



2010 Biology

Higher

Finalised Marking Instructions

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

Marking Instructions

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Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1 (a)	Protein, phospholipids, porous, selectively All = 2, 3/2 = 1	2		
(b) (i)	46.5 units (+/- 0.5)	1		
(ii)	800 µg per hour	1		
(iii)	1. Respiration provides the energy for uptake ATP active transport 2. Cyanide reduces respiration (enzymes) inhibits energy/ATP release stops prevents 3. (More) cyanide gives decreased uptake prevents/stops active transport OR Less energy/ATP gives decreased uptake prevents/stops active transport All 3 = 2, 2 = 1	2	Enzymes not equal to respiration affects Transport alone	Uptake of cyanide negates 1 mark

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2 (a)	(On surface of/in/on) grana/granum	1	chloroplast	Grana of chlorophyll cell
(b)	Species – B (or in explanation) Explanation More accessory pigment to allow Higher mass of carotene and xanthophyll pigments other than chlorophyll widening/broadening of absorption spectrum OR absorption of light transmitted/reflected (by other plants) collection not absorbed (by other plants) pick up of other wavelengths/frequencies use of other colours/green light of different/more colours/wavelengths	1	More pigments Higher total mass of pigments Most wavelengths Other light waves Wider wavelength Lower light intensity	Chlorophyll a as accessory pigment
(c) (i)	A – carbon dioxide CO ₂ B – glucose/carbohydrate	1 1	TP/Cellulose/Starch	
(ii)	<u>Reduces/reduction of GP/ CO₂</u>	1		
(iii)	RuBP 5 GP 3 Both	1		3xC 5xC
(iv)	RuBP decrease/lower/reduced/less/runs out/used up GP increase/higher/more/accumulates Both No/less ATP/NADPH/NADPH ₂ /H/H ₂ /hydrogen	1 1	RuBP cannot be regenerated Energy not equal to ATP Products from light stage	Other wrong Biology Extra substances

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3 (a) (i)	7.5 grams per litre	1		
(ii)	0.2 grams per litre per minute 1/5th grams per litre per minute	1		
(b) (i)	1. Anaerobic respiration produces ethanol Anaerobic conditions Fermentation 2. Oxygen (in air) starts aerobic respiration stops anaerobic respiration stops fermentation Allows Krebs cycle	1 1	Alcohol Reaction needs anaerobic conditions Aerobic conditions do not produce ethanol	
(ii)	The ethanol has poisoned the yeast It killed The concentration become lethal to OR all glucose/food/respiratory substrate used up	1	Ethanol has denatured enzymes Toxic waste Resources used up No energy left Not enough glucose left Glucose becomes limiting factor	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a) (i)	X – deoxyribose Y – phosphate Both	1	Sugar	Inorganic phosphate Pi
(ii)	1. cytosine/C 2. thymine/T Both	1		
(iii)	Enzyme(s) OR (DNA) polymerase = 1 ATP = 1	2		Other wrong enzymes
(iv)	Cell division OR mitosis OR meiosis	1	Cell replication Division	
(b)	TAG	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
5 (a) (i)	Lymphocytes	1		Other wrong answers
(ii)	(foreign) antigen/antigenic	1		Other wrong answers
(b) (i)	1 : 3 : 4	1		
(ii)	Black	1		
(iii)	The more tannin /the greater the tannin content the less fungus/leaf area covered/growth/area infected/damage/ more (fungal) resistance OR use values from the table (must be comparative but units not required) OR converses	1		
(iv)	(Fresh mass includes) water which can change/vary/fluctuate	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a) (i)	(As distance increases) from 500 to 2500m the number of dances decreases from 6 to 3/falls by 3 = 1 (when distance increased) from 2500 to 5000m the number decreased from 3 to 2/falls by 1 = 1 (500 m to 5000m dances drop from 6 to 2) = 1 Units needed at least once <i>NB ignore references to time for dances</i>	2		
(ii)	1.25s	1		
(iii)	500%	1		
(iv)	6s	1		
(b) (i)	2.5 Not in table OK and ignore any units given	1		
(ii)	3500m	1		
(c) (i)	Direction OR quantity OR quality (of food) Amount/how big/density/volume/mass/abundance Energy content/richness	1	Type of food What the food is Colour Energy gained goodness	
(ii)	Reduces/saves the energy spent in foraging/ finding food OR ensures a net energy gain OR description of net energy gain OR conserves energy by going straight to food source	1	Idea of one bee only Time not same as energy Allows bees to save energy as others will bring food back	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7 (a)	Same genes/sequence of genes/order of genes OR genes match gene for gene	1	Reference to letters Paired Have chiasmata Same alleles Same size/shape Genes in same positions Same genetic information	
(b) (i)	Chiasma(ta)	1		
(ii)	Increases variation Produces variety in species/gametes Introduces diversity Gives Creates allows ensures provides OR Allows new combinations of alleles recombination	1	Maintains Helps with Offers Different alleles can be expressed	
(c) (i)	Abcd P only aBCD P only AbcD P and Q aBCd P and Q All ticks needed	1		
(ii)	abcD OR ABCd OR reverses Watch for case in letter C/c!	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a)	(i) Affected female $X^R X^R$ and $X^R X^r$ both = 1 Unaffected female $X^r X^r$ = 1 Penalise only once for no superscript ie XR, X_R etc	1 1	RX etc penalise both times	
	(ii) 50%	1		
	(iii) Substitution One amino acid altered Different amino acid coded for	1 1	Slight/minor change	
(b)	Controls the absorption/uptake of <u>calcium</u> from/by/in the (small) intestine Affects Promotes Helps	1	Allows Into the intestine Into bone	Mention of absorption of phosphate Large intestine

