2009 Biology

Higher

Finalised Marking Instructions

Higher Biology 2009

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 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_2, H_2O
   - 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 error. An answer may be given $7{\cdot}3 \pm 0{\cdot}1$

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

2009 Biology Higher

Marking scheme

Section A

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

Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1 (a)	Y transmitted/transmission/transmit/transmissioned Z reflected/reflection/reflect (both)	**1**		
(b) (i)	Chlorophyll/chlorophyll a/chlorophyll b	**1**		
(ii)	Widen/broaden absorption spectrum **OR** Absorb different colours/named colours Use other wavelengths Photosynthesise with more regions of the spectrum Colours/light not absorbed by chlorophyll **AND** pass the energy on to chlorophyll/main pigment/primary pigment	**1**	Absorb more light Absorb a greater wavelength of light Absorb a variety of light light ≠ energy	
(c) (i)	Stroma (of chloroplast)	**1**		Stroma of chlorophyll
(ii)	To reduce/reduction of GP/CO_2	**1**	Reacts with Joins with Convert GP to glucose Reduced GP to RuBP only Reduce to form carbohydrate	Reduce GP to RuBP
(d)	P temperature Q carbon dioxide/CO_2 R temperature **OR** light intensity (both OK) Reference to low temperature etc OK All 3 = 2, 2/1 = 1	**2**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2 (a) (i)	W oxygen/O_2 X acetyl (group) Y carbon dioxide/CO_2 All 3 = 2, 2/1 = 1	**2**	Acetyl Co-A Acetyl acid	
(ii)	6	**1**	5	
(b) (i)	10 hours	**1**		
(ii)	3·5	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3 (a) (i)	Translation	**1**		
(ii)	Peptide	**1**	Polypeptide	
(iii)	1 proline 4 glycine (Watch for order)	**1**		
(b)	(Many) Golgi apparatus/vesicles/bodies **OR** Rough ER **OR** ribosomes attached to ER	**1**	Vesicles alone Secretory vesicles ER	Mention of other wrong organelles

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a) (i)	Protein (coat)	**1**	Amino acid	
(ii)	Virus / Nucleic acid / DNA / RNA — takes over / alters / changes / re-programmes — cell/host metabolism / cell/host reactions / cell/host processes / cell/host biochemistry / cell/host metabolic pathway(s)	**1**	Takes control of cell Takes control of cell nucleus Takes over cell functions/ activities Disrupts cell metabolism Inhibits/slows cell metabolism Rewrites cell instructions Hijacks cell Stops host cell metabolism Uses machinery of host cell Virus uses cell nucleotides to replicate Virus uses host cell resources	
(iii)	1 <u>viral</u> nucleic acid/DNA/RNA transcribed to/directs synthesis of mRNA 2 mRNA translated into protein coats **OR** (new) protein coats formed/synthesized/made (protein coat = capsid) 3 viruses assembled/put together **OR** description eg nucleic acid/DNA/RNA enters/joins protein coat **OR** Protein coat surrounds/wraps around nucleic acid/DNA/ RNA Any 2, any order	**1** **1**	Protein synthesis Protein shell Protein coats coded for Protein coats assembled Viruses made/produced/formed Nucleic acid continues to replicate	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (b) (i)	(Foreign) Antigen	**1**	Foreign Body	
(ii) 1	3·75 times 3.75 in calculation space but answer rounded to 3.8	**1**	3.8 no working	
