



# **2011 Biology**

## **Higher**

### **Finalised Marking Instructions**

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## Higher Biology 2011

### 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<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

## 2011 Biology Higher

### Marking scheme

#### Section A

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

Marking Instructions

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Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1 (a)	P mitochondrion/mitochondria = 1 Q (cavity of) Golgi (apparatus/body) = 1 OR smooth ER	2	ER/rough ER	
(b) (i)	1. Protein 2. Phospholipid (either way round) Bilayer not negating Both = 1	1	lipid	
(ii)	Selectively/semi permeable OR description based on comparison of molecular size	1	porous only water passes through permeable to water partially permeable controls entry and exit of substances allows certain molecules in and out	
(c)	Hypotonic	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<b>(d)</b>	1. Draws food/particles/micro-organisms in using cilia <b>OR</b> moves to food/particles/microorganism using cilia  2. Encloses food into a (food) vacuole Engulfs particles vesicle Seals in micro-organisms Takes <b>OR</b> endocytosis  3. Lysosomes fuse with/attach to (food) vacuole  4. Digests food with enzymes from lysosomes Breaks down particles  <p style="text-align: right;">All 4 = 2, 2/3 = 1</p>	<b>2</b>	phagocytosis    digestive juices lysozyme alone	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2 (a)	Cytoplasm	1		
(b)	Enzymes <b>OR</b> ATP <b>OR</b> ADP <b>OR</b> NAD <b>OR</b> Pi <i>full names OK</i>	1	Alternative respiratory substrates NADH	
(c)	R pyruvic acid/pyruvate = 1 S ethanol/alcohol = 1	1 1	Lactic acid	
(d)	<u>Oxygen</u> needed as a final/last/terminal acceptor of hydrogen	1	joins with hydrogen to form water needed for cytochrome system	to combine with carbon

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3 (a)	1440	1		
(b)	<p>Oxygen is no longer limiting/a limiting factor (uptake/aerobic respiration)</p> <p><b>OR</b></p> <p>Another factor/temp/glucose/respiratory substrate is limiting the uptake</p> <p><b>OR</b></p> <p>ATP production/aerobic respiration has reached the maximum</p> <p><b>OR</b> 30°C not the optimum</p> <p><b>OR</b> potassium uptake is at its maximum</p>	1	<p>potassium concentration now a limiting factor</p> <p>potassium not present</p> <p>cell cannot uptake more</p> <p>cell is full</p> <p>there is not enough of a particular factor/glucose etc</p> <p>number of mitochondria</p>	Wrong limiting factor CO <sub>2</sub> is limiting factor
(c)	<ol style="list-style-type: none"> <li>1. Enzyme activity less (than at 30°C)/now reduced <b>OR</b> 20°C/temp/conditions not optimum for enzymes/ below optimum for enzymes</li> <li>2. ATP production/respiration requires enzymes <b>OR</b> mention of respiratory enzymes</li> <li>3. Less energy/ATP available/released/produced</li> <li>4. Active uptake/transport requires energy <b>OR</b> potassium uptake is active/requires energy</li> </ol> <p style="text-align: right;">All 4 = 2, 3/2 = 1</p>	2	30°C is optimum 20°C is not optimum	



Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a) (i)	<p>Photosynthesis occurs in wavelengths/colours of light/green/yellow light/regions of spectrum little absorbed by the (single) pigment/pigment shown/chlorophyll</p> <p><b>OR</b> Photosynthesis occurs when absorption of green/yellow/ by the (single) pigment is low</p> <p><b>OR</b> Photosynthesis occurs in all colours but the (single) pigment absorbs mainly blue and red/little yellow/green (light)</p>	1	<p>The two lines on the graph do not match</p> <p>Photosynthesises light not absorbed by the pigments</p> <p>Only blue and red absorbed</p> <p>No green/yellow absorbed</p>	
(ii)	(Paper/thin layer) chromatography (paper)	1		
(b)	<ol style="list-style-type: none"> <li>1. Photosynthesis occurs in the red and blue (areas of the spectrum/colour of light)</li> <li>2. Photosynthesis produces oxygen</li> <li>3. (Aerobic) bacteria go to (the red and blue) areas where oxygen is most abundant</li> </ol> <p style="text-align: right;">All 3 = 2, 2/1 =1</p>	2	<p>Bacteria moving to glucose</p> <p>References to glucose</p>	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates									
5 (a) (i)	<table border="1" data-bbox="421 264 853 373"> <tr> <td></td> <td><math>X^R</math></td> <td><math>X^r</math></td> </tr> <tr> <td><math>X^r</math></td> <td><math>X^R X^r</math></td> <td><math>X^r X^r</math></td> </tr> <tr> <td>Y</td> <td><math>X^R Y</math></td> <td><math>X^r Y</math></td> </tr> </table> <p data-bbox="421 408 1120 443"><i>Fusing of wrong gametes as long as gametes haploid</i></p> <p data-bbox="976 478 1205 545">Gametes = 1 All 4 offspring = 1</p>		$X^R$	$X^r$	$X^r$	$X^R X^r$	$X^r X^r$	Y	$X^R Y$	$X^r Y$	1 1	Lack of superscripts	Allele shown on Y c'some
	$X^R$	$X^r$											
$X^r$	$X^R X^r$	$X^r X^r$											
Y	$X^R Y$	$X^r Y$											
(ii)	All boxes ticked/1s in boxes	1											
(iii)	Fertilisation/Fusion of gametes is a random/chance process  OR sample size/offspring number too small	1	It/reproduction/breeding is random Crossing over Independent assortment Some gametes not viable										
(b)	NKML OR LMKN spacing not important	1											

