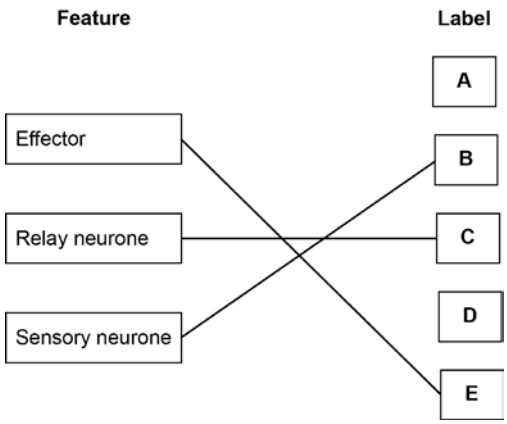
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	Reflex action		1	AO1/1 4.2.1.6
01.2		extra lines from the left negate the mark	3	AO2/1 4.2.1.6
01.3	dependent		1	AO1/2 RPA 8
01.4	17.0	allow answers in range 17.0–17.3 cm	1	AO2/2 RPA 8
01.5	0.5 cm		1	AO2/2 RPA 8
01.6	23.5 does not fit the pattern **or** at least 5 cm higher than the other values		1 1	AO3/1a AO3/3a RPA 8
01.7	The results are for the left and right hands of different people		1	AO3/3a RPA 8
Total			**10**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	gamma beta alpha	allow **1** mark for 1 or 2 correct	2	AO1/1 4.3.2.4
02.2	any **two** from: • do not point (radioactive) source at students • keep (radioactive) source outside the box for minimum time necessary • wear safety glasses **or** eye protection **or** do not look at source • wear gloves • hold (radioactive) source away from body • hold (radioactive) source with tongs / forceps		2	AO3/3a 4.3.2.5
02.3	as time increases count rate decreases count rate halves every 80 seconds		1 1	AO3/1a 4.3.2.3
02.4	half-life is 80 seconds so after 200 seconds count rate = 113		1 1	AO2/2 AO3/2a 4.3.2.3
02.5	because a very small amount of radiation will be emitted **or** will be similar to / same as background radiation		1	AO2/2 4.3.2.3
Total			**9**	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	in the blood(stream)	allow plasma ignore dissolved or in solution	1	AO1/1 4.2.1.7
03.2	all three plots correct suitable line drawn	accept two correct plots for **1** mark	2 1	AO2/2 4.3.1.5
03.3	1 hour		1	AO3/1a 4.3.1.5
03.4	230–185 = 45	identification of steepest part of graph and correct readings taken	1 1	AO2/2 4.3.1.5
03.5	line on graph showing extrapolation for person **B** correct value read from graph (at 130 mg per 100 cm^3) allow **1** mark for a value of 4.5–5 hours if no extrapolation shown		1 1	AO3/2a 4.3.1.5
Total			**9**	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	Place more quadrats in the field Place quadrats randomly		1 1	AO3/3b RPA12
04.2	26 400		1	AO2/2 RPA12
04.3	transect		1	AO1/2 4.4.2.4
04.4	as distance from the path increases the number of (ribwort) plants increases steep rise from 0.5 to 3.0 between 2 and 4 m from path **or** numbers level off to about 4 plants from 10 m from the path		1 1	AO3/1a RPA12
04.5	The ribwort plants get walked on		1	AO3/1b 4.4.2.3
Total			**7**	

