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Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCE in Biology (6BI02) 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 – B ; xylem - D ;	**Allow** lower case b and d	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(b)			**(4)**

Statement	True	False
Both tissues have a structural function	☒	
Both tissues have a transport function		☒
End plates are missing in xylem vessels	☒	
Xylem vessels have tapered ends		☒

Question Number	Answer	Additional Guidance	Mark
1*(c)	**(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. idea of *cellulose* (molecules) { in bundles / as *microfibrils* / held together by *hydrogen* bonds } ; 2. layers of *microfibrils* (in the primary cell wall) / mesh of *microfibrils* (in secondary cell wall) ; 3. reference to presence of *lignin* in the cell wall ; 4. distribution of *lignin* described ; 5. presence of (bordered) pits ; 6. presence of { *pectin* / *hemicellulose* } in the cell wall ;	**QWC emphasis is on correct spelling of biological terms** (Note – only penalise once for an incorrect spelling) 2. ACCEPT net or criss-cross arrangement instead of mesh 3. ACCEPT *lignified* or *lignification* 4. e.g. rings / spirals / annular / helical 5. IGNORE pores and plasmodesmata 6. IGNORE middle lamella	**(4)**

Question Number	Answer	Additional Guidance	Mark
2(a)	1. nucleus drawn in the correct position and labelled ; 2. mitochondrion or mitochondria drawn in the correct position and labelled ; 3. flagellum drawn in the correct position and labelled ; 4. acrosome drawn in the correct position and labelled ;	2. NOT just labelling of the mid-section 3. NOT a single line 4. NOT a single line across the head region	(4)

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	for { movement / motility / eq } to reach the { ovum / egg } ;	ACCEPT 'swim or move or propel' sperm towards the egg	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	1. (aerobic) respiration ; 2. reference to { energy / ATP } for movement ;		(2)

Question Number	Answer	Additional Guidance	Mark
2(b)(iii)	1. contains { enzymes / acrosin / eq } ; 2. digestion of zona pellucida / eq ;	2. ACCEPT creation of a pathway through the follicle cells	(2)

Question Number	Answer	Additional Guidance	Mark
3(a)	1. { membrane bound sacs / cisternae } ; 2. idea of { sacs/ cisternae } { in stacks / of different sizes / eq } ; 3. (cisternae) curved / flattened ; 4. smooth membranes / no ribosomes ;		(3)

Question Number	Answer	Additional Guidance	Mark
3(b)	1. (Golgi apparatus) { modifies / processes } protein ; 2. details of modification e.g addition of carbohydrate chains, trimming of carbohydrate / reference to glycoprotein ; 3. (Golgi apparatus) packages proteins in (secretory) vesicles ; 4. for (export from cells by) exocytosis / eq ; 5. reference to lysosomes ;	2. ACCEPT glycoside 3. ACCEPT idea of protein being pinched off in a vesicle	(4)
Question Number	**Answer**	**Additional Guidance**	**Mark**
4(a)(i)	1. chromatids separated / chromosomes decondensed / eq ; 2. nucleus divided / two nuclei present /eq ;		(2)

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	1. DNA replicated / (identical) copies of DNA produced / eq ; 2. idea that { quantity of DNA / number of chromosomes } is doubled / cell is 4n ;	1. IGNORE DNA synthesis 2. ACCEPT two sets of DNA	(2)

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	C 64 ;		(1)

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	1. no time in G1 or G2 phase / usually a cell spends { several hours / more time / 14 hours } in G1 and G2 phase ; 2. less protein synthesis / fewer organelles ; 3. idea of { cytoplasm / organelles / cell membrane } { shared / divided / halved } with each cell division ;	2. ACCEPT less cytoplasm or cell membranes produced ACCEPT no organelles produced	(2)

Question Number	Answer	Additional Guidance	Mark
4(c)	1. genes would be { activated / deactivated } / eq ; 2. active genes transcribed / mRNA produced ; 3. translation (of mRNA) to produce proteins / eq ; 4. idea that proteins { modify cell / determine function of cell } / structure of cell altered permanently ;	1. ACCEPT switching on or off of genes, NOT turned on or off DO NOT ACCEPT translation of proteins	(4)

Question Number	Answer	Additional Guidance	Mark
4(d)	1. tissues made of cells and organs made of tissues /eq ; 2. tissues made of { one type / similar types } of cells AND organs made of different tissues / eq ; 3. organs have more functions than tissues ;	Piece together the answer if necessary	(2)

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	1. a resource that can be { renewed / replaced } / not finite / will not run out ; 2. idea that it is available to future generations ;	1. IGNORE regrown or replanted as this is not in the context of plants	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	1. idea that (starch comes from plants and) more plants can be grown (to replace those used) ; 2. idea of crude oil { not being renewable / finite /eq } ; 3. idea that using packaging pellets made from starch will allow crude oil supplies to last for longer ;	1. IGNORE renewable DO NOT ACCEPT starch can be regrown 2. ACCEPT will run out	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	(pH) 9.0 or 9 **AND** 30 (ºC) ;	IGNORE units	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	1. idea of { increased breakdown / larger decrease in mass } at pH 7.5 { when temperature increased / at 40 ºC } ; 2. idea of { increased breakdown / larger decrease in mass } at pH 9.0 { when temperature decreased / at 30 ºC } ; 3. at { pH 7.5 there is 2% / pH 9.0 there is 23% } difference (between 30°- 40 ºC) ;		**(3)**

