



**2015 Biology (Revised)**

**Advanced Higher**

**Finalised Marking Instructions**

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## Part One: General Marking Principles for: Biology (Revised) Advanced Higher

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

- (a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor.
- (b) Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

### GENERAL MARKING ADVICE: Biology (Revised) Advanced Higher

The marking schemes are written to assist in determining the “minimal acceptable answer” rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates’ evidence, and apply to marking both end of unit assessments and course assessments.

1. There are no **half marks**. Where three answers are needed for two marks, normally one or two correct answers gain one mark.
2. In the mark scheme, if a word is **underlined** then it is essential; if a word is **(bracketed)** then it is not essential.
3. In the mark scheme, words separated by / are **alternatives**.
4. If two answers are given which contradict one another the first answer should be taken. However, there are occasions where the second answer negates the first and no marks are given. There is no hard and fast rule here, and professional judgement must be applied. Good marking schemes should cover these eventualities.
5. Where questions in data are in two parts, if the second part of the question is correct in relation to an incorrect answer given in the first part, then the mark can often be given. The general rule is that candidates should not be penalised repeatedly.
6. If a numerical answer is required and units are not given in the stem of the question or in the answer space, candidates must supply the units to gain the mark. If units are required on more than one occasion, candidates should not be penalised repeatedly.

7. Clear indication of understanding is what is required, so:
- if a description or explanation is asked for, a one word answer is not acceptable
  - if the question asks for **letters** and the candidate gives words and they are correct, then give the mark
  - if the question asks for a word to be **underlined** and the candidate circles the word, then give the mark
  - if the result of a calculation is in the space provided and not entered into a table and is clearly the answer, then give the mark
  - **chemical formulae** are acceptable eg CO<sub>2</sub>, H<sub>2</sub>O
  - contractions used in the Arrangements document eg DNA, ATP are acceptable
  - words not required in the syllabus can still be given credit if used appropriately eg metaphase of meiosis
8. Incorrect **spelling** is given. Sound out the word(s),
- if the correct item is recognisable then give the mark
  - if the word can easily be confused with another biological term then **do not** give the mark eg ureter and urethra
  - if the word is a mixture of other biological words then **do not** give the mark, eg mellum, melebrum, amniosynthesis
9. **Presentation of data:**
- if a candidate provides two graphs or bar charts (eg one in the question and another at the end of the booklet), mark both and give the higher score
  - if question asks for a line graph and a histogram or bar chart is given, then do not give the mark(s). Credit can be given for labelling the axes correctly, plotting the points, joining the points either with straight lines or curves (best fit rarely used)
  - if the x and y data are transposed, then do not give the mark
  - if the graph used less than 50% of the axes, then do not give the mark
  - if 0 is plotted when no data is given, then do not give the mark (ie candidates should only plot the data given)
  - no distinction is made between bar charts and histograms for marking purposes. (For information: bar charts should be used to show discontinuous features, have descriptions on the x axis and have separate columns; histograms should be used to show continuous features; have ranges of numbers on the x axis and have contiguous columns)
  - where data is read off a graph it is often good practice to allow for acceptable minor errors. An answer may be given  $7.3 \pm 0.1$
10. **Extended response questions:** if candidates give two answers where this is a choice, mark both and give the higher score.
11. **Annotating scripts:**
- put a 0 in the box if no marks awarded – a mark is required in each box
  - indicate on the scripts why marks were given for part of a question worth 3 or 2 marks. A ✓ or x near answers will do
12. **Totalling scripts:** errors in totalling can be more significant than errors in marking:
- enter a correct and carefully checked total for each candidate
  - do not use running totals as these have repeatedly been shown to lead to more errors

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**Part Two: Marking Instructions for each Question**

**Section A**

<b>Question</b>	<b>Expected Answer(s)</b>	<b>Max Mark</b>
1.	C	1
2.	D	1
3.	C	1
4.	B	1
5.	B	1
6.	A	1
7.	C	1
8.	C	1
9.	A	1
10.	D	1
11.	A	1
12.	D	1
13.	C	1

<b>Question</b>	<b>Expected Answer(s)</b>	<b>Max Mark</b>
14.	B	1
15.	C	1
16.	D	1
17.	A	1
18.	B	1
19.	D	1
20.	A	1
21.	A	1
22.	B	1
23.	D	1
24.	C	1
25.	B	1

