



2012 Biology

Higher

Finalised Marking Instructions

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Higher Biology 2012

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 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 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 7.3 ± 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 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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Marking scheme

Section A

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

Marking Instructions

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Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1 (a) (i)	P stroma	1	stoma	Other incorrect answers
(ii)	Grana/granum/thylakoids absent/destroyed/removed/disappeared/disintegrated/ broken down/dissolved/gone OR no grana	1	Functions alone Less grana Grana killed Pigments/chlorophyll removed	
(iii)	1. ATP = 1 2. NADPH/NADPH ₂ /hydrogen/H/H ₂ = 1	2	Reduced hydrogen acceptor NADP/NAD/NADH/NADH ₂ CO ₂	Other incorrect answers
(b)	No/Less CO ₂ to combine with/convert/change/join to/bind to RuBP OR less CO ₂ and RuBP is CO ₂ acceptor OR no/less RuBP is converted into GP/TP/6C compound/ glucose/carbohydrate = 1 GP/TP still changed/converted/regenerated to RuBP = 1	2	No/Less CO ₂ to break down RuBP Not carbon for CO ₂	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2 (a)	TACATCATG or GTACTACAT	1		
(b)	Ribosome	1		
(c)	AUC	1		
(d)	Peptide	1	Polypeptide	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a)	Allow respiration of snail to become steady OR Allow snail to adjust/get used to conditions/temperature/surroundings/environment OR allow snail to acclimatise OR Allow pressures to equalise OR Allow liquid levels to settle/become zero (at 20°C) OR Allow apparatus/it to reach equilibrium	1	Allow normal respiration Set-up/apparatus for snail Snail to adapt	
(b)	Same apparatus/experiment/set-up/procedure but with no snail/glass beads/dead snail OR Exactly the same but with no snail etc	1	Repeat with no snail	
(c)	Volume/concentration of solution (to absorb carbon dioxide) OR Diameter/width of glass tube/scale OR (Same) snail/mass of snail/species/type of snail/size of snail/number of snails/one snail	1	Amount/pH of solution Volume of coloured liquid Viscosity of coloured liquid Light intensity Volume/size of test tube	
(d)	Enclosed scales with 0s and labels as on table and graph fills graph paper [two possibilities – 0-0.04 or 0-0.05 on Y] 0 instead of 0.00 OK on Y = 1 Plots and lines with ruler = 1 Reversed scales – lose 1 mark	2		
(e)	0.004 OR 4×10^{-3}	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(f)	<p>Oxygen taken in by snail/used in respiration causes the liquid to rise/move/go up</p> <p>OR</p> <p>As the snail respire, oxygen level fall causing liquid to rise/move/go up = 1</p> <p>CO₂ produced by snail/respiration is absorbed/taken in by/removed by the solution = 1</p> <p>OR</p> <p>Oxygen taken in by snail/used in respiration and CO₂ produced by snail/respiration absorbed by solution = 1</p> <p>Volume of gas/pressure decreases and liquid moves/rises = 1</p> <p>[Reference to snail only needed once]</p>	2		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
5 (a) (i)	<p>The warmer/hotter the zone/climate the greater the % (of cyanogenic clover)</p> <p>OR</p> <p>As temperature increases, the % (of cyanogenic clover plants) increases</p> <p>OR</p> <p>Converses</p> <p>OR</p> <p>Comparison based on all named zones OK</p>	1	<p>At high temperatures there is a greater %</p> <p>Not number of/more etc</p>	
(ii)	<p>Increased/more/greater % cyanogenic plants giving protection against herbivores/prevents/reduces grazing by herbivores /damage by herbivores</p> <p>OR</p> <p>Converse</p> <p>OR</p> <p>Increased/more/greater % cyanogenic plant in areas where non-cyanogenic plants have been removed/ eaten by herbivores</p> <p>OR</p> <p>Increased/more/greater % cyanogenic plants where they have a selective advantage</p>	1		
(iii)	Nicotine/tannin	1		
(iv)	<p>Low/underground meristems</p> <p>deep roots/rhizomes/underground stems/underground food stores/bulbs/tubers/corms</p>	1	<p>Leaf rosettes</p> <p>Thorns/spines/stings</p> <p>Low growing points</p> <p>High powers of regeneration</p>	
(b)	Resin	1	sap	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a)	<p>1. The greater the distance from cover of the prey/ redshanks/birds the lower the (hunting) success /number caught/number killed OR The greater the distance from cover of the prey/ redshanks/birds the less likely they are to be caught = 1</p> <p>2. The greater the flock size/number of redshank/birds the lower the hunting success /number caught/number killed = 1 OR Converses OR – as an alternative The smaller the flock the greater the decrease in hunting success as the distance of the redshank/prey/birds from the cover increases = 1</p>	1 1	Easier/harder to hunt More chance of survival	
(b) (i)	Avoidance	1		
(ii)	Habituation/habituated	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7 (a) (i)	Ovary OR Anther/stamen	1	Ovule Not gamete mother cell on own	
(ii)	First Homologous pairs/homologous chromosomes/bivalent separating/present/being pulled apart/lined up	Both = 1 1	Anything to do with chromatids or chromosome numbers	
(iii)	Gamete: 4 Mother cell: 8	Both = 1 1		
(b) (i)	Crossing over/recombination OR Random assortment OR Independent assortment	1	Non-disjunction Chiasmata formation Random alignment Chromosome shuffling	
(ii)	Non-disjunction	1	Translocation Spindle failure	Complete

