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Mark Scheme (Results)

Summer 2014

GCE Biology (6BI02)
Paper 01

Unit 2: Development, Plants and Environment
Version Final

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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.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is NOT what is expected it may be worthy of credit.

The mark scheme gives examiners:
- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is NOT essential for the award of the mark, but helps the examiner to get the sense of the expected answer.
Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.

ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do NOT give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:
- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.
Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does NOT preclude others.

Question Number	Answer	Additional guidance	Mark
1(a)	1. idea of enzymes being {produced / released / secreted / eq} ; 2. idea of these enzymes being used to {digest / break down / eq} (tissues of style) ; 3. idea of forming a pathway ;	2. ACCEPT digest it	(2)

Question Number	Answer	Mark
1(b) (i)	B embryo sac ;	(1)

Question Number	Answer	Mark
1(b) (ii)	C the egg cell and the polar nuclei ;	(1)

Question Number	Answer	Mark
1(b) (iii)	B diploid zygote and triploid endosperm ;	(1)

Question Number	Answer	Additional guidance	Mark
1(c)	1. pollen grain does not possess flagellum / eq ; 2. pollen grain does not have an acrosome ; 3. idea of {more / 2 / 3} nuclei in pollen grain ; 4. idea of difference in outer boundary e.g. exine in pollen grains ;	ALLOW converse points 1. ACCEPT tail or undulipodium 2. IGNORE lysosome 4. ACCEPT cell wall	**(2)**

Question Number	Answer	Additional guidance	Mark
2(a)	1. idea of more than one gene for a single characteristic ; 2. at different loci / eq ; 3. idea of giving rise to continuous variation ;	1. IGNORE alleles ACCEPT 'a phenotype' if specific	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)	1. malnutrition / lack of { nutrients / a named nutrient e.g. protein, calcium / eq } ; 2. idea of nutrient required for specified growth e.g. muscle, bone ; 3. idea of other relevant environmental factor that affects expression of genotype for height e.g. health ; 4. idea of an environmental factor determining achievement of (genetic) potential ;	1. ACCEPT deficiency 3. ACCEPT disease	**(3)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr>
<td>2(c)(i)</td>
<td>1. increased for { all / both Northern and Southern } Europeans / eq ;

2. greater increase for Southern Europeans than Northern Europeans / faster rate of increase for Southern Europeans ;

3. idea of greatest increase for Southern Europeans from 1970 to 1975 ;

4. idea of fall in height for Northern Europeans between 1970 and 1975 ;

5. manipulation of data to either show the increase of both or to show that the increase was greater for Southern Europeans than Northern Europeans ;</td>
<td>1. ACCEPT separate comments for North and South

2. ACCEPT converse

Mp2 can also gain Mp1 if height referred to

5. ACCEPT as mm
<table>
<tr><th></th><th>Increase</th><th>increase as %</th></tr>
<tr><td>Southern</td><td>4.3 - 4.4 cm</td><td>2.5-2.6%</td></tr>
<tr><td>Northern</td><td>2.3cm</td><td>1.29 or 1.3%</td></tr>
<tr><td>Difference between N and S Europeans</td><td>2 / 2.1 cm more for SE</td><td></td></tr>
</table>
</td>
<td>(3)</td>
</tr>
</table>

Question Number	Answer	Additional guidance	Mark
2(c)(ii)	1. idea of change in diet or differences in diets between Northern and Southern Europeans ; 2. difference in diet described, eg more protein ; 3. idea of improved health care or better sanitation ; 4. less effects of disease on growth / eq ; 5. differences due to migration / eq ; 6. idea of changes to gene pool as a result of migration ;	4. ACCEPT idea of vaccinations	**(2)**

Question Number	Answer	Additional guidance	Mark
3(a)	1. presence of { membrane bound / named membrane bound } organelle in eukaryotic cells / eq ; 2. presence of { plasmids / slime capsule / pili / eq} in prokaryotic cells ; 3. size of ribosomes i.e. larger in eukaryotic cells / 70S in prokaryotes and 80S in eukaryotes / eq ; 4. DNA in a nucleus in eukaryotic cells /eq ; 5. { DNA / chromosome } linear in eukaryotic cells and circular in prokaryotic cells / eq ; 6. relevant comment regarding cell walls e.g. cell walls always present in prokaryotic cells, only in some eukaryotic cells;	ACCEPT converse where appropriate 1. ACCEPT reference to a named organelle such as mitochondria or nucleus present in eukaryotic cells and NOT in prokaryotic cells 2. ACCEPT reference to mesosomes 6. cell walls in prokaryotic cells contain{ peptidoglycan / murein} and in eukaryotic cells they contain {cellulose /chitin }	**(3)**

Question Number	Answer	Additional guidance	Mark
3(b)	1. idea of molecular { differences / similarities } ; 2. in { DNA / RNA } ; 3. in proteins / proteomics ; 4. idea of (evolutionary) relationships between organisms ;	2. ACCEPT base sequences 3. ACCEPT amino acid sequences 4. ACCEPT idea of closely related species	**(3)**

