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Mark Scheme (Results)

October 2016

Pearson Edexcel International GCE in Biology (WBI02) Paper 1

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General Marking Guidance

- This mark scheme provides a list of acceptable answers for this paper. Candidates will receive credit for all correct responses but will be penalised if they give more than one answer where only one is required (e.g. putting an additional cross in a set of boxes). If a candidate produces more written answers than the required number (two instead of one, three instead of two etc), only the first answers will be accepted. Free responses are marked for the effective communication of the correct answer rather than for quality of language but it is possible that, on some occasions, the quality of English or poor presentation can impede communication and loose candidate marks. It is sometimes possible for a candidate to produce a written response that does not feature in the mark scheme but which is nevertheless correct. If this were to occur, an examiner would, of course, give full credit to that answer.
- 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.
- 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.

Question Number	Answer	Mark
1(a)(i)	**B** mitochondrion	(1)

Question Number	Answer	Mark
1(a)(ii)	**C** ribosomes	(1)

Question Number	Answer	Mark
1(a)(iii)	**A** chloroplast	(1)

Question Number	Answer	Mark
1(a)(iv)	**A** centrioles	(1)

Question Number	Answer	Mark
1(a)(v)	**B** chloroplasts, mitochondria and nuclei	(1)

Question Number	Acceptable Answers	Additional Guidance	Mark
1(b)	1. both consist of {membrane bound sacs / cisternae } ; 2. in both the { cisternae / eq } are interconnected / eq ; 3. rER has (80s) ribosomes and sER does not ;	interconnected cisternae gains mp 1 and 2	(2)

(Total for Question 1 = 7 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
2(a)	1. (circular) plasmid ; 2. (circular) { nucleoid / chromosome / DNA } ; 3. (slime) capsule ; 4. flagellum ; 5. pili ; 6. {small / 70 S} ribosomes ; 7. mesosomes / invaginations; 8. {murein / peptidoglycan} cell wall ;	Only award marks if reasonable looking structure is labelled IGNORE correct labels to poor diagrams DO NOT choose which answers to accept e.g. 2 correct + 1 wrong = 2 marks 2 correct + 2 wrong = 1 mark 3 correct + 1 wrong = 2 marks 3 correct + 2 wrong = 1 mark **4 IGNORE** tail number of flagella **8 IGNORE** cell wall unqualified	(3)

Question Number	Acceptable Answers	Additional Guidance	Mark
2(b)(i)	1. role of {a species / *S. acidicaldarius*} in its { habitat / environment / community / ecosystem} ; 2. living in { high temperature / 75-80°C } AND { low pH / pH 2-3 / acidic conditions } ; 3. providing food (for next trophic level) / decomposition / eq;	**2 ACCEPT** hot springs	(2)

Question Number	Acceptable Answers	Additional Guidance	Mark
2(b)(ii)	1. analysis of {organic molecules / DNA / RNA / proteins / enzymes / phospholipids / ribosomes } ; 2. idea of making a comparison with other types of Archaea and bacteria ;	**1 IGNORE** irrelevant answers	(2)

(Total for Question 2 = 7 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
3(a)(i)	1. 24 – 19 / 5 ; 2. (5 x 100 ÷ 19 =) 26 / 26.3 / 26.32 (%) ;	Allow full marks for correct answer with no working	(2)

Question Number	Acceptable Answers	Additional Guidance	Mark
3(a)(ii)	as a control / to enable comparison (to no honey) / to show that the honey was having the affect ;	**DO NOT ACCEPT** control variable	(1)

Question Number	Acceptable Answers	Additional Guidance	Mark
3(a)(iii)	1. use the same concentration of honey for Manuka and Ulmo ; 2. same { volume of honey / diameter of wells in agar / size of (honey-soaked) paper discs } ; 3. idea of {inoculating with / seeding with / producing a lawn of / eq} same bacteria (on agar) ; 4. description of aseptic technique, e.g. use of sterile {equipment / water} ; 5. incubated at the same temperature **AND** for the same length of time 6. measure zones of inhibition / eq ; 7. idea of repeating {measurements of zones / experiment} to calculate a mean ;	**1 ACCEPT** same range of concentrations **3 DO NOT ACCEPT** on petri dish **4 ACCEPT** idea of maintaining aerobic conditions **5 ACCEPT** stated values in range of 20 to 30°C and 1 to 7 days 6. **IGNORE** observe **7 ACCEPT** average	(5)

Question Number	Acceptable Answers	Additional Guidance	Mark
3(b)(i)	{tube / generative / male } nucleus ;	ACCEPT chromosome, nucleolus, mitochondrion, sperm nucleus,	(1)

