



2008 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.	C	16.	B
2.	A	17.	D
3.	A	18.	C
4.	A	19.	C
5.	D	20.	C
6.	C	21.	D
7.	B	22.	A
8.	D	23.	A
9.	A	24.	C
10.	D	25.	B
11.	B	26.	D
12.	D	27.	D
13.	B	28.	B
14.	C	29.	A
15.	B	30.	C

Marking Instructions

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Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates												
1 (a)	P granum/grana/thylakoid Q stroma (Both needed)	1	Lamellae Stoma/Stromata Strome	Second answer												
(b) (i)	Anywhere within a granum	1														
(ii)	Widen/broaden the absorption/action spectrum OR <table border="0" style="display: inline-table; vertical-align: middle;"> <tr> <td rowspan="3" style="font-size: 3em; vertical-align: middle;">{</td> <td>can absorb</td> <td rowspan="3" style="font-size: 3em; vertical-align: middle;">{</td> <td>other</td> <td rowspan="3" style="font-size: 3em; vertical-align: middle;">{</td> <td>parts of the spectrum</td> </tr> <tr> <td>can photosynthesise using</td> <td>more different</td> <td>colours (of light)</td> </tr> <tr> <td>OR Absorbs light/wavelengths/colours not absorbed by chlorophyll</td> <td>extra as many as possible</td> <td>wavelengths (of light)</td> </tr> </table>	{	can absorb	{	other	{	parts of the spectrum	can photosynthesise using	more different	colours (of light)	OR Absorbs light/wavelengths/colours not absorbed by chlorophyll	extra as many as possible	wavelengths (of light)	1	Larger/greater/many/all/more than one wavelength(s) of light A greater quantity of light Wider range of light Making use of ≠ absorption	
{	can absorb		{		other		{	parts of the spectrum								
	can photosynthesise using				more different			colours (of light)								
	OR Absorbs light/wavelengths/colours not absorbed by chlorophyll	extra as many as possible		wavelengths (of light)												
(c) (i)	ATP/NADPH/NADPH ₂ /Hydrogen/H ₂	1	NADH, oxygen													
(ii)	6, 1, 3, 5 (All = 2, 2 or 3 = 1)	2	2 x 3, 2 x 3C													
(d) (i)	Light <u>intensity</u>	1														
(ii)	Carbon dioxide/CO ₂ <i>Note – must be stated somewhere in answer</i> Greater increase in rate at increased % carbon dioxide (at same temp) than at increased temp (at same % carbon dioxide) OR Use correct values from the graph eg CO ₂ increases rate by 1 unit but temp by only 0.5 units	1	CO	Mention of temperature or light												

