Pearson Edexcel

Mark Scheme (Results)

January 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)(i)	**A** both meiosis and mitosis	***B*** *is incorrect because the DNA has to replicate before both mitosis and meiosis* ***C*** *is incorrect because the DNA has to replicate before both mitosis and meiosis* ***D*** *is incorrect because the DNA has to replicate before both mitosis and meiosis*	(1)

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	**B** meiosis only	***A*** *is incorrect because there is no prophase I in mitosis* ***C*** *is incorrect because crossing over there is no prophase I in mitosis* ***D*** *is incorrect because crossing over occurs in meiosis, prophase I*	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)	**C** four daughter cells with one copy of each chromosome / two daughter cells with two copies of each chromosome	***A*** *is incorrect because mitosis results in two daughter cells with two copies of each chromosome and meiosis results in four daughter cells with one copy* ***B*** *is incorrect because mitosis results in two daughter cells with two copies of each chromosome and meiosis results in four daughter cells with one copy* ***D*** *is incorrect because mitosis results in two daughter cells with two copies of each chromosome and meiosis results in four daughter cells with one copy*	(1)

Question Number	Answer	Additional Guidance	Mark
1(c)	1. because they do not have a nucleus ; 2. because they do not have (linear) chromosomes ; **3. meiosis** does not take place because they do not {reproduce sexually / produce gametes} ;	2. ACCEPT because they have circular DNA 3.ACCEPT **meiosis** does not take place as they reproduce by binary fission	(2)

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(d)</td><td>
<table>
<tr><th>Feature</th><th>Prokaryotic and eukaryotic cells</th><th>Prokaryotic cells only</th><th>Eukaryotic cells only</th><th>Not found in either prokaryotic or eukaryotic cells</th></tr>
<tr><td>cell membrane</td><td>☒</td><td></td><td></td><td></td></tr>
<tr><td>ribosomes</td><td>☒</td><td></td><td></td><td></td></tr>
</table>
</td><td>One mark per row.
More than one cross in a row cannot be given a mark.</td><td>(2)</td></tr>
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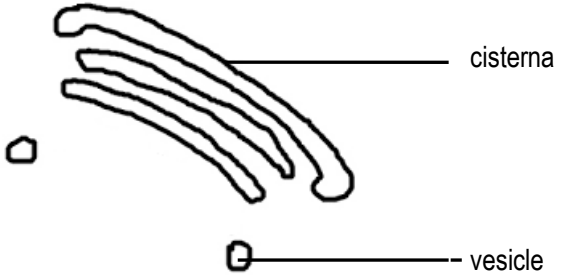
Question Number	Answer	Additional Guidance	Mark
1(e)	1. minimum of 3 **curved** cisternae drawn ; 2. vesicles drawn ; 3. {cisterna / cisternae} **and** vesicle correctly labelled ;	IGNORE labels when marking mp1 and mp2  2. more than one vesicle should be shown and should be **detached from** the cisternae (ignore positioning) 3. ACCEPT lysosome as eq to vesicle ACCEPT secretory / golgi / transport if vesicle is qualified ACCEPT phonetic spellings / plural names DO NOT ACCEPT if any other organelles are labelled as being part of the Golgi IGNORE labels of molecules e.g. protein	(3)

Question Number	Answer	Additional Guidance	Mark
2(a)	1. **controls** the growth of the pollen tube ; 2. idea of **controlling** the production of {enzymes / protein} ; 3. how these are involved in the growth of the pollen tube ;	2. ACCEPT codes for enzymes 2. NOT produces / secretes enzymes 3.e.g. they form a pathway for pollen tube /they digest the style / they produce the pollen tube	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)	B both are haploid	A is incorrect because both nuclei are haploid C is incorrect because both nuclei are haploid D is incorrect because both nuclei are haploid	(1)

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	1. {polymer / polysaccharide} of (α) glucose ; 2. held together by **glycosidic** bonds / eq ; 3. reference to amylose **and** amylopectin ;	ACCEPT phonetic spellings 1. ACCEPT **starch** is made up of **many / lots** of (α) glucose 2. ACCEPT 1,4- and/or 1,6- if ref to specific glycosidic bonds is stated 2.ACCEPT starch / amylose / amylopectin contains glycosidic bonds 3. NOT amylase (penalise once)	(2)

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	1. starch is insoluble ; 2. glucose molecules can move into the embryo (plant) ; 3. glucose can be used {in respiration / as a source of energy / eq} ;	2.ACCEPT starch cannot move into embryo (plant) 3. must be context of glucose	(2)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	1. a group of organisms that can {reproduce / breed} with each other to produce fertile offspring ; 2. idea that great tits {can reproduce only with other great tits / cannot reproduce with other types of birds} ;	1.Not viable offspring 2. ACCEPT great tits cannot produce fertile offspring with other types of birds 2. IGNORE mere repetition of MP1 mentioning great tits	(2)