## Section B

Question			Expected Answer(s)	Max Mark	Additional Guidance
1	(a)	(i)	Prosthetic group	1	
1	(a)	(ii)	Transfer of phosphate/phosphorylation (of a protein)	1	
1	(b)	(i)	As ATP increases to 1.0 $\mu\text{M}$ , rate of ATP use increases <b>and</b> levels off at about <b>1.5 units</b>	1	Accept 1.6 units
1	(b)	(ii)	To increase ATP use <b>significantly</b>	1	Use = hydrolysis
1	(c)	(i)	A reference against which the treatment can be compared <b>OR</b> To show that altered/independent variable causes the (dependent variable to) change	1	
1	(c)	(ii)	When the pump is inhibited ATP used is <b>less</b>	1	
1	(d)	(i)	Pilot	1	
1	(d)	(ii)	2.5 min + this is optimum time <b>OR</b> time when ATP use is maximum/highest	1	greatest difference in ATP use
1	(e)		The proton pump is using the ATP	1	

Question			Expected Answer(s)	Max Mark	Additional Guidance
1	(f)	(i)	for ion entry They open + at critical/threshold membrane potential <b>OR</b> if sufficient change in voltage	1	
1	(f)	(ii)	Activated phototropin boosts pump activity (1) <b>OR</b> hydrogen ions moved out <b>OR</b> internal negative charge develops <b>OR</b> voltage increases across membrane  K <sup>+</sup> moves down (electrical) gradient/diffuses into cell (1) <b>OR</b> voltage gated K <sup>+</sup> channels open	2	boost = idea of adding to red light activity
1	(f)	(iii)	No cell wall/not whole guard cells/turgor not possible/protoplasts are not in pairs <b>OR</b> water movement/osmosis not monitored	1	

(13)

2	(a)		Inadequate sanitation (or equiv.) Contaminated drinking water High abundance of parasites (in tropical climates) Overcrowding/high density hosts (Any 2)	2	
2	(b)		8520	1	

(3)

Question			Expected Answer(s)	Max Mark	Additional Guidance
3	(a)	(i)	Stray male: <b>Orange and <math>X^G Y</math></b>	1	
3	(a)	(ii)	male $X^G Y$ ; female $X^G X^G$	2	
3	(b)	(i)	Prevents a double-dose of gene products <b>OR</b> Compensates for the difference in the number of X chromosomes in male and female mammals <b>OR</b> This effect equalises the amount of protein produced by X-linked genes in males and females	1	
3	(b)	(ii)	<ul style="list-style-type: none"> <li>• (female embryos are heterozygous and during embryonic development) one of the two X chromosomes in each cell inactivates</li> <li>• only the allele on the active X chromosome is expressed</li> <li>• inactivation is random in each cell (no way to predict which of the two X chromosomes will become inactivated)</li> <li>• as cells multiply they form patches (dominant allele expressed in some cells, recessive is expressed in others)</li> </ul>	2	
3	(c)		Heterogametic	1	

(7)

4	(a)		As number of mates per male increases, the number of surviving offspring per female increase	1	
4	(b)		Higher survival with larger number of mates due to greater access to food resources/quality of territory	1	
4	(c)		They favour the system that maximises number (and quality) of surviving offspring	1	
4	(d)		Greater energy expenditure in egg production than sperm production Greater energy expenditure in care of young/nest building etc	1	

(4)

Question			Expected Answer(s)	Max Mark	Additional Guidance
5	(a)		Invertebrates with jointed legs <b>OR</b> segmented body with paired appendages <b>OR</b> Exoskeleton	1	
5	(b)		Prevents recognition (of epitopes, VSGs) by T cells and antibodies	1	
5	(c)		Degenerate	1	
5	(d)	(i)	Drugs toxic to parasite also toxic to human cells Drug resistance Supply of drugs to remote locations Lack of knowledge/education concerning treatments	1	
5	(d)	(ii)	Approx 0.6 µg/mL	1	
5	(d)	(iii)	Replace/reduce/refine to minimise harm	1	
5	(d)	(iv)	To prevent bias/measure placebo effects	1	

(7)



Question		Expected Answer(s)	Max Mark	Additional Guidance
6	(a)	X = myosin Y = actin	1	
6	(b)	ATPase	1	
6	(c)	Bridge swings forward and rebinds <b>OR</b> Reference to the conformation change that moved the bridge forward  ATP is split to give ADP and Pi <b>OR</b> ATP is split and ADP released  Conformation of bridge changes and it pulls Y along	2	
6	(d)	(when Pi is released) the bridge resets to allow repeated actions	1	

