National Qualifications 2019

2019 Biology

Advanced Higher

Finalised Marking Instructions

SQA

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 <u>**underlined**</u> 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_2O) 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	Response	Mark
1.	B	1
2.	C	1
3.	D	1
4.	D	1
5.	C	1
6.	B	1
7.	D	1
8.	A	1
9.	C	1
10.	C	1
11.	A	1
12.	D	1
13.	B	1
14.	D	1
15.	B	1
16.	D	1
17.	C	1
18.	A	1
19.	B	1
20.	C	1
21.	D	1
22.	A	1
23.	D	1
24.	A	1
25.	A	1

Section 2

Question			Expected response	Max mark	Additional guidance
1.	(a)		No - does not support. (no mark) squid of similar mantle length have different age/number of rings **OR** squid with similar age/number of rings have different mantle length **OR** some younger squid are larger than older squid	1	as age increases, mantle length doesn't always increase any data points must be a range for one mantle length and/or for one age *no correlation* or *no trend* not sufficient
	(b)		review (articles)	1	
	(c)	(i)	water allows sperm to reach eggs	1	**ACCEPT**: water allows gametes to reach each other Must refer to water
		(ii)	large number of gametes required **OR** loss of (many) gametes/offspring **OR** low(er) chance of fertilisation	1	
	(d)	(i)	(males with greater mantle length) produce longer/larger spermatophores	1	**ACCEPT**: as mantle length increase, spermatophore length increases. positive correlation between mantle length and spermatophore length
		(ii)	No – **some** males with large mantle length produced fewer spermatophores than males with small mantle length **OR** Yes – **weak** positive correlation between mantle length and number of spermatophores	1	**NOT**: no correlation
	(e)	(i)	March	1	
		(ii)	**increase** in proportion of stage 1 from March to April	1	Idea of connection from March to April. **NOT**: reference to *number* alone.
		(iii)	(increased) migration/(higher levels of) predation/shortage of food/ disease/environmental catastrophe	1	

Question			Expected response	Max mark	Additional guidance
2.	(a)	(i)	(an antibody) produced by/derived from a cell line/single (clone of) cell(s) **OR** an antibody that recognises/binds to a single epitope/**part of** antigen	**1**	hybridoma = single cell **ACCEPT:** same paratope/antigen binding site/CDRs
		(ii)	PEG/polyethylene glycol	**1**	
	(b)		plate/well not washed (adequately) at stage 5/after stage 4/after antibody added **OR** unbound antibody present **OR** antibody not washed away	**1**	**NOT:** reference to washing at stage 3 **NOT:** cross contamination **NOT:** reference to lack of antibody specificity
	(c)		pH affects the solubility/structure of proteins **OR** pH would affect interactions between R groups **(1)** (an insoluble protein/protein with changed structure) will have reduced affinity for/binding to antigens/substrate **(1)**	**2**	proteins = antibodies = enzymes structure = shape = conformation **ACCEPT:** protein **may** denature (outwith optimum pH)
	(d)		immune response/fighting parasitic infection uses energy so less available for milk production **OR** parasite is using energy so less available for milk production	**1**	

Question			Expected response	Max mark	Additional guidance
3.	(a)	(i)	retinal	1	
		(ii)	higher/high (degree of) amplification	1	**ACCEPT:** description of amplification eg one photon stimulates/activates hundreds/many G proteins which stimulate many enzymes
		(iii)	absorbs light to pump protons/H⁺ **(1)** to generate a potential difference **OR** to generate a proton/ion gradient **(1)**	2	must **imply** active process generate = maintain
	(b)		different forms/structure of opsin (combining with retinal)	1	
	(c)		crab rhodopsin maximum absorbance at 490nm, octopus maximum at 450nm **(1)** 450nm can penetrate deeper into water than 490nm **(1)** <u>1 mark only can be awarded for:</u> octopus maximum absorbance is 450nm, (which is the only wavelength) that can penetrate to deep water/beyond 200 m **(1)**	2	range maximum absorbance for crab 480-500nm range maximum absorbance for octopus 440-460nm

Question			Expected response	Max mark	Additional guidance
4.	(a)		hydrophobic/non-polar	**1**	
	(b)	(i)	ligand	**1**	
		(ii)	(binding to protein causes) conformational change	**1**	
	(c)	(i)	addition of phosphate group/ phosphorylation	**1**	
		(ii)	(constantly active kinase) leads to **constant** phosphorylation of CFTR **(1)** (ion) channel constantly/always/ more often open **OR** (ion) channel open for longer **OR** (leads to) increased movement of Cl⁻ ions **out** of cell **(1)**	**2**	constant = repeated = permanent

Question			Expected response	Max mark	Additional guidance
5.	(a)		study of the outbreak/occurrence **AND** spread/distribution of (infectious) diseases	**1**	
	(b)		people may not recall correctly/may give false information	**1**	idea of the data not being accurate false information = lie = untruthful
	(c)	(i)	small number of participants **OR** (sample may be biased) gender/age/ BMI/underlying disease	**1**	
		(ii)	(sample is) not representative	**1**	**ACCEPT**: sample does not have same mean/degree of variation about the mean as the population (as a whole)
	(d)		data/results for six servings per day are **more** variable	**1**	variable = wider range of values
	(e)		(observational studies) cannot show causation **OR** **effect** may be **caused by** an uncontrolled (confounding) variable(s)/factor(s)	**1**	caused = influenced by = due to

