

# 2008 Biology

# Higher

# **Finalised Marking Instructions**

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#### **Higher Biology 2008**

#### 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 <u>underlined</u> 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<sub>2</sub>, H<sub>2</sub>O
  - 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  $7.3 \pm 0.1$
- 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.	С	16.	В
2.	A	17.	D
3.	A	18.	C
4.	A	19.	C
5.	D	20.	C
6.	C	21.	D
7.	В	22.	A
8.	D	23.	A
9.	A	24.	C
10.	D	25.	В
11.	В	26.	D
12.	D	27.	D
13.	В	28.	В
14.	C	29.	A
15.	В	30.	C

# **Marking Instructions**

## **Biology Higher 2008**

### **Section B**

Questi	ion	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		
(c)	(ii)	Widen/broaden the absorption/action spectrum  OR  Can absorb  can photosynthesise using  more  different  extra  as many as possible  Absorbs light/wavelengths/colours not absorbed by chlorophyll  ATP/NADPH/NADPH <sub>2</sub> /Hydrogen/H <sub>2</sub>	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	
	(ii)	6, 1, 3, 5 (All = 2, 2 or 3 = 1)	2	2 x 3, 2 x 3C	
(d)	(i)	Light intensity	1		
	(ii)	Carbon dioxide/CO <sub>2</sub> <i>Note</i> – <i>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) <b>OR</b> Use correct values from the graph eg CO <sub>2</sub> increases rate by 1 unit but temp by only 0·5 units	1	СО	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  Note - Comparative needed only once for two marks, eg large surface area for increased absorption = 2 No comparative = no marks	2	Promotes diffusion	
(iii)	Glycogen	1	Incorrect spellings	

Q	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 <sub>2</sub> (Both needed)	1	Kerbs cycle	Calvin cycle
	(	(ii)	NAD, FAD	1	NADH NADH <sub>2</sub>	
	(c)		Acts as final/terminal/last acceptor of hydrogen/H/H <sub>2</sub> (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  Transfers/transports energy from	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 ≠ 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	2		
	(ii)	OR the lower the population the more the resin produced 3.5	1		
	(b)	blocking holes preventing sealing wounds isolating areas localising areas forming a protective barrier forming a trap covering/forming around fentry of spread of spread of bacteria pathogens infection disease viruses parasite	1	Traps insects Invaders, bugs, germs, animals alone.  Damage ≠ infection/disease	

Questi	on	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a)	(i)	From 0/beginning - 40 days water loss decreases from $3 \cdot 1 \text{cm}^3$ per hr per kg to $0 \cdot 6$ /by $2 \cdot 5$ 40 - 50 days increase from $0 \cdot 6$ to $0 \cdot 9$ /by $0 \cdot 3$ 50 - 70 days decrease from $0 \cdot 9$ to $0 \cdot 4$ /by $0 \cdot 5$ All $3 = 2$ , $2 = 1$ , $1 = 0$	2	Wrong tree	
		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.			
	(ii)	25%	1		
	(iii)	1:2	1	2:1	
	(iv)	Reduces the (rate of) water loss/requirement for water/transpiration  OR conserves/saves water = 1  Cherry laurel/other broad leaved tree does not lose leaves and has higher (rate of) water loss = 1	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)	<ul> <li>1 Male GB, Gb, gB, gb Female gB, gb (All needed)</li> <li>2 Correct offspring derived from gametes supplied (All needed)</li> </ul>	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 ≠ allele	