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	1. (a place) where {organisms / species} live / eq ; 2. great tits live in woodland ;		(2)

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	1. (beak length) is an example of continuous variation / eq; 2. idea of a {character / eq} determined by more than one gene ; 3. at different loci / eq ;	NOT genotype / allele	(2)

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	1. idea that variation in beak length is due to mutation ; 2. food (availability / supply) is a **selection pressure** ; 3. idea that birds with a longer beak can reach (food) in the **bird feeders** ; 4. birds with a longer beak (are more likely to) survive **and** reproduce ; 5. idea that advantageous **alleles** are passed to the offspring ; 6. increasing the (advantageous / longer beak) **alleles** in the population ;	1. e.g. longer beak is the result of a mutation 2.ACCEPT shortage of food will result in **competition** 2. ACCEPT food inside the feeder acts as a selection pressure 3. ACCEPT converse 3. ACCEPT birds with a longer beak can obtain more food from the **bird feeders** 4. Piece together answer if necessary 4.ACCEPT converse 5. e.g. **alleles** for longer beaks are passed to the offspring 5. IGNORE genes 6.ACCEPT in context of numbers or frequency 6. IGNORE change in allele frequency	(4)

Question Number	Answer	Additional Guidance	Mark
4(a)	1. prevents sperm from being washed out / eq ; 2. fertilisation more likely to occur ; 3. more offspring produced ; 4. ensures that male's genes are passed on / prevents other males from fertilising that female / eq ;	1.ACCEPT sperm remain / are still present in the female 2.e.g. increases chances of fertilisation 3.ACCEPT increases population 4. ACCEPT prevents another male mating with the female ACCEPT prevents another (hectocotylus / tentacle) from entering the female / siphon IGNORE references to preventing polyspermy	(2)

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	1. a group of cells ; 2. with similar {structure / function / origin / eq} ;	1.ACCEPT cluster / mass 2.ACCEPT same / specific	(2)

Question Number	Answer	Additional Guidance	Mark

4(b)(ii)	1. stem cells (are present) ; 2. that can {give rise to specialised cells / differentiate / eq} ;	1.ACCEPT pluripotent / totipotent cells 2.ACCEPT that can divide into specialised cells	(2)

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	(sea) water only / (sea) water with no peptide ;		(1)

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	**B** 0 to 10^2	***A*** *is incorrect because the optimum concentration could be between* 10 to 10^2 ***C*** *is incorrect because the optimum concentration could be between* 0 to 10 ***D*** *is incorrect because the optimum concentration is not above* 10^2	(1)

Question Number	Answer	Additional Guidance	Mark

4(c)(iii)	1. release of enzymes (from the acrosome) / eq ; 2. on contact of sperm (head) with (zona pellucida / follicle cells / jelly layer) ; 3. resulting in digestion of {zona pellucida / follicle cells} / eq ;	1.ACCEPT release of acrosin	(2)

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	1. cellulose molecules linked by hydrogen bonds ; 2. reference to **microfibrils** ; 3. idea of sheets / layers (of microfibrils) ; 4. (microfibrils) arranged in {net / mesh / criss-cross /eq };	4.ACCEPT at different angles (to each other)	(3)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	1. vessels are hollow tubes ; 2. lignin needed to add {strength / support} to the vessels ; 3. xylem involved in transport of water ; 4. lignin needed to waterproof the vessels ;	ALLOW xylem as eq to vessels throughout ACCEPT cell walls as being in context of vessels 2.ACCEPT provides rigidity to the vessels / prevents vessels collapsing 4. e.g.to make vessels impermeable to water / to prevent water loss from vessels	(3)

Question Number	Answer	Additional Guidance	Mark
5(a)(iii)	**C**	***A*** *is incorrect because it is the sclerenchyma*	

		***B** is incorrect because it is the phloem* ***D** is incorrect because it is the parenchyma*	(1)

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	1. 230-180 / 50 ; 2. 22 / 21.7 / 21.74 (%);	Correct answer with no working shown gains both marks ACCEPT answer as positive or negative value	(2)