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9 (a)	<p>Problem</p> <ul style="list-style-type: none"> • lose water by osmosis • cells/tissue/fish hypotonic to sea/surroundings • sea/surroundings hypertonic to cells/tissue/fish • higher water concentration in fish than sea/surroundings <p>OR converse</p> <p>Fish Physiological</p> <ul style="list-style-type: none"> • chloride secretory cells secrete/get rid of salt/ions • (kidney with) few/small glomeruli • low kidney filtration rate • slow kidney filtration <p>Rat Behavioural</p> <ul style="list-style-type: none"> • Nocturnal/active/feeds at night • remain in burrow by day <p>Rat Physiological</p> <ul style="list-style-type: none"> • no sweat glands/sweating • colon/large intestine efficient at absorbing water • long loops of Henle OR kidney tubules allow high reabsorption of water • dry mouth/nasal passages • high level of ADH <p style="text-align: right;">All 4 = 2, 3/2 = 1</p>	2	<p>Not enough water to drink Answers in terms of salt Concentrations Dehydration as water lost</p> <p>Low volumes of urine Excrete salts</p> <p>Dry faeces</p>	
(b)	<p>Allow leaf/plant to float OR make it buoyant OR prevent it sinking OR keeps it at the surface = 1 To keep it in light for photosynthesis OR To allow gas exchange/CO₂ uptake/transpiration through the stomata = 1</p>	2	<p>Close to surface</p> <p>Reference to gases in air spaces Stop stomata flooding</p>	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10 (a) (i)	Diameter/size/mass/number/surface area of beads OR type of gel OR time tap kept open OR strain/thickness covering/concentration/mass/amount/batch/volume of <i>E.coli</i> OR same volume of solution collected	1	pH solution in beaker volume of solution	
(ii)	Same/identical funnel/set up/experiment OR keep everything the same with gel beads uncoated/no <i>E. Coli</i> /sterile = 1 To show <i>E.coli</i> produced the enzyme/ lactose did not break down alone/ <i>E.coli</i> is the factor affecting lactose/ lactose is broken down by β galactosidase = 1 OR Same/identical funnel/set up/experiment OR keep everything the same to which water/nothing/no lactose was added = 1 To show the substrate was lactose/ <i>E.coli</i> did not produce product alone/ lactose is the inducer of β galactosidase = 1	2	Keep everything Replace <i>E. coli</i> with another bacterium Replace lactose with glucose	
(b)	Scales and labels = 1 Plots and line = 1 (straight lines between plots)	2	Half scale	
(c)	0.04 grams per minute	1		
(d)	Repressor joins with lactose/inducer Operator switches on structural gene Structural gene produces enzyme/ β galactosidase Time needed to breakdown lactose any 2 = 2 / 1 = 1 OR Enzyme being induced/produced/made/released = 1 Time needed to breakdown lactose = 1	2		
(e)	Saves/preserves/conserves does not waste energy/ATP OR saves/preserves/conserves/does not waste resources	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11 (a) (i)	3-4 weeks and 4-5 weeks	1		
(ii)	A	1		
(iii)	Photosynthesis	1		
(iv)	Dispersal of seeds/fruits OR flowers (leaf) fall OR decomposition	1	Leaf fall/abscission Grazing Starting to die	
(b)	length/girth/thickness/width of stem/shoots/roots/internodes OR height/length OR number/length/surface area of leaves	1	Growth of size	
(c)	(Apical) meristem	1		lateral