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a) (i)	aabb (any order) Cushion AB, Ab, aB, ab (any order) <p style="text-align: right;">All 3 lines = 2, 1/2 lines = 1</p>	2		
	(ii) 1 : 1 : 1 : 1	1	2:2:2:2	
(b)	Linked/linkage	1	Sex-linked Linked chromosomes	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates																
9 (a)	Hypertonic, into Both = 1	1																		
(b)	Increase until day 9/until 615 <u>micrometres</u> /by 335 <u>micrometres</u> /for 4 days = 1 Then remains the same/levels out/shows no change = 1 OR for 1 mark Increase to 615/by 335 then remains the same/levels out/shows no change =1	2	Until day 10 Increases then stays the same																	
(c)	<table border="1" data-bbox="421 547 1308 828"> <thead> <tr> <th data-bbox="421 547 719 616">Kidney function</th> <th data-bbox="719 547 889 616">Increases</th> <th data-bbox="889 547 1059 616">Decreases</th> <th data-bbox="1059 547 1308 616">Stays the same</th> </tr> </thead> <tbody> <tr> <td data-bbox="421 616 719 684">Filtration rate</td> <td data-bbox="719 616 889 684">✓</td> <td data-bbox="889 616 1059 684"></td> <td data-bbox="1059 616 1308 684"></td> </tr> <tr> <td data-bbox="421 684 719 753">Urine concentration</td> <td data-bbox="719 684 889 753"></td> <td data-bbox="889 684 1059 753">✓</td> <td data-bbox="1059 684 1308 753"></td> </tr> <tr> <td data-bbox="421 753 719 828">Urine volume</td> <td data-bbox="719 753 889 828">✓</td> <td data-bbox="889 753 1059 828"></td> <td data-bbox="1059 753 1308 828"></td> </tr> </tbody> </table> <p data-bbox="1115 858 1308 895" style="text-align: right;">All 3 = 2, 2 = 1</p>	Kidney function	Increases	Decreases	Stays the same	Filtration rate	✓			Urine concentration		✓		Urine volume	✓			2		
Kidney function	Increases	Decreases	Stays the same																	
Filtration rate	✓																			
Urine concentration		✓																		
Urine volume	✓																			

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10 (a) (i)	1. Rate drops from 180 to 150cm ³ /m ² /hr from 0 to 10mg/l Must have starting value or drops by 30 to 150cm ³ /m ² /hr 2. Remains constant at 150cm ³ /m ² /hr between 10 and 20 mg/l 3. Drops from 150 to 100cm ³ /m ² /hr from 20 to 40 mg/l/over the next 20mg/l <p style="text-align: right;">All 3 = 2, 2 or 1 = 1</p> [Drops from 180 cm ³ /m ² /hr at 0 mg/l to 100 cm ³ /m ² /hr at 40 mg/l = 1 mark] Both units needed but only once	2	No units No numbers	
	(ii) Decrease (in transpiration rate) is not steady as lead concentration increases OR Graph is not a straight line/levels off between 10 and 20mg/l OR Between 10 and 20 mg/l there is no change/stays the same	1		
(b)	60% decrease	1		
(c) (i)	0.04 mg per g dry mass	1		
(ii)	40 : 1	1		
(d)	Moisture/water content of/in fresh mass/shoots/roots/plants varies/fluctuates/changes/is different in each plant	1	Fresh mass is unreliable Dry mass does not fluctuate Liquid alone Affected by changes in surroundings To take into account water content	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(e)	50mg lead	1		
(f)	Lead inhibits/slows down enzymes = 1 Less respiration/ATP/energy/protein synthesis/photosynthesis/DNA replication/cell division/mitosis = 1	2	Damages/denatures/poisons/ Prevents/stops Stops respiration etc Slows enzyme production	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11 (a) (i)	5.5 kg	1		
(ii)	1–5 years	1		
(b) (i)	Hormone W – TSH/thyroid stimulating (hormone) Hormone X – GH/growth hormone/somatotrophin Structure Y – Thyroid (gland) All 3 = 2, 2 = 1	2		
(ii)	Increase in/speeds up metabolism/metabolic rate OR Makes metabolism work faster	1	Controls Work harder Overactive metabolism Symptoms of metabolism	
12 (a) (i)	1. Stimulates/promotes/increases (cell) division/elongation/mitosis/vacuolation 2. Apical dominance	1 1	Causes Differentiation multiplication	
(ii)	Some genes are switched/turned on and others are switched/turned off OR Only certain/specific/particular genes are switched/turned on OR Different genes are switched on/off in different cell types	1	Differentiation is controlled by switching genes on and off Depends what genes are switched on Different genes are switched on or off	
(b) (i)	Component of/in/involved in/part of/makes/for/formation of chlorophyll	1	Chlorophyll alone Prevents chlorosis	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(ii)	Red leaf bases OR Leaves go red at bases OR Leaves red at base	1	Shoot/stem/stalks Red leaves at bases Red edges to leaves Less ATP	Additional wrong answers eg chlorotic

