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INTERNATIONAL GCSE **COMBINED SCIENCE** **9204/BE**

Paper 1 Biology Extension

Mark scheme

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Version 1.0 Final Mark Scheme



2 2 6 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

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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		fertilisation		AO2 3.5.2.d,g,l
	A	✓	1	
	B	✓	1	
	C		1	
	D	✓	1	
01.2	alleles	ignore recessive / dominant	1	AO1 3.5.2.b
01.3	4		1	AO2 3.5.4.a
01.4	neither A nor B have PKU	allow neither A nor B are affected	1	AO3 3.5.4.a
	but one of their children / E has PKU	allow but one of their children / E is affected ignore reference to person I	1	
		allow E has PKU but his parents do not for 2 marks		
01.5	proteins are digested into amino acids	allow proteins contain amino acids or proteins contain phenylalanine	1	AO2 3.5.3.k /3.2.3.c
	(so less protein) means less phenylalanine (is absorbed)		1	
Total			10	

Question	Answers	Extra information	Mark	AO/Spec. Ref.
02.1	sound	in this order	1	AO2 3.4.1.e 3.4.2.b,c,d
	ear		1	
	brain	allow spinal cord allow CNS ignore spine	1	
	muscles		1	
02.2	sensory		1	AO1 3.4.1.d
	neurone	allow neuron or nerve cell	1	
02.3	0.86 to 1.08 (s)	allow 1.08 to 0.86 (s)	1	AO2 3.4.1.a 6.3.11
02.4	any two from: - reaction time increases as age increases (for both groups) - reaction time is lower in (all of) the high education groups - the gap between the reaction of the two groups decreases with age	allow converse ignore positive correlation unqualified	2	AO2 3.4.1.a
02.5	as people get older the difference in reaction time gets less (between the two groups)	allow as age increases the reaction times of the groups get closer allow correct reference to figures from the graph	1	AO3 3.4.1.a
Total			10	

Question	Answers	Extra information	Mark	AO/Spec. Ref.
03.1	6 (divisions in 2 hours)		1	AO2 3.4.6.b 6.3.10
	$2^6 / 2 \times 2 \times 2 \times 2 \times 2 \times 2$		1	
	64		1	
		allow correct calculation from incorrectly calculated number of divisions given		
03.2	shape / colour / transparency / texture / shiny / dull	allow size of colony in controlled conditions	1	AO3 3.4.6
03.3	any three from: • use sterile Petri dish or use sterile agar • use sterile wire loop	if neither mark awarded, allow 1 mark for use sterile equipment / apparatus	3	AO4 3.4.6
	• sterilise / boil nutrient agar (before adding bacteria) • position lid to prevent bacteria falling into bottle / Petri dish (during transfer) • secure lid onto Petri dish (after transfer)	allow only lift one side of the lid (during transfer) ignore references to PPE / gloves		
03.4	20 to 25 (°C)	allow any temperature in this range	1	AO4 3.4.6 3.3.3.b
	(under 25 °C) to discourage growth of pathogenic bacteria		1	
	OR			
	25 to 40 (°C) (1)	allow any temperature in this range		
	(25 to 40 °C) bacteria grow at a fast / optimum rate (1)	allow this is the optimum temperature for enzyme action		
03.5	(individual) colonies are separated	allow bacteria are separated	1	AO3 3.4.6
	(so) characteristics visible (to identify bacteria)	allow named examples of characteristics	1	

		allow so you can pick off bacteria from individual colonies to identify them under a microscope for 2 marks		
Total			11	

Question	Answers	Mark	AO/Spec. Ref.
04.1	Level 3: the plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO4 3.1.3.a
	Level 2: The plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: the plan 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 HCl concentration • dependent variable is time taken to lose colour • control variables include temperature, volumes, size of cube, start/end point • agar containing red dye cut into equal size cubes • use a ruler to measure size of agar • prepare (at least 3) different concentrations of HCl • use pH meter to measure HCl concentration • add different HCl concentrations to boiling tubes with agar cubes • measure volumes with a measuring cylinder • record time for each agar cube to lose all its red colour • use stop clock to measure time • repeats For Level 3 independent variable, dependent variable and control variables must be considered		

Question	Answers	Extra information	Mark	AO/Spec. Ref.
04.2	<i>distance moved by acid</i> 1.25 (cm)		1	AO2 3.1.5.i 6.3.3,15
	<i>calculation of rate</i> $\frac{1.25}{241}$	allow correct substitution using 2.5	1	
	<i>answer</i> 0.0051867...;	allow correct calculation using 2.5	1	
	<i>standard form</i> 5.19×10^{-3} (cm/s)	allow correct conversion of calculated rate into standard form	1	

04.3	rate of diffusion was almost the same for all cubes		1	AO3 3.1.5.i
	(but the 4 cm cube) has a longer / greater distance (for diffusion)		1	
04.4	against concentration gradient	allow movement from a low concentration to a high(er) concentration	1	AO1 3.1.5.f
	using energy	allow using ATP	1	
	from respiration	ignore aerobic / anaerobic	1	
Total			15	