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
12 (a)	Gene mutation	1	Inborn error of metabolism Genetic defect Inherited mutation	
(b)	Gain tyrosine from diet/food AND can be converted to pigment/ enzyme 3 still working/present	1		
(c)	controls/increases/speeds up/regulates/stimulates metabolic rate/metabolism/metabolic processes	1	Influences Affects	Slows down

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
13 (a)	B – Nitrogen protein (synthesis)/enzymes/amino acids/nucleic acids/RNA/DNA/ATP/chlorophyll/NAD/NADP C – Magnesium All 3 = 2, 2 = 1	2	Helps use chlorophyll	
(b)	Term – Etiolated/etiolation Long stems/internodes OR yellow/pale/small/curled/chlorotic leaves OR leaves lose pigment	1 1	Tall and thin on own Shrivelled leaves White leaves Weak and sickly	Additional wrong descriptions eg red/long roots growth stunted

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
14 (a) (i)	22.5 OR 23 beetles per m ²	1		
(ii)	Food (supply) OR predators OR disease OR competition for food/ space Rainfall/drought/flooding OR temperature OR pesticide/insecticide OR named natural disaster eg (forest) fire Both	1	Competition General term natural disasters Extreme weather	
(b)	(Conservation/management of) endangered species/threat of extinction/to see if it might become extinct (Conservation/management of) food species/source (Conservation/management of) raw material species/source Indicate levels of pollution/pollution indicators Any two	1	Prevent extinction Help endangered species Indicator species Culling Prevent overhunting Examples of raw material eg medicine	

Section C

1A Write notes on:

- (i) the effects of indole acetic acid (IAA);
(ii) the role of gibberellic acid (GA) in the germination of barley grains.
- | | | | |
|------|----|--|----------------|
| (i) | 1 | IAA Stimulates/promotes/increases/causes/needed for cell division/mitosis | 1 |
| | 2 | IAA Stimulates/promotes/increases/causes/needed for cell elongation | 1 |
| | 3 | IAA Stimulates/promotes/increases/causes/needed for differentiation | 1 |
| | 4 | IAA causes apical dominance/inhibits (growth of) lateral buds | 1 |
| | 5 | IAA is important/involved in tropic effects/tropisms/geotropism/ phototropism | 1 |
| | 6 | IAA causes shoot/plant growth towards light OR description | 1 |
| | 7 | Low/fall in/decrease in IAA (concentration) causes abscission/leaf fall/flower fall
OR converse | 1 |
| | 8 | IAA causes fruit formation/development/growth | 1 |
| | | Auxin = IAA | Max 6 (from 8) |
| (ii) | 9 | GA produced in embryo | 1 |
| | 10 | GA travels to aleurone layer | 1 |
| | 11 | GA stimulates/induces/results in/switches on gene for production of (α -)amylase in aleurone layer | 1 |
| | 12 | (α -)amylase breaks down/digests starch to maltose | 1 |
| | 13 | maltose required for respiration/ATP production/to supply energy/ATP (for germination) | 1 |
| | 14 | GA breaks dormancy (of seeds) | 1 |
| | | Gibberellin = GA | Max 4 (from 6) |
| | | Total | 10 |

Notes

- Point 1 -3 – not controls but penalise only once
Point 5 – not trophic
Point 6 – not root but not negating
Point 6 – not curving/bending
Point 11 – not aleurone layer stimulates enzyme production
Point 13 – not maltose used as a food source alone
Point 14 – not promotes germination
Point 14 – not buds but not negating

1B Write notes on:

(i)	endotherms and ectotherms;	
(ii)	temperature regulation in mammals.	
(i)	1 endotherms can regulate/control/maintain their (body) temperature (physiologically) AND ectotherms cannot/ectotherms temperature is dependent on their environment/behaviour	1
	2 endotherms derive (most body) heat from respiration/metabolism/chemical reactions	1
	3 ectotherms derive/get (body) heat from surroundings/environment OR description of behaviour	1
		Max 2 (from 3)
(ii)	4 temperature monitoring centre/thermoreceptors in hypothalamus OR information about temperature detected/received by hypothalamus	1
	5 nerve message/communication/impulse sent to skin/effectors	1
	6 vasodilation/widening of blood vessels to skin in response to increased temperature OR vasoconstriction/narrowing of blood vessels to skin in response to decreased temperature	1
	7 more/less blood to skin/extremities OR less/more blood in body core	1
	8 increased/more OR decreased/less heat radiated from skin/extremities	1
	9 increased temperature/body too hot leads to (increase in) sweat production OR converse	1
	10 increase in heat loss due to evaporation of (water in) sweat OR converse	1
	11 Decrease in temperature causes hair erector muscles to raise/erect hair	1
	12 traps (warm) air OR forms insulating layer	1
	13 Decrease in temperature causes muscle contraction/shivering which generates heat/raises body temperature	1
	14 temperature regulation involves/is an example of negative feedback	1
		Max 8 (from 11)
	Total	10

