

2004 Biology

Higher

Finalised Marking Instructions

Higher Biology 2004

GENERAL MARKING ADVICE: BIOLOGY

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 ask 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 CO₂, H₂O
 - 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 joints, 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
- is 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 error. An answer may be given 7.3 ± 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 ✗ 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

2004 Biology Higher

Marking scheme

Section A

1.	B	16.	B
2.	C	17.	A
3.	B	18.	C
4.	A	19.	D
5.	C	20.	C
6.	C	21.	D
7.	A	22.	B
8.	D	23.	D
9.	D	24.	B
10.	A	25.	B
11.	D	26.	B
12.	A	27.	A
13.	C	28.	C
14.	A	29.	C
15.	D	30.	A

Marking Instructions

Biology Higher

Section B & C

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates						
<p>1 (a) (i)</p> <p>(ii)</p>	<p>1. Phospholipid 2. Protein OR 1. Protein 2. Phospholipid <i>(Both needed)</i></p> <table border="1" data-bbox="472 568 927 671"> <thead> <tr> <th><i>Process</i></th> <th>Letter</th> </tr> </thead> <tbody> <tr> <td>Glycolysis</td> <td>D</td> </tr> <tr> <td>Transcription</td> <td>F</td> </tr> </tbody> </table>	<i>Process</i>	Letter	Glycolysis	D	Transcription	F	<p>1</p> <p>1</p> <p>1</p>	<p>Lipid/Fat</p>	
<i>Process</i>	Letter									
Glycolysis	D									
Transcription	F									
<p>(b)</p>	<p>Golgi (apparatus)/Golgi (body)/(Secretory) vesicles</p>	<p>1</p>		<p>Reference to mitochondrion or nucleus</p>						
<p>(c)</p>	<p>Can detect light/Has a light detector</p> <p>Can move <u>to</u> the light/Has flagellum to move <u>nearer</u> light</p> <p>Has chloroplasts/grana/chlorophyll/ structure E (for photosynthesis).</p> <p><i>All three ideas = 2 marks, two ideas = 1 mark</i></p>	<p>2</p>	<p>Light detector allows Euglena to move = 0 marks</p> <p>Has flagellum for movement = 0 marks</p>							