Question 5

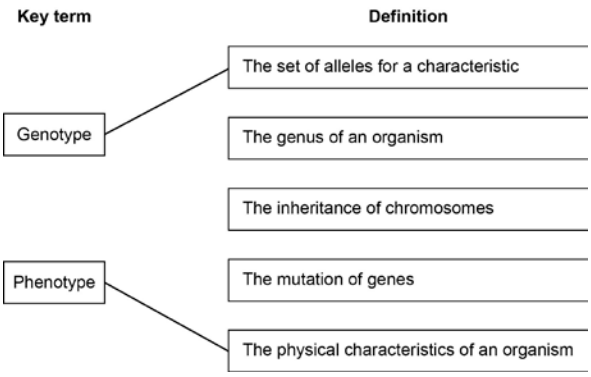
Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	carbon dioxide (decreased) **one** from: • photosynthesis • formation of (sedimentary) rocks • formation of fossil fuels • dissolved in oceans nitrogen (increased) **one** from: • volcanoes/volcanic activity • ammonia reacted with oxygen oxygen (increase): • photosynthesis	**1** mark for one reason for each gas ignore respiration	1 1 1	AO2/1 4.4.1.1
05.2	1960 because the rise became much steeper		1 1	AO3/1b 4.4.1.4
05.3	362 – 320 = 42 (ppm) 42 ÷ 320 × 100 = 13(%)	both readings from graph	1 1 1	AO2/1 4.4.1.4

Question 5 continues on the next page

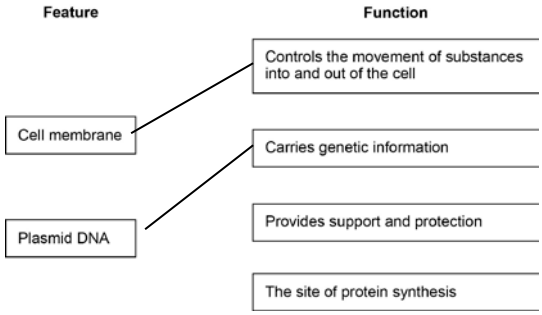
Question 5 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	**Level 2:** A detailed and coherent explanation of how the rise in carbon dioxide levels affect the environment.		3–4	AO1/1
	Level 1: Simple relevant statements are made about the effects of rise in carbon dioxide levels on the environment. The account is incomplete or inaccurate and lacks coherence.		1–2	AO1/1
	No relevant content.		0	
	Indicative content consequences of rise in carbon dioxide levels • carbon dioxide is a greenhouse gas • it stops infrared radiation escaping from the Earth • warming up the atmosphere • rise in level warms atmosphere up more • so leads to global warming • leading to climate change effects on environment: • extreme weather fluctuations • rise in sea levels • effects on human habitats • effects on animal habitats • decrease in biodiversity • effects on food producing capacity.			4.4.1.4 4.4.1.5 4.4.2.5 4.4.2.6
Total			**12**	

Question 6

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>06.1</td><td>
<table>
<tr><td>Characteristic</td><td>Environmental</td><td>Genetic</td><td>Both</td></tr>
<tr><td>Eye colour</td><td></td><td>✓</td><td></td></tr>
<tr><td>A scar</td><td>✓</td><td></td><td></td></tr>
<tr><td>Weight</td><td></td><td></td><td>✓</td></tr>
</table>
</td><td></td><td>1
1
1</td><td>AO2/1
4.4.3.4</td></tr>
<tr><td>06.2</td><td> 
</td><td>extra lines from the left negate the mark</td><td>2</td><td>AO1/1
4.4.3.4</td></tr>
<tr><td>06.3</td><td>
<table>
<tr><th>Stage in selective breeding</th><th>Order of stage</th></tr>
<tr><td>Cows are bred over many generations</td><td>4</td></tr>
<tr><td>Parents are bred together</td><td>2</td></tr>
<tr><td>Cows with the desired characteristics are chosen</td><td>1</td></tr>
<tr><td>Calves with the most desired characteristics are bred together</td><td>3</td></tr>
</table>
</td><td>all 3 correct for 2 marks
1 or 2 correct for 1 mark</td><td>max. 2</td><td>AO1/2
4.4.4.5</td></tr>
<tr><td>06.4</td><td>beef/meat
milk yield</td><td>allow hardiness, disease resistance</td><td>1
1</td><td>AO2/2
4.4.4.5</td></tr>
<tr><td>06.5</td><td>higher veterinary costs
less income from sale of (milk and meat) products</td><td></td><td>1
1</td><td>AO3/2b
4.4.4.5</td></tr>
<tr><td>Total</td><td></td><td></td><td>11</td><td></td></tr>
</table>

