



# GCSE

## **Biology A**

General Certificate of Secondary Education

Unit **A161/02**: Modules B1, B2, B3 (Higher Tier)

# **Mark Scheme for January 2013**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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**Subject-specific Marking Instructions**

- a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).
- b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

*e.g. for a one-mark question where ticks in the third and fourth boxes are required for the mark:*

<del>✗</del>
<del>✗</del>

*This would be worth  
1 mark.*

✓
<del>✗</del>

*This would be worth  
0 marks.*

<del>✗</del>
<del>✗</del>
✓
✓

*This would be worth  
1 mark.*

- c. The list principle:  
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

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d. Marking method for tick-box questions:

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

e.g. if a question requires candidates to identify cities in England:

Edinburgh	<input type="checkbox"/>
Manchester	<input type="checkbox"/>
Paris	<input type="checkbox"/>
Southampton	<input type="checkbox"/>

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
<b>Score:</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>NR</b>

e. For answers marked by levels of response:

i. **Read through the whole answer from start to finish**

ii. **Decide the level that best fits** the answer – match the quality of the answer to the closest level descriptor

iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

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Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

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Question		Answer	Marks	Guidance
1	(a)	<p>Only female individuals are produced.  The individuals produced are clones.  Mutation is always involved.  The individuals are produced from a sperm and an egg.  The majority of individuals produced are infertile.  The individuals produced have identical genes.  Two parents are always involved.</p> <div style="display: flex; flex-direction: column; align-items: center;"> <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>  <input checked="" type="checkbox"/>  <input type="checkbox"/> </div>	2	minus 1 mark for each additional incorrect response
	(b)	<p><i>any one from each section:</i>  naturally  <u>identical</u> twins;  when a fertilised eggs cell splits;  example of asexual reproduction in animals;</p> <p>artificially  when the nucleus from a body cell is transferred to an empty <u>egg</u> cell or egg cell with nucleus removed;  artificial splitting of embryos;</p>	2	<p>examples include greenfly / hydra / starfish / worker bees</p> <p>egg cell must be empty</p>

Question		Answer	Marks	Guidance
1	(c)	<p><b>Level 3 (5–6 marks)</b> Includes reference to both <u>adult</u> stem cells / bone marrow stem cells AND <u>embryonic</u> stem cells AND gives correct definition eg ‘unspecialised’ or ‘can develop into any type of cell AND explains how they might be used to treat a named disease. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Includes reference to both <u>adult</u> stem cells / bone marrow stem cells AND <u>embryonic</u> stem cells AND gives correct definition eg ‘unspecialised’ or ‘can develop into any type of cell. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Includes reference to both <u>adult stem cells / bone marrow stem cells</u> AND <u>embryonic</u> stem cells. OR Refers to stem cells AND gives a correct definition eg ‘unspecialised’ or ‘can develop into any type of cell. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to A</b></p> <p><b>Indicative scientific points about stem cells may include:</b></p> <ul style="list-style-type: none"> <li>• adult stem cells / bone marrow stem cells</li> <li>• embryonic stem cells</li> <li>• stem cells are unspecialised / undifferentiated</li> <li>• stem cells can develop into many other types of cell</li> <li>• embryonic can develop into all types of cell</li> <li>• adult cannot develop into all types of cell</li> <li>• specialisation occurs at an early stage</li> </ul> <p><b>Indicative scientific points about treatment may include:</b></p> <ul style="list-style-type: none"> <li>• may be able to replace damaged tissue</li> <li>• example given</li> </ul> <p><i>must include example e.g.</i></p> <ul style="list-style-type: none"> <li>• diabetes</li> <li>• Alzheimer’s</li> <li>• Parkinson’s</li> <li>• Spinal injury</li> <li>• heart disease</li> <li>• motor neurone disease</li> <li>• skin burn injuries</li> <li>• MS</li> <li>• cancer such as leukaemia</li> <li>• liver damage</li> </ul> <p><b>Use the L1, L2, L3 annotations in SCORIS; do not use ticks.</b></p>
<b>Total</b>			<b>10</b>	