(ii) 2	1 (Response) is quicker/faster/took less time/more rapid increase/slower decrease 2 (Antibody concentration) remains high for longer/decreased slower/maintained at higher level for longer **OR** use figures from table correctly Must be a reference to time in each answer. Comparative needed.	**1**	Response lasts longer Response is more sustained Rapid increase Slow decrease Sustained for longer Maintained for longer	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
5 (a) (i)	88%	**1**		
(ii)	88:19:4	**1**		
(b)	Pair A (could be given in justification but must be explicit) different numbers/less of woodrats **AND** brush mice (and deer mice) **OR** quote correct numbers from table **OR** less food overall **OR** higher percentage of deer mice in their diet	**1**		Rock squirrel
(c) (i)	(Increases/changes) from 3·6 to 4·0 in summer (of year 1) then (decreases/changes) from 4·0 to 2·0 in winter (of year 2) Then (increases/changes) from 2·0 to 3·2 (in spring of year 2) All 3 = 2, 2 = 1, 1 = 0 Values can be rolled together but start reference needed Increase by correct values ok	**2**		
(ii)	52%	**1**		
(d)	20g	**1**		
(e)	In winter (total) number **AND** biomass of prey is less (per hectare) so have bigger territory **OR** converse for summer	**1**	Travelling further ≠ larger territory	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a)	Ovaries/testes	**1**	Gonads Ovum (ovary)	ovum
(b) (i)	Chiasma/ata	**1**		
(ii)	R and T T and R	**1**		
(iii)	Independent assortment Random segregation alignment	**1**	Mutation Linkage Non-disjunction Assortment of chromosomes Chance where genes go Chromosome shuffling	
(c)	40	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7 (a) (i)	BE, Be, bE, be	**1**		
(ii)	1 black: 1 chocolate: 2 yellow	**1**	2: 2: 4 4: 4: 8	
(b)	bbEE/EEbb If appears in space for calculation ok	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a) (i)	As the cuticle thickness increases up to 5·6 (micrometers) the rate of water loss decreases = 1 But further increase in cuticle thickness causes very little/no difference in rate of water loss = 1 **OR** as the cuticle thickness increases the rate of water loss decreases (until a limit is reached) or converse = 1	**2**		
(ii)	Turgid	**1**		
(iii)	Increased temperature/warmer **OR** increased wind speed/windiness/windy conditions **OR** windier **OR** increased light intensity/brighter light **OR** increased soil water availability **OR** decreased humidity **OR** reduced/lower air pressure Any 2 = 1 (must be comparative)	**1**	Light alone Hot/dry/windy High/low etc Higher wind pressure	
(b) (i)	Reduces air movements **OR** traps water vapour/moist air/increased humidity = 1 Fewer stomata **OR** smaller surface area for evaporation/transpiration = 1	**2**	Traps water Traps moisture Smaller surface area alone	
(ii)	Xerophytes/xerophytic	**1**	Xeromorphic Xeophytes	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9 (a) (i)	(Biomass) It reduced because (grass) it has been eaten/grazed/removed = 1 Increased (diversity) because reduced competition allows less vigorous/less dominant to survive/colonise/move in **OR** Dominant grass(es) removed vigorous species eaten more competitive plants grazed kept in check **AND** allows others/less vigorous/less dominant to survive/colonise/ move in = 1	**2**	Biomass decreases as grazing increases Diversity increases because it gives other species a chance to grow stronger ≠ dominant	
(ii)	Reduce/decrease the diversity Some species would be completely eaten/unable to recover from grazing **OR** only grazing tolerant/a few species survive heavy grazing **OR** even less vigorous/delicate species eaten	**1**	Less nutrients back into soil Weaker ≠ less vigorous	

