



Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE  
in Biology (5BI3H) Paper 01

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## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
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## Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Question Number	Answer	Acceptable answers	Mark
<b>1 (a) (i)</b>	XX	ignore any superscript or subscript letters/symbols reject XY	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1 (a) (ii)</b>	An explanation linking two of the following  they did not inherit the (haemophilia) allele (1)  (allele is) located on X chromosome (1)  males receive X chromosome from their mother/Y chromosome from father (1)  B is homozygous dominant/ neither X chromosome from B has the allele for haemophilia (1)	ignore gene throughout  accept have the dominant/normal allele  accept disorder is located on the X chromosome  ignore mother is unaffected accept mother neither affected <b>nor</b> a carrier  accept mother for B and father for A	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark																		
<b>1 (a) (iii)</b>	<table border="1"> <tr> <td></td> <td><math>X^H</math></td> <td>Y</td> </tr> <tr> <td><math>X^H</math></td> <td><math>X^H X^H</math></td> <td><math>X^H Y</math></td> </tr> <tr> <td><math>X^h</math></td> <td><math>X^H X^h</math></td> <td><math>X^h Y</math></td> </tr> </table> <p>a Punnett square showing the gametes of individuals C and D (1)</p> <p>a Punnett square showing the genotypes of the offspring (1)</p> <p>25% / 0.25 / 1 in 4 probability of a child having haemophilia (1)</p>		$X^H$	Y	$X^H$	$X^H X^H$	$X^H Y$	$X^h$	$X^H X^h$	$X^h Y$	<table border="1"> <tr> <td></td> <td><math>X^H</math></td> <td><math>X^h</math></td> </tr> <tr> <td><math>X^H</math></td> <td><math>X^H X^H</math></td> <td><math>X^H X^h</math></td> </tr> <tr> <td>Y</td> <td><math>X^H Y</math></td> <td><math>X^h Y</math></td> </tr> </table> <p>reject if allele shown on Y chromosome</p> <p>50% of males have haemophilia</p> <p>Punnett square must be interpreted correctly</p>		$X^H$	$X^h$	$X^H$	$X^H X^H$	$X^H X^h$	Y	$X^H Y$	$X^h Y$	<b>(3)</b>
	$X^H$	Y																			
$X^H$	$X^H X^H$	$X^H Y$																			
$X^h$	$X^H X^h$	$X^h Y$																			
	$X^H$	$X^h$																			
$X^H$	$X^H X^H$	$X^H X^h$																			
Y	$X^H Y$	$X^h Y$																			

Question Number	Answer	Acceptable answers	Mark
<b>1 (b)</b>	<p>An explanation linking the following</p> <p>aseptic conditions (1)</p> <p>prevent growth of <b>unwanted</b> organisms/prevent contamination (1)</p> <p>OR</p> <p>temperature /pH (1)</p> <p>provide optimal conditions for growth /prevent enzymes denaturing (1)</p> <p>OR</p> <p>nutrient levels (1)</p> <p>provide optimal conditions for growth (1)</p> <p>OR</p> <p>aeration/oxygen (1)</p> <p>for <u>aerobic</u> respiration/ provide optimal conditions for growth / prevent <u>anaerobic</u> respiration (1)</p>	<p>ignore sterile</p> <p>provide optimal conditions for enzymes/prevent micro-organisms being killed</p>	(2)

(Total for question 1 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
<b>2(a)(i)1</b>	immune (1)		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(a)(i)2</b>	memory lymphocytes (1)		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(a)(ii)</b>	<b>B</b> hybridomas		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(a)(iii)</b>	<b>Two</b> of the following: pregnancy testing (1) locating the position of blood clots (1) locating the position of cancers (1)	accept detecting blood clots  accept detecting cancer cells	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(b)(i)</b>	A comparison including two from: first response <ul style="list-style-type: none"> <li>• delay in production of antibodies (1)</li> <li>• less antibodies produced (1)</li> <li>• production of antibodies slower (1)</li> </ul>	or a second response <ul style="list-style-type: none"> <li>• no delay in production of antibodies (1)</li> <li>• more antibodies produced (1)</li> <li>• production of antibodies faster (1)</li> </ul> accept comparisons of data  ignore references to decrease in antibody number	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(b)(ii)</b>	faster recovery / {no/less} symptoms of infection / increased chance of survival / kills pathogen faster(1)	accept more <u>memory</u> lymphocytes produced/ immune / fights infection faster	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(b)(iii)</b>	<b>B</b> Edward Jenner		<b>(1)</b>

