

INTERNATIONAL GCSE CORE BIOLOGY

9221

Paper 1

Mark scheme

Specimen paper

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 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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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 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 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.

Question	Answer	Extra information	Mark	AO / Spec. Ref.
01.1	D		1	AO1 3.2.4a

Question	Answer	Extra information	Mark	AO / Spec. Ref.
01.2	A		1	AO1 3.2.4a

Question	Answer	Extra information	Mark	AO / Spec. Ref.
01.3	B		1	AO2 3.2.4a

Question	Answer	Extra information	Mark	AO / Spec. Ref.
01.4	amylase		1	AO1 3.2.4c

Question	Answer	Extra information	Mark	AO / Spec. Ref.
01.5	sugars		1	AO1 3.2.4c

Question	Answer	Extra information	Mark	AO / Spec. Ref.
01.6	distance of the marathon		1	AO4 3.2.4a 3.2.6g
	length of time the diet was eaten		1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
01.7	more glycogen (stored in muscles)		1	AO2 AO3 3.2.6a,b,g
	(to be) converted (back) into glucose		1	
	(so) increased respiration		1	
	(and) greater energy release (available for muscle contraction / exercise)	do not accept energy produced / made / created	1	
Total Question 1			Marks	11

Question	Answer	Extra information	Mark	AO / Spec. Ref.
02.1	Blood vessel Artery Capillary Vein	Description	1	AO1 3.2.3j, k
		has thick walls of muscle and elastic fibres		
		has valves to stop the backflow of blood	1	
		is narrow with thin walls for fast diffusion	1	
		is solid and not tube-shaped		

Question	Answer	Extra information	Mark	AO / Spec. Ref.
02.2	plasma		1	AO1 3.2.3l

Question	Answer	Extra information	Mark	AO / Spec. Ref.
02.3	lung(s)		1	AO1 3.2.3n

Question	Answer	Extra information	Mark	AO / Spec. Ref.
02.4	Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.		4-6	AO1 3.2.3n,o,p
	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: • A are red blood cells (rbcs) • rbcs have no nucleus • which contain haemoglobin • (haemoglobin) binds to oxygen • so rbcs carry oxygen from the lungs to the body tissues • B are white blood cells (wbcs) • wbcs have a nucleus • they defend the body against microorganisms / bacteria / fungi • C are platelets • which are small fragments of cells • they help in clotting • at the site of wounds / cuts • (platelets) start the clotting process For Level 2, components must be named and functions described.			
Total Question 2			Marks	11

Question	Answer			Extra information	Mark	AO / Spec. Ref.	
03.1					1 1 1	AO2 3.5.3a	
	Characteristic	Variation caused by					
		genes	the environment				both genes and the environment
	Body mass						✓
	Broken scale		✓				
	Scales made of protein	✓					

Question	Answer	Extra information	Mark	AO / Spec. Ref.
03.2	124 x (10 ÷ 100)		1	AO2 3.3.1b
	12.4 (g)		1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
03.3	<i>conversion</i> 120 kg = 120000 g or 600 g = 0.6 kg		1	AO2 3.3.1b
	120000 ÷ 600 or 120 ÷ 0.6		1	
	200		1	
Total Question 3			Marks	8

Question	Answer	Extra information	Mark	AO / Spec. Ref.
04.1	eating / feeding		1	AO2 3.3.3e

Question	Answer	Extra information	Mark	AO / Spec. Ref.
04.2	carbon dioxide + water	allow correct formulae	1	AO2 3.3.3e
	glucose + oxygen		1	3.2.1a

Question	Answer	Extra information	Mark	AO / Spec. Ref.
04.3	any one from: - moist(ure) - oxygen (present)		1	AO1 3.3.3b

Question	Answer	Extra information	Mark	AO / Spec. Ref.
04.4	<i>correct graph readings</i> 10.2 and 6.0	allow $\pm$ half small square	1	AO2 3.3.3a,b
	(10.2 – 6.0 =) 4.2 (a.u.)		1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
04.5	(decay) enzymes increase in activity as the temperature increases to a maximum of 38°C	allow increased temperature causes increased (molecular) movement leading to faster reaction rate of enzymes	1	AO3 3.2.4b 3.3.3a,b
	after (38°C) the enzyme activity decreases because the enzymes denature	do not accept enzymes are killed	1	
	as the shape of the enzyme (active site) changes		1	