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2 (a) (i)	S protein T phospholipids phospholipid heads/bilayer	1 1	Pore Lipid/fat/glycerol/hydrophilic head	
(ii)	Allows exit/export of mRNA (from nucleus) to cytoplasm/ribosomes/rough ER OR allows exit/export of ribosomes to ER/cytoplasm OR Allows entry of mRNA to cytoplasm from nucleus	1	Lets molecules pass through Lets mRNA pass through Lets mRNA out of nucleus RNA only tRNA only Reference to secretion to cytoplasm	Additional wrong information
(iii)	(Presence of) large numbers of/many mitochondria	1	12 mitochondria Several mitochondria	Mention of other organelles
(b) (i)	Glucose/it moves from a high concentration to a low concentration (through the membrane) OR Glucose/it moves down/with the concentration gradient	1	High to low concentration Across/along concentration gradients Ions/substances/molecules	
(ii)	Increases the surface area/maximum surface area = 1 For increased/maximum absorption/diffusion/uptake/exchange (of glucose/materials) = 1 <i>Note – Comparative needed only once for two marks, eg large surface area for increased absorption = 2</i> <i>No comparative = no marks</i>	2	Promotes diffusion	
(iii)	Glycogen	1	Incorrect spellings	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3 (a)	Glucose, glycogen, amino acids, protein, carbohydrate	1	Fatty acid, glycerol, lipid, oil	
(b) (i)	Krebs, citric acid, TCA cycle Carbon dioxide/CO ₂ (Both needed)	1	Kerbs cycle	Calvin cycle
(ii)	NAD, FAD	1	NADH NADH ₂	
(c)	Acts as final/terminal/last acceptor of hydrogen/H/H ₂ (to form water)	1	Forms water Hydrogen receptor/carrier	
(d) (i)	Lactic acid	1	Latic acid	
(ii)	Cytoplasm	1		Additional answer
(iii)	Transfers chemical energy OR <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> Transfers/transport energy from links </div> <div style="font-size: 2em; margin-right: 10px;">}</div> <div> respiration energy producing reactions </div> </div> to energy requiring reactions/processes/examples	1	Provides energy for cell process Transports energy round cell	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a)	True False phosphate False doubled All 3 = 2, 1 or 2 = 1	2	sugar phosphate, inorganic phosphate, Pi Increased \neq doubled	
(b)	Enzymes, DNA templates, ATP, polymerase, parental strand of DNA	1	Free nucleotides	
(c) (i)	58%	1		
(ii)	1080	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
5 (a) (i)	As the (population) density/number of trees (per hectare) increases the (total volume of) resin decreases = 1 But at high (population) densities/numbers of trees (per hectare) increasing density has little/no effect = 1 OR converse OR use of correct values from table OR the lower the population the more the resin produced	2		
(ii)	3·5	1		
(b)	blocking holes preventing { entry of { microorganisms sealing wounds } spread of { fungi isolating areas } { bacteria localising areas } { pathogens forming a protective barrier } { infection forming a trap } { disease covering/forming around } { viruses } { parasite	1	Traps insects Invaders, bugs, germs, animals alone. Damage ≠ infection/disease	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a) (i)	<p>From 0/beginning - 40 days water loss decreases from 3·1cm³ per hr per kg to 0·6/by 2·5 40 - 50 days increase from 0·6 to 0·9/by 0·3 50 - 70 days decrease from 0·9 to 0·4/by 0·5 All 3 = 2, 2 = 1, 1 = 0</p> <p><i>Note – Units of water loss must be mentioned at least once. Correct answer with no units = 1. If differences used (2·5, 0·3, 0·5) at least one value from the graph must be given.</i></p>	2	Wrong tree	
(ii)	25%	1		
(iii)	1 : 2	1	2 : 1	
(iv)	<p>Reduces the (rate of) water loss/requirement for water/transpiration =1 OR conserves/saves water =1 Cherry laurel/other broad leaved tree does not lose leaves and has higher (rate of) water loss =1</p>	2	No/stops/prevents water loss Justification from values	
(b) (i)	3	1		
(ii)	3·25-3·3	1	3·5	
(iii)	Wind (speed)/windiness/humidity/air pollution/air pressure/light intensity/air movement/hours of sunlight/	1	Amount of light/sunlight Light Pollution Blocked stomata Planting density Salinity of soil	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7 (a) (i)	Male grey Female black (Both needed)	1		Second wrong answer
(ii)	1 Male GB, Gb, gB, gb Female gB, gb (All needed) 2 Correct offspring derived from gametes supplied (All needed)	1 1		
(iii)	4 : 3 : 1 OR correct ratio from wrong offspring in 7(a)ii	1		
(b)	Male horse was homozygous/true breeding for white markings/homozygous dominant/TT	1	Answers connected to sex-linkage Pure breeding Always passes on T Gene \neq allele	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a) (i)	Cooperative (hunting) Bigger prey can be obtained OR less energy used per individual OR subordinate/lower ranking animals may gain more food OR hunting more likely to be successful OR more food gained than by hunting alone	1 1	Less time spent hunting prey All animals get food Bigger prey hunted Less energy used Weaker/smaller/subservient \neq subordinate Easier/quicker to catch prey	
(ii)	<u>Dominance hierarchy</u>	1	Rank order Pecking order Dominant \neq Dominance	
(iii)	1 More/adequate prey/food available OR reduces/less competition OR energy expended in defence of territory is less than energy gained from food 2 Population/number of wolves/size of wolf pack/number in pack OR level of competition from neighbouring packs OR food supply/amount of food/prey density/population of prey	1 1	No competition References to fighting with other wolves Ensures a constant food supply Only they can eat prey Food belongs to them Density of pack References to habitat or climate Water supply	
(b) (i)	81.5 OR 81.5 shown in calculation space	1	82 81	
(ii)	Captive breeding, cell/seed/gene/sperm banks, breeding programme	1	Alternatives to wildlife reserves Rare breed farms Hunting bans etc Quotas On-site protection	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9 (a)	4	1		
(b)	Reach compensation point earlier in the day/ at low light intensity OR can photosynthesise earlier in the day/at low light intensities/ for longer each day OR net/overall gain of food produced earlier	1	Reach compensation point quicker/faster	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10 (a)	Although temperatures fall to -10°C /are reduced at night the camel's body temperature is maintained at about 36°C /higher than this OR body temperatures not same as environment and so does not fall to -10°C	1	Environmental temperature varies more than the camel temperature	
(b)	Endotherms	1	Mammal Endothermic Warm-blooded	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11 (a)	2500	1		
(b) (i)	Variety/type of barley OR Volume/mass of (water culture) solution OR Carbon dioxide concentration (of atmosphere) OR Concentration of other minerals/nutrients/elements/named example OR pH OR oxygen concentration in solution	1	Size etc of seedling Volume of water Level of solution Concentration of solution Depth of plant in solution Size of container Wavelength of light	
(ii)	No soil to adhere to the roots and potentially affect mass determinations/damage roots at harvest/easier to harvest roots OR Control of nutrient (concentration) easier to achieve or difficult to achieve in soil OR disease less likely	1	Ensures water availability Visibility of roots	
(iii)	Algae may use up/change the nutrient/mineral/element levels of the solutions OR Prevents interspecific competition for ions/minerals/nutrients/elements = 1 Fresh mass includes water which does not relate to growth OR dry mass is measure of actual biomass produced OR water content of seedlings/fresh mass may vary OR fresh mass has water content which may vary = 1	2	Resources Light Oxygen alone Dry mass more accurate Dry mass is invariable	
(c) (i)	Scale determined from supplied graph and table and labels directly from table	1	Y axis scale without zeros	
(ii)	Points accurately plotted and graph added with straight lines and key completed correctly	1		
(d)	Oxygen allows more (aerobic) respiration (Aerobic) respiration produces more ATP/energy For more active uptake/transport of K (Comparative needed at least once) All 3 = 2, 2 = 1 All 3 plus no comparison = max 1	2		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
12 (a) (i)	Produces (new) cells/tissue/xylem/phloem OR is the site of mitosis/cell division OR is a meristem	1	Increases tree width Secondary thickening Lateral growth Growing point of plant	
(ii)	Xylem	1	lignin	
(b)	(Caterpillars) eat/reduce/remove leaves/leaf surfaces Less photosynthesis Less energy/food/materials available for growth/to produce xylem All 3 = 2, 2 = 1	2	Stunts growth	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
13 (a) (i)	Drinking water/intake of water/watery fluid	1	Drinking, respiratory water Fluids, Liquids Decreased sweating	
(ii)	Hypothalamus	1		
(iii)	X antidiuretic hormone/ADH Increases kidney tubule permeability to <u>water</u>	1 1		
(b)	Change from set point/normal/certain limits is detected/picked up by receptors Corrective mechanism switched on/effectors respond (Correction results in) return to set point/normal Corrective mechanism switched off All four = 2, 3/2 = 1 OR Use of a specific example but getting all the above points	2	A response occurs Steady state \neq set point	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
14 (a)	<u>13 or less hours</u> of light per day OR Photoperiod of <u>13 hours or less</u> OR Maximum of <u>13 hours</u> of light per day OR <u>11 or more hours</u> of dark per day	1	Less than 13 hours of light per day Decreasing photoperiod Decreasing daylength	
(b)	Young born February/March/April/Spring = 1 AND Description of favourable conditions eg sufficient food/ suitable temperatures/lower rainfall OR offspring have time for growth before winter OR offspring not born in winter when temps too cold = 1	2	Summer/after winter May Weather suitable/favourable	
(c)	Photoperiodism/photoperiodic behaviour	1	Photoperiod	

