Mark Scheme (Results)

Summer 2014

IAL Biology (WBI02)
Paper 01

Unit 2: Development, plants and 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.

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	Mark
1(a) (i)	C - prophase ;	**(1)**

Question Number	Answer	Mark
1(a) (ii)	D - telophase ;	**(1)**

Question Number	Answer	Mark
1(a) (iii)	B - hydrochloric acid ;	**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)	1. independent assortment ; 2. description of independent assortment { of maternal and paternal chromosomes / eq } ; 3. crossing over ; 4. description of crossing over as swapping over { DNA / sections of chromatid } / eq ; 5. produces recombinants / new combinations of alleles / eq ;	1. & 2. ACCEPT random assortment or distribution 4. IGNORE genes ACCEPT in relation to chiasma or chiasmata 5. ACCEPT in relation to chromosomes or chromatids	**(4)**

Question Number	Answer	Additional guidance	Mark
1(c)	1. idea that one { male nucleus / gamete / eq } fertilises the { egg cell (nucleus) / female nucleus / female gamete } ; 2. idea that one { nucleus / gamete / eq } fertilises the (two) polar nuclei ;	ACCEPT fuses for fertilises ACCEPT description of male nucleus as the product of division of generative nucleus 1. NOT ovum 2. NOT polar bodies Does not need to refer to male nucleus for this mark point	**(2)**

Question Number	Answer	Mark
2(a) (i)	B - domain ;	**(1)**

Question Number	Answer	Mark
2(a) (ii)	C - molecular phylogeny ;	**(1)**

Question Number	Answer	Mark
2(a) (iii)	B - two of the groups ;	**(1)**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	1. presence of { membrane bound / named membrane bound } organelle in eukaryotic cells / eq ; 2. absence of { plasmids / slime capsule / pili / eq} that are found in { bacteria / prokaryotic cells } ; 3. size of ribosomes i.e. larger in eukaryotic cells / 80S in eukaryotes AND 70S in { bacteria / prokaryotic cells } / eq ; 4. DNA in a nucleus in eukaryotic cells ; 5. { DNA / chromosome } linear in eukaryotic cells AND circular in { bacteria / prokaryotic cells } / eq ;	1. ACCEPT reference to a named organelle such as mitochondria, rER or nucleus present in eukaryotic cells 4. ACCEPT genetic material or chromatin ACCEPT chromosome NOT chromatid	**(2)**

Question Number	Answer	Additional guidance	Mark
*2(b)(ii)	***QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence.** 1. folded into { 3-D / *secondary* / *tertiary* } *structure* in *rough endoplasmic reticulum* ; 2. idea of *protein* being packaged into *vesicles* (at the end of the rER) ; 3. *vesicles* { move to / transported to / fuse with / eq } the *Golgi* { *apparatus* / *body* }; 4. idea that { *protein* / *enzymes* } modified in *Golgi apparatus* ; 5. detail of modification e.g. activation of *enzyme*, addition of *glycoside* or *carbohydrate* ; 6. (modified *protein* / *enzyme* / eq) packaged into (*secretory*) *vesicles* (by *Golgi apparatus*) eq ; 7. idea of *exocytosis* ;	***QWC - Emphasis of spelling** 1. ACCEPT rER 2. ACCEPT shuttle vesicles 7. ACCEPT vesicle fusing with cell membrane and releasing enzyme	**(5)**

Question Number	Answer	Additional guidance	Mark
2(b)(iii)	1. reference to β glucose ; 2. reference to 1,4-glycosidic bonds ; 3. cellulose molecules linked by hydrogen bonds / eq ; 4. forming of microfibrils ; 5. idea of microfibrils arranged in { a mesh / layers } ;	1. ACCEPT b-glucose or Beta-glucose 2. IGNORE alpha or beta	(3)

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

Question Number	Answer	Additional guidance	Mark
3(b)(i)	1. correct values selected, i.e. 1.72 and 1.76 ; 2. difference divided by 1.72 and multiplied by 100, e.g. (0.04 ÷ 1.72) x 100 ; 3. { 2.32 / 2.33 } (%) ;	correct answer gains 3 marks 2. ACCEPT (difference ÷ original value) x 100 if incorrect values selected from table	**(3)**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	1. idea of an increase in height for both groups ; 2. { greater / faster } change for Southern Europeans than Northern Europeans / eq ; 3. idea of no change in height for either group from 1965 to 1970 ; 4. manipulation of data to show increase was greater for Southern Europeans than Northern Europeans from 1955 to 1980 ;	1. ACCEPT separate comments for Northern and Southern Europeans 2. ACCEPT converse Mp2 also gains Mp1 4. e.g. S=0.04 m and N=0.02 m OR S-N=0.02 m / S double N OR 1.18 / 1.2 % more for S	**(3)**