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Question		Answer	Marks	Guidance
2	(a)	(both Ali and Mary) they are carriers/ it is recessive / have faulty gene or allele;	1	<b>accept</b> heterozygous <b>reject</b> Ali OR Mary
	(b)	(i) C;	1	
		(ii) B;	1	
	(c)	(i) the older the mother; the more likely to have a child with <u>Down's</u> ;  OR for 2 marks risk of <u>Down's</u> increases with age;;  OR for 1 mark little or no risk at 20–25 years of age / higher risk at 45;	2	Disorder / Down's syndrome, has to be specified for second mark
		(ii) ask patients how they feel use a larger sample size collect data for other genetic conditions collect data for other ages use smaller graph paper collect data from just one hospital	2	minus 1 mark for each additional incorrect response
		(iii) there is only a small chance of having Down's syndrome; but consequence is large / any qualification of consequence;	2	accept "there is <b>only</b> a 1% chance" = first marking point examples of consequences include financial, stress, challenging, affects other family members, long commitment etc.



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Question		Answer	Marks	Guidance
2	(d)	<p><b>Level 3 (5–6 marks)</b> Includes several indicative scientific points from at least two or three areas. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Includes an indicative scientific point or points from at least two areas. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Includes an indicative scientific point or points from at least one area. Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to C</b></p> <p><b>Indicative scientific points about implications of test may include:</b></p> <ul style="list-style-type: none"> <li>• risk of miscarriage as a result of having the test</li> <li>• risk of infection / harm to fetus</li> <li>• results may not be accurate</li> <li>• false positives and false negatives</li> </ul> <p><b>Indicative scientific points about decisions may include:</b></p> <ul style="list-style-type: none"> <li>• whether or not to have children</li> <li>• whether or not they would terminate a pregnancy</li> <li>• who to inform of their decision</li> <li>• moral / ethical considerations</li> </ul> <p><b>Indicative scientific points about implications of not or after testing may include:</b></p> <ul style="list-style-type: none"> <li>• financial implications of having a disabled child</li> <li>• care issues / quality of life for baby</li> <li>• stress on family if they have a disabled child</li> <li>• test result could reveal other information eg paternity issues and other disorders</li> <li>• problems re employment</li> <li>• problems re insurance</li> </ul> <p><b>Use the L1, L2, L3 annotations in SCORIS; do not use ticks.</b></p>
		<b>Total</b>	<b>15</b>	

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Question		Answer	Marks	Guidance
3	(a)	B E; D C; F A;	3	if LHS and RHS reversed = 1 mark max Only mark what is inside box unless box contents are crossed out and then mark anything outside of box.
	(b)	<pre> graph LR     A[alcohol] --- B1[more ADH]     A --- B2[no change]     A --- B3[delayed ADH production]     E[Ecstasy] --- B1     E --- B2     E --- B3     B1 --- C1[larger volume of dilute urine]     B1 --- C2[larger volume of concentrated urine]     B1 --- C3[smaller volume of dilute urine]     B1 --- C4[smaller volume of concentrated urine]     B1 --- C5[no change in the volume or concentration of urine]     B2 --- C1     B2 --- C2     B2 --- C3     B2 --- C4     B2 --- C5     B3 --- C1     B3 --- C2     B3 --- C3     B3 --- C4     B3 --- C5     B3 --- C6[less ADH]     C6 --- C1     C6 --- C2     C6 --- C3     C6 --- C4     C6 --- C5 </pre>	2	alcohol lines correct = 1 mark ecstasy lines correct = 1 mark
	(c)	<p><i>any four from:</i>  <u>store</u> water;  gets water from food;  more ADH so (keeps more water) / kidneys reabsorb more water;  gets water from respiration;  does not sweat/no sweat glands;  cool underground / nocturnal behaviour;  produces more concentrated urine / smaller volume of urine;  produces dry faeces/reabsorption of water in colon;</p>	4	<b>ignore</b> all reference to adaptation and evolution
<b>Total</b>			<b>9</b>	

