

**INTERNATIONAL GCSE
COMBINED SCIENCE
9204/BE**

Paper 1 Biology Extension

Mark scheme

November 2023

Version: 1.0 Final



2 3 B Y 9 2 0 4 / B E / M S

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 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 from [oxfordaqaexams.org.uk](https://www.oxfordaqaexams.org.uk)

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Level of response marking instructions

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.

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

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
- the Assessment Objectives, level of demand 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 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

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 ecf 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 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore 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.

3.10 Do not accept

Do **not** accept 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.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	receptor effector	must be in this order	1 1	AO1 3.4.1.b 3.4.1.d 3.4.2.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	thermoregulatory		1	AO1 3.4.3.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	any two from: • faster / more oxygen supply • faster / more glucose supply • faster / more carbon dioxide removal • faster / more lactic acid removal	allow CO ₂ does not build up	2	AO1 3.2.5.g 3.2.5.h 3.2.5.i

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	220 – 8 = 212		1	AO2 3.2.5.g 6.3.4
	212 × (60 ÷ 100)	allow a correct substitution using an incorrectly determined maximum heart rate	1	
	127.2	allow a correct calculation using an incorrectly determined maximum heart rate	1	
	127 (beats per minute)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	body temperature increases (during exercise)	allow exercise / respiration releases more heat allow muscle <u>contraction</u> releases heat	1	AO2 3.4.3.d
	(sweat) cools the body as it evaporates	allow sweat evaporates using thermal / heat energy	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	sweat rate varies in different areas of the body		1	AO3 3.4.3.d
	the feet have the highest sweat rate		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	respiration (rate) increases or breathing (rate) increases		1	AO2 3.2.5.g

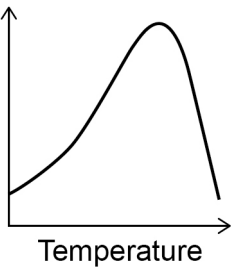
Total			14	
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	ethanol		1	AO1 3.2.5.m

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	less energy released (during anaerobic respiration)	allow converse if clearly describing aerobic respiration	1	AO1 3.2.5.k
	because the breakdown of glucose is not complete (in anaerobic respiration)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	(syringe) has a scale	allow measurements are marked on the syringe	1	AO4 3.2.5.m

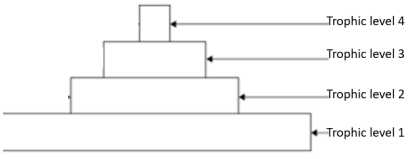
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	Level 3: The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.		5–6	AO4 3.2.5.m
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.		3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content • independent variable is temperature • dependent variable is volume of carbon dioxide • control variables include volumes, concentrations, time • use measuring cylinder to measure volume of yeast suspension • use measuring cylinder to measure volume of glucose solution • use of oil would give anaerobic conditions • use gas syringe to measure volume of carbon dioxide • use thermometer to measure temperature • use water baths to maintain temperature • place solutions in water baths to reach temperature before mixing or allow solutions to equilibrate before mixing • add glucose to yeast in conical flask and connect to gas syringe • measure volume of carbon dioxide produced over set time • time using a stopwatch • at least three temperatures tested • repeats For Level 3 there must be detail of independent variable, dependent variable and control variable(s)			

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	Rate of respiration  Temperature		1	AO3 3.2.3.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	sugar / glucose / fructose has been used up	allow yeast killed by ethanol	1	AO3 3.2.5.m

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	yeast can use fructose (and glucose) (for respiration)	allow glucose and fructose give same / similar rates (of respiration)	1	AO3 3.2.5.m
	yeast cannot use galactose (for respiration)	allow very little respiration using galactose if no other mark awarded allow 1 mark for yeast in galactose produces least carbon dioxide or yeast in glucose produces most carbon dioxide	1	

Total			14	
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1		1 mark for correct shape 1 mark for correct labels in correct places allow all named organisms at each trophic level	2	AO2 3.3.1.b 3.3.1.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	(population size of) fox decreases as (population size of) hare decreases because less food is available (for the fox)	accept converse	1 1	AO2 3.3.2.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.		
03.3	Type of adaptation		3 marks for 4 correct; 2 marks for 3 correct; 1 mark for 1 or 2 correct	3	AO2 3.3.2.f	
	Behavioural adaptation	Functional adaptation				Structural adaptation
						✓
		✓				
	✓					
						✓

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	coat colour changes from white in winter to dark / speckled in summer (so) it is camouflaged against snow in winter (and) camouflaged against vegetation in summer (which means) it can avoid predators all year		1 1 1 1	AO2 AO3 3.3.2.d