Question Number	Answer	Additional guidance	Mark
3(b)(iii)	1. idea of differences in diets between Northern and Southern Europeans ; 2. difference in diet described, e.g. more protein in Northern Europe ; 3. idea of improved health care or better sanitation ; 4. less effects of disease on growth / eq ; 5. different gene pools / eq ; 6. more alleles for tallness in Northern Europe ;	5. ACCEPT difference in genes	**(2)**

Question Number	Answer	Mark
4(a)	A – amyloplast ;	(1)

Question Number	Answer	Additional guidance	Mark
4(b)	1. idea that this is a renewable (resource) ; 2. resource can be made available for future generations / will not run out / eq ; 3. more sweet potato plants can be grown / eq ;	2. ACCEPT not finite 3. ACCEPT regrown	(2)

Question Number	Answer	Additional guidance	Mark
4(c)(i)	1. amino acids OR proteins ; 2. nucleic acids / (organic) bases / DNA / ATP ; 3. idea of how this organic compound is used by the plant ;	2. ACCEPT RNA, NAD, NADP, ADP, chlorophyll 3. e.g. (amino acids) for the synthesis of proteins, (proteins) as enzymes, (bases) for synthesis of DNA, (nucleic acids) for cell division, (ATP) as an energy source	(2)

Question Number	Answer	Additional guidance	Mark
4(c)(ii)	1. idea that { 3 / 4 / few } different levels of nitrate tested ; 2. no indication of repeats { at (each level of nitrate) to calculate an average } / eq ; 3. intervals between values large / use narrower intervals / eq ; 4. optimum may have been between { 0 and 30 / between 30 and 60 / between 0 and 60 } / eq ; 5. other factors not controlled / eq ;	ACCEPT concentration 3. ACCEPT other levels not tested i.e. between 0 and 30 OR 30 and 60	(3)

Question Number	Answer	Additional guidance	Mark
4(d)	1. lack of cytoplasm / hollow / dead cells / eq ; 2. thickened cell walls / eq ; 3. presence of lignin / eq ; 4. idea of cells joined end to end (to form vessels) ;	3. ACCEPT lignification / lignified 4. ACCEPT stacked tubes, no end walls	(2)

Question Number	Answer	Additional guidance	Mark
5(a)(i)	1. idea that up to month 2 the percentage germination increases ; 2. idea of a decrease in germination after 2 months in storage ;	1. ACCEPT in the first month, from first to second month 2. ACCEPT then it decreases	**(2)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr>
<td>5(a)(ii)</td>
<td>1. idea that there is little difference (between the three temperatures) up to 2 months ;

2. idea that lower temperature results in greater germination success ;

3. correct manipulation of data to compare different temperatures ;</td>
<td>2. ACCEPT converse statements

3. For example
<table>
<tr><td>time</td><td>5°C</td><td>15°C</td><td>22°C</td></tr>
<tr><td>1-2 months</td><td>goes up by 14%</td><td>goes up by 13%</td><td>goes up by 11%</td></tr>
<tr><td>after 8 months</td><td>34% more than 15°C OR 64% more than 22°C</td><td>30% more than 22°C</td><td></td></tr>
</table>
</td>
<td>(2)</td>
</tr>
</table>

Question Number	Answer	Additional guidance	Mark
5(b)	1. to {prevent / reduce} { enzyme activity / metabolic reactions / eq } ; 2. to prevent germination of seeds / eq ; 3. to {prevent / reduce} { microbial growth / decay / decomposition of seeds / eq} ; 4. idea of to {prevent / reduce} damage when seeds are frozen ;	2. ACCEPT prevent growth, keep dormant NOT reduces germination 3. ACCEPT rotting	(2)

Question Number	Answer	Additional guidance	Mark
5(c)	1. idea of seed harvested from different plants of the same species ; 2. idea of seed collected from plants growing in different { locations / countries / eq } ; 3. idea of { variety of alleles / large gene pool } ;		(2)