Total Question 4			Marks	9
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Question	Answer	Extra information	Mark	AO / Spec. Ref.
05.1	any two from: - cell wall (permanent) vacuole - chloroplasts		2	AO1 3.1.1a,b

Question	Answer	Extra information	Mark	AO / Spec. Ref.
05.2	mitosis		1	AO1 3.5.2d

Question	Answer	Extra information	Mark	AO / Spec. Ref.
05.3	mitochondrion		1	AO1 3.1.1a

Question	Answer	Extra information	Mark	AO / Spec. Ref.
05.4	correct gametes for male: dd	allow alternative symbols if defined do not accept if alternative symbols used and not defined	1	AO2 AO3 3.5.3f,g
	offspring genotypes correctly derived: Dd Dd dd dd	allow correct derivation from student's incorrect male gametes	1	
	identification of Dd as child with disorder D		1	
	0.5 / ½ / 1 in 2 / 50% / 1 : 1	allow correct probability from student's incorrectly derived genotypes do not accept 50/50, 1:2	1	

Total Question 5			Marks	8
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Question	Answer	Extra information	Mark	AO / Spec. Ref.
06.1	method for counting pulse		1	AO4 3.2.6g,l 6.2.4
	method to measure time or record beats per unit time		1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
06.2	the data is continuous and not categoric		1	AO4 3.2.6g,l 6.2.4 6.1 Ma 6.3.12
	so a line graph should be used rather than a bar chart		1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
06.3	as the level of exercise increases, heart rate increases		1	AO2 3.2.6g,l 6.2.4
	until it reaches a maximum at 15 step-ups or until it reaches a maximum at 174 beats per minute		1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
06.4	pain due to build-up of lactic acid in muscle cells		1	AO2 3.2.6i,j,l
	because not enough oxygen for aerobic respiration and anaerobic respiration took place		1	

Total Question 6			Marks	8
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Question	Answer	Extra information	Mark	AO / Spec. Ref.
07.1	1.9 – 1.1 = 0.8 (mg/ dm ³) and 90 – 30 = 60 (min)	allow 1 hour	1	AO2 3.4.5a,b
	0.8 ÷ 60 or 0.8 ÷ 1.0		1	
	(=) 0.013(33...) or 0.8		1	
	(unit) (0.013) mg/ dm ³ / min or (0.8) mg/ dm ³ / hour	unit must be consistent with numerical answer	1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
07.2	pancreas		1	AO1 3.4.5c

Question	Answer	Extra information	Mark	AO / Spec. Ref.
07.3	glucagon causes glycogen to be broken down into glucose		1	AO1 3.4.5c
	(which) enters the blood stream and raises the blood glucose concentration		1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
07.4	in Type 1 people do not produce enough insulin so insulin needs to be given		1	AO1 3.4.5d,e
	in Type 2 the body does not respond to insulin		1	
	so blood glucose concentration needs to be controlled by low carbohydrate intake and exercise to use up glucose		1	

Total Question 7			Marks	10
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Question	Answer	Extra information	Mark	AO / Spec. Ref.
08.1	isolate the herbicide A resistant gene	allow cut out the herbicide A resistant gene	1	AO2 AO1 3.5.5b,c
	(using) enzymes	allow use of enzymes at any correct point	1	
	the gene is inserted into a vector / plasmid / virus		1	
	the vector is used to insert the gene into the wheat plant cells		1	
	at an early stage of development so the wheat develops with resistance (to herbicide A)		1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
08.2	<i>segments are:</i> $\frac{2.5}{9}$ or $\frac{5}{18}$ (0.27(7) or 27.7(7)%)	all segments correct for 2 marks allow 1 mark if 2 segments correct	2	AO2 3.5.5c,d 6.3.6 6.3.11
	$\frac{5}{9}$ or $\frac{10}{18}$ (0.55(5.) or 55.5(5..)%)			
	1. $\frac{5}{9}$ or $\frac{3}{18}$ (0.16(6..) or 16.6(6...)%)			

