2013 Biology

Higher

Finalised Marking Instructions

Part One: General Marking Principles for Biology Higher

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

(a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor.

(b) Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

GENERAL MARKING ADVICE: Biology Higher

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_2, H_2O
- 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 $7{\cdot}3 \pm 0{\cdot}1$

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

Part Two: Marking Instructions for each Question

Section A

Question			Expected Answer/s	Max Mark	Additional Guidance
1			A		
2			B		
3			D		
4			A		
5			D		
6			B		
7			D		
8			A		
9			B		
10			D		
11			C		
12			C		
13			C		
14			D		
15			A		

Question			Expected Answer/s	Max Mark	Additional Guidance
16			B		
17			C		
18			A		
19			C		
20			D		
21			D		
22			B		
23			A		
24			C		
25			B		
26			A		
27			B		
28			C		
29			B		
30			C		

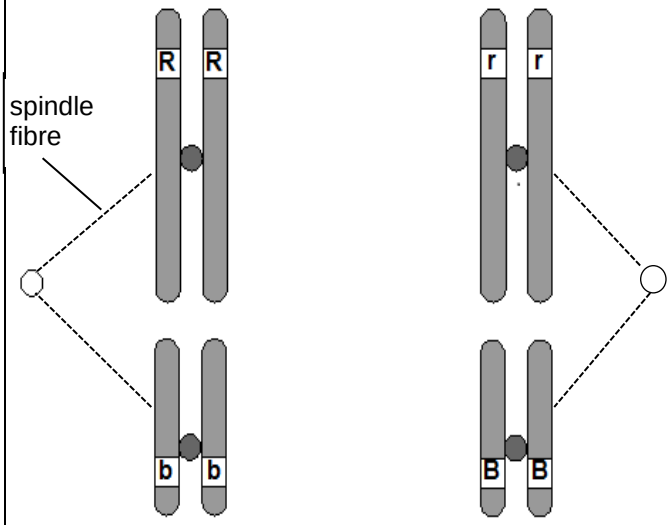
Section B

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
1	**a**	**i**	X (inorganic) phosphate (group) Y deoxyribose (sugar) **Both = 1**	**1**	P Sugar alone	
1	**a**	**ii**	Z hydrogen/H	**1**		
1	**b**	**i**	**Step 2** bonds between bases/strands/nucleotides break **OR** hydrogen bonds break **OR** DNA (molecules) unzips **OR** strands separate **Step 4** sugar phosphate bonds/backbones form (between nucleotides) **OR** bonds form between adjacent/neighbouring nucleotides **OR** bonds form between one nucleotide and the next	**1** **1**	Bonds break Nucleotides line up Hydrogen bonds form Bonds between bases form Opposite Complementary	
1	**b**	**ii**	Enzymes / (DNA) polymerase **OR** ATP	**1**	energy	RNA polymerase
1	**b**	**iii**	Ensures each cell has identical/the same/the exact/the correct/a complete copy of/a full set of DNA/genetic information/genetic material/genes/ chromosomes/genome **OR** ensures that no genetic information/genetic material/DNA/genes/chromosomes lost **OR** ensures each (daughter) cell can produce all of its enzymes/proteins	**1**	Information alone Produce identical daughter cells	

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
2	**a**	**i**	More/increased greenfly damage/destroy/injure/attack/eat (leaves) **= 1** More glycosides converted to cyanide **OR** more cyanide produced **= 1**	**2**	Greenfly eat more leaves Trees stop producing glycosides	
2	**a**	**ii**	Greenfly numbers increase/do not decrease even although cyanide is increasing/present/being produced/high **OR** correct values for increasing greenfly numbers given even although cyanide is increasing/present/being produced/high	**1**	Greenfly increase as glycosides decrease	
2	**a**	**iii**	0·4	**1**		
2	**a**	**iv**	0·33	**1**		
2	**b**		Isolates/seals/blocks/closes off/covers/forms a protective layer over/coats infected/damaged/injured/wounded area/tissue **OR** prevents spread/entry of/further damage by microorganisms/bacteria/fungi/viruses/pathogens/ infection/disease **OR** acts as a barrier to microorganisms/bacteria/fungi/viruses/pathogens/ infection/disease	**1**	Organisms Antigens Insects Particles Attackers	