Extended response question C1A

Write notes on:

- | | | |
|------|---|-------------|
| (i) | the control of lactose metabolism in <i>E. coli</i> ; | 6 |
| (ii) | phenylketonuria in humans. | 4 |
| | | (10) |

- | | | | | |
|----|-----|---|---|----------|
| 1A | (i) | 1 | the <u>regulator gene</u> produces/codes for repressor (molecule/substance/protein) NOT gene* | 1 |
| | | 2 | lactose is the inducer | 1 |
| | | 3 | lactose binds with repressor (molecule/substance/protein) | 1 |
| | | 4 | in the presence of lactose operator switches on structural gene | 1 |
| | | 5 | in the presence of lactose/so enzyme/B galactosidase made
OR structural gene codes for enzyme
NOT wrong enzyme | 1 |
| | | 6 | in absence of lactose repressor (molecule/substance/protein) binds to operator | 1 |
| | | 7 | in the absence of lactose/so operator cannot switch on/switches off structural gene | 1 |
| | | 8 | in the absence of lactose/so/when structural gene switched off enzyme not made | 1 |
| | | 9 | (<i>E. coli</i>) conserves resources/energy OR does not waste energy
NOT only made when required | 1 |
| | | | Maximum 6 | 6 |

* Note – repressor gene – penalise only once

- | | | | |
|------|----|--|-------------|
| (ii) | 10 | phenylalanine is involved in a metabolic pathway
OR show in diagram of pathway | 1 |
| | 11 | each step (in a metabolic pathway) is controlled by an enzyme | 1 |
| | 12 | PKU is caused by mutation (of a gene)/inborn error of metabolism and leads to an altered/absent enzyme | 1 |
| | 13 | phenylalanine builds up/is not broken down/converted to a toxic compound/phenylpyruvate | 1 |
| | 14 | damage to nervous system development/description, eg brain damage/mental retardation/learning difficulties | 1 |
| | | Maximum 4 | 4 |
| | | Total | (10) |

