



Mark Scheme (Results)

Summer 2019

Pearson Edexcel International Advanced Level
In Biology (WBI02) Paper 01
Development , Plants and the Environment

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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.
- 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	Additional Guidance	Mark
1(a)	sclerenchyma fibres are for support only / xylem vessels are for transport / eq ;	Accept strengthening for support	(1)

Question Number	Answer	Additional Guidance	Mark																									
1(b)	<table border="1"> <thead> <tr> <th>Feature</th> <th>Sclerenchyma fibres and xylem vessels</th> <th>Sclerenchyma fibres only</th> <th>Xylem vessels only</th> <th>Not found in either sclerenchyma fibres or xylem vessels</th> </tr> </thead> <tbody> <tr> <td>absence of end walls between adjacent cells</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">X</td> <td style="text-align: center;">☒</td> </tr> <tr> <td>cell membrane</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">X</td> </tr> <tr> <td>lignified cell walls</td> <td style="text-align: center;">X</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> </tr> <tr> <td>pits</td> <td style="text-align: center;">X</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☒</td> </tr> </tbody> </table>	Feature	Sclerenchyma fibres and xylem vessels	Sclerenchyma fibres only	Xylem vessels only	Not found in either sclerenchyma fibres or xylem vessels	absence of end walls between adjacent cells	☒	☒	X	☒	cell membrane	☒	☒	☒	X	lignified cell walls	X	☒	☒	☒	pits	X	☒	☒	☒		(4)
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Question Number	Answer	Additional Guidance	Mark
2(a)	<ol style="list-style-type: none"> 1. structural / functional / smallest / eq ; 2. unit of a organism / eq ; 	<p>1. ACCEPT examples e.g. contains organelles / cytoplasm /site of metabolic reactions</p> <p>2. IGNORE building block</p>	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	<ol style="list-style-type: none"> 1. {synthesise / eq} the pepsinogen (in ribosomes); 2. folding protein into {secondary / tertiary / 3D } shape ; 3. idea of packaging (for transport to the Golgi apparatus) ; 	<p>2. and 3. ACCEPT protein / polypeptide as eq to pepsinogen</p>	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	<ol style="list-style-type: none"> 1. modification of the pepsinogen / eq ; 2. idea of packaging of the pepsinogen into a vesicle (for exocytosis) / eq ; 	<p>ACCEPT protein / polypeptide as eq to pepsinogen</p> <p>1. ACCEPT description eg addition of carbohydrate to protein</p>	(2)

Question Number	Answer	Additional Guidance	Mark
2(c)	<ol style="list-style-type: none"> 1. gastric stem cells can divide indefinitely but chief cells cannot / eq ; 2. idea that gastric stem cells can differentiate into other cell types but chief cells cannot / eq ; 3. gastric stem cells cannot produce pepsinogen but chief cells produce pepsinogen / eq ; 	<p>Answers must be comparative, accept the word "only" as making a statement comparative</p> <ol style="list-style-type: none"> 1. ACCEPT comparative answers in terms of Hayflick limit 2. NOT answers that imply gastric stem cells are totipotent <p>2. ACCEPT gastric stem cells are undifferentiated but chief cells are differentiated</p> <p>2.ACCEPT specialised for differentiated</p>	<p>(2)</p>

Question Number	Answer	Additional Guidance	Mark
3(a)	57 / 57.1 / 57.14 (%) ;		(1)

Question Number	Answer	Additional Guidance	Mark
3(b)	1. cylinders / tubes / hollow rods ; 2. at right angles ; 3. made of microtubules ;	1. NOT tubules 2. ACCEPT perpendicular / 90° 3. IGNORE numbers of microtubules	(2)

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	R Q S P ;		(1)

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	<ol style="list-style-type: none"> 1. prokaryotic cells do not have (linear) chromosomes ; 2. prokaryotic cells do not have a nucleus ; 	<p>ACCEPT 'they' as eq to prokaryotes / prokaryotic cells</p> <ol style="list-style-type: none"> 1. ACCEPT (prokaryotic cells) have circular DNA / eq 2. IGNORE nuclear membrane 	(2)