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
3	**a**		Root hair (cell) **= 1** Large/increased/maximises surface (area) **= 1**	**2**	Large vacuole Long root hair	
3	**b**		Active transport **= 1** Supplies/produces/provides/gives/releases/makes ATP / energy **OR** Site of ATP production **= 1**	**2**		

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
4	a	i	Concentration of glucose (solution) **OR** pH **OR** strain / type / species / variety /age of yeast **OR** concentration of yeast	**1**	Size of flask Light intensity Oxygen concentration	
	a	ii	Allow the flasks/solutions/glucose and lead to reach/heat up to/cool down to/settle at/ an even/ the correct/the required/the specific/ the appropriate temperature **OR** 20ºC /the temperature of the water bath	**1**	Acclimatise Adapt	
4	a	iii	Allow the lead (nitrate) to diffuse into/be taken up by/have its effect on/inhibit/react with/be absorbed by cells/yeast **OR** allows lead (nitrate) to have its effect on/ inhibit respiration **OR** allows lead (nitrate) to have its effect on/ inhibit/react with enzymes	**1**		
4	b		Axes scales and labels with units **= 1** 11 needed on Y axis decimal points **not** needed on scale zero(s) required Plotting and joining as a straight line **= 1**	**2**	Half scales	
4	c		As the lead (concentration) increases respiration decreases **OR** inhibition was increased	**1**		
4	d	i	Carbon dioxide / CO_2	**1**		
4	d	ii	Anaerobic respiration/fermentation (had started)	**1**		

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
5	**a**	**i**	RB, Rb, rB, rb **Any order**	**1**		
5	**a**	**ii**		**1**		
5	**a**	**iii**	Separation of chromatids **OR** chromatids pulled apart/move to opposite ends	**1**	Chromosomes pulled apart into chromatids Chromatids split apart	
5	**b**	**i**	Tick Eh and eH **(both)**	**1**		
5	**b**	**ii**	Crossing over/cross over **= 1** Increases/causes/produces/ensures/creates/ provides/results in/allows variation **OR** increases variety in offspring/gametes **= 1** **OR** creates new phenotypes/genotypes/combinations of alleles	**2**	Chiasmata Recombination of alleles Variation alone Increases genetic diversity Maintains variation	

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
6	**a**	**i**	Geographical	**1**	Mountains Oceans	
6	**a**	**ii**	Prevents/is a barrier to/blocks/interrupts/ gene/allele/mutation flow/exchange/sharing **OR** splits/divides/separates the gene pool **OR** prevents the gene pools mixing **OR** prevents populations/sub-populations/groups breeding with each other/interbreeding		Prevents interbreeding Separates species over time Prevents populations breeding	
6	**a**	**iii**	They would be unable to interbreed to produce fertile young/offspring **OR** if they did interbreed they would produce infertile/sterile young/offspring			
6	**b**	**i**	Gene probe/probing **OR** chromosome banding/mapping **OR** recombination frequency **OR** Cross-over values/COVs	**1**	Gene mapping Gene banding	
6	**b**	**ii**	**Endonuclease** Open/cut open/break open plasmid **OR** removing/separating/cutting gene/allele/DNA from chromosome **OR** cut DNA **= 1** **Ligase** Seals/sticks/glues/secures/joins/combines/attaches /fixes/binds/links/inserts/fuses/puts genes/alleles/DNA into plasmids **= 1**	**2**	Cutting gene from the plasmid Cutting section out of plasmid Closing the plasmid Attaching to plasmid	
6	**b**	**iii**	The blood clotting/human gene has been inserted into the tetracycline (resistance) gene **OR** the tetracycline (resistance) gene has been separated /split/cut/interrupted **= 1** **OR** sequence of bases on the tetracycline gene has been interrupted **AND** Tetracycline (resistance) gene cannot be (fully) transcribed / is not functional / cannot function correctly/ can no longer work **= 1** **OR** protein which gives resistance cannot be translated/produced **= 1**	**2**	Tetracycline gene replaced /covered by the blood-clotting gene DNA has been removed Insertion mutation Destroyed Damaged	

