National
Qualifications
2018

2018 Biology

Advanced Higher

Finalised Marking Instructions

General marking principles for Advanced Higher Biology

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 detailed marking instructions, which identify the key features required in candidate responses.

(a) Marks for each candidate response must **always** be assigned in line with these general marking principles and the detailed marking instructions for this assessment.

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

(c) 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 should seek guidance from your Team Leader.

(d) There are no half marks awarded.

(e) Where a candidate makes an error in the first part of a question, credit should normally be given for subsequent answers that are correct with regard to this original error. Candidates should not be penalised more than once for the same error.

(f) Unless a numerical question specifically requires evidence of working to be shown, full marks should be awarded for a correct final answer (including units) on its own.

(g) Larger mark allocations may be fully accessed whether responses are provided in continuous prose, linked statements or a series of discrete developed points.

(h) In the detailed marking instructions, if a word is **underlined** then it is essential; if a word is **(bracketed)** then it is not essential.

(i) In the detailed marking instructions, words separated by / are alternatives.

(j) A correct answer can be negated if:
- an extra, incorrect, response is given;
- additional information that contradicts the correct response is included.

(k) Where the candidate is instructed to choose one question to answer but instead answers both questions, both responses should be marked and the better mark awarded.

(l) The assessment is of skills, knowledge and understanding in Biology, so marks should be awarded for a valid response, even if the response is not presented in the format expected.
For example, if the response is correct but is not presented in the table as requested, or if it is circled rather than underlined as requested, give the mark.

(m) Unless otherwise required by the question, use of abbreviations (eg DNA, ATP) or chemical formulae (eg CO_2, H_20) are acceptable alternatives to naming.

(n) 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.

(o) Incorrect spelling is given. Sound out the word(s),

- if the correct word 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 terms then do not give the mark, eg mellum, melebrum, amniosynthesis.

(p) Marks are awarded only for a valid response to the question asked. For example, in response to questions that ask candidates to:

- **identify**, **name**, **give**, or **state**, they need only name or present in brief form;
- **describe**, they must provide a statement or structure of characteristics and/or features;
- **explain**, they must relate cause and effect and/or make relationships between things clear;
- **compare**, they must demonstrate knowledge and understanding of the similarities and/or differences between things;
- **calculate**, they must determine a number from given facts, figures or information;
- **predict**, they must suggest what may happen based on available information;
- **evaluate**, they must make a judgement based on criteria;
- **suggest,** they must apply their knowledge and understanding of Biology to a new situation. A number of responses are acceptable: marks will be awarded for any suggestions that are supported by knowledge and understanding of Biology;
- **account for,** they must give a reason or reasons for a particular action, event, observation, change, or state**.**

Marking instructions for each question

Section 1

Question	Answer	Max mark
1.	A	**1**
2.	B	**1**
3.	D	**1**
4.	B	**1**
5.	D	**1**
6.	A	**1**
7.	D	**1**
8.	A	**1**
9.	B	**1**
10.	C	**1**
11.	B	**1**
12.	D	**1**
13.	B	**1**
14.	A	**1**
15.	B	**1**
16.	C	**1**
17.	C	**1**
18.	B	**1**
19.	C	**1**
20.	B	**1**

Question	Answer	Max mark
21.	D	**1**
22.	C	**1**
23.	C	**1**
24.	D	**1**
25.	A	**1**