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3 (a) (i)	Cristae of mitochondria OR Folded inner membrane of mitochondria	1	Mitochondria Cristae	Matrix
(ii)	NAD/NADH/NADH ₂ /reduced NAD/FAD	1	NADP	
(iii)	X = ADP/Adenosine diphosphate Y = Pi/phosphate/PO ₄ (or converse)	1	P (for phosphate)	
	Z = Oxygen/O ₂	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<p>3 (b) (i)</p>	<p>To make amino acids/proteins/enzymes/bases/nucleotides/nucleic acids/DNA/RNA/chlorophyll/NAD/NADP/ATP/ADP/IAA</p>	<p>1</p>	<p>For growth To make hormones To make GA</p>	
<p>(ii)</p>	<p>Oxygen needed to make ATP in respiration/to release energy in respiration</p> <p>OR</p> <p>Aerobic respiration gives more energy/more ATP</p> <p>AND</p> <p>Uptake of nitrate/Uptake of elements/Active transport requires energy/ATP</p>	<p>1</p>	<p>Oxygen for active transport</p>	
<p>(iii)</p>	<p>Inhibits/Denatures/Poisons/Damages/Destroys enzymes</p> <p>AND</p> <p>Enzymes involved in/regulate/control respiration/ATP production/active transport/uptake of nitrate/uptake of minerals</p> <p>OR</p> <p>Award both marks for a single sentence covering both points e.g. "Lead inhibits the activity of <u>enzymes</u> needed in ion uptake".</p>	<p>1</p>	<p>Lead inhibits ion uptake</p>	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a)	(i) R = Deoxyribose	1	Sugar/pentose	
	S = Thymine	1	T/Thiamine	
	(ii) Hydrogen	1		
(b)	To make a copy of chromosomes/of genetic information/of DNA. AND Daughter <u>cells</u> receive one copy/one set/correct information	1		
(c)	(i) Proline-Glycine-Serine-Alanine	1		
	(ii) Gene/Allele	1		
(d)	Transfer RNA/tRNA	1		
(e)	(For fibrous accept): collagen/keratin/actin/myosin/elasticin Globular (for cellulase) <i>(Both needed)</i>	1	Hair Muscle	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
5 (a)	(i) Translocation	1	Alcohol Caffeine	
	(ii) Radiation/UV/X-rays/gamma rays OR Chemicals/mustard gas OR <u>High</u> temperature	1		
(b)	(Partial) Non disjunction OR Failure of homologous chromosomes/pairs to separate OR Spindle failure	1	Any reference to fertilisation events Complete non-disjunction	
(c)	(i) Deletion/Insertion	1	Other metabolic products formed	
	(ii) Enzyme would not work/Wrong enzyme made/ Enzyme not made AND (Metabolic) pathway would be blocked/would not work/ would stop	1		
(d)	64	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a) (i) (ii)	Gene probe/Gene probing/Chromosome mapping/Gene mapping/Banding (patterns)/Crossover values/Recombination frequencies 1. Restriction enzyme/Endonuclease 2. Ligase	 1 1 1	Gene banding Endonucleus	
(b)	Insulin/Somatotrophin/Growth hormone/GH	1	ADH	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates															
7 (a)	<p>(i) Drinking water/Drinking watery liquids/Increased water intake/High water content of food eaten</p> <p>(ii) 1. Antidiuretic hormone/ADH 2. Pituitary</p> <p>(iii) Blood/Bloodstream</p> <p>(iv) Increase permeability to <u>water</u> OR Increase water absorption</p> <p>(v) Decrease/Lower/Fall/Less</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Drinking Drinking fluids</p> <p>Hypothalamus</p> <p>More permeable Are permeable to water</p> <p>Dilute</p>																
(b)	<table border="1" data-bbox="454 807 1097 1121"> <thead> <tr> <th data-bbox="454 807 777 842"><i>Statement</i></th> <th data-bbox="777 807 927 842">Sea water</th> <th data-bbox="927 807 1097 842">Fresh water</th> </tr> </thead> <tbody> <tr> <td data-bbox="454 842 777 911">Salmon drinks a large volume of water</td> <td data-bbox="777 842 927 911" style="text-align: center;">✓</td> <td data-bbox="927 842 1097 911"></td> </tr> <tr> <td data-bbox="454 911 777 979">Salmon produces a large volume of urine</td> <td data-bbox="777 911 927 979"></td> <td data-bbox="927 911 1097 979" style="text-align: center;">✓</td> </tr> <tr> <td data-bbox="454 979 777 1048">Chloride secretory cells pump out ions</td> <td data-bbox="777 979 927 1048" style="text-align: center;">✓</td> <td data-bbox="927 979 1097 1048"></td> </tr> <tr> <td data-bbox="454 1048 777 1121">Salmon gains water by osmosis</td> <td data-bbox="777 1048 927 1121"></td> <td data-bbox="927 1048 1097 1121" style="text-align: center;">✓</td> </tr> </tbody> </table> <p data-bbox="427 1158 1016 1187"><i>All four correct = 2 marks, 2 or 3 correct = 1 mark</i></p>	<i>Statement</i>	Sea water	Fresh water	Salmon drinks a large volume of water	✓		Salmon produces a large volume of urine		✓	Chloride secretory cells pump out ions	✓		Salmon gains water by osmosis		✓	2	5 th tick loses 1 mark, 6 th tick loses 2 marks	
<i>Statement</i>	Sea water	Fresh water																	
Salmon drinks a large volume of water	✓																		
Salmon produces a large volume of urine		✓																	
Chloride secretory cells pump out ions	✓																		
Salmon gains water by osmosis		✓																	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a)	(i) 3	1		
	(ii) Day 10-15	1		
	(iii) Decrease due to food used/respiration of stored food	1	Any reference to osmotic effects	
	Increase due to food made/photosynthesis [Starch or energy store are equivalent to food]	1		
	(iv) Variable mass/Variable width of shoots OR Other parts of plant may grow at a different rate/No account taken of root/leaf/fruit/lateral growth OR Water content of shoot cells is variable/may mask dry mass changes	1	Any definition of growth	
(v) 0.025	1			
(b)	(i) (Underline) less (Justification) <u>NO</u> photosynthesis	1		There is no growth
	(ii) (Underline) greater (Justification) plants would become etiolated OR plants trying to reach light	1	Plants grow faster Plants are taller Length of stem is greater	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates				
8 (c) (i)	<table border="1" data-bbox="454 331 1041 403"> <tr> <td data-bbox="454 331 757 368">Effects caused by IAA</td> <td data-bbox="757 331 1041 368">Effects caused by GA</td> </tr> <tr> <td data-bbox="454 368 757 403">B, C, D, E</td> <td data-bbox="757 368 1041 403">A, F</td> </tr> </table> <p data-bbox="427 440 954 504"><i>6 correct = 3 marks, 4 or 5 correct = 2 marks 2 or 3 correct = 1 mark</i></p>	Effects caused by IAA	Effects caused by GA	B, C, D, E	A, F	3		Second entry of any letter negates that letter
Effects caused by IAA	Effects caused by GA							
B, C, D, E	A, F							
(ii)	Herbicide/Weedkiller/Rooting powder/Seedless fruits/Parthenocarpy/Prevention of fruit fall	1						