Notes

- Point 1 – not heat for temperature
 - Point 3 – must be clear that the behaviour is of an ectotherm
 - Point 3 – not their body temperature varies with/changes with environment
 - Point 5 – sent through blood negates
 - Point 6 – not blood vasodilates
 - Point 7 – not heat in body core
 - Point 11 – not converse
 - Point 12 – not traps heat
- Ignore references to metabolic rate

2A Give an account of the importance of isolating mechanisms, mutations and natural selection in the evolution of new species.

1	isolating mechanisms prevent gene flow between (sub-)populations/groups are barriers to gene exchange between breeding between mutations being passed between	1
OR isolating mechanisms split a gene pool		
2	geographic, ecological, reproductive (any two)	1
3	third	1
		Max 2 (from 3)
4	mutations occur randomly	1
5	different mutations occur in each (sub-)population/group	1
6	Mutations increase/decrease survival OR beneficial or not OR provide a selective advantage or not	1
		Max 2 (from 3)
7	different conditions/habitat/environment exist for each (sub-)population	1
8	natural selection acts differently on/there are different selection pressures on each (sub-)population/groups	1
9	surviving/best suited/fittest individuals are able to breed/pass on (favourable) genes/alleles/characteristics/mutations	1
10	over long periods/after a long time/after many generations	1
11	(a) new species formed/speciation has occurred	1
12	new species are unable to interbreed/breed together to produce fertile young	1
		Max 4 (from 6)

Coherence

- divided into 3 clear sections OR isolation separate from mutation and natural selection
- At least 1/2 points on isolation (Points 1 – 3)
- At least 1/2 points on mutation (Points 4 – 6)
- And at least 2/3 points on natural selection (Points 7 – 12)
- (must be 5 points in total)

All five points

1

Relevance

- no mention of artificial selection
- At least 1/2 points on isolation (Points 1 – 3)
- And at least 1/2 points on mutation (Points 4 – 6)
- And at least 2/3 points on natural selection (points 7 – 12)
- must be 5 points in total

All five points

1

Total

10

Notes

- Point 1 – not split population into two groups
 - Points 1, 5, 7 and 8 – species not equal to population/groups – penalise each time
 - Points 2 and 3 – not examples eg river
 - Point 9 – not strongest individuals or survival of fittest alone
- Award points in place most advantageous to candidate

2B	Give an account of the transpiration stream and its importance to plants.	
1	water moves into root (hair cells) by osmosis/ from HWC to LWC/ down water concentration gradient OR water diffuses into root (hair) cells	1
2	water moves across/ enters the cortex by osmosis/ from HWC to LWC/ down water concentration gradient/ via cell walls	1
3	water enters/ reaches/ goes into xylem	1
4	water rises/ travels/ moves through xylem (vessels)	1
5	cohesion is attraction between/ sticking together of water molecules	1
6	adhesion is attraction between water (molecules) and xylem (walls)/ sticking of water molecules to xylem	1
5a	adhesion and cohesion named (if neither 5 nor 6 is scored)	1
7	water moves into leaf cells by osmosis/ from HWC to LWC / down a water concentration gradient OR water diffuses into leaf cells	1
8	water evaporates into (leaf) air spaces	1
9	water vapour diffuses from leaf surfaces/ lost through stomata	1
		Max 6 (from 9)
10	water (provides raw material) for photosynthesis/ photolysis OR water provides turgidity/ keeps cells turgid OR causes cooling/ cools the plant OR minerals/ nutrients/ ions supplied/ transported	1 (any 1)
11	Any one other	1
12	Any one other	1
		Max 2 (from 3)
	Coherence	
	<ul style="list-style-type: none"> • Divided into clear sections • At least 4 points on transpiration stream (Points 1 – 9) • And at least 1 point on importance (Points 10 – 12) 	
	All three points	1
	Relevance	
	<ul style="list-style-type: none"> • No mention of details of xerophytes or hydrophytes, mineral deficiencies • At least 4 points on transpiration stream (Points 1 – 9) • And at least 1 point on importance (Points 10 – 12) 	
	All three points	1
	Total	10

Notes

- Point 1 – not along concentration gradient
Point 5a – not capillarity/ capillary action
Point 8 – not passes for evaporates
Point 9 – not through leaves for leaf surface or stomata
Point 10 – not support for turgidity

Factors affecting transpiration not irrelevant

[END OF MARKING INSTRUCTIONS]