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)			(4)

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**	☒	☒	☒

Question Number	Answer	*Additional Guidance*	Mark
2(a)	1. structural / functional / smallest / eq ; 2. unit of a organism / eq ;	1.**ACCEPT** examples e.g. contains organelles / cytoplasm /site of metabolic reactions 2.**IGNORE** building block	**(2)**

Question Number	Answer	*Additional Guidance*	Mark
2(b)(i)	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) ;	2. and 3. **ACCEPT** protein / polypeptide as eq to pepsinogen	**(2)**

Question Number	Answer	*Additional Guidance*	Mark
2(b)(ii)	1. modification of the pepsinogen / eq ; 2. idea of packaging of the pepsinogen into a vesicle (for exocytosis) / eq ;	**ACCEPT** protein / polypeptide as eq to pepsinogen 1. **ACCEPT** description eg addition of carbohydrate to protein	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(c)	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 ;	Answers must be **comparative**, accept the word "only" as making a statement comparative 1. **ACCEPT** comparative answers in terms of Hayflick limit 2. **NOT** answers that imply gastric stem cells are totipotent 2**. ACCEPT** gastric stem cells are undifferentiated but chief cells are differentiated 2.ACCEPT specialised for differentiated	**(2)**

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)	1. prokaryotic cells do not have (linear) chromosomes ; 2. prokaryotic cells do not have a nucleus ;	**ACCEPT** 'they' as eq to prokaryotes / prokaryotic cells 1. **ACCEPT** (prokaryotic cells) have circular DNA / eq 2. **IGNORE** nuclear membrane	**(2)**

Question Number	Answer	*Additional Guidance*	Mark
3(d)	1. formation of the nuclear {envelope / membrane} ; 2. formation of nucleoli ; 3. formation of {cell plate / cell wall} ; 4. cell division / eq ;	**IGNORE** sequence 1. **ACCEPT** formation of nucleus 1 and 2. **ACCEPT** re-formation 2. **ACCEPT** singular or plural name 4. **IGNORE** cytokinesis 4. **ACCEPT** division of cytoplasm 4. **ACCEPT** formation of cell membrane	**(3)**

Question Number	Answer	*Additional Guidance*	Mark
3(e)	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} ;	3.**ACCEPT** example of growth or metabolism e.g. for duplication of organelles / for synthesis ofDNA	**(2)**

Question Number	Answer	Mark
4(a)(i)	The only correct answer is **B** ***A*** *is incorrect because each gene is determining one character* ***C*** *is incorrect because one gene is determining several characters* ***D*** *is incorrect because it is impossible*	**(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)	1. idea that the leaves will look { yellow / white };	1. **ACCEPT** correct reference to chlorosis 1. **IGNORE** "leaves change colour" / "leaves will not be green"	
	2. because chlorophyll will not be made ;	2. **ACCEPT** magnesium needed to produce chlorophyll	
	3. idea that the plant will {be small / not be healthy / eq} ;	3. e.g. stunted growth / reduced growth	
	4. as photosynthesis will be slow / eq ;		**(3)**

Question Number	Answer	*Additional Guidance*	Mark
*4(b)(ii)	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} ;	**QWC focus on clarity of expression** 1. e.g. same age /height /mass /species /variety 2.**IGNORE** references to using different concentrations of Mg^{2+} 2. and 3. **IGNORE** nutrients 5. e.g. temperature / light intensity /pH / water 6. e.g. use of incubator / light source described / use of buffer solution 7. minimum time should be 7days 8 e.g. measure height / mass /number of leaves /extract pigments and measure light absorbance / starch concentration 9.**ACCEPT** repeat the investigation {to calculate mean / for reproducibility / for reliability}	**(6)**

Question Number	Answer	Additional Guidance	Mark
5(a)	1. the role of {an organism / a species / sloth} in its {habitat /community / environment / ecosystem eq} ; 2. sloths are {herbivores / provide food for carnivores / eq} ;	1. **IGNORE** exploit environment 2.**ACCEPT** sloths eat leaves	**(2)**

Question Number	Answer	*Additional Guidance*	Mark
5(b)	1. 15% of 48 and 53 calculated = 7.2 and 7.95 ; 2. Correct lengths = 55.2 and 60.95 (cm) ;	**Correct answer with no working shown gains both marks** 2. **ACCEPT** 5.75 or 6 (cm) as correct answer 2.**ACCEPT** 55 and 61 (cm)	**(2)**

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

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	1. remove **all** the organisms from (the fur of) the sloth ; 2. {count / identify} the number of different **species** ;	**1. IGNORE** references to use of quadrats but **DO NOT ACCEPT** context of pitfall trap 2.**NOT** organisms	**(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)	1. idea of comparing {DNA / proteins / RNA } (of different civets) ; 2. idea of relating {different base sequences / different amino acid sequences } to different species ;	1. **ACCEPT** analysing / observing as eq to comparing 1. **IGNORE** electrophoresis	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	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 ;	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)	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)**	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 ;	**QWC – focus on logical sequence** 2. **ACCEPT** to preserve their habitat **2. ACCEPT** also in context of MP7 7. **ACCEPT** "bred in captivity" 9. **ACCEPT** increase / maintain genetic diversity	**(5)**

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

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	1. streamlined for ease of movement (through female reproductive tract) / eq ; 2. flagellum for propelling sperm (through the female reproductive tract) / eq ; 3. acrosome containing enzymes that break down the zona pellucida / eq ; 4. mitochondria to provide energy for movement / eq ; 5. nucleus to carry genetic material ;	2. **ACCEPT** idea flagellum allows it to swim 2. **ALLOW** transferred error from labelling in 7a(i) 4.**ACCEPT** mitochondria to produce ATP for movement / eq 5. **ACCEPT** haploid nucleus to restore diploid number (of chromosomes) after fusion / eq	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	1. lycopene has {no significant effect / little effect} on the number of sperm in the control rats ; 2. lycopene increases the number of sperm in rats exposed to PCBs ; 3. credit correct manipulation of data to quantify mp1 or 2 ;	"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. mp1 (mean) increase is 30 x10^6 mp2 (mean) increase is 120 x 10^6	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	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 ;	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 3.**ACCEPT** fruit juice **IGNORE** concentrations **ACCEPT** named fruits	**(3)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>8(a)</td><td>
<table>
<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>
<tr><td>gamete</td><td>☒</td><td>X</td><td>☒</td><td>☒</td></tr>
<tr><td>planula</td><td>☒</td><td>☒</td><td>X</td><td>☒</td></tr>
<tr><td>ephyra</td><td>☒</td><td>☒</td><td>X</td><td>☒</td></tr>
</table>
</td><td></td><td>(3)</td></tr>
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Question Number	Answer	Additional Guidance	Mark
8(b)	female female ;	**ACCEPT** ♀	**(1)**

Question Number	Answer	Additional Guidance	Mark
8(c)	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 ;	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)	1. the fewer the initial number of polyps the greater (the increase) in population density ; 2. idea that the relationship is not linear ;	1. **ACCEPT** negative correlation 1. **ACCEPT** converse responses	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(d)(ii)	1. idea of less competition for attachment sites ; 2. idea of less competition for food ; 3. fewer polyps attract fewer predators ;	**ACCEPT** converse answers describing higher initial number of polyps **IGNORE** less competition for resources	**(2)**

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