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1		extra lines from the left negate the mark	2	AO1/1 4.1.3.2
07.2	Contaminated food		1	AO1/1 4.3.3.2
07.3	any **two** from: • cook food (thoroughly) • pasteurise food • wash hands properly • disinfect work surfaces • keep raw and cooked foods separate • only drink clean water		2	AO2/1 4.3.3.2
07.4	It will not cause sickness and diarrhoea side effects		1	AO3/2a 4.3.3.2
07.5	**E** **B** **D**		1 1 1	AO1/2 4.4.4.6
Total			**9**	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	$N_2 + 2O_2 \longrightarrow 2NO_2$	correct formulae for reactants correct balancing	1 1	AO1/1 AO2/1 4.4.1.6
08.2	2.96 – 0.98 1.98 ÷ 2.96 (×100) = 66.9(%)	correct values read from graph allow ecf from readings from graph allow 66.9 shown without working for the **3** calculation marks incorrect number of sig. figs max **2** marks	1 1 1	AO2/2 4.4.1.6
08.3	less acid rain **or** fewer respiratory problems in humans	allow improved air quality	1	AO1/1 4.4.1.6
Total			**6**	

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	**mobile phase** propanone **stationary phase** paper		1 1	AO2/2 RPA9
09.2	any **three** from: • contains chlorophyll a, b and carotene • contains Pigment B • does not contain pheophytin • contains (at least) one unknown substance • contains five substances • contains a substance that does not dissolve in the solvent		3	AO3/1a RPA9
09.3	$Rf = \frac{distance\ moved\ by\ substance}{distance\ moved\ by\ solvent}$		1	AO1/1 4.2.2.4
09.4	both measurements correct R_f = 5.0/9.0 = 0.56	solvent front = 9.0 cm and pigment B distance = 5.0 cm allow ecf from incorrect measurements	1 1 1	AO2/2 RPA9
09.5	origin line drawn in ink so it will run **or** dissolve in the solvent **or** split up spots under solvent **or** solvent above spots/origin line so they will mix with solvent **or** wash off paper **or** colour the solvent **or** dissolve in the solvent		1 1 1 1	AO3/3a RPA9
Total			**13**	

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	**Level 3:** A full, detailed and coherent plan covering all the major steps is provided, which outlines what needs to be measured to calculate specific heat capacity. The steps are set out in a logical manner that could be followed by another person to calculate the specific heat capacity.		5–6	AO1/2
	Level 2: The substantive content of a plan is present but may be missing some steps. The plan may not be in a completely logical sequence but leads towards the calculation of the specific heat capacity.		3–4	
	Level 1: Simple statements relating to relevant apparatus or steps are made but they may not be in a logical order. The plan would not allow another person to calculate specific heat capacity.		1–2	
	No relevant content.		0	
	Indicative content • measure the mass of metal • correct use of balance • description of how work is done or energy transferred to metal • how energy transfer or work done is measured • equate work done/energy transferred = increase in thermal energy store of the metal • calculate specific heat capacity	**extra information** eg electrical work, mechanical work (eg dropping lead shot) eg electrical using joulemeter, mechanical decrease in potential energy store of falling lead shot		RPA2

Question 10 continues on the next page

Question 10 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	4 600 = 1 × 657 × temperature change temperature change = 4 600/657 = 7 (°C)	 allow 7 with no working shown for **3** marks	1 1 1	AO2/2 4.1.1.4
10.3	Type of material		1	AO3/3b RPA2
10.4	heat loss then any **one** from: • turned off the power supply too early • incorrectly measured mass of material • incorrectly measured temperature • incorrectly read the change in thermal energy		1 1	AO3/3a RPA2
10.5	would give a more accurate value **or** the calculated specific heat capacity will be smaller because the bubble wrap insulates the material **or** prevents heat loss		1 1	AO3/3b RPA2
Total			**14**	

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