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	1. area of plastic sheet ; 2. thickness of plastic sheet ; 3. concentration of { enzyme / solution } ; 4. enzyme type ; 5. volume of { enzyme / solution } ;	1. IGNORE size 5. NOT amount	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(iv)	1. idea that pH 11 is outside the range of data collected 2. idea of insufficient data (to support prediction) / cannot extrapolate from two values of pH / no indication of a trend ;	1. IGNORE pH 11 not tested	(1)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	(area or zone) where { no bacteria / bacteria not growing / bacteria killed } ;	ACCEPT bacteria not dividing / replicating / multiplying	(1)

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	1. the larger the size of zone of inhibition the { more bacteria killed / fewer bacteria grow / fewer bacteria multiply } / eq 2. idea of comparability between { species / plant extracts } ;	1. ACCEPT converse	(1)

Question Number	Answer	Additional Guidance	Mark
6(b)	1. clove has the greatest antimicrobial properties /most bacteria are sensitive to clove / eq ; 2. sage has no antimicrobial properties / no bacteria are sensitive to sage / eq ; 3. flower buds are more effective than leaves and stems ; 4. no difference between basil and rosemary AND between lemon balm and thyme ;	1. ACCEPT clove is the most effective 2. ACCEPT sage is ineffective against bacteria or is the least effective	(3)

Question	Answer	Additional Guidance	Mark

Number			
6(c)	1. repeats for each type of plant extract ; 2. to allow { mean / average } to be calculated / to increase reliability of results ; OR 3. use the same part of the plant for each extract ; 4. to control variables / to allow comparisons / to make { method / conclusions } valid ;	2. ACCEPT identify anomalies 4. IGNORE valid results	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(d)	1. idea of incubating at { temperatures below 37 ºC / a lower temperature } ; 2. prevents growth of pathogenic bacteria ; OR 3. idea of using non-pathogenic bacteria ; 4. prevent risk of infection to humans ;	2. ACCEPT idea that 37 ºC encourages growth of pathogens	**(2)**

Question	Answer	Additional Guidance	Mark

Number			
7(a)	1. idea of more than one gene for a single { characteristic / trait } ; 2. on more than one locus ; 3. idea of continuous variation ; 4. idea of genes interacting with each other ;	IGNORE phenotype	(2)

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	a Himalayan rabbit shaved (in the same place) and no ice pack (taped to bald patch);	**ACCEPT** shaved with no ice or another object taped to its back instead of an icepack	(1)

Question Number	Answer	Additional Guidance	Mark
7(b)(ii)	1. fur grew black when exposed to cold temperatures / eq ; 2. fur remains white when not exposed to cold temperatures / eq ; 3. idea that the gene is { expressed / activated } at low temperatures ;	2. ACCEPT fur is white in warm areas	(3)

Question Number	Answer	Additional Guidance	Mark
7(c)	1. fur is (only) black where { the temperature is lower than 25 ºC / ice pack is placed } ; 2. because the enzyme is active / eq ;	1. ACCEPT darker fur	(2)

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	Bulgaria ;		(1)

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	A (5:8) ;		(1)

Question Number	Answer	Additional Guidance	Mark
8(a)(iii)	1. higher biodiversity in Slovenia / lower biodiversity in Greece ; 2. correct manipulation of data to support answer ;	e.g. for Slovenia: AT+TT = 180 more 92.3%, AT = 110 more, TT = 70 more	(2)

Question Number	Answer	Additional Guidance	Mark
8(b)	1. the { role / position / eq } of a { species / organism } ; OR idea of how a { species / organism } exploits resources ; 2. within the { community / ecosystem /habitat } ;	2. ACCEPT reference to cave habitat IGNORE environment	(2)
Question	Answer	Additional Guidance	Mark

Number			
8(c)(i)	they are { found only in Slovenia and Croatia / not found in other countries / only found in these caves } ;		(1)

Question Number	Answer	Additional Guidance	Mark
8(c)(ii)	B (slow metabolic rate) ;		(1)

Question Number	Answer	Additional Guidance	Mark
8(c)(iii)	**(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. genetic variation in population ; 2. reference to selection pressure ; 3. description of a beneficial characteristic ; 4. idea that these organisms with beneficial characteristics survive and reproduce ; 5. passing on { beneficial alleles / eq } to offspring / eq ; 6. over { generations / time } there is a change in allele frequency ; 7. relevant reference to { geographical/ reproductive } isolation ;	**Emphasis is on clarity of expression** 3. e.g. external gills, slow metabolic rate, streamline shape 4. ACCEPT beneficial alleles 5. NOT genes 7. ACCEPT allopatric speciation (due to isolation in caves)	(5)

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