Question Number	Answer	Additional Guidance	Mark
3(d)	<ol style="list-style-type: none"> 1. formation of the nuclear {envelope / membrane} ; 2. formation of nucleoli ; 3. formation of {cell plate / cell wall} ; 4. cell division / eq ; 	<p>IGNORE sequence</p> <ol style="list-style-type: none"> 1. ACCEPT formation of nucleus 1 and 2. ACCEPT re-formation 2. ACCEPT singular or plural name <ol style="list-style-type: none"> 4. IGNORE cytokinesis 4. ACCEPT division of cytoplasm 4. ACCEPT formation of cell membrane 	(3)

Question Number	Answer	Additional Guidance	Mark
3(e)	<ol style="list-style-type: none"> 1. idea that the number of mitochondria (in each cell) will be halved ; 2. so replication of mitochondria needed to restore original number; 3. (mitochondria needed) to provide {energy / ATP} for (cell) {growth / metabolism / cycle / mitosis} ; 	<p>3.ACCEPT example of growth or metabolism e.g. for duplication of organelles / for synthesis ofDNA</p>	(2)

Question Number	Answer	Mark
4(a)(i)	<p>The only correct answer is B</p> <p><i>A is incorrect because each gene is determining one character</i></p> <p><i>C is incorrect because one gene is determining several characters</i></p> <p><i>D is incorrect because it is impossible</i></p>	(1)

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	{line / bar} graph to show a bell-shaped curve ;	ACCEPT a skewed distribution	(1)

Question Number	Answer	Additional Guidance	Mark
4(bi)	<ol style="list-style-type: none"> 1. idea that the leaves will look { yellow / white }; 2. because chlorophyll will not be made ; 3. idea that the plant will {be small / not be healthy / eq}; 4. as photosynthesis will be slow / eq ; 	<ol style="list-style-type: none"> 1. ACCEPT correct reference to chlorosis 1. IGNORE "leaves change colour" / "leaves will not be green" 2. ACCEPT magnesium needed to produce chlorophyll 3. e.g. stunted growth / reduced growth 	(3)

Question Number	Answer	Additional Guidance	Mark
*4(b)(ii)	<ol style="list-style-type: none"> 1. idea of using wheat plants of the same genotype ; 2. idea that a control group of wheat is grown with all mineral ions ; 3. idea that the test group of wheat is grown with all mineral ions but {no / reduced} magnesium ions ; 4. other growth conditions need to be {optimum / not limiting} ; 5. credit two named abiotic factors that need to be controlled; 6. credit how one of these abiotic factors is controlled ; 7. idea that the plants are left several days to grow ; 8. credit an indication of how the dependent variable will be measured ; 9. idea of growing several wheat plants in each group {to calculate mean value / for reproducibility / for reliability} ; 	<p>QWC focus on clarity of expression</p> <p>1. e.g. same age /height /mass /species /variety</p> <p>2.IGNORE references to using different concentrations of Mg²⁺</p> <p>2. and 3. IGNORE nutrients</p> <p>5. e.g. temperature / light intensity /pH / water</p> <p>6. e.g. use of incubator / light source described / use of buffer solution</p> <p>7. minimum time should be 7days</p> <p>8 e.g. measure height / mass /number of leaves /extract pigments and measure light absorbance / starch concentration</p> <p>9.ACCEPT repeat the investigation {to calculate mean / for reproducibility / for reliability}</p>	<p>(6)</p>

Question Number	Answer	Additional Guidance	Mark
5(a)	<ol style="list-style-type: none"> the role of {an organism / a species / sloth} in its {habitat / community / environment / ecosystem eq} ; sloths are {herbivores / provide food for carnivores / eq} ; 	<ol style="list-style-type: none"> IGNORE exploit environment ACCEPT sloths eat leaves 	(2)

Question Number	Answer	Additional Guidance	Mark
5(b)	<ol style="list-style-type: none"> 15% of 48 and 53 calculated = 7.2 and 7.95 ; Correct lengths = 55.2 and 60.95 (cm) ; 	<p>Correct answer with no working shown gains both marks</p> <ol style="list-style-type: none"> ACCEPT 5.75 or 6 (cm) as correct answer ACCEPT 55 and 61 (cm) 	(2)