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a) (i)	1. From 0 to 5 days/for the first 5 days it remains constant/ stays at 1375 units 2. From 5 to 15 days/next 10 days drops to 450 units/falls by 925 units... 3. ... then remains constant <b>OR</b> From 15 to 25 days/after which/for next 10 days/for remaining days stays constant at 450 units (450 not needed if following on from 2.) (don't penalise mis-read of 450 twice) (must mention units/days at least once) <div style="text-align: right;">             All 3 = 2, 2 =1              All 3 with no units = 1           </div>	2	Until 5 days  No figures no marks	
(ii)	60	1		
(iii)	50	1		
(iv)	It would never reach its compensation point <b>OR</b> Compensation point greater than 400 (units) <b>OR</b> Compensation point never reaches 400 (units) <b>OR</b> Lowest compensation point is 500 (units) <b>OR</b> Could not be reduced lower than 500 (units) <b>OR</b> Compensation point levels off at 500 (units) <b>OR</b> Needs more than/at least 500 (units) to grow <div style="text-align: right;">= 1</div>  No net energy gain <b>OR</b> respiration would exceed photosynthesis <b>OR</b> more carbohydrate/glucose/food used than gained <div style="text-align: right;">= 1</div>	2	Could not photosynthesise at 400 units Compensation point is 500 units   Reference to energy produced/used up  CO <sub>2</sub>	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(b) (i)	Tick Spider plant <b>OR</b> mention in reason Reason Spider plant has compensation points of 250 units at day 20 and/or 500 units at day 10 in Graph 1/the other Graph <b>OR</b> The compensation points (in Graph 2) match compensation point in Graph 1/the other graph	1		Other boxes
(ii)	1.75 times	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7 (a) (i)	AUG	1		
(ii)	Second base is G/guanine OR guanine in second/centre position OR contains guanine OR None have uracil/U	1	References to first/third position All contain A, G and C	
(b)	Isoleucine, glutamine <i>Codons in boxes not negating</i>  Both needed = 1	1		
8 (a)	Radiation/example of radiation	1		Further chemicals/ mustard gas
(b) (i)	Insertion Deletion Substitution Inversion  All = 2, 2/3 = 1	2		
(ii)	Gene mutation numbers 1 and 2 = 1  Description: Will affect many codons triplets amino acids  OR They will affect every codons after the mutation all triplets from that point on amino acids = 1	2	Frameshift mutation  More than one  AAs   AAs	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9 (a) (i)	Bring down/kill larger prey (than by hunting alone) <b>OR</b> Increases hunting success/better chance of catching prey <b>OR</b> Less energy expended per individual <b>OR</b> Greater net gain of energy per individual = 1  Reduces/less (inter/intra) competition = 1	2	Less energy used Hunt larger prey Easier to obtain prey Ensures all/weaker/smaller animals get food Animals get more food than when alone  Prevents competition	
	(ii) Ensures that energy gained in food is greater than energy expended in catching food/hunting food/foraging <b>OR</b> converse	1	Equal to	
	(iii) Numbers confuse the predator/lion <b>OR</b> Individuals take turns at watching for predators/lions <b>OR</b> More chance that at least one individual will see predator/lion <b>OR</b> More chance of spotting/getting warning about predator/lion <b>OR</b> Description of group protection in wildebeest <b>OR</b> Harder to single out individual	1	Safety in numbers Predator confused Acting like a pack and protecting one another Less chance of being eaten in a big group	
(b) (i)	Avoidance (behaviour)	1		
	(ii) Reduces chances of being eaten <b>OR</b> Avoids/prevents/reduces predation <b>OR</b> Protection from predators	1	Protection alone Protection from harmful stimulus/danger/threat Increases chances of survival Reduces chance of being killed	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10 (a)	Temperature <b>OR</b> variety/type/species/age of rice (grains)	1	Oxygen concentration Size/mass of rice grains Mass/area of filter paper Reference to beakers/ containers	
(b) (i)	Shows that it is GA which is causing the results/germination/ breaking of dormancy <b>OR</b> shows results without GA to compare to others/those with GA	1	Provide comparison Shows that there is no/low germination without GA Shows what happens without GA	Increase reliability of results
(ii)	Some GA is already present in (rice) grains/seeds/embryo <b>OR</b> (rice) grains/seeds/embryo produces GA	1	GA present GA present in plants Germination occurs naturally	
(c)	Use of 50 (rice) grains at each concentration/each time/in each solution/in each beaker	1	Use large number of grains Use 50 grains	
(d)	Increased <b>OR</b> given with reason Reason        evaporation of water/solvent  Both = 1	1	Liquid Solution Evaporation alone	
(e)	42	1		
(f)	Scales – both need 0s or in origin, at least half grid filled Labels – Y number/no of rice grains germinated after 36 hours in GA solution (36 hours could be in a title or line label) X concentration of GA solution (mg per litre)        = 1 Plots and straight line joins                                = 1 Reversed axes can still score plot mark	2		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<b>(g)</b>	1. Increasing GA concentration increases (the rate of) germination/number germinating <b>OR</b> increasing GA concentration above 30 mg per litre has little effect on rate of germination <b>OR</b> between 5 and 10 mg per litre of GA greatest increase in germination/number germinated = <b>1</b> 2. The longer in GA (solution) the greater (the rate of) germination/number germinating = <b>1</b> <i>If GA concentration mentioned in 1 "solution" alone in 2 OK</i>	<b>2</b>	Growth instead of germination If GA high/higher more seeds germinate GA needed for germination GA stimulates germination More rice grains germinate after 36 hours More grains germinate the longer the experiment left More germination the longer time in the solution	
<b>(h)</b>	Aleurone (layer) Accept alerone/alurone	<b>1</b>		



Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11 (a)	A and B moult allows increases in length exoskeleton/skin shed followed by inflation growth = 1  B and C exoskeleton/skin prevents increase in length <b>OR</b> restricts/limits/inhibits growth = 1	1  1	Shell/coat/cuticle – penalise once	Growth stops
(b) (i)	X Growth hormone/GH/somatotrophin = 1 Y Thyroid stimulating hormone/TSH = 1	1 1	somatrophin	
(ii)	Thyroid	1		
(iii)	Controls/increases/regulates/stimulates the metabolic rate/ metabolism/metabolic processes	1	Affects/maintains/responsible for	
12 (a) (i)	As (the concentration of) galactosidase/enzyme increases/is produced/appears/is introduced the (concentration of) lactose decreases <b>OR</b> lactose begins to fall/decrease after galactosidase levels increase/starts to be produced	1	As lactose decreases the enzyme increases	
(ii)	True/T/tick False/F/cross True/T/tick  All 3 = 2, 2 = 1	2		
(b)	Undifferentiated Genes Limited  All 3 = 2, 2 = 1	2		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
13 (a)	H = 1 B F Both = 1 B D Both = 1 A = 1  Words/chemical symbols OK	1 1 1 1		
(b)	E, A Both = 1  Words OK	1		
14 (a)	Hypothalamus B/water and C/temperature Pancreas A/glucose  All correct = 1	1		
(b)	1. Glucagon – correct spelling needed 2. Adrenaline/epinephrine (either order)  Both = 1	1		
(c)	Decrease the permeability (of kidney tubule cells) to <u>water</u>	1	Less water reabsorbed	
(d) (i)	Vasoconstriction/constriction/narrowing of diameter/ Narrows = 1  Less/inhibits/reduces blood flow to skin so less heat is lost by <u>radiation</u> = 1	1  1	No blood to skin Smaller/close up Vasocontraction/contraction	
(ii)	Endotherms	1	Endothermic	

## Section C

### 1A

- |      |    |  |           |
|------|----|--|-----------|
| (i)  | 1  | fish (tissues) hypotonic to/at higher water concentration than sea water/<br>surroundings/environment <b>OR</b> converse   | 1         |
|      | 2  | water loss by osmosis through mouth/gills  | 1         |
|      | 3  | drinks sea/salt water NOT drinks from surroundings   | 1         |
|      | 4  | chloride secretory cells in gills secrete/excrete/remove/get rid of salt   | 1         |
|      | 5  | by active transport/actively/against concentration gradient  | 1         |
|      | 6  | (kidneys have) few small glomeruli   | 1         |
|      | 7  | slow filtration/low rate of filtration   | 1         |
|      | 8  | low volume/amount of concentrated urine  | 1         |
|      |    | Max 6 (from 8)   |           |
| (ii) | 9  | behavioural and physiological (mechanisms) NOT physical<br>(might be mentioned separately)   | 1         |
|      | 10 | active by night/nocturnal <b>OR</b> stays in (damp/humid) burrow by day  | 1         |
|      | 11 | dry faeces <b>OR</b> efficient absorption of water by large intestine  | 1         |
|      | 12 | does not sweat/no sweat glands <b>OR</b> dry mouth and nasal passages  | 1         |
|      | 13 | long loops of Henle/kidney tubules so high/more/increased reabsorption of<br>water<br><b>OR</b> high/increased levels of ADH so high/more/increased reabsorption<br>water NOT absorption | 1         |
|      | 14 | low volumes/amounts of concentrated urine  | 1         |
|      |    | Max 4 (from 6)   |           |
|      |    | <b>Total</b>   | <b>10</b> |