Section 2

Question			Expected response	Max mark	Additional guidance
1.	(a)		All/most binding sites/GLUT transporters filled/occupied. **OR** Transporters (have specific binding sites for transported substance so) can be saturated.	**1**	Idea of binding to transporter being at its maximum. Accept: converse
	(b)		(Glucose) transport/uptake highest (in GLUT 3) at low (glucose) concentrations. **OR** Reaches V_{max} at the lowest concentration. **OR** (GLUT 3 has the lowest K_M so) it takes a small amount/lowest amount of substrate to reach saturating concentration/fill all the binding sites.	**1**	
	(c)	(i)	V at K_M = 0·02mmol/min so V_{max} = 0·04mmol/min $V = \frac{(0{\cdot}04 \times 5{\cdot}5)}{(17 + 5{\cdot}5)}$ $= 0{\cdot}0098/9{\cdot}8 \times 10^{-3}$ (mmol/min)	**2**	one mark can be awarded if: • incorrect V_{max} used • V= 8·31 (17 has been doubled in place of 0·02) • V= 4·16 (17 has been used in place of 0·04) • V= 0·0049 (0·02 has been used in place of 0·04) Accept 0·01 Incorrect rounding = 1 mark penalty
		(ii)	Response/insulin production is only to high glucose concentrations (or converse). **OR** (High K_M ensures) glucose uptake high/increasing only at high glucose concentration.	**1**	

Question			Expected response	Max mark	Additional guidance
1.	(d)		(Insulin) **receptors** lose sensitivity **(1)** GLUT4 not recruited **OR** GLUT4 not transported to membrane (from intracellular stores). **(1)**	**2**	Lose sensitivity = loss of receptor function = do not respond Accept idea of: fewer
	(e)		As caffeine concentration increases the uptake of glucose decreases (then levels off).	**1**	concentration = Units as per axis label
	(f)		6µmol (of caffeine) far too small to have an effect (on glucose uptake). **OR** No effect/not much effect as much higher concentrations are needed to give significant inhibition.	**1**	

Question			Expected answer(s)	Max mark	Additional guidance
2.	(a)	(i)	Cooperativity/cooperative binding	**1**	**NOT:** cooperation
		(ii)	(Acid/lower pH means) **Lower** affinity for/binding to oxygen in haemoglobin (so greater release of oxygen).	**1**	Haemoglobin = Hb/HB
		(iii)	Prosthetic group	**1**	
	(b)	(i)	Malaria	**1**	
		(ii)	(Drugs) reduce the formation/production of haemozoin **OR** (Toxic) haem builds up **OR** Prevents the conversion of the haem **OR** Inhibits HDP/production of HDP. **(1)** Haem kills the parasite. **(1)**	**2**	Reduce=Inhibit=prevent=slow haem = toxic product

Question			Expected answer(s)	Max mark	Additional guidance
3.	(a)	(i)	Resting (potential)	**1**	
		(ii)	100 mV	**1**	Units essential
		(iii)	(K^+ ion concentration is greater inside the cell than outside so K^+) ions flow **out** of the cell/in opposite direction **(1)** and return (membrane) to resting potential **OR** Restores membrane potential/polarity/repolarisation. **(1)**	**2**	**NOT:** reference to Na^+ ions
	(b)		Blocks/damages (voltage-gated)Na^+ channel **OR** prevents (voltage-gated) Na^+ channel opening.	**1**	**NOT:** reference to ligand-gated **NOT:** prevents nerve transmission alone
4.	(a)	(i)	Quaternary (structure)	**1**	
		(ii)	Hydrophobic/non-polar	**1**	
	(b)		Different (combinations of) exons are included in the mRNA/spliced together **(1)** Result in different sequences of amino acids/R-groups **OR** Results in different folding/ bonding/conformation/structure. **(1)**	**2**	Coding regions = exons Amino acid sequence = primary structure R-group sequence = R-group interactions Conformation = shape
	(c)		(Binding) changes the conformation (of the receptor/protein).	**1**	Conformation = shape
	(d)		Positive modulator **OR** (Allosteric) activator **OR** agonist.	**1**	