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9 (a)	Cambium	1		
	(b) Has a large diameter/Is wide	1	Larger/Bigger	
	(c) Annual ring	1	Annual growth Growth ring	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11 (a)	From 10 to 30 (beetles) by 50 days Then to 15 (beetles) by 300 days (If a minimum of three <u>correct</u> values are given - award 1 mark)	1 1	No values present	
(b)	2:5	1		
(c)	250	1		
(d)	Parasite/Disease has a greater effect on <i>T. castaneum</i> OR <i>T. castaneum</i> less resistant to parasite/disease = 1 mark AND More food available for <i>T. confusum</i> /Less competition for food = 1 mark OR Parasite/Disease has less effect on <i>T. confusum</i> OR <i>T. confusum</i> more resistant to parasite/disease = 1 mark AND Get more food/Compete better for food = 1 mark [<u>Comparisons</u> needed in each mark]	2		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates												
11 (e)	Start with same number of both species OR Each species on its own for comparison/as controls	1	Longer time Repeat the experiment Use more food Use larger containers Start with larger numbers													
(f)	<table border="1" data-bbox="454 536 1097 711"> <thead> <tr> <th data-bbox="454 536 757 603">Factors</th> <th data-bbox="757 536 927 603">Density-dependent</th> <th data-bbox="927 536 1097 603">Density-independent</th> </tr> </thead> <tbody> <tr> <td data-bbox="454 603 757 639">Presence of parasites</td> <td data-bbox="757 603 927 639">✓</td> <td data-bbox="927 603 1097 639"></td> </tr> <tr> <td data-bbox="454 639 757 676">Availability of food</td> <td data-bbox="757 639 927 676">✓</td> <td data-bbox="927 639 1097 676"></td> </tr> <tr> <td data-bbox="454 676 757 711">Temperature</td> <td data-bbox="757 676 927 711"></td> <td data-bbox="927 676 1097 711">✓</td> </tr> </tbody> </table> <p data-bbox="427 746 1003 778"><i>All three correct = 2 marks, two correct = 1 mark</i></p>	Factors	Density-dependent	Density-independent	Presence of parasites	✓		Availability of food	✓		Temperature		✓	2		4 th tick loses 1 mark 5 th tick loses 2 marks
Factors	Density-dependent	Density-independent														
Presence of parasites	✓															
Availability of food	✓															
Temperature		✓														