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
13 (a) (i)	Hypothalamus Will accept hypothalmus	1		
(ii)	Nerves/nerve impulses/through neurones/through motor neurones/nerve messages/nerve signals/nervous system	1	Nerve triggers	Sensory hormones
(iii)	Example – increased sweating OR vasodilation = 1 Explanation – heat lost/skin cools as sweat/water evaporates OR Increased heat loss by radiation [must match] = 1	1 1	Hair flattening/relaxed erector muscles Metabolic rate Dilation of blood vessels	
(iv)	Metabolism/chemical reactions/chemical processes/metabolic processes controlled by enzymes AND enzymes have an optimum temperature/ a temperature at which they work best/only work between certain temperatures	1	Processes or reactions alone Right/suitable temperature Denatured enzymes	
(b)	Ectotherm/ectothermic	1	Cold-blooded	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
14 (a) (i)	Prey increases as predators numbers are/predation is low/decreasing = 1 Then prey decreases as predator numbers are/predation is high/increasing = 1	2	No predators	
(ii)	Food supply/availability OR competition for food OR disease/parasites OR competition for space/habitat OR toxic waste builds up/accumulates OR toxic waste produced by organism	1	Competition alone Food alone Space alone Habitat alone Toxic waste alone	
(b)	Food/raw materials Control (of the pest species)/limit damage /keep pest numbers low/limits spread of disease/show if pest control is effective/shows if pesticide was effective OR example of a control method Indicator Conservation/protection OR prevent extinction/dying out OR maintain/prevent decline of population OR conserve genes All 4 = 2, 3/2 = 1	2	Economic To ensure eradication of pest Biodiversity or preservation Not examples Assess remaining numbers Look at levels of over-hunting	
15 (a) (i)	1. Long Twelve Both = 1	1		
(ii)	2. Will not flower = 1 Needs 14 hours continuous/uninterrupted dark (to flower) = 1 OR needs 14hours dark but this plant has only 13 hours OR needs 10 hours or less of light	2	Critical dark period interrupted	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(b) (i)	Spring Young born when weather (eg of favourable weather)/food supply better OR Time for growth/development before winter <p style="text-align: right;">Both = 1</p>	1	Growth conditions are better/optimum Environmental conditions better Climate less harsh More light for hunting	
(ii)	Photoperiodism	1	photoperiod	

Section C

1A

- (i) 1 isolation prevents interbreeding/mating **or** genes/alleles/mutations flowing/being exchanged between one group/(sub) population and another **OR** isolation splits the gene pool 1
- 2 Isolation/barrier can be geographical/ecological/reproductive (not genetic) **(any 2)** 1
- 3 a third barrier 1
- 4 mutations are random (not spontaneous) 1
- 5 mutations can be beneficial (or not)/give (selective) advantage (or not) (must not suggest all mutations are beneficial) 1
- 6* mutations are different in different groups/(sub) populations 1
- 7* environments/conditions/habitats/surroundings different on either side of the barrier **OR** environments/conditions/habitats/surroundings of each population differ 1
- 8* selection pressure(s) are different on either side of the barrier **OR** selection pressure(s) on each population differ 1
- [* in 6 – 8 idea of “either side of the barrier” can be carried through the answer]

Max 6 (from 8)

- (ii) 9 survival of the fittest/those with the most favourable/beneficial [not strongest/most suitable/suited] characteristics/genes/alleles/phenotypes/mutations 1
- 10 (survive to) pass on favourable/beneficial [not strongest] characteristics/genes/alleles/phenotypes/mutations to offspring 1
- 11 adaptive radiation 1
- 12 after long periods of time/many generations/millions of years/many years/thousands of years/hundreds of years 1
- 13 new species are formed/speciation occurs 1
- 14 populations would be unable/no longer able to breed with each other/interbreed to produce fertile young/offspring 1

Max 4 (from 6)