Question Number	Answer	Additional guidance	Mark
3(c)(i)	1. idea of cell membrane being different ; 2. idea of different number of protein molecules ;	1. ACCEPT description of difference e.g. ether bonds, branched hydrocarbons 2. ACCEPT NOT same number, they have 10 protein molecules	**(2)**

Question Number	Answer	Additional guidance	Mark
3(c)(ii)	1. number of protein molecules is closer to Eukaryota than to Bacteria / eq ; 2. no peptidoglycan in cell wall ;		**(2)**

Question Number	Answer	Additional guidance	Mark
4(a)	1. idea of increasing cell number ; 2. idea of replacing {damaged / dead } cells OR idea of repairing (damaged) tissue ; 3. to produce <u>genetically</u> identical cells ;	1. ACCEPT 'production of new cells' and cells divide multiply or replicate 2. NOT growth or repair of cells	**(2)**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	Stage 2. { hydrochloric / acetic / ethanoic } AND { macerate / soften / separate / break up / eq } ; Stage 3. Toluidine (blue) / orcein / Feulgen / Schiff's (reagent) ; Stage 4. Slide AND { coverslip / cover slide } ;	Stage 2. ACCEPT HCl, ACCEPT break down Stage 3. ACCEPT ethanoic /acetic / proprionic orcein. ACCEPT unambiguous spellings that couldn't be anything other than the name of a stain	**(3)**

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	1. { safety goggles / safety glasses / gloves } when handling { acid / stain } 2. care (with scalpel) when cutting root tip 3. care with slide when squashing root tip ;	IGNORE lab coats protecting clothes	**(1)**

Question Number	Answer	Additional guidance	Mark
4(c)	**(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. idea of chemical stimulus e.g. signal protein, growth substance ; 2. idea of some genes {active / inactive / eq} ; 3. idea of transcription of active genes ; 4. mRNA translated / { polypeptide / protein } made / eq ; 5. idea of cell {structure / function} determined / cell modified e.g. lignin synthesised ;	**QWC emphasis is logical sequence** 1. ACCEPT hormone 2. ACCEPT genes switched on / off 3. ACCEPT mRNA synthesised	**(4)**

Question Number	Answer	Additional guidance	Mark
4(d)(i)	chiasmata / pairing of homologous chromosomes / synapsis / formation of bivalents ;	IGNORE non-observable processes that are different ACCEPT crossing over ACCEPT spelling of chiasmata as chaismata or phonetically correct	**(1)**

Question Number	Answer	Additional guidance	Mark
4(d)(ii)	1. crossing over and { independent/ random} assortment ; 2. description of crossing over as swapping over sections of { chromatid / DNA } ; 3. description of independent assortment of maternal and paternal chromosomes ; 4. consequence described e.g. produces recombinants or new combinations of alleles ;	1. this mark can be awarded if there are no correct details provided for either process	**(2)**

Question Number	Answer	Additional guidance	Mark
5(a)	1. renewable / eq ; 2. resources can be made available for future generations / will not run out / eq ; 3. more (Canola) plants can be grown / eq ;	2. ACCEPT not finite ACCEPT references to either oil or plants not running out	**(2)**

Question Number	Answer	Additional guidance	Mark
5(b)	1. amino acids OR proteins ; 2. idea of used in synthesis of { nucleic acids / DNA / ATP} ; 3. idea of how this organic compound is used in growth;	2. ACCEPT RNA, NAD, NADP, ADP, chlorophyll 3. (amino acids) for the synthesis of proteins, (proteins) as enzymes, (nucleic acids) for cell division, (ATP) as an energy source	**(2)**

Question Number	Answer	Mark
5(c) (i)	A a negative correlation ;	**(1)**

Question Number	Answer	Additional guidance	Mark
5(c)(ii)	1. correct values from graph, i.e. 2.40 and 3.30 ; 2. difference divided by 2.4, e.g. (0.9 ÷ 2.4)x 100 ; 3. 37.5 (%) ;	Correct answer gains 3 marks 1. 2.4 and 3.3 2. (3.30-2.40)x100/2.40 ACCEPT (difference ÷ original value)x 100 if incorrect values selected from graph	**(3)**

Question Number	Answer	Additional guidance	Mark
5(c)(iii)	1. idea of using genetically similar plants e.g. raised from seeds from same plant, clones ; 2. idea of repeats {at each level of nitrate fertiliser / used to produce mean data / to identify outliers or anomalies} ; 3. environmental variable related to soil controlled e.g. soil pH, concentration of other mineral ions ; 4. another environmental variable controlled e.g. temperature, light (intensity), water ; 5. idea of control described, e.g. no nitrate/ soil with no extra nitrate ; 6. idea of same method of extraction of oil used ;	IGNORE reference to time as the investigation is measuring seed production 1. ACCEPT cuttings 3. ACCEPT same area, location	**(4)**

