Mark Scheme (Results)

Summer 2015

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.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><th>Organelles</th><th>Prokaryotic cell</th><th>Eukaryotic cell</th></tr>
<tr><td>centrioles</td><td>x</td><td>✓</td></tr>
<tr><td>flagella</td><td>✓</td><td>✓</td></tr>
<tr><td>Golgi apparatus</td><td>x</td><td>✓</td></tr>
<tr><td>ribosomes</td><td>✓</td><td>✓</td></tr>
</table>
1 mark for any two correctly completed boxes ;
</td><td>Blanks are incorrect
Composite tick and cross are incorrect unless clearly replaced</td><td>(4)</td></tr>
</table>

Question Number	Answer	Mark
1(b) (i)	D mitochondria, rough endoplasmic reticulum and smooth endoplasmic reticulum;	**(1)**

Question Number	Answer	Mark
1(b) (ii)	B plasmodesmata ;	**(1)**

Question Number	Answer	Mark
1(b) (iii)	D a cell wall and ribosomes ;	**(1)**

Question Number	Answer	Mark
1(b) (iv)	B molecular phylogeny ;	**(1)**

Question Number	Answer	Mark
1(b) (v)	B Archaea and Bacteria ;	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)	**(QWC - Take into account quality of written communication when awarding the following points)** 1. Idea that in the rER insulin is folded e.g. forms {3-D shape, secondary / tertiary structure } ; 2. idea of insulin being packaged into (transport) vesicles by the rER ; 3. vesicles { move to / fuse with / eq } the Golgi apparatus / vesicles (fuse to) form the Golgi apparatus ; 4. idea of insulin being changed in Golgi apparatus ; 5. idea of insulin being transferred in (secretory) vesicles from the Golgi apparatus to the cell (surface) membrane ; 6. vesicles (containing insulin) fuse with cell (surface) membrane / exocytosis ;	**QWC emphasis on logical sequence** ACCEPT Golgi and protein instead of insulin 4.IGNORE folded, processed ACCEPT modified, described change e.g. add / remove sugars, glycosides, carbohydrate	**(4)**

Question Number	Answer	Mark
2(b)(i)	C unspecialised cells that can differentiate to give rise to almost any type of cell in the body, excluding totipotent cells ;	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	1. idea of stimulus e.g. chemical ; 2. idea that some genes are { active / switched on / expressed } ; 3. idea of { transcription / mRNA produced } at active genes ; 4. mRNA is {translated / used} to produce protein ; 5. idea that this protein modifies cell OR idea that this protein determines { cell structure / function } ;	2. IGNORE genes being 'turned on'	**(4)**

Question Number	Answer	Mark
3(a)(i)	13.1 ;	**(1)**

Question Number	Answer	Mark
3(a)(ii)	16.0 / 16 (%) ;	**(1)**

Question Number	Answer	Mark
3(a)(iii)	mitochondria / mitochondrion ;	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(iv)	1. idea of more sperm (cells) with defective flagella ; 2. idea that flagella needed to move sperm (cells) ; 3. idea of more sperm (cells) with defective mid-piece ; 4. idea that if mitochondria are affected there is no { respiration / energy / ATP } (for movement of flagella) ;	1. needs to be comparative ACCEPT only 4% in control 2. ACCEPT swim 4.ACCEPT damaged or fewer mitochondria ACCEPT less energy, less respiration or less ATP	**(4)**

Question Number	Answer	Additional Guidance	Mark
3(b)	1. (acrosome contains) { acrosin / enzyme / eq } ; 2. Reference to acrosome reaction ; 3. idea that { zona pellucida / jelly layer } needs to be digested ; 4. sperm (cell) needs to { reach / fuse with } cell (surface) membrane of egg / eq ;	3. ACCEPT broken down	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(c)	1. idea that smoking causes {damage to sperm / infertility} ; 2. idea of smoking as a variable to be controlled ; 3. idea of making sure that any effects were due to globozoospermia OR idea of difficulty in distinguishing between genetic and environmental factors ;	3. e.g. difficult to tell if it was due to smoking or disease	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	1. reference to aseptic technique ; 2. using sterilised { containers / agar / growth medium / equipment / eq } / eq ; 3. idea of sealing the container ;	 2. IGNORE clean the bench ACCEPT tweezers, loops 3. ACCEPT use clingfilm, cotton wool, put lid on, foil	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	1. idea of contaminants causing {infection / disease / eq} of plant (tissue) ; 2. idea of contaminants compete (for nutrients) ; 3. idea of contaminants causing { poor growth / decay / death } / eq ;	1. ACCEPT pathogen of plant 2.NOT for light	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	1. light ; 2. temperature ; 3. humidity ; 4. sugar / glucose / sucrose ; 5. minerals / mineral ion(s) / named mineral ion ;	1. ACCEPT sunlight, wavelength 3. IGNORE water, moisture 5. e.g. nitrate	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	1. increase in number of shoots per explant { between pH 4.5 and 6.0 / up to pH 6.0 } ; 2. pH 6 is {optimum / highest number of shoots} / lowest number of shoots at pH 4.5 ; 3. idea of effect of pH on protein or enzyme ; 4. description of the consequence of this change on {metabolism / uptake of nutrients / eq} ;	1. ACCEPT positive correlation up to 6.0 2. IGNORE goes up and then down ACCEPT pH 6 is best 4. ACCEPT effect on named cell process	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	1. {number / range / variety / eq} of species ; 2. genetic variety within a species / number of different alleles in a {species / gene pool} ;	1. ACCEPT amount	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	idea of (counting) number of species in a known area of rainforest ;	ACCEPT use a quadrat to count species	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	1. idea that loss of biodiversity means fewer species ; 2. idea that the loss of endemic species leads to extinction ; 3. idea that species {lost / not yet discovered / eq} may be useful ;	3. ACCEPT plants lost may be useful	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	**(QWC - Take into account quality of written communication when awarding the following points)** 1. extract made from seeds (of Jatoba) / eq ; 2. agar plate with bacteria / culture of bacteria grown in nutrient broth / eq ; 3. description of aseptic technique ; 4. idea of extract (of Jatoba) placed on (paper) disc OR in a well cut into the agar OR added to broth ; 5. control described e.g. disc plus solvent only ; 6. incubated at temperature in range 20 to 30°C AND stated time in range 1 to 7 days ; 7. (look for) zone of inhibition / clarity of broth / eq ; 8. replication qualified e.g. { repeat the experiment / repeats to calculate mean } ;	**Clarity of expression** 1. ACCEPT description 2. ACCEPT bacterial lawn 7. ACCEPT clear area around extract 8. IGNORE repeat unqualified	**(5)**