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
12 (a)	True False True False <i>(All four correct = 2 marks, 2 or 3 correct = 1 mark)</i>	2		
(b)	Lactose	1		
(c)	Saves energy/Conserves resources/Does not make enzyme when no substrate present/Does not make enzyme when lactose absent/Does not make enzyme when it is not needed OR Converses of the 'Does not' statements	1		

Extended response question C1A

Give an account of meiosis under the following headings:

- | | | |
|------------------------------|---|------|
| (i) first meiotic division | 6 | |
| (ii) second meiotic division | 2 | |
| (iii) importance of meiosis. | 2 | |
| | | (10) |

Note: Marks may be awarded for carefully drawn and correctly labelled diagrams.

First meiotic division:

- | | |
|---|---|
| 1. start with a gamete mother cell/diploid cell | 1 |
| 2. each chromosome made up of two chromatids | 1 |
| 3. <u>homologous</u> chromosomes pair up (Not: homologous pairs join up) | 1 |
| 4. crossing over may occur | 1 |
| 5. at chiasmata | 1 |
| 6. <u>nuclear</u> membrane disappears OR spindle forms | 1 |
| 7. independent assortment occurs OR (homologous) chromosomes line up on equator | 1 |
| 8. homologous chromosomes/pairs are pulled apart | 1 |
| 9. new <u>nuclear</u> membrane formed OR division of cytoplasm. | 1 |

Maximum 6 marks

Second meiotic division:

- | | |
|--|---|
| 10. chromosomes line up on equator and <u>chromatids</u> pulled apart | 1 |
| 9. new <u>nuclear</u> membrane formed OR division of cytoplasm
(award point 9 once only - EITHER in context of first OR second meiotic division) | 1 |
| 11. four cells produced. | 1 |

Maximum 2 marks

Importance of meiosis:

- | | |
|---|---|
| 12. produces haploid gametes/cells OR chromosome number halved | 1 |
| 13. crossing over gives recombination/ variation/diversity | 1 |
| 14. independent assortment gives variation/diversity | 1 |
| 15. meiosis/it gives variation/diversity
(award point 15 ONLY if points 13+14 gain 0 marks) | 1 |

Maximum 2 marks

Note: Do NOT award points 4, 5, 7 or 8 if in the context of the second meiotic division.

Extended response question C1B

Give an account of the evolution of new species under the following headings:

- | | | |
|--|---|-------------|
| (i) isolating mechanisms | 4 | |
| (ii) effects of mutations and natural selection. | 6 | |
| | | (10) |

Note: Marks may be awarded for carefully drawn and correctly labelled diagrams.

Isolating mechanisms:

- | | |
|---|---|
| 1. a species is a group of organisms interbreeding to produce fertile offspring | 1 |
| 2. common gene pool | 1 |
| 3. a species/a population separated into two by an isolating mechanism/barrier | 1 |
| 4. prevents gene exchange/gene flow/interbreeding between populations/groups | 1 |
| 5. two types of isolation given (eg geographical/ecological) | 1 |
| 6. third type of isolation given (eg reproductive). | 1 |

Maximum 4 marks

Effects of mutations and natural selection:

- | | |
|---|---|
| 7. mutations occurring in each population/group will be different
OR mutation occurs in one group | 1 |
| 8. (mutation) gives variation/different phenotypes/new genes/new alleles/alters gene pool | 1 |
| 9. different environments | 1 |
| 10. selection is different for each population/group | 1 |
| 11. best adapted/best suited survive OR survival of the fittest OR converse | 1 |
| 12. (they/best adapted/best suited/fittest) pass on favourable characteristics/genes/alleles to offspring/next generation
OR less well adapted/less suited/less fit do not pass their characteristics/genes/alleles to offspring/next generation | 1 |
| 13. many generations/long period of time | 1 |
| 14. new species formed when populations/groups can no longer <u>interbreed</u> . | 1 |

Maximum 6 marks

Extended response question C2A

Give an account of the structure of a chloroplast in relation to the stages of photosynthesis and describe the separation of photosynthetic pigments by chromatography. (10)

Note: Marks may be awarded for carefully drawn and correctly labelled diagrams.

