2011 Biology

Advanced Higher

Marking Instructions

Advanced 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_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.

2011 Biology Advanced Higher

Marking scheme

Section A

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

Section B

Question	Acceptable Answer	Mark	Notes	Negates
1 (a) (i)	Type of symbiosis **OR** idea of close/intimate association between two **species** Host harmed and parasite benefits Benefit (to parasite) in terms of nutrition/energy/resources any 2	**2**		
(ii)	Obligate	**1**	**Not** obligative, obliged etc	
(b) (i)	Idea of checking human faeces (for parasite eggs)	**1**	**Not** urine samples, human waste **Not** check for signs of skin being penetrated	
(ii)	Health education/ideas on how to reduce infection Sanitation/prevent faeces reaching lake Drug treatment (for superspreaders) any 2	**2**	**Not** related to hygiene **Not** clean bathing water **Not** reference to cattle at lake	**If 3 or more listed,** **negate** clean bathing water **negate** reference to cattle at lake
(c) (i)	Intervention village(s) reach target/1% and control(s) don't. Use data to illustrate trends	**2**	Conclusion is between control and intervention villages Minimum data is for one village over time, no need for comparison	
(ii)	Commit to position about the results (reliable or unreliable) **and** justify appropriately, eg 'Reliable because two villages used for treatment and control', or 'not reliable because (*only*) two villages …' Reliability in relation to **error bars** – when error bars are small the reliability is better	**1**	**Not** comments that are speculative to do with sample size issues, percentages or with random variation that might be influencing the results, eg weather.	

Question	Acceptable Answer	Mark	Notes	Negates
(d) (i)	Difficult to kill them all OR **Survivors** reproduce rapidly	**1**	**Not** snails develop resistance to molluscicide	
(ii)	(Parasites still exist because) Adults long lived/still inside host Eggs still being produced Free-living parasite stages not affected	**1**		
(e)	*S.japonicum* can infect other **mammals**/can have a range of **primary** hosts (so) cattle have to be kept away from lake (and) mice can be used for test purposes	**1** **1** **1**		

Question	Acceptable Answer	Mark	Notes	Negates
2 (a)	photosynthesis **and** respiration	**1**		
(b)	12.5%	**1**		
(c) (i)	added to by human activity	**1**		
(ii)	methane/CFC/nitrous oxide/ozone	**1**	symbols are acceptable	
3 (a) (i)	earlier species **change conditions/environment** to better suit later species	**1**	accept habitat, area	
(ii)	allogenic	**1**		
(b) (i)	bioaccumulation bioconcentration	**1**		
(ii)	high toxicity so herbivores/primary consumers die OR biomagnification makes herbivores too toxic (for carnivores)/ biomagnification results in toxicity in higher trophic levels OR low productivity/too little energy to support higher levels	**1**	**Not** lower diversity hence fewer trophic levels	
(iii)	Survives high concentration of nickel while **other species** susceptible OR The **relative abundance** depends on Ni levels of soil	**1**	**Not** 'it indicates Ni concentration or serpentine rock'; must mention relative abundance	

Question	Acceptable Answer	Mark	Notes	Negates
4	1. Fundamental niche is the resources a species is capable of using/could use in the absence of competition 2. Realised niche is the resources a species actually use or available in presence of competitors 3. (Competition arises) when resources limited 4. Competitive exclusion arises from interspecific competition/when two **species** competing 5. Two **species** with the same/similar niche cannot coexist (in same location) 6. (One species will survive and) one species will die out/ local extinction	**4**	OK *organism* = species in 1,2 and 6 Accept 'food and habitat' as minimum equivalent to resources	
5 (a) (i)	(For the increase in O2 pressure 0-30 units) Myoglobin **increases** to 0.975 Haemoglobin **increases** to 0.50 both	**1**		
(ii)	curves differ/binding differs tertiary (structure) the same/similar **only** Hb has quaternary 3 points = 2 marks 2 points = 1 mark	**2**	or illustrate with correct values	
(b)	1 (less)	**1**	**Not** changed proportions	
(c)	prosthetic groups	**1**		