Questio	n	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a)	<b>(i)</b>	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	Less time spent hunting prey All animals get food Bigger prey hunted Less energy used Weaker/smaller/subservient ≠ subordinate Easier/quicker to catch prey	
	(ii)	Dominance hierarchy	1	Rank order Pecking order Dominant ≠ Dominance	
	(iii)	<ol> <li>More/adequate prey/food available         <b>OR</b> reduces/less competition         <b>OR</b> energy expended in defence of territory is less than energy gained from food</li> <li>Population/number of wolves/size of wolf pack/number in pack         <b>OR</b> level of competition from neighbouring packs         <b>OR</b> food supply/amount of food/prey density/population of prey</li> </ol>	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 <b>OR</b> can photosynthesise earlier in the day/at low light intensities/ for longer each day <b>OR</b> 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 $-10^{\circ}\text{C}$ /are reduced at night the camel's body temperature is maintained at about $36^{\circ}\text{C/higher}$ than this <b>OR</b> body temperatures not same as environment and so does not fall to $-10^{\circ}\text{C}$	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		Resources Light Oxygen alone	
			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	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		<b>Unacceptable Answer</b>	Negates	
12	(a) (i)	Produces (new) cells/tissue/xylem/phloem  OR is the site of mitosis/cell division  OR is a meristem		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		<b>Unacceptable Answer</b>	Negates
13	(a)	(i)	Drinking water/intake of water/watery fluid		Drinking, respiratory water Fluids, Liquids Decreased sweating	
	(ii) Hypothalamus					
		(iii)	X antidiuretic hormone/ADH  Increases kidney tubule permeability to water	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 ≠ set point	

	Question	Acceptable Answer	Mark	Unacceptable Answer	Negates	
14	(a)	13 or less hours of light per day OR Photoperiod of 13 hours or less OR Maximum of 13 hours of light per day OR 11 or more hours of dark per day	1	Less than 13 hours of light per day Decreasing photoperiod Decreasing daylength		
	<b>(b)</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) (ii)			actose metabolism in E. coli; ia in humans.	6 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 <b>OR</b> 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	(E. coli) conserves resources/energy <b>OR</b> does not waste energy NOT only made when required	1
		Maxin	num 6	6
* Note	- repres	ssor gen	e – 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
		Maxin	<u> </u>	4
		Total		(10)

## **Extended response question C1B**

Write notes on population change under the following headings:

(i) (ii)			f density dependent factors; lant communities.		5 5 (10)
1B	(i)	1	if population density/description increases factor has more/increased/intensified effect <b>OR</b> converse		1
		2	predation toxic waste made	ailability/shortage	
			Any two		1
		3	a third factor		1
		4	when population (density) increases the <b>OR</b> when population (density) increases <b>OR</b> converses		1
		5	their effect is to decrease population (de	ensity) <b>OR</b> 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 s	upply not awarded		
	(ii)	7	succession is the sequence of plant com an area <b>OR</b> description	munities inhabiting	1
		8	succession is unidirectional <b>OR</b> arrow in diagram labelled succession	on/time/years	1
		9	communities/populations/plants modify fertility/examples making it more suitab communities/populations/plants		1
		10	later communities/climax community ha	as greater/est species diversity	1
		11	later communities/climax community ha	ave more complex food webs	1
		12	later communities/climax community has (comparative needed in 10 – 12)	ave greater/est biomass	1
		13	the final community is the climax comm	nunity/vegetation	1
		Maxin	num 5		5
		Total			(10)

## Extended response question C2A

Give	an accou	unt 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 mutation	ns 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
	Maxii	mum 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
	Maxii	mum 2	2
	At lea	rence ed into clear sections ast 4 marks on gene mutation at least 1 mark on mutagenic agents aree points	1
		ention of chromosome mutations, polyploidy, non-disjunction	
		ast 4 marks on gene mutation at least 1 mark on mutagenic agents	
		aree points	1
			2
		Total	(10)

## **Extended response question C2B**

Give	an accou	nt of somatic fusion in plants and genetic engineering in bacteria.	(10)
2B	1	somatic fusion overcomes sexual incompatibility (in plants) <b>OR</b> 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
	Maxin	num 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 <b>AND</b> 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/altered bacteria cultured/multiply and produce new protein/product insulin/HGH	1
	Maxin	num 4	4
	At least And at Total of	ence d into clear sections st 2 marks on somatic fusion t least 2 marks on genetic engineering of 5 marks needed ar points	1
	At least And at Total of	ntion of GM crops, selective breeding, details of diabetes or dwarfism etc st 2 marks on somatic fusion t least 2 marks on genetic engineering of <u>5</u> marks needed	1
	All for	ur points	1
		T. 4.1	2
		Total	<b>(10)</b>