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Question		Answer	Marks	Guidance
4	(a)	<p><i>any one from each area</i></p> <p><b>perceived risk</b> is that running is safe; idea that what he believes or thinks / subjective</p> <p><b>calculated risk</b> is that there is a small chance that he could die from running a marathon; idea that it uses data;</p>	2	
	(b)	<p><i>any two from:</i></p> <p>charity; he enjoys running / often runs / fit / proud; the risk is relatively small; he can choose to run the marathon / could walk or jog;</p>	2	benefits outweigh risk = 2 marks
	(c)	<p>32 x 36000 / 1152000; 1152000/11;  1 in 104727; OR 1:104727 OR 1/104727; OR 0.0000095 / 0.0000096; OR 0.00095% / 0.00096%;</p>	3	correct overall response = 3 marks
	(d)	<p><i>any two from:</i></p> <p>idea of the chances of it happening are very small; the consequences if it did are very high / death; consideration of other factors to minimise the risk eg training beforehand / diet / fitness levels / rehydration during race;</p>	2	
<b>Total</b>			<b>9</b>	

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Question		Answer	Marks	Guidance
5	(a)	...competition. <input checked="" type="checkbox"/> ...evolution. <input type="checkbox"/> ...natural selection. <input type="checkbox"/> ...part of an ecosystem. <input checked="" type="checkbox"/> ...transfer of nutrients. <input checked="" type="checkbox"/> ...selective breeding. <input type="checkbox"/> ...interdependence. <input checked="" type="checkbox"/>	3	4 correct = 3 marks 3 correct = 2 marks 2 correct = 1 mark
	(b)	Idea that other organisms will interact within the food web; Idea of migration;	2	
	(c) (i)	512;	2	If answer is not 512 then working must show <b>256</b> = 1 mark OR <b>1024</b> = 1 mark  <b>512</b> = 2 marks
	(ii)	<i>any one from:</i> quickly take advantage of available food / competition; decomposition rate can be enhanced / quickly; microorganism are very small compared to dead animal or plant so need large numbers;	1	NB do not give "quickly" for reference to reproduction only.
	(iii)	<i>any two from:</i> mutation; environmental change; natural selection; isolation;	1	2 correct = 1 mark
<b>Total</b>			<b>9</b>	

Question		Answer	Marks	Guidance
6	(a)	<p><b>Level 3 (5–6 marks)</b> Environment named AND includes several indicative scientific points from both 'living' AND 'non-living' areas. Quality of written communication does not impede communication of the science at this level.</p> <p><b>Level 2 (3–4 marks)</b> Environment named AND includes one indicative scientific point from both 'living' AND 'non-living' areas. OR Environment named AND includes two indicative scientific points from either 'living' OR 'non-living' areas. Quality of written communication partly impedes communication of the science at this level.</p> <p><b>Level 1 (1–2 marks)</b> Answer includes an indicative scientific point or points from at least 'living' OR 'non-living' areas Quality of written communication impedes communication of the science at this level.</p> <p><b>Level 0 (0 marks)</b> Insufficient or irrelevant science. Answer not worthy of credit.</p>	6	<p><b>This question is targeted at grades up to A*</b> <b>Indicative points about non-living indicators may include:</b></p> <ul style="list-style-type: none"> <li>• nitrate levels / NOX levels / pollution levels</li> <li>• litmus / BDH universal / pH</li> <li>• oxygen level</li> <li>• light levels</li> <li>• water levels</li> <li>• CO2 / monitoring stations</li> <li>• size of polar ice cap</li> </ul> <p><b>Indicative points about living indicators may include:</b></p> <ul style="list-style-type: none"> <li>• species of lichens present - showing levels of SO2</li> <li>• mayfly larvae in water - high oxygen concentration</li> <li>• Trent biotic index – gives score</li> </ul> <p><b>General</b> Examples of environments may include:</p> <ul style="list-style-type: none"> <li>• River / lakes / water</li> <li>• Wood</li> <li>• Lawn / field</li> <li>• Desert</li> <li>• Oceans / sea</li> <li>• atmosphere / air</li> <li>• ice caps</li> <li>• Earth</li> <li>• soil</li> </ul> <p><b>IGNORE</b> fossils <b>REJECT</b> incorrect examples e.g. non living lichens BUT allow example unqualified e.g. lichens</p> <p><b>Use the L1, L2, L3 annotations in SCORIS; do not use ticks.</b> Answers must be correctly related to a named environment eg woodland or river. If not named then marks restricted to L1.</p>

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Question		Answer	Marks	Guidance
6	(b)	<i>any two from:</i> changes are small; changes are variable / fluctuate; eliminate outliers;	2	Ignore need more data or references to reliability
		<b>Total</b>	<b>8</b>	

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