Question Number	Acceptable Answers	Additional Guidance	Mark
3(b)(ii)	1. idea of transferring genetic material from one flower to another ; 2. nuclear division within the pollen to produce (haploid) {gametes / male nuclei} ; 3. pollen tube { grows / creates pathway} through the style ; 4. by enzymes produced by the {pollen tube / pollen tube nucleus} ; 5. from stigma to { micropyle / embryo sac / ovule / egg cell } ;	**5** piece this together	(4)

(Total for Question 3 = 13 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
4(a)	1. embryonic stem cells are { totipotent / pluripotent / eq } and cells of a tissue are not ; 2. embryonic stem cells are { undifferentiated / unspecialised / eq} and cells of a tissue are {differentiated / specialised / eq} ; 3. cells of a tissue work together for a particular function and stem cells do not / eq ; 4. stem cells { are capable of continuous division / have no Hayflick limit } and cells of a tissue are not ;	**NB** piece together	(3)

Question Number	Acceptable Answers	Additional Guidance	Mark
***4(b)**	(QWC – Spelling of technical terms *(shown in italics)* must be correct and the answer must be organised in a logical sequence) 1. idea that the *enzyme* is transported (through the *cell / cytoplasm*) in the rER ; 2. idea that in the rER *enzyme* is folded; 3. idea of *enzyme* being packaged into (transport) *vesicles* (by the rER) to { move to / fuse with / eq } the *Golgi apparatus* ; 4. credit description of modification ; 5. idea of *enzyme* being transferred in (*secretory*) *vesicles* from the *Golgi apparatus* to the cell (surface) *membrane* ; 6. *vesicles* (containing *enzyme*) fuse with cell (surface) *membrane* / *exocytosis* ;	QWC emphasis – spelling **2** e.g. forms {3-D shape, *secondary* / *tertiary* structure } **4 ACCEPT** e.g. addition / removal of *sugars, glycosides, carbohydrate*, or activation of *enzyme* **5. IGNORE** lysosomes	(5)

Question Number	Acceptable Answers	Additional Guidance	Mark
4(c)	1. idea of { monitoring research / ensuring research is necessary } ; 2. issue licences (for stem cell research) ; 3. idea of monitoring sources of stem cells ; 4. ensure that only early stage embryos are used as sources of stem cells ; 5. prevention of unethical use of stem cells ;	**2 ACCEPT** idea of giving permission for the research **4** in the UK this is up to 14 days **5** e.g. human cloning, genetic manipulation	(3)

(Total for Question 4 = 11 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
5(a)(i)	1. calcium deficiency results in fewer seed heads per plant than magnesium deficiency; 2. calcium deficiency results in fewer grains per seed head than magnesium deficiency ; 3. calcium deficiency results in lower grain yield than magnesium deficiency; 4. credit correct manipulation of figures to quantify the difference between the effect of calcium deficiency and magnesium deficiency (for mp 1 / 2 / 3) ;	**ACCEPT** converse throughout 4. e.g. 0.9 fewer seed heads, 3 fewer grains per seed head, 1.4g lower yield	(2)

Question Number		Additional Guidance	Mark
5(a)(ii)	1. magnesium required for chlorophyll production ; 2. (less chlorophyll results in) less photosynthesis ; 3. less {glucose / starch} produced / eq ;	**3 ACCEPT** GALP / hexose / carbohydrate	(2)

Question Number	Acceptable Answers	Additional Guidance	Mark
5(a)(iii)	1. calcium required for { pectin / pectate } ; 2. idea that without {calcium / pectin / pectate} the cell walls will be weaker ; 3. so plants will have stunted growth / eq ;		(2)

Question Number	Acceptable Answers	Additional Guidance	Mark
5(b)	1. made up of { many / eq } (α) glucose (monomers) / polymer of glucose / polysaccharide ; 2. so lots of energy can be stored ; 3. amylose is { coiled / helical / eq } ; 4. making starch very compact ; 5. so lots of {energy / glucose} can be stored in one place ; 6. amylopectin is branched ; 7. so breakdown is faster / eq ; 8. starch is insoluble ; 9. so has no osmotic effect / eq ;	**Max 3 marks for descriptions of starch i.e. 3 from mps 1, 3, 6 and 8**	(4)

(Total for Question 5 = 10 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
6(a)(i)	1. {range / different number / variety}of alleles for height ; 2. in a human {population / species /gene pool } ;		(2)