Total 10

1B

(i)	1	foraging is searching for/obtaining/hunting for (not catching) food/prey	1
	2	net gain of energy OR energy gain in food/prey must be greater than that lost in foraging/ searching for food/obtaining food/hunting (not equal to or energy gain in food must not be less than energy lost in foraging or not greater or equal to)) OR Converse	1
	3	behaviour/search pattern/example is organised to minimise energy loss or maximise energy gain	1
			Max 2 (from 3)
(ii)	4	hunting together/working together/working as a team to obtain food/prey/eg	1
	5	increases success rate OR more chance of catching prey	1
	6	Large/larger prey obtained/caught/killed (not hunted)	1
	7	less energy used/lost (not wasted) per individual (than by hunting alone) OR more energy/food gained per individual	1
	8	sharing occurs OR aggression is reduced OR all feed (if food sufficient)	1
	9	dominance hierarchy is a pecking order/rank order/rank system OR some are dominant and some are subordinate/submissive (not strongest/weakest)	1
	10	dominant/leader/alpha/highest ranking/highest in hierarchy eat first/get more/best food (not strongest/weakest) OR ensure survival of dominant/leader/alpha/highest ranking/highest in hierarchy when food scarce	1
	11	<u>subordinate</u> gain more than by hunting alone	1
			Max 7 (from points 4 -11)
	12	territory is an area defended/marked for food OR energy is expended to defend/mark territory	1
	13	territorial behaviour reduces competition for food	1
	14	size of territory depends on food availability/density/abundance	1
			Max 1 (from points 12 -14) Max 8 (from points 4 -14)
Total			10

2A

1	double membrane OR inner and outer membrane OR labelled diagram	1
2	central matrix/matrix in the middle/centre OR fluid-filled matrix OR labelled diagram	1
3	matrix contains enzymes	1
4	cristae are folds in the inner membrane OR cristae have a large surface area OR labelled diagram	1
Max 3 (from 4)		
5	cytochrome OR cytochrome system/molecules/carriers/chemicals on/in cristae	1
6	consists of hydrogen carriers/ hydrogen acceptors/electron transfer system/electron transport system	1
7	NAD/FAD/NADH/FADH/NADH ₂ /FADH ₂ carries hydrogen to cristae/cytochrome system/electron transfer system/electron transport system	1
8	Iron required for/ is a component of cytochrome/cytochrome system/hydrogen carrier system	1
9	oxygen is the <u>final hydrogen acceptor</u>	1
10	water is produced (as a final metabolic product)	1
11	ATP is produced/synthesised/regenerated OR ADP + Pi → ATP (wrong numbers do not negate)	1
12	greatest source of ATP OR most ATP produced (per glucose molecule respired) OR gives 36 molecules of ATP whereas glycolysis gives 2 (wrong numbers negate in this second alternative)	1
Max 5 (from 8)		
C	Divided into clear sections (new line enough) At least 1 point on mitochondria structure (points 1 – 4) And at least 4 points on cytochrome system (points 5 – 12) (must be 5 points in total) All three points	1
R	No mention of details of any other organelle or reactions At least 1 point on mitochondria structure (points 1 – 4) And at least 4 points on cytochrome system (points 5 – 12) (must be 5 points in total) All three points	1
Total		10

2B

1	phagocytosis is not specific/non-specific (not unspecialised)	1
2	carried out by phagocytes/phagocytic cells/macrophages	1
3	engulf/envelope/surround bacteria/viruses/foreign organisms/foreign cells/pathogens/antigens (not foreign body)	1
4	vacuole/vesicle formed OR enclosed in vacuole/diagram	1
5	lysosomes fuse/join with vacuole/vesicle	1
6	lysosomes contain/release digestive enzymes which destroy/digest/break down bacteria/viruses/foreign organisms/pathogens/antigens	1
Max 4 (from 6)		
7	lymphocytes produce antibodies	1
8	antibody production is stimulated by/caused by/in response to foreign non-self antigens	1
9	antibody production/response/antibody/action of lymphocytes is specific	1
10	antibodies combine with/join to antigens	1
	[NB - lymphocytes produce specific antibodies in response to a foreign antigen = 3marks]	
11	bacteria/viruses/foreign organisms/foreign cells/pathogens/antigens rendered harmless/destroyed/agglutinated/broken down (not immobilised)	1
12	involved in immunity/immune response (not a description of immunity)	1
Max 4 (from 6)		
C	Divided into clear sections (new line enough) At least 2/3 points on phagocytosis (points 1 – 6) And at least 2/3 points on lymphocytes (points 7 – 12) (Must be 5 points in total) All three points	1
R	No mention of details of viruses At least 2/3 points on phagocytosis (points 1 – 6) And at least 2/3 points on lymphocytes (points 7 – 12) (Must be 5 points in total) All three points	1
	Total	10

[END OF MARKING INSTRUCTIONS]