Question	Acceptable Answer	Mark	Notes	Negates
6 (a) (i)	hydrophilic/not lipid soluble	**1**	**Not** reference to molecule too big	
(ii)	(signal) transduction	**1**		
(b) (i)	at most/all GABA concentrations more chloride movement (with drug present)	**1**	**Not** faster Cl movement	
(ii)	change in conformation/shape (of the GABA receptor)	**1**	Use of *active* site instead of *binding* site OK but **not** referring to receptor as an enzyme. Ignore mechanisms proposed for causing change	
7 (a)	single-stranded **DNA** (bases) complementary OR strand anneals (to template)	**2**	**Not** RNA	
(b)	(gene) probes/probing (gel) electrophoresis blotting sequencing restriction digest Any 1	**1**		
(c)	(Test is negative for ΔF508 so counselling needs to warn of) other possible mutations (30%) causing CF OR low chance of having/carrying CF	**1**		

Question	Acceptable Answer	Mark	Notes	Negates
			Transfer of points between sections is allowed	
8 A (i) **(ii)**	***Organisation of genetic material*** ***Ultrastructure and other features***	**5** **10**	Annotations on diagrams must clearly convey the information required.	
(i)	Prokaryotic DNA 1. within cytoplasm/not contained in a nuclear membrane 2. exists as a circular DNA molecule/nucleoid 3. plasmids are **additional** circles/rings of DNA Eukaryotic 4. contained within a nuclear membrane 5. DNA is associated with histone/proteins 6. organised as nucleosomes/chromatin 7. (nucleosomes) coiled/condensed to form chromosomes 8. chromosomes are linear Award point 1 or 4 not both max 5 marks	**5**	Accept 'bacterial chromosome' for nucleoid **Not** scaffold proteins	

Question	Acceptable Answer	Mark	Notes	Negates
(ii)	Prokaryotic 9. ribosomes (only organelle) 10. cell wall made of peptidoglycan 11. capsule/layer of mucus (lipopolysaccharide) is protective/ is adhesive 12. pili for cell attachment/exchanging plasmids 13. flagella for movement Eukaryotic 14. name and function of one organelle from list 15. name and function of another organelle from list 16. cytoskeleton is a system of protein fibres that provide support OR movement OR movement/organisation of organelles 17. animal cells (may) have microvilli to increase surface area/absorption 18. plant cell walls made of cellulose 19. middle lamella is where plant cell walls contact (rich in pectin) 20. plasmodesmata connect cytoplasms/adjacent plant cells 21. plant cells (may) also contain – chloroplasts for photosynthesis OR vacuoles for cell sap max 10 marks	**10**	**Eukaryotic** Endoplasmic reticulum – transport of proteins/ synthesis of lipids Golgi apparatus – processing/modification/ secretion of proteins Mitochondrion – (aerobic) respiration/ATP production Lysosomes – enzymatic digestion Microbodies/peroxisomes – oxidation reactions Ribosomes – protein synthesis Nucleolus – ribosome formation 18-21 Penalise only once for missing reference to ‘plant’	‘

Question	Acceptable Answer	Mark	Notes	Negates
			Transfer of points between sections is allowed	
8 B (i)	***Interphase***	**5**		
(ii)	***Mitosis***	**5**		
(iii)	***Mutations***	**5**		
(i)	1. interphase is G_1, S, G_2 OR interphase is the period between cell divisions 2. G_1 and G_2 are growth periods OR organelles/proteins made 3. DNA replication occurs during S phase 4. G_1 checkpoint assesses cell size/mass 5. G_1 checkpoint ensures there is sufficient (mass) to make two daughter cells/to enter S phase 6. G_2 checkpoint assesses DNA replication 7. G_2 checkpoint controls entry into mitosis 8. ensuring each daughter cell receives a complete genome/'set' of DNA max 5 marks	**5**	Increase in mass is equivalent to growth	
(ii)	9. spindle fibres are microtubules 10. correct description of one phase of mitosis – as in notes 11. as above 12. M/metaphase checkpoint controls entry to **anaphase** 13. ensures chromosomes are aligned correctly (on the equator) OR ensures each daughter cell receives correct number of chromosomes/chromatids 14. mitosis promoting factor (MPF) needed for entry to mitosis OR MPF is a protein 15. cytokinesis is the division of the cytoplasm/separation into two cells max 5 marks	**5**	prophase = chromosomes visible as two chromatids metaphase = chromosomes/chromatid pairs attach to spindle/line up on metaphase plate anaphase = spindle fibres pull/separate the chromatids to opposite poles telophase = chromatids de-condense	