Question			Expected answer(s)	Max mark	Additional guidance
5.	(a)		Tubulin	**1**	
	(b)		MTOC/microtubule organising centre/ centrosome.	**1**	
	(c)	(i)	Negative control **OR** To show results without treatment/ antibody (for comparison). **OR** To show the effect is due to the antibody/not due to the buffer.	**1**	Ignore reference to pH NOT just; as a comparison to cells with antibody
		(ii)	Cytoplasmic dynein plays a role (in spindle formation) in prophase/before metaphase/not in metaphase and anaphase. **OR** There may be a critical level of cytoplasmic dynein required (for mitosis to proceed).	**1**	
	(d)		Cytokinesis	**1**	
6.	(a)	(i)	Remission/cure brought about because of product/Vivafel.	**1**	**IGNORE:** mechanism of action
		(ii)	ANY ONE from: • no control/evidence of cat without treatment • no control of confounding variables.	**1**	**NOT**: no repeats/replicates **NOT:** only treats bone cancer Mention of amputation requires clarification as to impact.
	(b)		Cats will not have expectations/understanding of treatment/psychological effect not possible.	**1**	
	(c)	(i)	(Refinement) – harm minimized/reduced **OR** (Reduction) – minimum cat numbers for validity **OR** **owner** gives informed consent/can withdraw cat.	**1**	2R's need exemplifying **NOT** replacement
		(ii)	The treatment/Vivafel will have no effect on cancer (in the subjects).	**1**	Must refer to cancer

Question			Expected answer(s)	Max mark	Additional guidance
7.			**ANY TWO FROM:** 1. (Representative) sample should have same mean as population. 2. (Representative) sample should have same degree of variation about the mean as population. 3. Sample size bigger in more variable populations (to be reliable) **OR** 4. Greater reliability with larger/more numerous samples. 5. Reliable sampling – similar/consistent values obtained. MAX 2 MARKS **AND** **ANY TWO FROM:** 6. Sampling: random/randomised – all individuals have equal chance of being selected/avoid selection bias. 7. Sampling: systematic/systematically – individuals selected at regular intervals. 8. Sampling: stratified – population divided into categories and sampled proportionately. 9. Naming of; Random, Systematic and Stratified sampling. MAX 2 MARKS	4	Pts. 5-7 If sampling strategies only described, penalise once for lack of name. Pt. 8 **only** awarded if none of pts 5-7 awarded.

Question			Expected answer(s)	Max mark	Additional guidance
8.	(a)		(Longer-necked animals obtain better feeding so) survival increased/selective advantage. **(1)** Improved fitness/more surviving offspring. **(1)**	**2**	Answer must be comparative for both marks to be awarded. Penalise once for no comparison.
	(b)		Increased competition for (reduced number of) trees. **OR** Increased selection pressure for long(er) necks.	**1**	
	(c)	(i)	Longer-necked (male) giraffes have better success in male-male rivalry, so get a mate/access to females/to reproduce.	**1**	
		(ii)	If NFS hypothesis were supported: only males would have long necks **OR** females would have shorter necks. **OR** If NFS hypothesis not supported: females have long necks but do not use them for fighting.	**1**	

Question			Expected answer(s)	Max mark	Additional guidance
9.	(a)		Males/half the population not able to produce offspring. **(1)** (Only) half of each parent's genome passed to offspring. **OR** Successful genomes disrupted. **(1)**	**2**	Accept: reproduce = able to produce offspring **NOT:** genes or traits
	(b)		Sexual reproduction increases variation. **(1)** To keep/maintain resistance to/tolerance of parasites **OR** To allow co-evolution between snail and parasite. **(1)**	**2**	Accept: description of co-evolution - must be in context of question
	(c)		Parasites (of these snails) absent/low density (in non-native habitats) **OR** (Parthenogenesis more common when) parasite density low.	**1**	