Question Number	Answer	Mark
6(a)(ii)	**A** activating these genes that are then transcribed to produce mRNA	(1)

Question Number	Acceptable Answers	Additional Guidance	Mark
6(a)(iii)	1. idea that it determines which proteins are produced by the cell ; 2. idea that these proteins determine {structure / function} (of the cell) ;		(2)

Question Number	Acceptable Answers	Additional Guidance	Mark
6(b)(i)	1. socio economic factors ; 2. pollution ; 3. disease ; 4. health care ; 5. exposure to sunlight ;	1. e.g. poverty, child labour 2. e.g. exposure to lead	(2)

Question Number	Acceptable Answers	Additional Guidance	Mark
6(b)(ii)	1. more milk consumed results in greater change in height ; 2. comment on the significance of data ; 3. credit correct manipulation of data ;	**1 ACCEPT** converse **2** e.g. S.D is lower with less milk consumed, no overlap in data **3** e.g. <500 range is 18.3 – 19.3 and for >500 range is 20.2 – 22.4, mean with more milk is 2.5cm higher	(3)

Question Number	Acceptable Answers	Additional Guidance	Mark
6(b)(iii)	1. sample size small ; 2. results not shown separately for boys and girls ; 3. no exact measure of how much milk consumed ; 4. idea that there is no other information given about the group control of variables ;	**2 ACCEPT** boys and girls have different growth rates **4 ACCEPT** height is affected by other variables	(2)

(Total for Question 6 = 12 marks)

Question Number	Acceptable Answers	Additional Guidance	Mark
7(a)	(QWC – Spelling of technical terms *(shown in italics)* must be correct and the answer must be organised in a logical sequence) 1. removal of { 5-10 mm of root tips / (apical) meristem } ; 2. use of acid ; 3. reference to appropriate stain, e.g. toluidine blue, orcein ; 4. idea of teasing cells apart with a needle ; 5. idea of placing the root tip on microscope slide, covering and squashing ; 6. idea of heating slide to intensify the { colour / stain } ;	QWC emphasis is on logical sequence **2 ACCEPT** e.g. HCl **3 ACCEPT** Feulgens, Schiffs reagent, acetocarmine	(4)

Question Number	Answer	Mark
7(b)	**B** amino acids, ATP and DNA	(1) comp

Question Number	Acceptable Answers	Additional Guidance	Mark
7(c)(i)	1. thick walls ; 2. lack of {cytoplasm / nucleus / cell contents} / hollow cells ; 3. idea of location in vascular bundle ;		(2)

Question Number	Acceptable Answers	Additional Guidance	Mark
7(c)(ii)	1. transport water ; 2. transport mineral ions ; 3. provide support ;	**2. ACCEPT** named e.g. of mineral ion	(2)

(Total for Question 7 = 9 marks)

<table>
<tr><th>Question Number</th><th>Acceptable Answers</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>8(a)</td><td>1. greater biodiversity (overall) of endemic species than non-endemic ;

2. idea that the difference is greatest (between endemic and non-endemic) in reptiles ;

3. idea that the difference is least (between endemic and non-endemic) in mammals;

4. credit correct manipulation of figures ;</td><td><table><tr><th>Animal</th><th>Endemic</th><th>Non-end</th><th>Difference</th></tr><tr><td>Amphibian</td><td>80</td><td>25</td><td>55</td></tr><tr><td>Mammal</td><td>110</td><td>67</td><td>43</td></tr><tr><td>Reptile</td><td>207</td><td>46</td><td>161</td></tr></table>+/- 3</td><td>(2)</td></tr>
</table>

Question Number	Answer	Mark
8(b)	**B** 34%	(1)

Question Number	Answer	Mark
8(c)(i)	**B** behavioural	(1)

Question Number	Acceptable Answers	Additional Guidance	Mark
8(c)(ii)	1. by natural selection ; 2. idea of a mutation (in the DNA); 3. idea that tamaraw with better night vision are more successful at { feeding (at night) / avoiding hunters / eq}; 4. tamaraws with better night vision are more likely to survive and reproduce ; 5. these alleles are passed onto the offspring ; 6. these alleles become more common in the population /eq ;		(4)

Question Number	Acceptable Answers	Additional Guidance	Mark
8(c)(iii)	1. ban in hunting (allowed numbers to increase) ; 2. (captive breeding and) reintroduction (increased population) ; 3. idea of {improved / no more loss of} habitat (leading to increased numbers) ; 4. credit appropriate explanation for the decrease in numbers during this time period ;		(3)

(Total for Question 8 =11 marks)