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	1. idea that the genetically modified plants are drooping ; 2. because there is less {lignin in the cell walls / secondary thickening} ; 3. therefore less support to the {stems / leaves} ; 4. xylem vessels collapse ; 5. idea that plant is not being supplied with sufficient water ;	ACCEPT converse answers for non-GM plants 1. ACCEPT wilting / withering 1. e.g. they are less upright / cannot stay upright / the unmodified plants are more upright 1. IGNORE reference to height 2.context of cell wall needs to be stated 3.IGNORE ref to supporting the plant	(3)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	as the distance from the root cap increases the **mitotic index** decreases / eq ;	ACCEPT converse	(1)

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	1. (total number of cells =) 3 + 91 / 94 ; 2. (mitotic index =) 3.2 / 3.19 ; 3. (distance from root cap =) 1 /1.0 /1.00(mm) ;	Correct answer with no working shown gains full marks ALLOW 1.0 to 1.02	(3)

Question Number	Answer	Additional Guidance	Mark
***6(a)(iii)**	1. use the same species of plant ; 2. cut 2 mm length of root tip ; 3. place root tip in acid / eq ; 4. credit named stain ; 5. credit details of method ; 6. idea of counting number of cells in mitosis **and** the total number of cells at different distances (from the root cap) ; **OR** calculate mitotic index at each distance ;	**QWC focus on logical sequence** 1.ACCEPT use same plant / root 2. ALLOW length up to 5mm 3. ACCEPT warmed in acid 4. e.g. (aceto)carmine, Feulgen's, Schiff's, toluidine (blue), orcein, methylene blue 5. e.g. teasing root tissue apart, squashing the cells underneath a cover slip, warming to intensify stain 6.ACCEPT counting number of cells in mitosis **and** in interphase at different distances from the root cap 6. NOT different regions	(5)

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	cytokinesis ;	ALLOW formation of cell plate ACCEPT phonetic spellings IGNORE growth phase	(1)

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	1. increase the volume of cytoplasm ; 2. idea of {water uptake / formation of vacuole} ; 3. make more {organelles / named organelle} / eq ; 4. synthesis of {proteins / enzymes / named protein} / eq ; 5. increase the cell membrane / eq ; 6. synthesis of new cell wall ;	1.ALLOW amount of cytoplasm 2.ALLOW enlargement of vacuole	(3)

Question Number	Answer	Additional Guidance	Mark
7(a)	1. Withering did not have {animal / pre-clinical} trials ; 2. Withering had a smaller sample size ; 3. Withering did not test on healthy people ; 4. Withering did not use a placebo ; 5. Withering did not do a double-blind trial ; 6. Withering tested mixtures of chemicals / eq ;	**ACCEPT** throughout the converse for modern testing protocols 6.**ACCEPT** Withering used plant extracts rather than the active ingredients	(3)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	1. patients given a range of doses / concentrations / eq ; 2. lowest effective concentration selected / eq ;	1. answers must be in context of patients not just people or healthy volunteers	(2)

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	digoxin has an {OH / hydroxyl} group that digitoxin does not have / eq ;	ACCEPT digoxin has two OH groups but digitoxin only has one OH group ACCEPT digoxin has an extra OH group IGNORE digoxin has more OH groups ACCEPT OH unqualified, but DO NOT CREDIT ref to hydroxide molecule / hydroxide ion / OH bond /OH atom / OH molecule	(1)

Question Number	Answer	Additional Guidance	Mark
7(b)(iii)	1. it will depend on size of patient / eq ; 2. different people have different {metabolic rates /metabolism / eq} ; 3. absorption of drug will depend on food that has been eaten recently / eq ; 4. may be {interactions with / effects of /eq} other drugs ;	1. ACCEPT age / gender of patient 2. ACCEPT genetic differences / different genotypes	(2)

Question Number	Answer	Additional Guidance	Mark
***8(a)**	1. one behavioural adaptation identified ; 2. one behavioural adaptation explained ; 3. one physiological adaptation identified ; 4. one physiological adaptation explained ; 5. one anatomical adaptation identified ; 6. one anatomical adaptation explained ;	**QWC focus on clarity of response** e.g. wading e.g. can avoid predators by wading e.g. secreting pigments e.g. pigments needed to attract mate e.g. long legs e.g. can wade in deeper water to avoid competition	(6)

Question Number	Answer	Additional Guidance	Mark
8(b)	1. because they occupy different niches ; 2. credit example of how the niche might **differ** ;	 2 e.g. feed on different food / feed in different depths of water 2.IGNORE no competition for food	 (2)

Question Number	Answer	Additional Guidance	Mark
8(c)	1. birth rate equals death rate / eq ; 2. idea that not many (other) animals can live in the lakes ; 3. little /no competition for food ; 4. few predators ;	1.ACCEPT low death rate / eq 1.ACCEPT long life span / eq 3.IGNORE resources 4. ACCEPT no predators	 (2)