Question	Answers	Extra information	Mark	AO/Spec. Ref.
05.1	platelets (help blood to clot)		1	AO1 3.2.2.l,m
	fibrinogen changed to fibrin		1	
	by enzymes		1	
	fibres trap cells to form a clot	allow cells are trapped and form a barrier / scab	1	
05.2	any three from: <i>red blood cells have</i> • haemoglobin • no nucleus • (no nucleus so) more space for haemoglobin • a biconcave shape • (biconcave shape) to give a large surface area • a flexible shape to squeeze through capillaries		3	AO1 3.2.2.j
05.3	muscle (tissue)		1	AO1 3.2.2.b
05.4	rises as heart contracts	allow rises as more blood forced out of the heart	1	AO2 3.2.2.d,e
	falls between contractions	allow falls as heart relaxes	1	
05.5	thick / elastic wall		1	AO1/AO2 3.2.2.f
	does not burst when blood pressure is high	allow (elastic tissue) maintains blood pressure allow narrow lumen (1) to maintain blood pressure (1) allow muscle in wall (1) to enable contraction (1)	1	
05.6	blood pressure falls		1	AO2 3.2.2.g
	as capillaries are branching	allow for 2 marks substances move out therefore less volume	1	

05.7	blood is in capillaries for longer (increased time for) exchange of materials (between blood and cells / tissues)		1 1	AO2 3.2.2.g
Total			16	

Question	Answers	Extra information	Mark	AO/Spec. Ref.
06.1	absorb water / minerals / nitrates (from the soil)	allow reference to anchorage ignore nutrients	1	AO2 3.1.4.b 3.2.1.e 4/5
06.2	reduced photosynthesis (due to lower leaf area) so less glucose / protein produced for growth	ignore food allow fewer minerals absorbed (1) so less protein produced for growth (1)	1 1	AO2 3.1.4.a,b 3.2.1.e
06.3	(required) gene cut out of chromosome (of first organism) (correct) use of enzymes gene inserted into vector / plasmid / virus vector used to insert gene into (cells of) second / different organism		1 1 1 1	AO1 3.5.5.b
06.4	protease		1	AO2 3.2.3.c
06.5	$\frac{5100 - 400}{5100} \times 100$ 92.1568... 92.2(%)	allow incorrectly calculated value for percentage decrease correctly given to 1 decimal place	1 1 1	AO2 3.5.5.e 6.3.3

Question	Answers	Mark	AO / Spec. Ref.
06.6	Level 3: A judgement, strongly linked and logically supported by a range of sufficient reasons is given;	5–6	AO3 3.5.5.d,e,f
	Level 2: Some logically linked reasons are given. There is a simple judgement;	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content • root damage / nematode infection reduced in GM crops • root damage reduced significantly in group P • less root damage reduction in groups C/CP • some root damage in all GM groups • no GM crop has root damage reduction to level of non-GM in non-infected soil • not all GM crop yield better than non GM crops • greatest yield increase in GM group P • slight decrease in GM group C (compared to non-GM) • so not all GM is effective • pesticides also lead to increase in yield • pesticides may be toxic but peptide (from GM plants) breaks down • we don't know how much of an increase in yield there would be with pesticides • bananas sterile so less likely to spread gene to other plants • asexual reproduction produces clones so modification passed on • cystatin may also reduce plant protein digestion & affect growth/yield gene C does not lead to improved yield. • when gene C is combined with gene P in CP it decreases the effectiveness of P • so it would be best not to use gene C at all For level 3 students must show an understanding of the ineffectiveness of gene C / cystatin compared to gene P / peptide and consider pesticides.		
Total		17	

Question	Answers	Extra information	Mark	AO/Spec. Ref.
07.1	mutation		1	AO1 3.5.1
	meiosis or <u>sexual</u> reproduction		1	3.6.1
07.2	changes that occur in an organism's lifetime can be passed on		1	AO1 3.6.2.a
07.3	natural selection		1	AO1 3.6.2.a
07.4	different shaped / sized beaks	allow descriptions of different shaped beaks	1	AO2 AO3 3.3.2.c
	to feed on different types of food		1	3.6.2.b
	which reduces competition	allow so they all have more food	1	
07.5	(populations) are separated / isolated		1	AO1 3.6.2.b,c
	genetic variation (in each population) or different / new alleles (in each population)	allow mutations occur	1	3.6.1 3.5.3.a
	different environment	allow different (environmental) conditions	1	
	individuals that are better adapted survive long enough to reproduce		1	
	(different favourable) alleles / genes / mutations passed on (in each population)		1	
	eventually the two types can no longer interbreed successfully	allow eventually two types cannot produce fertile offspring	1	
Total			13	

Question	Answers	Extra information	Mark	AO/Spec. Ref.
08.1	imprinting		1	AO2 3.4.5.c
08.2	increased chance of parental alleles / genes / DNA being passed on	allow increased chance of survival	1	AO1 3.4.5.b
08.3	(advantage) good / advantageous qualities passed on to all offspring		1	AO3 3.4.5.a
	(disadvantage) less variation in the population		1	
08.4	only (individuals of) the same species will respond or ensures that mating is successful		1	AO2 3.4.5.a
08.5	females are (more) likely to mate with a sterile male	allow reproduction is not successful	1	AO3 3.4.5.a
	but no offspring produced		1	
	so fewer mosquitoes to transmit malaria		1	
Total			8	