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
7	a		**Q** $X^d Y$ **S** $X^D X^d$ **W** $X^D Y$ **All 3 = 2, 2 or 1 = 1**	**2**		
7	b		S is not affected but she inherits the allele / X^d from Q / her father **OR** S is $X^D X^d$/heterozygous/has both the dominant and recessive allele/is a carrier but she is not affected **OR** V is affected but neither parent / R nor S was	**1**	Has genes for both Generic answer not from diagram	
7	c		Males inherit/receive/have one copy of the gene/allele so if it is recessive/for red green colour deficiency they will be affected **OR** females inherit/receive/have two copies of the gene so could be carriers **OR** females inherit/receive/have two copies of the gene so have two chances to inherit a dominant/masking allele **OR** males need one recessive/red-green colour deficiency allele to be affected but females need two	**1**		

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
8	a	i	(curling) increases humidity/creates a humid atmosphere/creates a moist atmosphere/traps water vapour/traps moist air/traps humid air **OR** (curling) creates still air conditions/reduces effect of wind/shelters stomata from wind/ keeps wind out **OR** reduces surface area exposed **= 1** and reduces transpiration/evaporation/diffusion of water vapour **= 1**	**2**	Water Moisture Stops evaporation No evaporation	
8	a	ii	uncurls/opens/unrolls **= 1** Larger surface area/more chloroplasts/more chlorophyll to trap/absorb/take in light **OR** more leaf exposed to light **OR** A larger surface area for CO_2 uptake/gas exchange **= 1**	**2**	Large surface area for photosynthesis Leaves exposed to more light Leaves get maximum amount of light	
8	a	iii	Xerophyte / xerophytic / xeromorphic	**1**		
8	b		**1** gives buoyancy/brings leaf to surface/helps leaf to float/causes floatation for photosynthesis/gas exchange **= 1** **2** allows leaf to remain on surface when water level changes **OR** prevents damage/snapping/breaking in currents/flowing water **= 1**	**2**	For light alone	

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
9	**a**		GA / gibberellic acid / gibberellin embryo **(both)**	**1**		
9	**b**		**Function** Converts/breaks down/digests/ changes/turns starch to maltose/sugar **= 1** **Importance** Provides energy/ATP (for germination/mitosis) **= 1**	**2**	Glucose Stimulates the production of maltose	

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
10	**a**	**i**	**1** Increases from 4·0 - 4·5g to beginning of September / end of August / during August/ in August **2** Falls from 4·5 - 1·5g from beginning of September / end of August until beginning of December / end of November. **3** Remains constant (at 1·5g) from beginning of December / end of November to end of January **All 3 = 2, 1 or 2= 1** **All correct but no units = 1**	**2**		
10	**a**	**ii**	60%	**1**		
10	**a**	**iii**	More/plentiful/good food / nectar available **OR** less energy needed to keep warm **OR** more torpor than in winter **OR** using less energy because not migrating	**1**	Eat more food	
10	**b**	**i**	Energy conserved / saved for flying / migration /flight **OR** energy not wasted so more energy for flying/migration/flight	**1**	Energy stored Enough energy for flight Movement/big journeys/travel More energy needed for migration	
10	**b**	**ii**	(Conservation of) energy needed for breeding/ courtship/nest building/feeding chicks/fighting for territory	**1**		
10	**b**	**iii**	0·5 / half / ½	**1**		
10	**c**		$45cm^3$	**1**		
10	**d**		Reduces competition	**1**	No competition Prevents competition	