Question	Acceptable Answer	Mark	Notes	Negates
(iii)	16. proto-oncogenes/proliferation genes stimulate cell division 17. proto-oncogenes mutate to oncogenes 18. oncogenes stimulate excessive/abnormal cell division/ tumour formation 19. tumour suppressor genes/anti-proliferation genes inhibit cell division 20. tumour supressors act at checkpoints 21. (tumour suppressor) mutation results in loss of inhibition/ loss of control of division 22. oncogenes are dominant and in tumour suppressor genes, **mutations** are recessive OR only single oncogene mutation required whereas two tumour suppressor mutations required max 5 marks	**5**	**Not** regulate	

Section C: Biotechnology

Question	Acceptable Answer	Mark	Notes	Negates
1 (a)	Antibiotic **and** type of organism penicillin and *Penicillium*/fungus OR Correct antibiotic and *Streptomyces*/bacterium OR other (see notes)	**1**	**Organism** / **Antibiotic** Bacillus licheniformis – bacitracin C.acremonium – cephalosporin Nocordia uniformis – norcardins S. caespitosus – actinomycins S. antibioticus – mitomycin S. erythreus – erythromycin S. griseus – streptomycin, cycloheximide S. virginae – virginiamycin S. ramosus – oxytetracycline S. clavuligerus – cephamycin	
(b) (i)	So that only a single species/strain is used to prepare the inoculums OR idea of pure culture OR uncontaminated culture	**1**		
(ii)	Area X	**1**		
(c)	dissolve oxygen/aerate OR to achieve distribution of nutrients/fungal cells/heat energy/efficient mixing	**1**		

Question	Acceptable Answer	Mark	Notes	Negates
(d)	filtration/ultrafiltration addition of salt to a penicillin rich solvent precipitation from solvent/flocculation centrifugation crystallisation	**1**		
(e)	production starts as glucose is (nearly) exhausted OR lag period 0-1.5 days before production begins	**1**		
	production begins towards end of active growth/exponential phase OR production begins as stationary phase is entered/growth plateaus	**1**		

Question	Acceptable Answer	Mark	Notes	Negates
2 (a)	Mouse injected with antigens Production of B-cells triggered/activated (B-cells) isolated from spleen any 2	**2**	**Not** blood	
(b)	Polyethylene glycol/PEG	**1**		
(c)	Any one from: • mAbs bind to cancer cell-specific antigens • immune response against target cancer cell triggered OR body destroys its own cancer cells • delivery of radiation directly to tumours (radioactive molecule can be attached to mAb) • delivery of attached toxin to destroy cancer cell • treatment of breast cancer using herceptin • mAb can prevent growth of cancer cells (by blocking growth receptors)	**1**		
3	1. cell walls reduce yield 2. composition/component: pectin, cellulose, araban – any 2 3. cellulose tough/causes difficulty with breaking open cells OR cellulose makes mechanical extraction difficult 4. pectin increases viscosity/causes difficulty with filtration 5. pectin/araban cause haze/cloudiness 6. first example of enzyme used to break down the wall materials 7. second example 8. low solubility issues of araban and pectin	**5**	From list below: cellulase breaks down cellulose OR increases yield; pectinase breaks down pectin OR decreases viscosity/decreases haze; arabanase breaks down araban OR decreases haze	

Question	Acceptable Answer	Mark	Notes	Negates
4 (a)	Living cells only	**1**		
(b) (i)	1.25% and 2.5%	**1**		
(ii)	same initial concentration of colony forming units/same viable count added to each dilution	**1**		
(iii)	9 million cells	**1**		

Section C: Animal Behaviour

Question	Acceptable Answer	Mark	Notes	Negates
1 (a) (i)	15	**1**		
(ii)	they break more easily OR less (total) height needed to break them it takes fewer drops to break them shorter handling time less time/energy to break shells	**1**	**Not** about net energy gain	
(b)	optimal foraging maximises net energy gain	**1**		
	it gives the lowest **total** height needed to break a whelk the least energy expenditure in flight at this height	**1**		
(c)	Encounter rate (of prey by predator)/search time	**1**		
2	1. nature = behaviour that is innate/instinct/genetically determined OR nature allows stereotyped response to stimuli 2. nurture defined as behavioural modification/learning 3. nature eg: any example of instinctive behaviour 4. nurture eg: imprinting/habituation/cultural transmission OR description of species and behaviour 5. (adult) invertebrates generally have a shorter **lifespan** than primates ***** 6. long lifespan gives time for learning 7. short lifespan entails reliance on innate behaviour OR invertebrates rely on innate behaviour 8. invertebrate **parental care** is rare ***** 9. primates rely more on nurture **than do invertebrates**	**5**	nurture = learning * converse applies single gene effects, taxes, kineses, reflexes	