Question Number	Answer	Additional guidance	Mark
6(a)	1. reference to stem cells being {totipotent / pluripotent} ; 2. can specialise or differentiate / can give rise to {differentiated / specialised} cells ; 3. idea that these can replace damaged cells (in spinal cord of Dachshund) / new nervous tissue can be formed / eq ; 4. capable of continuous division / no Hayflick limit ;	1. IGNORE unspecialised 2. IGNORE stem cells 'turn into' or 'become' 3. ACCEPT new nerve cells	**(2)**

Question Number	Answer	Additional guidance	Mark
6(b)	1. cells genetically identical / same genotype / eq ; 2. no rejection / avoids immune response / eq ; 3. idea of no disease transmission ;	IGNORE tumours, cancer 1. ACCEPT reference to same tissue type or same antigens – NOT the same DNA 2. NOT **reduced** risk of rejection ACCEPT idea of no need for immunosuppressant drugs 3. ACCEPT – reduced risk of infection	**(2)**

Question Number	Answer	Additional guidance	Mark
6(c)(i)	1. reference to placebo OR idea of being used as a control ; 2. to compare with stem cell treatment / eq ;	1. IGNORE placebo effect	(2)

Question Number	Answer	Additional guidance	Mark
6(c)(ii)	1. to remove bias / eq 2. idea of making it a double blind trial ;		(1)

Question Number	Answer	Mark
7(a)(i)	C short brown fibre	(1)

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr>
<td>7(a)(ii)</td>
<td>1. conclusion {valid / eq} for 5mm coir fibres / eq ;

2. (valid) because {ranges/ data} do not overlap (for 5mm fibres) eq ;

3. not valid for 35mm coir fibres / eq ;

4. (not valid) because {no significant difference / there is overlap of data / eq} (for 35mm fibres) ;

5. (not valid) because 5mm white fibres are stronger than 35mm brown fibres / eq ;

6. manipulation of data to support {overlap / no overlap / difference} ;</td>
<td>ACCEPT reference to short for 5mm and long for 35 mm fibres.

6.
<table><tr><th></th><th>5mm white coir</th><th>35mm white coir</th></tr><tr><td>5mm brown coir</td><td>151 MPa</td><td>181 MPa</td></tr><tr><td>35mm brown coir</td><td>white fibres 6 MPa more</td><td>brown fibres 24 MPa more</td></tr></table></td>
<td>(4)</td>
</tr>
</table>

Question Number	Answer	Additional guidance	Mark
7(b)(i)	1. they are light because of {lack of cytoplasm / hollow / no cell contents / eq} ; 2. strong due to presence of {lignin / thickened cell walls} ; 3. waterproof due to lignin ;		(3)

Question Number	Answer	Additional guidance	Mark
7(b)(ii)	less { lignin / lignified} / thinner cell walls ;	IGNORE no lignin	(1)

Question Number	Answer	Additional guidance	Mark
8(a)	idea of found in only one specific geographical location ;	ACCEPT reference to {one / the} area / place IGNORE habitat or environment	(1)

Question Number	Answer	Additional guidance	Mark
8(b)	1. idea that genetic diversity {will be low / decreases / stays the same } OR idea of smaller gene pool ;		
	2. closely related wolves mating / inbreeding / eq ;	2. NOT inTERbreeding Do not give this mark for "inbreeding depression"	
	3. risk of inbreeding depression / more chance of homozygous recessive genotypes / eq ;	3. ACCEPT greater risk of genetic disorders	
	4. risk of genetic drift / eq ;	4. ACCEPT reference to loss of alleles	(2)

Question Number	Answer	Additional guidance	Mark
8(c)	1. idea that this increases the gene pool ; 2. idea that this increases potential for the species to { adapt / survive } ; 3. description of how this will increase survival e.g. better hunters, disease resistance ;	1. ACCEPT introduction of genetically different individuals, { new / different } alleles introduced into population 2. ACCEPT population but not individuals	**(2)**

Question Number	Answer	Additional guidance	Mark
8(d)(i)	<table><tr><th>Adaptation for the Ethiopian wolf</th><th>Behavioural</th><th>Anatomical</th><th>Physiological</th></tr><tr><td>Small sharp teeth widely spaced to cope with small prey</td><td></td><td>X</td><td></td></tr><tr><td>Narrow snout to fit into small gaps when hunting small prey</td><td></td><td>X</td><td></td></tr><tr><td>Hunting alone, as prey too small to share with other wolves</td><td>X</td><td></td><td></td></tr></table>	**ACCEPT in the cells indicated a cross or tick**	**(3)**

Question Number	Answer	Additional guidance	Mark
8(d)(ii)	**(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. genetic variation in population / variation due to mutation / eq ; 2. description of selection pressure ; 3. idea that some individuals possessed { advantageous / beneficial / eq } characteristics ; 4. (therefore) survived to adulthood / survived to breed ; 5. passing on {advantageous alleles / eq} (to offspring) / eq ; 6. change in allele frequency (over generations) / eq ; 7. idea of {geographical / reproductive} isolation ;	**QWC emphasis is clarity of expression** 2. ACCEPT small prey 5. NOT just passing on a characteristic or genes	**(4)**

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