Question			Acceptable Answer/s	Max Mark		Negates
11	**a**		2:3	**1**		
11	**b**		3·5 / 3½ hours	**1**		
11	**c**		**1** Glucose used in respiration/in glycolysis/to provide energy/to provide ATP **= 1** **2** Glucose converted to/stored as/turned into glycogen **OR** glucose taken up by liver/muscle **= 1**	**2**	Glucose is used for chemical reactions	
11	**d**		Increased **= 1** Bring/increases glucose back to normal/norm/set point/80mg per $100cm^3$ **= 1** **OR** prevents glucose falling too low/further **OR** keeps glucose levels normal/at set point/80mg per $100cm^3$	**2**		

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
12	**a**	**i**	0 – 2 years	**1**		
12	**a**	**ii**	X	**1**		
12	**a**	**iii**	(Body) mass rises/increases when GH level falls/ remains constant/remains steady	**1**		
12	**b**		Pituitary (gland)	**1**		

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
13	**a**	**i**	**1** Lactose binds with/joins with/attaches to repressor (molecule/protein) **2** Operator switches on/turns on/activates structural gene **3** Structural gene causes production of /produces/creates/makes/ codes for the enzyme/galactosidase **OR** structural gene transcribed and translated **All three = 2, 1 or 2 for 1 mark**	**2**	Lactose is the inducer	
13	**a**	**ii**	Saves/conserves/prevents waste of/is more economical with use of ATP/energy/resources/ amino acids	**1**		
13	**b**		Add to each flask/solution **AND** It would turn yellow/change colour in Flask 1/where lactose was present **OR** it would stay colourless in Flask 2 /where lactose was absent **Both = 1**	**1**	See which one turns yellow	

Question			Acceptable Answer/s	Max Mark	Unacceptable Answer	Negates
14	**a**		Phototropism/phototropic **= 1** More light for photosynthesis **OR** reaches/brings into/grows towards light for photosynthesis **=1**	**2**		
14	**b**	**i**	Substance/IAA/auxin accumulates/builds up/ moves to/becomes more concentrated on the dark side/shaded side/side away from light **OR** less substance/IAA/auxin on light/unshaded side **OR** substance/IAA/auxin destroyed on the light side but not on the dark side **= 1** Elongation/mitosis/cell division on dark/shaded side/side away from light causing growth towards light **= 1**	**2**	Left side Produced on the dark side but not on the light side Only present on the dark side Bends/leans	
14	**b**	**ii**	IAA / auxin / indole acetic acid	**1**		

Section C

1A

(i)	1	pigments absorb light (energy)	1
	2	light can be transmitted or reflected (**both**)	1
	3	chlorophyll absorbs (mainly) in the blue and red regions of the spectrum **OR** absorbs blue and red light **OR** absorbs red and blue wavelengths	1
	4	accessory pigments/xanthophyll and carotene (and chlorophyll b) absorb light from other regions of the spectrum/of other wavelengths/of other colours **OR** absorb green and yellow light **OR** absorb light/ wavelengths/colours not absorbed by chlorophyll **OR** broaden/widen the absorption spectrum	1
	5	accessory pigments/xanthophyll and carotene (and chlorophyll b) pass the energy (**NOT** light) on to chlorophyll	1
	6	accessory pigments are xanthophyll, carotene (and chlorophyll b) **OR** all pigments named (chlorophyll a and b, xanthophyll, carotene)	1
		Max 4 (from 6)	
(ii)	7	(pigments/light dependent stage) in the grana	1
	8	photolysis	1
	9	water is split/broken down to release hydrogen and oxygen	1
	10	hydrogen carried by/joins with/attaches to NADP **OR** NADPH/$NADPH_2$ is made	1
	11	NADPH/$NADPH_2$/ hydrogen needed for /transferred to carbon fixation stage/Calvin cycle **NOT** stroma/dark stage/light independent stage	1
	12	oxygen released **OR** oxygen is a by-product/waste product	1
	13	energy can be used in the regeneration/synthesis/production of ATP **OR** energy can be used in photophosphorylation	1
	14	ATP is needed for /passed to the carbon fixation stage/Calvin cycle **NOT** stroma/dark stage/light independent stage	1
		Max 6 (from 8)	
		Total	**10**