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	1. idea of testing on animals for toxicity ; 2. idea of testing on healthy volunteers to determine side effects ; 3. idea of finding out how the drug is metabolised ;		**(2)**

Question Number	Answer	Additional Guidance	Mark
6(a)	1. cellulose (molecule) is a { polymer / chain / eq } of β-glucose / eq ; 2. cellulose molecules held together { by hydrogen bonds / as microfibrils } ; 3. idea of arrangement of microfibrils in { parallel / net / mesh / criss cross / eq } ; 4. reference to { matrix / hemicelluloses /pectin / eq } ;	1. ACCEPT many β-glucose 4. IGNORE lignin	**(3)**

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	1. { group of / many / several / eq } cells ; 2. idea that the cells in a tissue { work together / eq } for a common function ;		**(2)**

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	1. idea that lignin holds the { fibres / microfibrils } together ; 2. lignin keeps { fibres / microfibrils } parallel / eq ;		**(2)**

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	1. { hollow / no cytoplasm / eq } ; 2. idea that vessels { have no end walls / are open at the ends } ; 3. vessels { have pits / are strong so that they do not collapse } ; 4. lignin makes the walls waterproof / eq ;	1. IGNORE dead, tube ACCEPT has a lumen 3. ACCEPT strong to keep tube open	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(c)(ii)	1. nitrate for production of { amino acids / protein / DNA / nucleic acids / bases / eq } ; 2. calcium for { pectate / pectin / middle lamella } ; 3. magnesium for chlorophyll ;	1. ACCEPT chlorophyll, enzymes	**(3)**

Question Number	Answer	Mark
7(a)(i)	A anatomical adaptation ;	**(1)**

Question Number	Answer	Mark
7(a)(ii)	C 1976 to 1977 ;	**(1)**

Question Number	Answer	Additional Guidance	Mark
7(b)	1. genetic variation / different alleles / large gene pool ; 2. mutations ; 3. polygenic inheritance / eq ;	1. ACCEPT genetic diversity, different genotypes 3. ACCEPT more than one gene controls beak size	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(c)	1. selection pressure is { lack of food / tough food /eq} ; 2. idea of selection for the { longer / deeper} beaks ; 3. birds with shorter beaks died / reference to figures in table ; 4. birds with { advantageous/ eq } alleles (survive) to breed ; 5. { advantageous / eq} allele(s) passed onto offspring / eq ; 6. change in genotypes over generations / eq ;	2. ACCEPT they survive 4&5. IGNORE genes 6. e.g. increased frequency of alleles for longer and deeper beaks	**(4)**

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	1. closely-related lions mated with each other / a small gene pool / eq ; 2. reference to inbreeding depression ; 3. idea of increased chance of homozygous recessive genotypes for genetic defects ;	 2. NOT interbreeding 3. NOT homologous ACCEPT recessive alleles more likely to be expressed	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	1. selection of { unrelated / genetically different } mates / eq ; 2. use of stud books / records of mating / DNA profiling / eq ; 3. exchange of animals between zoos / eq ; 4. exchange of gametes between zoos / eq ; 5. IVF / AI / eq ;		**(4)**

Question Number	Answer	Additional Guidance	Mark
8(b)	1. idea of { genetic cause / genetic mutations } ; 2. idea that a change in diet had no effect ; 3. reference to {monoamine oxidase (A) / MAOA} ; 4. idea of behaviour learnt from mother ;		**(2)**

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