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	fewer months of snow cover	allow snow melts early	1	AO3
	so arctic hares may still be white in the absence of snow		1	3.3.2.d 3.3.2.f
Total			13	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	similarity - double circulatory system - heart consists of atria and ventricles - left side receives blood from lungs 2 atria		1	AO3 3.2.2.b 3.2.2.c 3.2.2.d
	difference - frog has one ventricle and human has 2 ventricles - blood mixes in ventricle in frog does not in human heart - blood from lungs and skin enters same side of heart in frog but in human they enter different sides		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	blood plasma in A has less CO ₂ / carbon dioxide		1	AO2 3.2.2.i
	because CO ₂ / carbon dioxide diffuses out of the blood in the lungs		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	capillaries carry blood through the tissues		1	AO1 3.1.5.i 3.2.2.g
	blood capillaries have thin walls to provide a short diffusion path		1	
	many capillaries provide a large surface area (for diffusion) or efficient blood supply provides a large surface area (for diffusion)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	blood may flow backwards when the heart / ventricle contracts or lower blood pressure when heart / ventricle contracts	allow less blood leaves the heart	1	AO2 3.2.2.d
	(so) less oxygen reaches cells / tissues		1	
	(therefore) less respiration in cells / tissues so less energy released	do not accept less energy produced / made	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	Level 2: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.		3–4	AO3 3.2.2.d
	Level 1: Some logically linked reasons are given. There may also be a simple judgement.		1–2	
	No relevant content		0	
	Indicative content Mechanical valve advantages (compared to biological): • may be easier to obtain or may be more accessible • patient is young and this valve lasts longer • less frequent valve repairs over lifetime • lasts longer so fewer lifetime operations • less risk of rejection Mechanical valve disadvantages (compared to biological): • more stress related to risk of blood clots • many years of taking drugs • possible increased risk of rejection			

Total			14
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	$C_6H_{12}O_6$ and $6O_2$		1	AO1 3.2.1.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	absorb water by osmosis / diffusion (from the soil)		1	AO2 3.1.4.b 3.1.5.d 3.2.1.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	any two from: • (keep) environmental conditions constant • (same) watering regime • (same) number of leaves	allow a named condition eg temperature ignore light intensity	2	AO4 3.2.1.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	as light intensity increases the rate of photosynthesis increases	allow another factor is limiting the rate of photosynthesis	1	AO2 3.2.1.c
	until light is no longer the limiting factor (and the curve levels off)		1	
	because CO_2 / temperature is now limiting photosynthesis (at high light intensity)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	(true as) E has a higher rate of photosynthesis at lower light intensity		1	AO3 3.2.1.c
	(however) only 2 plants so not representative		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	survey positions of both species (in their habitat)	allow carry out a field / ecology investigation	1	AO4 3.3.2.d

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	starch for (energy) storage		1	AO1 3.2.1.d 3.2.3.b
	fat/oil for (energy) storage		1	
	cellulose for cell wall		1	
	proteins for growth / enzymes		1	
		if no other mark awarded allow 1 mark for 3 or 4 named molecules		

Total			14	
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	environmental conditions		1	AO1 3.5.3.a
	genes / alleles	allow mutation	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	(both sex) chromosomes are the same shape as in the female		1	AO3 3.5.3.d

Question	Answers	Mark	AO / Spec. Ref.
06.3	Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 AO2 3.5.1 3.5.2.e 3.5.2.f 3.5.2.g 3.5.2.h 3.5.2.i
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	
	No relevant content	0	
	Indicative content: • cells divide by meiosis to produce gametes • each cell produces four gametes • gametes are haploid • gametes have four chromosomes • different gametes have different combinations of chromosomes • fertilisation combines genetic information of parents • back to four pairs of chromosomes • to restore diploid number • new individual has unique set of chromosomes. • fertilised egg divides by mitosis • each cell divides to form two genetically identical cells • many mitosis divisions needed for new individual • cells begin to differentiate / specialise for specific functions For Level 2, all four processes must be considered		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4 mark with 6.5	gametes correct: B + b and B + b	allow marks for correct genotypes in a Punnet square	1	AO2 3.5.3.g
	correct derivation of offspring genotype: BB Bb Bb bb		1	
	correct for phenotype for each genotype: BB and Bb are brown and bb are black		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5 mark with 6.4	25% (homozygous brown)		1	AO2 3.5.3.g 6.3.6
	$96 \times \frac{25}{100} = 24$		1	
		allow correct calculation using their proportion of BB in 06.4		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	they fail to see / respond to visual signals from a mate	allow less able to see courtship behaviour	1	AO2 AO3 3.4.5.a/e 3.5.3.g 3.6.2.b
	fewer black fruit flies breed successfully		1	
	therefore fewer black alleles passed on to next generation		1	
		if no other mark awarded allow 1 mark for they are less likely to see / evade predators		

Total			17	
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Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	can see trends over time or condenses a large amount of information into a visual form	allow to show how (global) number of deaths from whooping cough has changed (from 1990 to 2019) allow can see effects of treatment / vaccination programmes	1	AO2 3.4.6.f

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	$\frac{116\,500}{7\,700\,000\,000}$ (0.00001513) × 100 000 = 1.5 (per 100 000)	 allow any correct answer given to more than 2 significant figures	1 1 1	AO2 3.4.6.f 6.3.3 6.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	to compare different years / places / populations / diseases		1	AO3 3.4.6.f

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	vaccine contains dead / inactive forms of the pathogen which stimulate white blood cells to produce antibodies / memory cells (that destroy the pathogen) so the body can make the correct / specific antibody very rapidly (when infected by the pathogen)		1 1 1	AO1 3.4.6.e

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	a large proportion of the population becomes immune to the pathogen	allow a large proportion of the population becomes immune to the bacteria / virus / fungi	1	AO1 AO2 3.4.6.d
	so less likely to come into contact with an infected person		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	mutation	do not accept bacteria become immune	1	AO1 3.4.6.h 4.4.6.i
	causes bacteria that are <u>resistant</u> (to antibiotic)		1	
	antibiotic kills non-resistant bacteria but resistant strains survive / reproduce		1	
	so more infections are caused by resistant bacteria		1	

Total			14	
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