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	<p>Advantage to the sloth: 1. algae provide camouflage from predators / eq ;</p> <p>Advantage to the algae: 2. idea (algae) are high up (in the trees) to absorb sunlight for photosynthesis / eq ;</p> <p>Advantage to the moth: 3. algae provide it with food / eq ;</p>	<p>1. ACCEPT idea algae are a food source for sloths</p> <p>2. ACCEPT idea they obtain water from sloth fur</p> <p>3. ACCEPT idea sloth fur provides protection / warm temperature for eggs</p> <p>3. ACCEPT idea (sloth fur) gives protection / camouflage from predators</p> <p>3. IGNORE moths eat sloth fur</p>	(3)

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	<p>1. remove all the organisms from (the fur of) the sloth ;</p> <p>2. {count / identify} the number of different species ;</p>	<p>1. IGNORE references to use of quadrats but DO NOT ACCEPT context of pitfall trap</p> <p>2. NOT organisms</p>	(2)

Question Number	Answer	Additional Guidance	Mark
6(a)	idea of new species being {identified / discovered / introduced / migrating / eq};	DO NOT ACCEPT context of speciation / conservation	(1)

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	<ol style="list-style-type: none"> 1. idea of comparing {DNA / proteins / RNA } (of different civets); 2. idea of relating {different base sequences / different amino acid sequences } to different species ; 	<ol style="list-style-type: none"> 1. ACCEPT analysing / observing as eq to comparing 1. IGNORE electrophoresis 	(2)

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	<ol style="list-style-type: none"> 1. idea of breeding each of the three {types / species / eq} of civet with each other ; 2. idea of mating the young with {each other / original civets} ; 3. idea that if no offspring are produced they must be different species ; 	<ol style="list-style-type: none"> 2. IGNORE "check if offspring are fertile" 3. ACCEPT in context of mp1 or mp2 	(2)

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	0.01 / 0.011 / 0.0107 ;	ACCEPT standard form	(1)

Question Number	Answer	Additional Guidance	Mark
6(c)(ii)	<ol style="list-style-type: none"> 1. idea leopards are camouflaged so may not be seen ; 2. some leopards may not be seen up in the trees ; 		(2)

Question Number	Answer	Additional Guidance	Mark
*6(c)(iii)	<ol style="list-style-type: none"> 1. protection of the leopards in the regions where they are {found / thought to be found} ; 2. to prevent them from being {hunted / killed / eq} ; 3. to prevent the numbers from dropping further / eq ; 4. planting vegetation to join up the (individual) regions ; 5. so that there is an increased chance of finding a mate ; 6. to reduce inbreeding amongst the leopards / eq ; 7. {captive breeding / breeding programmes} ; 8. to reintroduce leopards back into the wild / eq ; 9. to increase gene pool / eq ; 	<p>QWC - focus on logical sequence</p> <p>2. ACCEPT to preserve their habitat 2. ACCEPT also in context of MP7</p> <p>7. ACCEPT "bred in captivity"</p> <p>9. ACCEPT increase / maintain genetic diversity</p>	(5)

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	<p>1. drawing that shows a head, mid piece and flagellum ;</p> <p>2, 3 and 4 any three labelled structures from :</p> <p>head</p> <p>mid piece</p> <p>flagellum</p> <p>mitochondria</p> <p>acrosome</p> <p>(haploid) nucleus ;;;</p>	<p>1. IGNORE labels when assessing this mark</p> <p>1. Flagellum must be longer than (head + midpiece)</p> <p>2. 3.and 4. ACCEPT phonetic spellings</p> <p>ACCEPT neck, middle piece</p> <p>IGNORE tail ACCEPT flagella</p> <p>ACCEPT one or several drawn in mid piece</p> <p>ACCEPT mitochondrion</p> <p>structure must be drawn in head</p> <p>IGNORE enzymes</p> <p>must be drawn in head</p> <p>DO NOT ACCEPT diploid</p>	(4)