<table>
<tr><th>Question</th><th>Acceptable Answer</th><th>Mark</th><th>Unacceptable Answer</th><th>Negates</th></tr>
<tr><td>9 (b)</td><td>Ticks at dandelions and couch grass only
Mark off per wrong tick

<table>
<tr><th>Plant adaptation</th><th>Tick (✓)</th></tr>
<tr><td>Dandelions have deep roots</td><td>✓</td></tr>
<tr><td>Wild roses have thorns</td><td></td></tr>
<tr><td>Couch grass has underground stems</td><td>✓</td></tr>
<tr><td>Nettles have stings</td><td></td></tr>
<tr><td>Tobacco plants produce nicotine</td><td></td></tr>
</table>

Both = 2 marks
One = 1 mark
Mark off per additional wrong tick</td><td>2</td><td></td><td></td></tr>
</table>

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10 (a) (i)	Volume of extract/solution/sample pH (of solutions) time left in colorimeter/out of water bath Any 2	**2**	Anything connected with making extract Light Transparency of tube Size of tube Volume of Catechol	
(ii)	Shows what would happen without the lead ethanoate/lead/ ethanoate **OR** that lead ethanoate/lead/ethanoate is causing the effect/ inhibiting the enzyme	**1**	To compare alone	
(b)	Some reaction occurred immediately Enzyme started working before lead added Browning occurred before reading taken Pigment produced as soon as cut/while being cut up **OR** apple tissue was already damaged	**1**	Apple tissue already contained brown pigments	
(c) (i)	Appropriate enclosed scales with zeros and labels from table. Shared zero must be exactly at origin	**1**	Reversed scales	
(ii)	Correct plots joined by straight lines and correct label from table. Correct plot to wrong scale ok	**1**		
(d)	As concentration/it increases, the activity (of the enzyme) decreases/effect of enzyme decreases/the enzyme is inhibited more **OR** As concentration/it increases, the rate of browning decreases **OR** converse	**1**	Smaller reading on colorimeter ≠ decreased enzyme activity Is inhibited alone Weaker/less enzyme ≠ concentration	
(e)	Any figure from 1·6 and less than 2·0. denaturing of enzyme. 1·6	**1**	Denaturing protein Damaging enzyme Destroying enzyme 2·0	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11 (a) (i)	They share/have a common ancestor/the same ancestor/have evolved from a single species = 1 different mouths/heads (shapes) for different food/feeding methods = 1	**2**	Evolved to suit different ecological niches. Evolved from one type of cichlid Physical appearances ≠ mouth or head	
(b)	They would be unable to interbreed/breed together to produce fertile offspring. If they interbreed they would produce sterile offspring.	**1**	Unable to breed Unable to interbreed successfully	
(c) (i)	Ecological **OR** reproductive	**1**		
(ii)	Prevents gene/mutation/alleles exchange/flow/sharing **OR** prevents breeding between populations/sub-populations/ groups Prevents gene pools from mixing	**1**	Splits the gene pool Splits one species so it can evolve into two	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
12 (a)	L	**1**		
(b)	Xylem	**1**		
(c)	Spring = 1 xylem (cells) produced last in outermost ring at the time of cutting nearest to cambium nearest to meristem/L were wider/wide/large/ larger diameter/thin/thinner walls/less lignified walls = 1	**1** **1**	Spring/summer Spring/autumn	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
13 (a)	Regulator (gene)	**1**		
(b)	Lactose	**1**		
(c) (i)	1 Repressor (molecule) binds to/attaches/binds/joins with/ blocks operator 2 Operator switches off structural gene/gene 2 (or converse) **OR** this prevents transcription of structural gene 3 Enzyme/(β) galactosidase not made All 3 = 2, 2 = 1, 1 = 0	**2**	Repressor gene	
(ii)	Saves energy/ATP/resources/example of resources **OR** enzyme only produced when needed **OR** avoids wasting resources/energy	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
14 (a) (i)	Iron needed for haemoglobin/is in haemoglobin **AND** haemoglobin carries oxygen (to tissues) **OR** needed for/present in enzymes **AND** which control metabolism/increase reaction rate **OR** needed for cytochrome/hydrogen carriers **AND** they are involved in energy release/respiration/ATP production	**1**		
(ii)	Reduced/retarded/stunted growth **OR** low birthweight **AND** reduced mental development/causes brain damage/cerebral problems/mental retardation (Ignore additional effects)	**1**	Small babies Learning difficulties Physical development ≠ growth	
(b) (i)	Decreasing photoperiod/description of decreasing photoperiod **OR** less hours of light per day (or converse) More hours of dark per day	**1**	Longer nights/shorter days Shorter hours of daylight Temperature Daylight below a critical level Shortening of daylength Lengthening nights	
(ii)	Offspring born in spring/summer when weather/food supply more favourable **OR** not born in winter when weather/food supply unfavourable **OR** give time for development of young before winter	**1**	Fewer predators	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
15 (a)	Succession	**1**		
(b)	Makes soil more fertile/deeper/thicker **OR** soil has more nutrients/minerals/ions/humus/organic matter **OR** soil has better drainage/more aeration/better water retention **OR** there is more soil **OR** the plant roots stabilise the soil **OR** the land/ground is made more fertile **OR** provides shelter for other plants to grow **OR** podsol to brown earth	**1**	Soil richer/better	
(c)	Greater than Community Y (both needed)	**1**		

Section C

1A Write notes on:

(i) structure of the plasma membrane
(ii) function of the plasma membrane in active transport
(iii) structure and function of the cell wall.

(i)	1	contains protein	1
	2	contains phospholipid	1
	3	bilayer/double layer/two layers of phospholipids 2 labels to phospholipids indicates double layer	1
	4	phospholipids are fluid/constantly moving (phospholipids ≠ membrane, fluid ≠ liquid)	1
	5	protein arranged as a mosaic/patchy pattern/scattered/interspersed	1
	5a	fluid mosaic pattern/model **(only award if 4 or 5 not scored)**	1
	6	has channel forming proteins/pores (not membrane is porous)	1
	Maximum 4		**4**
(ii)	7	carriers / proteins — pick up / bind — ions / molecules / substances **AND** move/carry/assist them across membrane/into cell/out of cell	1
	8	ion/molecule/substance/specific example uptake is selective **OR** description (not selectively permeable)	1
	9	low to high concentration **OR** against concentration gradient	1
	10	requires energy/ATP	1
	Maximum 3		**3**
(iii)	11	made of cellulose <u>fibres</u> (protein negates) (strands ≠ fibres)	1
	12	fully/freely permeable	1
	13	provides support/rigidity for cells/plants **OR** gives cell shape (not strength or structure)	1
	14	stops cells bursting after water uptake/when turgid/when placed in hypotonic solution **OR** allows cells to become turgid	1
	Maximum 3		**3**
	Total		**(10)**

1B Write notes on:

(i) the structure of DNA
(ii) DNA replication and its importance.