**(Total for question 2 = 9 marks)**



Question Number	Answer	Acceptable answers	Mark
<b>3(a)(i)</b>	8-10 (hours)	accept any value between 8 and 10	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(a)(ii)</b>	(85/100) x 500 (1) Or (500/100) x 85 (1) 425 (plants)	award two marks for correct bald answer	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(a)(iii)</b>	plant can flower all year round/flowering not limited to one period of the year/plant can flower for longer/flower at any time.	ignore references to growing  accept pollination for flowering	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(a)(iv)</b>	<b>C</b> photoperiodism		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(i)</b>	less likely to be eaten (by animals / herbivores)	accept kills pests/reduces damage done by pests  reject predators	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(ii)</b>	<p>An explanation linking <b>two</b> of the following:</p> <p>the bamboo <b>mutated</b> to produce cyanide (1)</p> <p>or</p> <p>bamboo plants that produced cyanide survived to reproduce/ increase in numbers/increase in size (1)</p> <p><b>and</b></p> <p><b>mutation</b> in greater bamboo lemur allowed them to tolerate cyanide (1)</p> <p>or</p> <p>greater bamboo lemurs get more food so survive to breed/reproduce (more) (1)</p>	<p>accept some bamboo plants have the {<b>gene/allele</b>} to produce cyanide</p> <p>ignore bamboo plants not eaten</p> <p>accept lemurs have {<b>gene/allele</b>} to tolerate cyanide</p> <p>ignore {adapted to tolerate/resistant to} cyanide</p> <p>accept lemurs have less <b>competition</b> for food</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(c)(i)</b>	<b>A</b> aggression		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(c)(ii)</b>	<p>An explanation linking two of the following:</p> <p>sounds can be heard over a long distance /heard in the dark (1)</p> <p>do not need to have visual contact/allows communication with more animals (1)</p> <p>or</p> <p>more different types of sound (1)</p> <p>more {emotions/ behaviour/ information} can be conveyed (1)</p>	<p>accept quicker communication method</p> <p>accept doesn't require good vision</p>	<b>(2)</b>

**(Total for question 3 = 11 marks)**

Question Number	Answer	Acceptable answers	Mark
<b>4(a)(i)</b>	<b>B</b> <i>Homo erectus</i>		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4(a)(ii)</b>	any value between 0.7-0.9 million (years)	any value between 700 000-900 000 (years)	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4(b)</b>	A description including two of the following  structural features/shape of fossil (1)  (age of the fossil from) location in rock layers (1)  structure of stone tools (1)	accept comparison to other fossils  radioactive dating (of rocks)  ignore references to carbon dating ignore references to DNA analysis ignore brain size	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4(c)</b>	A comparison including three of the following  more abundant than nuclear DNA (1)  higher mutation rates (1)  less likely to degrade (1)	accept {large supply/lots} of mitochondrial DNA       only inherited down the female line/no crossing over/recombination (1)	<b>(3)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4(d)</b>	An explanation linking the following:  habituation / learned response (1)  stop responding to {neutral signal /harmless signal} (1)	accept become used to a harmless stimulus  ignore references to getting used to the sound of the waterfall	<b>(2)</b>

**(Total for question 4 = 9 marks)**

Question Number	Answer	Acceptable answers	Mark
<b>5(a)</b>	<p>An explanation linking <b>four</b> of the following points:</p> <ul style="list-style-type: none"> <li>• (dehydration detected by) osmoreceptors/hypothalamus (1)</li> <li>• pituitary gland (1)</li> <li>• (releases more) ADH (1)</li> <li>• ADH acts on the nephron/collecting duct/tubules (1)</li> <li>• making the {collecting duct/tubules/nephron} more permeable (1)</li> <li>• so <b>more</b> water is reabsorbed (by the body/blood) (1)</li> </ul>	<p>ignore brain</p> <p>accept {small amount/concentrated} urine produced</p>	<b>(4)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(b)(i)</b>	<b>A</b> corpus luteum		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(b)(ii)</b>	<ul style="list-style-type: none"> <li>• uterus lining remains thick/uterus lining continues to grow (1)</li> </ul>		<b>(1)</b>