1B

(i)	1	(translation) occurs on ribosomes **OR** mRNA attaches to /goes to/lines up on ribosomes	1
	2	mRNA has groups of 3/triplets of bases/nucleotides called codons	1
	3	each codon codes for a specific amino acid **OR** sequence of bases on mRNA determines sequence of amino acids in protein	1
	4	tRNA molecules have groups of 3/triplets of bases/nucleotides called anti-codons	1
	4a	**NB Only award if neither 2 nor 4 given** mRNA has codons and tRNA has anticodons	1
	5	tRNA molecules attach to/carry specific amino acids	1
	6	tRNA molecules carry amino acids to mRNA/ribosomes	1
	7	anti-codons link to / bond to / match with /line up against codons **NOT** triplets	1
	8	complementary bases pair **OR** A links to U and G links to C	1
	9	amino acids are joined by peptide bonds	1
			Max 7 (from 9)
(ii)	10	amino acid sequences/order determines protein shape/structure/ function/type	
	11	(molecular) shape determines protein function	
	12	proteins can be fibrous or globular **(both)**	
	13	fibrous eg collagen/structural component (of cells) **OR** other named example such as keratin/actin/myosin	
	14	globular eg enzyme/antibody/hormone **OR** named example	
			Max 3 (from 5)
		Total	**10**

2A

(i)	1	blood water must be kept within limits/isotonic/at the same concentration as the tissues/at normal level/at a set point	1
	2	(control involves) negative feedback	1
	3	changes/decrease in blood water detected by hypothalamus **NOT** osmoreceptors alone	1
	4	nerve messages/impulses sent to pituitary (gland)	1
	5	pituitary increases the level of ADH released/produces more ADH	1
	6	ADH transported to kidney via blood	1
	7	ADH increases the permeability of kidney tubules to water	1
	8	ADH allows more water to be reabsorbed **NOT** absorbed	1
	9	water reabsorbed by osmosis	1
	10	low/small volumes of concentrated urine produced	1
	11	blood water returns to normal level/set point/norm	1
	12	corrective mechanism switched off	1
		Max 8 (from 12)	
	C	logical order of presentation at least 5 marks scored **Both**	1
	R	no detailed mention of regulation of other factors at least 5 marks scored **Both**	1
		Total	**10**

2B

1	each (plant) community alters habitat/soil structure/soil depth/soil pH making it more suitable for next community/other species	1
2	succession is unidirectional **OR** description of at least three communities in sequence with time indicated	1
3	species diversity/biodiversity increases **OR** climax community has highest/higher species diversity/biodiversity	1
4	biomass increases **OR** climax community has highest/higher biomass	1
5	food webs become more complex **OR** climax community has more/most complex food webs	1
6	climax communities are the final/last communities produced **OR** succession proceeds until/leads to the climax community	1
	Max 4 (from 6)	
7	to provide (essential) data	1
8	ensure supply of/manage/set quotas for food/example of food species **OR** stop overfishing	1
9	ensure supply of/manage raw materials/example of raw material species	1
10	control of/limit damage caused by pest species/pest population/pests **OR** example of control of pests	1
11	pollution indicator/indicator species/biological indicator	1
12	protect/conserve endangered species **OR** prevent extinction of endangered species	1
	Max 4 (from 6)	
C	divided into sections at least 2/3 marks on succession and 2/3 on population monitoring 5 marks scored **All**	1
R	no mention of density dependence etc at least 2/3 marks on succession and 2/3 on population monitoring 5 marks scored **All**	1
	Total	**10**

[END OF MARKING INSTRUCTIONS]