**1B**

(i)	1	gamete mother cells (undergo meiosis)	1
	2	spindle forms <b>OR</b> nuclear membrane breaks down	1
	3	homologous chromosomes pair	1
	4	homologous chromosomes line up at equator/middle of cell <b>OR</b> crossing over occurs at chiasmata	1
	5	homologous chromosomes segregate/move apart <b>OR</b> independent assortment occurs	1
	6	Cytoplasm splits/new nuclear membranes form	1
	7	two haploid cells/cells with one set of chromosomes/cells with half the number of chromosomes form	1
		<b>Max 4 (from 7)</b>	
	8	two new spindles form (where candidate has scored both points 2 and 8, award mark only once in candidate's favour)	1
	9	chromosomes line up on equator/middle of cell	1
	10	chromatids separate/are pulled apart	1
	11	cytoplasm splits/new nuclear membranes form (where candidate has scored both points 6 and 11, award mark only once in candidate's favour)	1
	12	to give four haploid cells or four gametes	1
		<b>Max 3 (from 5)</b>	
			Max 7 (from 10)
(ii)	13	Independent/random assortment <b>OR</b> description of independent assortment NOT chromosome shuffling	1
	14	crossing over	1
	15	recombination <b>OR</b> description of recombination for example linked genes separated/genetic information exchanged	1
	16	non-disjunction/description NOT spindle failure alone	1
			Max 3 (from 4)
		<b>Total</b>	<b>10</b>

**2A**

1	occurs in stroma of chloroplasts		1
2	carbon dioxide/CO <sub>2</sub> accepted by RuBP to produce GP/PGA		1
3	glucose C <sub>6</sub> , RuBP 5C and GP/PGA 3C		1
4	NADP carries/supplies hydrogen to Calvin cycle/carbon fixation stage		1
5	H/H <sub>2</sub> /Hydrogen reduces GP/PGA/carbon dioxide/CO <sub>2</sub> to glucose/carbohydrate NOT NADPH		1
6	ATP provides energy		1
7	GP/PGA used to regenerate/make/generate/produce RuBP Details involving TP not negating		1
8	enzyme controlled	Max 6 (from 8)	1
9	energy in carbohydrate/glucose <b>OR</b> produces glucose for respiration		1
10	produces cellulose <b>OR</b> structural carbohydrate <b>OR</b> carbohydrate for cell walls		1
11	produces storage carbohydrate <b>OR</b> starch		1
12	major biological molecules <b>OR</b> protein, fat, lipid, nucleic acid, nucleotides etc are derived/produced/made	Max 2 (from 4)	1
C	Divided into clear sections At least 3/4 points on carbon fixation And at least 1/2 points on significance (must be 5 points in total) All three points		1
R	No mention of details of light dependent stage other than ATP/NADPH supplied by this stage At least 3/4 points on carbon fixation And at least 1/2 points on significance (must be 5 points in total) All three points		1
	<b>Total</b>		<b>10</b>

**2B**

1	virus attaches stick/joins/adheres to (host) cell	1
2	viral nucleic acid/DNA/RNA/virus enters/injected in	1
3	viral nucleic acid/DNA/RNA/virus takes over/alters cell metabolism <b>OR</b> viral nucleic acid/DNA/RNA/virus alters cell instructions	1
4	viral nucleic acid/DNA/RNA replicated NOT produced	
	Note – “viral” needed only <b>once</b> for 2, 3 and 4 If “viral” not used at all penalise only once	1
5	protein coats synthesised/produced	1
6	(host) cell supplies nucleotides/enzymes/ATP/amino acids	1
7	(new) viruses assembled/description NOT new viruses formed	1
8	(new) viruses released by (host) cell bursting/lysis/slow leakage	1
		Max 5 (from 8)
9	lymphocytes produce antibodies	1
10	antibodies produced in response to foreign/non-self antigens NOT foreign bodies  NB lymphocytes recognise foreign/non-self antigens and produce antibodies – give 9 and 10	1
11	antibodies are specific to antigens	1
12	antibodies destroy/render harmless/inactivate antigens/viruses/bacteria/pathogens	1
		Max 3 (from 4)
C	Divided into clear sections At least 3 points on viruses And at least 2 points on lymphocytes All three points	1
R	No mention of details of replication/protein synthesis/phagocytes At least 3 points on viruses And at least 2 points on lymphocytes All three points	1
	<b>Total</b>	<b>10</b>

[END OF MARKING INSTRUCTIONS]