Extended response question C1B

Write notes on population change under the following headings:

- | | | |
|------|---|-------------|
| (i) | the influence of density dependent factors; | 5 |
| (ii) | succession in plant communities. | 5 |
| | | (10) |

- | | | | | |
|----|-----|---|---|----------|
| 1B | (i) | 1 | if population density/description increases factor has more/increased/intensified effect OR converse | 1 |
| | | 2 | Factors include
disease/infection/parasites
food supply/availability/shortage
predation
toxic waste made by organism
competition for food*/space/habitat
NOT water | |
| | | | Any two | 1 |
| | | 3 | a third factor | 1 |
| | | 4 | when population (density) increases then named factor increases
OR when population (density) increases then food supply decreases
OR converses | 1 |
| | | 5 | their effect is to decrease population (density) OR converse | 1 |
| | | 6 | effect tends to return population to a stable size/optimum size/
carrying capacity/size environment can sustain | 1 |
| | | | Maximum 5 | 5 |

* Note - Only if food supply not awarded

- | | | | | |
|--|------|----|--|-------------|
| | (ii) | 7 | succession is the sequence of plant communities inhabiting
an area OR description | 1 |
| | | 8 | succession is unidirectional
OR arrow in diagram labelled succession/time/years | 1 |
| | | 9 | communities/populations/plants modify the habitat/increase soil
fertility/examples making it more suitable for subsequent/other/new
communities/populations/plants | 1 |
| | | 10 | later communities/climax community has greater/est species diversity | 1 |
| | | 11 | later communities/climax community have more complex food webs | 1 |
| | | 12 | later communities/climax community have greater/est biomass
(comparative needed in 10 – 12) | 1 |
| | | 13 | the final community is the climax community/vegetation | 1 |
| | | | Maximum 5 | 5 |
| | | | Total | (10) |

Extended response question C2A

Give an account of gene mutations and mutagenic agents. (10)

2A	1	gene mutations alter the base/nucleotide type, sequence/order of DNA	1
	2	they include inversion, substitution, insertion and deletion Any two	1
	3	remaining two	1
	4	description of a gene mutation including reference to bases/ nucleotide Any two descriptions OR diagrams with bases labelled	1
	5	remaining two descriptions	1
	6	inversion/substitution affect only one/two triplets/few bases/are point mutations	1
	7	and so only slightly alter/alter few amino acids in the amino acid sequence of the protein	1
	8	insertion/deletion affect many triplets/all codons after the mutation/are frame-shift mutations	1
	9	and so affect many amino acids in a protein/all amino acids after the mutation	1
		Maximum 6	6
	10	mutagenic agents cause/induce/increase the rate/frequency/chance/likelihood of mutation	1
	11	they include (ir)radiation/examples/chemical (agent)s/examples	1
		Maximum 2	2
		Coherence divided into clear sections At least 4 marks on gene mutation And at least 1 mark on mutagenic agents All three points	1
		Relevance no mention of chromosome mutations, polyploidy, non-disjunction At least 4 marks on gene mutation And at least 1 mark on mutagenic agents All three points	1
			2
		Total	(10)

Extended response question C2B

Give an account of somatic fusion in plants and genetic engineering in bacteria. (10)

2B	1	somatic fusion overcomes sexual incompatibility (in plants) OR used when 2 species cannot interbreed	1
	2	plant cells have their cell walls removed/broken down/destroyed/digested (membrane negates)	1
	3	using cellulase	1
	4	resulting in protoplasts	1
	5	which then fuse/join	1
	6	fused protoplast (cultured to) produce new plant/a callus	1
		Maximum 4	4
	7	genes located/found on chromosomes by gene probes/banding patterns	1
	8	endonucleases/restriction enzymes used to cut DNA/genes (from donor chromosomes)	1
	9	plasmids extracted/isolated/removed AND opened/cut open using restriction enzymes/endonuclease	1
	10	genes sealed/inserted into bacterial genome/plasmid using ligase	1
	11	altered plasmid placed into bacterial cell	1
	12	engineered/alterd bacteria cultured/multiply and produce new protein/product insulin/HGH	1
		Maximum 4	4
		Coherence divided into clear sections At least 2 marks on somatic fusion And at least 2 marks on genetic engineering Total of <u>5</u> marks needed All four points	1
		Relevance no mention of GM crops, selective breeding, details of diabetes or dwarfism etc At least 2 marks on somatic fusion And at least 2 marks on genetic engineering Total of <u>5</u> marks needed All four points	1
			2
		Total	(10)