Question			Expected answer(s)	Max mark	Additional guidance
10.	(a)		80(nm)	**1**	Units not required (in stem)
	(b)		(The virus): Does not use /have reverse transcriptase. **OR** Does not use RNA (as a template) to produce DNA. **OR** Does not integrate DNA into host (DNA).	**1**	Accept: Converse argument. Accept: virus does not convert RNA into DNA
	(c)		(destruction of cell by) digestive enzymes/proteinases/ proteases/caspases/DNAases.	**1**	
	(d)		Each new (viral) mutation would require a new vaccine **OR** vaccine antigens no longer match (virus) antigens **OR** once mutations occur, existing vaccines become ineffective **OR** vaccines might not contain all versions of the (target/viral) antigen/protein.	**1**	**NOT:** drug = vaccine

Question			Expected answer(s)	Max mark	Additional guidance
10.	(e)		AGREE or DISAGREE must be stated or clear from answer. AGREE: Trials with randomised control groups would be slower so more people would die (and this would be unethical). If treatment 'successful', control group would have higher death rate (and this would be unethical). DISAGREE: Evidence without a control group is weak/invalid. Safety/harm issues may only be revealed by presence of control group.	**1**	Idea of: individuals of control group will die
	(f)		Reduce overcrowding **OR** increase awareness of disease/ education **OR** (measures to prevent transmission) protective clothing/quarantine/improved sanitation **OR** reduced contact with (infected) wildlife (eg bushmeat)/control infection in wildlife.	**1**	**IGNORE:** reference to vectors

Question			Expected answer(s)	Max mark	Additional guidance
11.	A	(i)	Realised and fundamental niche 1. Niche defined as the multi-dimensional summary of the tolerances and requirements of a species. 2. Fundamental niche is that occupied in the absence of interspecific competition. 3. Realised niche is that occupied in response to interspecific competition. 4. Where two realised niches are (very) similar competitive exclusion may occur/one species may become locally extinct. 5. Resource partitioning may allow species with sufficiently different realised niches to co-exist. **Any 3**	**3**	Pts 2. and 3. • **NOT** intraspecific (penalise only once) • The term interspecific must be used once. • Accept description of competition in context of resources used.
		(ii)	Features of parasite niches a. Parasites (are symbionts that) gain resources/nutrients at the expense of their host. b. (Often) narrow niche **and** host specificity. c. (So) parasites **can be** degenerate. d. Ectoparasites live on (the surface of) their host. e. Endoparasites live within their host. f. Definitive host – on/in which parasite reaches sexual maturity/produces gametes/undergoes sexual reproduction. g. Intermediate host – also required to complete parasite's lifecycle. h. Some parasites require/use a vector for transmission. **Any 6**	**6**	Pt a. • **NOT** just 'benefit' Pt c. • Accept: description of degenerate • **NOT**: degenerative Pt f. • definitive = primary Pt g. • Accept completing developmental stages of lifecycle • Intermediate = secondary • **NOT**: where asexual reproduction takes place

Question			Expected answer(s)	Max mark	Additional guidance
11.	B	(i)	The activity of homologous chromosomes 1. (Homologous chromosomes) have the same size/centromere position/genes at same loci. 2. Pairing of (homologous chromosomes). 3. Chiasmata form where chromosomes/(non-sister) chromatids touch. 4. Chromatids break and rejoin **OR** crossing over occurs. 5. Exchange of DNA between (homologous) chromosomes/ non-sister chromatids. 6. (Leads to) new combinations of/recombination of alleles (of linked genes). 7. (Homologous chromosome pairs) line up randomly on spindle/equator/metaphase plate. 8. Independent assortment. 9. **Separation** of parental chromosomes irrespective of maternal and paternal origin. **Any 7**	**7**	Pt 1. Length = size Pt 2. Idea of active process Pt 5. **NOT**: Shuffling
		(ii)	Meiosis II a. Chromosomes line up **singly** on equator. b. (Sister) chromatids/chromosomes separate. c. (And are) randomly distributed to the daughter cells/gametes. d. (Four) haploid gametes formed. **Any 2**	**2**	Pt b. separate = pulled apart

[END OF MARKING INSTRUCTIONS]