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 / form new tissue} (in knee joint) / eq ; 4. capable of continuous division / no Hayflick limit / eq ;	1. IGNORE unspecialised ACCEPT multipotent 2. IGNORE stem cells 'turn into' or 'become'	(2)

Question Number	Answer	Additional guidance	Mark
6(b)	Sources of stem cells : 1. bone marrow ; 2. umbilical cord / placenta ; 3. embryo / (inner cell mass of) blastocyst ; 4. skin ; 5. blood ; 6. adipose tissue ;	4. ACCEPT appropriate named organ	(2)

Question Number	Answer	Additional guidance	Mark
6(c)	1. risk of rejection / eq ; 2. idea of risks when taking immunosuppressant drugs ; 3. risk of transmission of disease / eq ; 4. may cause cancer to develop / eq ;	3. ACCEPT risk of infection	**(2)**

Question Number	Answer	Additional guidance	Mark
6(d)	**(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. hormone ; 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 ;	**QWC emphasis is logical sequence** 2. ACCEPT genes switched on / off NOT genes turned on and off 3. ACCEPT mRNA synthesised	**(4)**

Question Number	Answer	Additional guidance	Mark
7(a)	1. fibres of the same { length / diameter / width / cross sectional area / eq } ; 2. {temperature / humidity} controlled / eq ; 3. idea of adding masses until fibre breaks / measure the mass {that breaks the fibre / that the fibre can hold before breaking / eq } ; 4. repeat and find the { mean / average } ; 5. description of action taken in case of { anomalous result / outlier } e.g. repeat, remove ; 6. description of how tensile strength calculated, e.g. conversion of mass to force or reference to force divided by cross sectional area of fibre ; 7. description of safety procedure qualified ;	3. ACCEPT reference to force instead of mass 7. e.g. cushion to stop damage to feet, goggles to protect eyes	**(4)**

Question Number	Answer	Mark
7(b)(i)	D- brown fibres are always stronger than white fibres ;	**(1)**

Question Number	Answer	Additional guidance	Mark
7(b)(ii)	1. Only results for white coir fibres support the statement ; 2. idea of no (significant) difference between { 5mm / short } and { 35mm / long } white fibres ; 3. { error bars / ranges / results } overlapping for white coir fibres ; 4. use of data to illustrate overlap ;	2. ACCEPT reference to only 15 mPa difference 4. e.g. for 5mm 180 is higher than 175 for 35mm, for 35mm 155 is lower than 160 for 5mm	**(3)**

Question Number	Answer	Additional guidance	Mark
8(a)	1. idea of the relationship between the organism and its {habitat / ecosystem / environment } ; 2. idea that it eats dead animals OR it eats at night ;	1. ACCEPT how it uses resources in the habitat, role it has in the habitat 2. ACCEPT active at night	**(2)**

Question Number	Answer	Additional guidance	Mark
8(b)	1. will continue to decrease / eq ; 2. may become extinct / eq ; 3. idea of levelling off ;	3. ACCEPT stabilises, at a slower rate	**(2)**

Question Number	Answer	Additional guidance	Mark
8(c)(i)	{ variety / number of different / eq } alleles in a { gene pool / population / species } ;		**(1)**

Question Number	Answer	Additional guidance	Mark
8(c)(ii)	1. idea that Tasmanian devils have a { small gene pool / low variety of alleles } ; 2. idea of less chance of having advantageous alleles (for resistance to disease) ; 3. low chance of survival / possibility of extinction / eq ;	1. ACCEPT idea of Tasmanian devils all being closely related ACCEPT converse e.g. large number of alleles the same 3. ACCEPT reference to species becoming endangered	**(3)**

Question Number	Answer	Additional guidance	Mark
8(c)(iii)	1. idea of alleles conferring { immunity / resistance } to the disease ; 2. (these six females) pass on these alleles to offspring ; 3. idea of increasing number of individuals with { immunity / resistance } ; 4. idea of using { IVF / embryo splitting / surrogates / eq } (to increase number of offspring) ; 5. re-introduction into the wild / eq ; 6. increasing the frequency of those alleles in the wild population ;	1. ACCEPT idea of advantageous alleles 3. ACCEPT produce offspring with immunity 4. ACCEPT cloning to increase number of resistant individuals	**(4)**

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