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	<ol style="list-style-type: none"> streamlined for ease of movement (through female reproductive tract) / eq ; flagellum for propelling sperm (through the female reproductive tract) / eq ; acrosome containing enzymes that break down the zona pellucida / eq ; mitochondria to provide energy for movement / eq ; nucleus to carry genetic material ; 	<p>2. ACCEPT idea flagellum allows it to swim 2. ALLOW transferred error from labelling in 7a(i)</p> <p>4.ACCEPT mitochondria to produce ATP for movement / eq 5. ACCEPT haploid nucleus to restore diploid number (of chromosomes) after fusion / eq</p>	(3)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	<ol style="list-style-type: none"> lycopene has {no significant effect / little effect} on the number of sperm in the control rats ; lycopene increases the number of sperm in rats exposed to PCBs ; credit correct manipulation of data to quantify mp1 or 2 ; 	<p>“lycopene increases the mean number of sperm produced” or “lycopene increases the number of sperm in both groups” can only be awarded one of these marks.</p> <p>mp1 (mean) increase is 30×10^6 mp2 (mean) increase is 120×10^6</p>	(2)

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	<ol style="list-style-type: none"> 1. idea of treating all rats with PCBs ; 2. idea that a control group of rats is not fed with fruit; 3. idea of {feeding / dosing / eq} (the other) groups of rats with {different / certain} types of fruits ; 4. idea of determining the number of sperm produced for each group of rats ; 	<p>1. This is a stand alone mark so can be given even if answer does not refer to a control group 1. Piece together if necessary</p> <p>3.ACCEPT fruit juice IGNORE concentrations ACCEPT named fruits</p>	<p>(3)</p>

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8(a)	<table border="1"> <thead> <tr> <th rowspan="2">Stage</th> <th colspan="4">Number of chromosomes in the cells</th> </tr> <tr> <th>11</th> <th>22</th> <th>44</th> <th>88</th> </tr> </thead> <tbody> <tr> <td>gamete</td> <td><input checked="" type="checkbox"/></td> <td>X</td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>planula</td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td>X</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>ephyra</td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td>X</td> <td><input checked="" type="checkbox"/></td> </tr> </tbody> </table>	Stage	Number of chromosomes in the cells				11	22	44	88	gamete	<input checked="" type="checkbox"/>	X	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	planula	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	<input checked="" type="checkbox"/>	ephyra	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	X	<input checked="" type="checkbox"/>		(3)
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Question Number	Answer	Additional Guidance	Mark
8(b)	<p>female</p> <p>female ;</p>	<p>ACCEPT ♀</p>	(1)

Question Number	Answer	Additional Guidance	Mark
8(c)	<ol style="list-style-type: none"> 1. sexual reproduction results in genetic diversity ; 2. idea of sexual reproduction reducing the chances that all jellyfish would be killed by a change in the environment ; 3. asexual reproduction results in genetically identical jellyfish / eq ; 4. idea that with asexual reproduction, all offspring capable of surviving in the (current) environment / eq ; 	<ol style="list-style-type: none"> 1. ACCEPT genetic variation 2. e.g. disease, change in pH, change in temperature 3. ACCEPT no genetic variation 3. ACCEPT asexual reproduction is fast(er) 3. ACCEPT asexual reproduction does not need a mate 4. ACCEPT idea the population increases quickly with asexual reproduction 4. ACCEPT asexual reproduction maintains a large population 4. ACCEPT isolated individual can reproduce asexually 	(3)

Question Number	Answer	Additional Guidance	Mark
8(d)(i)	<ol style="list-style-type: none"> the fewer the initial number of polyps the greater (the increase) in population density ; idea that the relationship is not linear ; 	<ol style="list-style-type: none"> ACCEPT negative correlation ACCEPT converse responses 	(2)

Question Number	Answer	Additional Guidance	Mark
8(d)(ii)	<ol style="list-style-type: none"> idea of less competition for attachment sites ; idea of less competition for food ; fewer polyps attract fewer predators ; 	<p>ACCEPT converse answers describing higher initial number of polyps</p> <p>IGNORE less competition for resources</p>	(2)