Question	Answer	Extra information	Mark	AO / Spec. Ref.
08.3	Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.		5-6	AO3 3.5.5c,d,e
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.		3-4	
	Level 1: Relevant points are made. They are not logically linked.		1-2	
	No relevant content		0	
	Indicative content: For: • GM (plant leaf area) reduced less than non-GM • figures to support eg 49% vs 82% • GM (plant leaf area) is 53 cm² more than non-GM at 5 months • from 0–3 months GM (plant leaf area) reduced at a slower rate than non-GM or figures to support • non-GM (plant leaf area) continued to reduce but GM increased from 3-5 months Against: • both (GM and non-GM plant leaf area) reduced from 0–3 months • neither (GM and non-GM plant leaf area) increased in 5 months • do not know how many plants were used in the investigation or • repeat with larger sample size • only tested with one species of insect or • repeat with a range of insect species • control of variables – there may be differences in: • water availability • ion availability • temperature • light intensity • number of insects on each plant (some may have died or moved away or reproduced at different rates)			
Total Question 8			Marks	13

Question	Answer	Extra information	Mark	AO / Spec. Ref.
09.1	any two from: - length / 10cm of tubing - time / 12 hrs left in solution - volume / 10 cm³ of (sugar) solution put into tubing (left at same) temperature / 20°		2	AO4 3.1.5e 6.2.1

Question	Answer	Extra information	Mark	AO / Spec. Ref.
09.2	to remove any solution (from outside of tubing)		1	AO4 3.1.5e 6.1, 6.2.1

Question	Answer	Extra information	Mark	AO / Spec. Ref.
09.3	student draws a suitable curve of best fit on the graph		1	AO2 AO3 3.1.5e
	reading from where the student's line crosses the 0 line (+/- half a small square)		1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
09.4	any one from: - repeat at each sugar concentration (at least twice more) and calculate a mean - use more sugar solutions in tubing between 0.6 and 0.8		1	AO4 3.1.5e

Question	Answer	Extra information	Mark	AO / Spec. Ref.
09.5	the starting masses would / might be different (for each tubing)		1	AO4 3.1.5e

Question	Answer	Extra information	Mark	AO / Spec. Ref.
09.6	decay is caused by microorganisms		1	AO1
	sugar solution is more concentrated than (cell contents of) microorganism		1	AO2
	(therefore) water moves out of microorganism by osmosis		1	AO3
	(so) microorganisms are unable to survive / reproduce		1	3.1.5d 3.3.3b
Total Question 9			Marks	11

Question	Answer	Extra information	Mark	AO / Spec. Ref.
10.1	used back legs less and less	if neither mark awarded allow 1 mark for the idea of use it or lose it	1	AO2 3.6.2a
	(so) they (shrunk and) were lost or (so) they (shrunk and) were not passed on / inherited		1	
	(and) used front legs to swim or steer (in the water)	allow used tail more and more (to swim)	1	
	(which) developed into flippers and were passed on (to offspring)	(so) it became (shorter and) stronger	1	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
10.2	any one from: - more evidence (now) for Darwin's theory or no evidence / proof for Lamarck's theory - more fossils discovered or DNA / genes better understood or mechanism of inheritance discovered (for Darwin's theory) - observations – people noticed that changes in their lifetime were not passed on to offspring		1	AO3 3.6.2a

Question	Answer	Extra information	Mark	AO / Spec. Ref.
10.3	(variation in the genes of Hyracotherium		1	AO2 AO3 3.6.2b
	due to (random) mutations		1	
	those individuals which were taller and had fused / less bones in feet were able to run faster on dry hard ground		1	
	(these individuals) survived the predators and reproduced		1	
	passing on advantageous / beneficial genes / alleles to offspring		1	
	this continued for many generations until Equus finally were all tall with fused bones in feet.			

Total Question 10			Marks	11
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