(i)	1	double helix (not one strand coiled into double helix)	1
	2	two chains/strands of nucleotide	1
	3	deoxyribose sugar, phosphate and base make up a nucleotide	1
	4	nucleotides joined together by sugar - phosphate bonds **OR** sugar and phosphate joined to form backbones/chains/strands (of nucleotides)	1
	5	base names (all four)	1
	6	complementary bases pair (to join strands) **OR** description - letters acceptable A-T **and** G-C	1
	7	(weak) hydrogen bonding between bases	1
	Maximum 6		**6**
(ii)	8	the molecule unwinds/uncoils/untwists **AND** unzips/H bonds (between bases) break	1
	9	base pairing of (free) DNA nucleotides with complementary partners	1
	10	sugar-phosphate bonds/backbones form	1
	11	rewinds into two double helices **OR** two double helices form	1
	12	requires enzymes/named enzyme(s) **OR** ATP (not energy)	1
	Maximum 3		**3**
	13	identical **OR** exactly the same DNA/molecules/copies produced	1
	14	ensures daughter/new cells have complete/correct/all/the same genetic information/genes/chromosomes	1
	Maximum 1		**1**
	Maximum 4		**4**
	Total		**(10)**

2A Give an account of the importance of nitrogen, phosphorus and magnesium in plant growth and describe the symptoms of their deficiency.

1	nitrogen for amino acid/protein/enzymes (synthesis)	1
2	nitrogen (nitrogenous for bases of) nucleic acids/DNA/RNA/nucleotides	1
3	nitrogen for chlorophyll (synthesis) **OR** plant deficient in nitrogen will not have any chlorophyll	1
4	phosphorus for nucleic acids/DNA/RNA/RuBP/NADP/GP/ATP	1
5	magnesium for chlorophyll (synthesis) **OR** plant deficient in magnesium will not have any chlorophyll	1

(max 2 on nitrogen, 1 on phosphorus, 1 on magnesium)

Maximum 4 **4**

6	nitrogen deficiency produces chlorosis/yellow leaves/pale green leaves **OR** pale yellow/green (not lack of chlorophyll)	1
7	nitrogen deficiency produces red leaf bases	1
8	nitrogen deficiency produces long roots	1
9	phosphorus deficiency produces red leaf bases	1
10	magnesium deficiency produces chlorosis **OR** description (not lack of chlorophyll)	1
11	nitrogen/phosphorus/magnesium deficiency stunts/reduces/retards/restricts (overall) growth (size ≠ growth, stumps ≠ stunts)	1

(max 2 on nitrogen, 1 on phosphorus, 1 on magnesium)

Maximum 4 **4**

Note An incorrect importance or deficiency negates one mark.

Coherence
- divided into clear sections (including tabulation)
- must be 5 points in total
- At least 2/3 points on use of elements and at least 2/3 point on deficiency symptoms

All three points 1

Relevance
- no mention of other elements eg potassium or effects of light eg etiolation
- must be 5 points in total
- At least 2/3 points on use of elements and at least 2/3 point on deficiency symptoms

All three points 1
Total **2**
(10)

2B Give an account of how animal populations are regulated by density-dependent and density-independent factors.

1 they include disease/parasites, food supply/lack of food/competition for food, predation, competition for space/territory/shelter, toxic waste produced by organisms
Any 2 1

2 a third factor 1

Note - including a density-independent factor negates one mark
- can be awarded within examples 4 – 8 below

3 increasing population/number of animals intensifies/increases the effect of density-dependent factors (or converse) 1
NOT only affects large populations

4 at higher populations – more/easier spread of disease/parasites 1
5 – less food available/more competition for food 1
6 – more predation/predators 1
7 – more competition for space/territory/shelter 1
8 – more toxic wastes from organism (or converses) 1

Any 2 from 4-8
Comparative needed for population size

9 this reduces population (or converse) 1

10 reduced effect of factor allows population to rise again (or converse) 1

11 result is that populations/numbers remain stable/are regulated 1

Maximum 6 **6**

12 include temperature/rainfall/natural events eg flood/fire/earthquake/drought/ rain storm/desertification/deforestation Any 2 1
(not extreme weather conditions)

Note - density-dependent factor will negate

13 increasing population size does not intensify/increase the effect of density-independent factors 1

14 can cause extreme changes to population sizes/examples 1

Maximum 2 **2**

Coherence
- divided into clear sections
- At least 4 points on density-dependent
- And at least 1 point on density-independent

All three points 1

Relevance
- no mention of for example monitoring populations or conservation
- At least 4 points on density-dependent
- And at least 1 point on density-independent

All three points 1
Total **2**
(10)

[END OF MARKING INSTRUCTIONS]