Question Number		Indicative Content	Mark
<b>QWC</b>	<b>5(b)(iii)*</b>	<p>A explanation to include some of the following points</p> <p>Stages and hormones</p> <ul style="list-style-type: none"> <li>menstrual cycle consists of menstruation, uterus lining thickening and ovulation</li> <li>hormones involved in the menstrual cycle are oestrogen, progesterone, FSH and LH</li> </ul> <p>Role of the hormones</p> <ul style="list-style-type: none"> <li>FSH stimulates the follicles to mature</li> <li>FSH stimulates the production of oestrogen</li> <li>follicles secrete oestrogen</li> <li>oestrogen is responsible for the repair of the uterus wall</li> <li>high levels of oestrogen stimulate the release of LH</li> <li>LH triggers ovulation</li> <li>corpus luteum produces progesterone</li> <li>progesterone maintains the lining of the uterus</li> </ul> <p>Control mechanisms</p> <ul style="list-style-type: none"> <li>oestrogen inhibits the production of FSH</li> <li>progesterone inhibits the production of LH</li> <li>progesterone inhibits the production of FSH</li> <li>menstruation is triggered by low levels of oestrogen and progesterone</li> <li>Low progesterone levels cause FSH to be released</li> </ul>	<b>(6)</b>
<b>Level I</b>	<b>0</b>	No rewardable content	
<b>1</b>	<b>1 - 2</b>	<ul style="list-style-type: none"> <li>A limited explanation of the menstrual cycle which might include at least one of the stages <b>or</b> some of the hormones involved <b>or</b> the role of one of the hormones involved</li> <li>the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>spelling, punctuation and grammar are used with limited accuracy</li> </ul>	
<b>2</b>	<b>3 - 4</b>	<ul style="list-style-type: none"> <li>A simple explanation of the menstrual cycle including some of the stages <b>and</b> the role of at least two of the hormones involved</li> <li>the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>spelling, punctuation and grammar are used with some accuracy</li> </ul>	
<b>3</b>	<b>5 - 6</b>	<ul style="list-style-type: none"> <li>A detailed explanation of the menstrual cycle including most of the hormones involved, their roles <b>and</b> at least one control mechanism</li> <li>the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>spelling, punctuation and grammar are used with few errors</li> </ul>	

**(Total for question 5 = 12 marks)**

Question Number	Answer	Acceptable answers	Mark
<b>6(a)(i)</b>	ligase	accept reasonable misspellings e.g. lygase  reject lipase	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>6(a)(ii)</b>	Two from the following <ul style="list-style-type: none"> <li>• leaves single stranded ends /overhangs / sticky ends (1)</li> <li>• complementary / bases pair up (1)</li> <li>• hold gene in place while ligase joins the DNA / makes inserting gene into plasmid more successful (1)</li> </ul>	accept (single stranded DNA) matches up  ignore join together easily	<b>(2)</b>



Question Number		Indicative Content	Mark
<b>QWC</b>	<b>*6(b)</b>	<p>A description to include some of the following points</p> <p>Sweets</p> <ul style="list-style-type: none"> <li>• made using invertase/sucrase</li> <li>• converts sucrose into glucose and fructose</li> <li>• reduces viscosity of sugar mixture</li> <li>• increases simple sugar content, increasing sweetness</li> <li>• production of soft centred sweets</li> <li>• production of lower calorie sweets</li> </ul> <p>Vegetarian Cheese</p> <ul style="list-style-type: none"> <li>• made using chymosin</li> <li>• produced by genetically modified organisms</li> <li>• Chymosin initiates clotting/protein coagulation</li> <li>• reduces the use of rennet extracted from animals</li> </ul> <p>Lactose free milk</p> <ul style="list-style-type: none"> <li>• made using lactase</li> <li>• using immobilised enzymes</li> <li>• lactose converted to galactose and glucose</li> <li>• beneficial to people with lactose intolerance</li> </ul>	<b>(6)</b>
<b>Level</b>	<b>0</b>	No rewardable content	
<b>1</b>	<b>1 - 2</b>	<ul style="list-style-type: none"> <li>• a limited description of the use of enzymes in the production of at least one food <b>or</b> naming an enzyme linked to its use</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>	
<b>2</b>	<b>3 - 4</b>	<ul style="list-style-type: none"> <li>• a simple description of at least two food products linked to their named enzyme <b>or</b> a detailed description of the production of one food including the name and role of the enzyme</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>	
<b>3</b>	<b>5 - 6</b>	<ul style="list-style-type: none"> <li>• a detailed description of most stages of the production of two or more food products made using enzyme technology including the name and role of the enzymes</li> <li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>	

Question Number	Answer	Acceptable answers	Mark
<b>6(c)</b>	A description including two from the following  <b>digestive</b> enzymes/named digestive enzyme (1)  breakdown <b>named biological</b> stain (1)  stains into soluble products (1)		<b>(2)</b>

**(Total for question 6 = 11 marks)**