Structure of chloroplast:

1. double outer membrane 1
 2. grana are stacks of membranes 1
 3. grana contain photosynthetic pigments/chlorophyll 1
 4. light-dependent stage/photolysis in grana 1
 5. stroma is fluid/liquid region surrounding grana 1
 6. carbon fixation stage/Calvin cycle in stroma 1
 - 2a grana and stroma correctly labelled in a diagram 1
- (award 2a **ONLY** if points 2 and 5 are 0 marks) **Maximum of 4 marks**

7. grind/mash leaves with acetone/solvent 1
 8. filter/centrifuge to remove cell debris/to obtain extract 1
 9. repeat applications/spots on chromatography paper/thin layer (gel) 1
 10. allow solvent time to run 1
 11. pigments travel different distances/pigments travel at different rates/pigments have different solubilities 1
 12. pigments are – Carotene, Xanthophyll, Chlorophyll a, Chlorophyll b. 1
- Maximum 4 marks**

1 mark for coherence + 1 mark for relevance

Maximum Total = 10 marks

Coherence

1. The writing must be under **sub-headings** or divided into **paragraphs**.
A sub-heading/paragraph for each of ‘Structure of chloroplast’ and ‘Separation of pigments’.
2. Related information should be **grouped together**.
Information on ‘Structure of chloroplast’ should be grouped together with at least **two** points given.
Information on ‘Separation of pigments’ should be grouped together with at least **two** points given.
There must be a minimum of **five correct** points (the fifth mark may come from either group)

Both must apply correctly to gain the **Coherence** mark.

Relevance

1. **Must not** give details of other organelle structure.
2. **Must** have given at least **two** relevant points from ‘Structure of chloroplast’ and at least **two** relevant points from ‘Separation of pigments’ and at least **five** correct points overall.

Both must apply correctly to gain the **Relevance** mark.

Extended response question C2B

Give an account of the nature of viruses and how they produce more viruses. (10)

Note: Marks may be awarded for carefully drawn and correctly labelled diagrams.

Nature of viruses:

1. very small/not cellular 1
2. reproduce inside cells/cannot reproduce outside cells 1
3. attack/infect specific (host) cells 1
4. nucleic acid/DNA/RNA surrounded by protein/protein coat/capsid. 1

Maximum 2 marks

Production of more viruses:

5. virus attaches to (host) cell 1
6. virus/nucleic acid/DNA/RNA enters cell 1
7. virus/nucleic acid/DNA/RNA takes over control of cell/alters metabolism 1
8. copies of viral nucleic acid/viral DNA/viral RNA made
OR viral nucleic acid/viral DNA/viral RNA replicates 1
9. viral protein made/protein coat made/capsid made 1
10. (host) cell nucleotides/amino acids/ATP/enzymes used 1
11. viruses/virus particles assembled OR equivalent 1
12. viruses/virus particles released. 1

Maximum 6 marks

1 mark for coherence + 1 mark for relevance

Maximum Total = 10 marks

Coherence

1. The writing must be under **sub-headings** or divided into **paragraphs**.
A subheading/paragraph for each of 'Nature of viruses' and 'Production of more viruses'.
2. Related information should be **grouped together**.
Information on 'Nature of viruses' should be grouped together and at least **one** point must be given.
Information on 'Production of more viruses' should be grouped together with at least **four** points given.

Both must apply correctly to gain the **Coherence** mark.

Relevance

1. **Must not** give details of cellular defence mechanisms in animals or plants.
2. **Must** have given at least **one** relevant point from 'Nature of viruses' and at least **four** relevant points from 'Production of more viruses'.

Both must apply correctly to gain the **Relevance** mark.

[END OF MARKING INSTRUCTIONS]