(5)

7	(a)	Induced fit  Explained as small changes in bonding improving the binding Activation energy lowered Description of catalysis breaking substrate/joining substrates <b>(Any 1)</b>	(1) 2	
7	(b)	Enzyme molecules cannot work any faster even though the substrate is increasing	1	
7	(c)	Exponential increase in velocity indicates more enzyme being activated Affinity increasing <b>OR</b> Small change in substrate concentration causes big increase in rate	1	

(4)

Question			Expected Answer(s)	Max Mark	Additional Guidance
8	(a)		Vecuronium competes for ACh receptor sites = dilutes ACh less activity of acetylcholinesterase will increase concentration of ACh (so ACh binding more likely, allowing muscle to contract again)	2	
8	(b)	(i)	(binding of neurotransmitter triggers the opening of) <b>ligand</b> -gated ion channel sufficient ion movement triggers opening of voltage-gated channels causing wave of depolarisation	2	
8	(b)	(ii)	Sodium-potassium pump Sodium ions moved out and potassium ions in	1	

(5)

9	(a)		Knowledge of the apoptosis pathway in this organism provides insight into the process in other species	1	
9	(b)		Defines organ shape/remove cells not required for final structure/shape	1	
9	(c)		Proteases that destroy the cell/activate other enzymes - DNAase	1	
9	(d)	(i)	<b>All</b> cells survive/no apoptosis because no CED-4 to make CED-3 activate caspase	2	
9	(d)	(ii)	If no CED-9 protein (to inhibit apoptosis) then all cells die so apoptosis must be able to happen in any cell	1	
9	(d)	(iii)	<i>ced-3/ced-9</i> mutant has the same phenotype as <i>ced-3</i> alone so CED-9 must act first to inhibit	1	

(7)

Question			Expected Answer(s)	Max Mark	Additional Guidance
10	A	(i)	1. occurs in gamete mother cells + in sex organs 2. 2 cycles of nuclear division <b>OR</b> state meiosis I following by II <b>Meiosis I</b> 3. nuclear membrane breaks down and spindle forms 4. homologous chromosomes associate in pairs 5. homologous <b>pairs</b> line up along equator 6. homologous chromosomes segregate/pulled apart 7. new nuclear membrane forms and cytoplasm divides 8. 2 cells with half the number of chromosomes/one set of chromosomes/one copy of genome <b>Meiosis II</b> 9. <b>two</b> new spindles form, one in each cell 10. chromosomes line up <b>singly</b> on equator 11. <b>chromatids</b> separate/are pulled apart 12. new nuclear membranes form and cytoplasm divides 13. <b>to give 4 haploid cells/gametes</b> <p style="text-align: right;"><b>(Any 7)</b></p>	7	
10	A	(ii)	14. crossing over occurs at chiasmata 15. chromatids break and rejoin 16. this process shuffles sections of DNA between the homologous pairs and recombining alleles 17. crossing over separate linked genes 18. chromosomes move apart irrespective of their maternal or paternal origin <b>OR</b> chromosomes show Independent Assortment <p style="text-align: right;"><b>(Any 3)</b></p>	3	

**(10)**

Question			Expected Answer(s)	Max Mark	Additional Guidance
10	B	(i)	<ol style="list-style-type: none"> <li>1. evolution is the change in genetic composition of population over time</li> <li>2. mutation gives rise to new sequences of DNA/novel alleles</li> <li>3. results in new variants/variation in traits/new phenotypes</li> <li>4. mutation can be harmful, neutral or beneficial</li> <li>5. beneficial mutations increases 'fitness'</li> <li>6. individuals compete for limited resources...</li> <li>7. ...individuals with favourable alleles more likely to survive and breed</li> <li>8. these (favoured) alleles become more frequent in subsequent generations</li> <li>9. definition of fitness in relation to fecundity</li> </ol>	6	
10	B	(ii)	<ol style="list-style-type: none"> <li>10. high selection pressure</li> <li>11. shorter generation time</li> <li>12. warmer environments</li> <li>13. sharing of beneficial DNA sequences between lineages</li> <li>14. / 15 eg of how... <ul style="list-style-type: none"> <li>➤ through sexual reproduction</li> <li>➤ <b>OR</b></li> <li>➤ horizontal gene transfer (as in X-bacteria)</li> </ul> </li> </ol>	4	

(10)

[END OF MARKING INSTRUCTIONS]