Question	Acceptable Answer	Mark	Notes	Negates
3 (a) (i)	Healthy females produce many eggs Brood pouch filled faster/reduced mating time Reduced predation risks Increase in number of eggs fertilised any 2	**2**	**Not** less chance of young being infected OR preventing infection OR producing healthier eggs	
(ii)	Genes allow more copies to pass into next generation Genes more likely to be passed on to next generation Genes are self-preserving Genes assist survival of the male fish any 1	**1**	**Not** about the male fish being selfish	
(b)	Nutrition of young in brood pouch/carrying young Providing parental care any 1	**1**		
(c)	Males do not avoid other males with black spots	**1**		
(d)	Fish with solvent only	**1**		
(e)	Males are not influenced by displays/stimuli that females might show if they saw the males	**1**		

Question	Acceptable Answer	Mark	Notes	Negates
4 (a)	(On average) they share half of their genes/genetic material OR The chances of sharing a gene are 0.5/50%	**1**	**Not** half DNA from each parent	
(b) (i)	Genes for altruism will spread when rB-C>0 OR helping relatives is beneficial when rB-C>0	**1**	rB>C	
(ii)	(Three) groups of most related have highest cannibalism OR no correlation	**1**	**Not** cannibalism absent where relatedness is below 0.25	

Section C: Physiology, Health and Exercise

Question	Acceptable Answer	Mark	Notes	Negates
1	Describe how atherosclerosis can lead to myocardial infarction. 1. deposition of fatty materials/plaque forms/atheroma forms 2. (atheroma) **under** lining layer/endothelium/intima **of artery** 3. platelets attach to rough surface/platelets release clotting factors OR thrombus/clot forms at site of plaque 4. clot/embolus/atheroma can block/narrow vessel 5. **blockage** of <u>coronary artery</u> (results in MI) 6. heart muscle cells/tissue **die** beyond blockage OR heart muscle (cells) **die** from lack of oxygen	**4**	Ignore excessive detail about the *formation* of plaque Fatty material = LDL/cholesterol **Not** *on* the artery wall **Not** in the lining *in* artery wall is OK Lumen = vessel	
2 (a)	**increase** exercise **reduce** intake of fatty foods	**2**	If more than two given, mark the first two.	
(b) (i)	<u>5.9</u> (mmol/l)	**1**		
(ii)	LDL has been reduced (to 2.9)/LDL now within normal range Total cholesterol is reduced/now about normal Total cholesterol/HDL ratio reduced/now about normal (3.1) any 2	**2**	High **L**DL increases risk and High **H**DL reduces risk HDL:LDL ratio **increases** (from 0.32 to 0.62) is acceptable	
(iii)	32.7% OR (about) 33% (1.8/5.5)	**1**	30% of 5.5 = 1.65; value achieved is 1.8, ie greater than 30%	

Question	Acceptable Answer	Mark	Notes	Negates
3 (a)	pancreas/islets/Beta cells **detect** glucose **and** insulin secretion (increases)	**1**		
	(Glucose level is reduced when) cells in liver/muscle/adipose tissue (increase) uptake glucose OR glucose is converted to/stored as glycogen	**1**	Produce more glucose transporters = increased uptake **Not** suggestion that insulin is an enzyme	
(b) (i)	fewer receptors **active/functioning/responding** to insulin OR receptors do not recruit glucose transporters to the membrane	**1**	**Not** receptors *worn out*	
(ii)	obesity is cause (of insulin resistance/Type 2 diabetes) high W:H/this ratio is an indicator for obesity (so worth reducing it) OR (reducing ratio) will reduce obesity/%body fat/BMI	**1** **1**	Reducing this will cause obesity level to fall and obesity is linked to type 2 diabetes.	

Question	Acceptable Answer	Mark	Notes	Negates
4 (a)	(Sporting activities) increase bone mass/bone density/ bone mineral density (BMD) OR osteoporosis takes longer to develop because BMD is higher	**1**		
	greatest bone mass achieved when young/by age of 30/in adolescence OR gives higher BMD before age-related loss	**1**		
(b) (i)	These are most common fracture sites in elderly/those with osteoporosis	**1**		
(ii)	not a weight bearing exercise **and** allows comparison with the others OR to demonstrate that **only** weight bearing exercise is effective	**1**		
(iii)	(Sample data eg) size of sample, replication OR **variation** in BMD/age between subjects OR idea of measuring error, eg error bars	**1**	**Not** male data required **Not** data for other bone areas	

[END OF MARKING INSTRUCTIONS]