Question			Expected response	Max mark	Additional guidance
6.			1 ethogram is a list of behaviours 2 (measure) latency - time (interval) between stimulus and response 3 (measure) frequency - how often (specific) a behaviour occurs (in given time) 4 (measure) duration - how long (specific) behaviour lasts 5 latency, frequency, and duration 6 construct time/activity budget (to allow comparison) 7 **avoid** anthropomorphism **max 4 marks**	**4**	Pt 5: only awarded if Pts 2, 3, and 4 not awarded

Question			Expected response	Max mark	Additional guidance
7.	(a)	(i)	they are involved in a close/intimate association **AND** are two/different species.	**1**	**NOT**: two types of organism
		(ii)	the parasite reaches **sexual** maturity/carries out sexual reproduction (within the cricket)	**1**	
	(b)	(i)	it allows transmission (of the parasite)	**1**	allows parasite to reach host larvae ≠ host
		(ii)	any correct example of behaviour modification of host; eg (alteration of) foraging, sexual behaviour, habitat choice, anti-predator behaviour.	**1**	**ACCEPT:** relevant description of behaviour change, but it must link to behaviour list in expected answer. **NOT**: movement
	(c)		monogamy/monogamous	**1**	
	(d)		arthropoda/arthropods	**1**	

Question			Expected response	Max mark	Additional guidance
8.	(a)	(i)	inflammatory (response)/ inflammation **OR** phagocytosis **OR** apoptosis	1	**ACCEPT:** • phagocytes engulfing/destroying • abnormal/infected cells • viruses/pathogen natural killer cells destroying abnormal/infected cells
		(ii)	(rapid) change/variation of antigen/ **surface** proteins **(1)** appropriate antibodies/memory cells won't be present **OR** (new vaccine) must contain **new** antigens/trigger **new** antibody production **(1)**	2	
	(b)	(i)	virulence	1	
		(ii)	$1{\cdot}1 \times 10^9$ **OR** 1 100 000 000	1	

Question			Expected response	Max mark	Additional guidance
9.	(a)		(an organism that) has both male and female reproductive/sex organs/tissues/structures/systems	**1**	
	(b)		sexual dimorphism	**1**	
	(c)		competition/parasitic infection	**1**	**NOT**: parasitism, or parasite alone
	(d)	(i)	due to different numbers (of females/fish) in each group/ treatment **AND** (the female/fish in each group) might have increased in size/grown by different amounts	**1**	
		(ii)	(females from treatment group 2) grew more (than those from treatment group 1)	**1**	must be comparative
		(iii)	(greater size an advantage in) protecting females **OR** getting larger/defending territories **OR** male-male rivalry	**1**	

	Question		Expected response	Max mark	Additional guidance
10.	A	(i)	hydrophilic signalling molecules include: 1. neurotransmitters 2. peptide/protein hormones 3. receptor is specific 4. receptors are transmembrane proteins 5. binding (to receptor) at cell surface/ plasma membrane 6. binding to receptor causes conformational change 7. bringing about a response/change inside the cell 8. **and** 9. ANY **TWO** EXAMPLES FROM: hydrophilic/transduced signals; • activate enzymes/phosphorylation • activate G-protein • promote rearrangement of the cytoskeleton • change secretion or uptake of molecules • activate proteins that regulate gene transcription **Any 6**	6	Pt.4 cell = plasma
		(ii)	a. binding of insulin to its receptor triggers GLUT-4 recruitment (to cell membrane) b. in fat and muscle cells c. type 1 diabetes is reduced/lack of insulin production **OR** type 2 diabetes is loss of insulin receptor function/sensitivity/ response d. (failure to recruit GLUT-4 so) impaired glucose uptake (into fat and muscle cells) e. type 2 diabetes associated with obesity f. exercise increases GLUT-4 recruitment **Any 4**	4	Pt.a triggers=promotes=activates recruitment=transport to the cell membrane Pt.e insulin insensitivity = type 2 diabetes

Question			Expected response	Max mark	Additional guidance
10.	B	(i)	1. lack of **control** of cell cycle can result in degenerative disease/cancer	6	
			2. phases are G1, S, G2, M		
			3. G1 and G2 are growth phases		Pt.3 other phases mentioned negates
			4. DNA replication in S phase		Pt.4 synthesis = replication
			5. mitosis and cytokinesis in M/mitosis phase		
			6. checkpoints at G1, G2, M		Pt.6 metaphase = M
			7. checkpoints regulate progression to next phase		
			8. example of what is being assessed at a checkpoint		Pt.8 examples: G1 size/mass G2 DNA replication success M chromosome alignment at metaphase plate Pt.9 **NOT**: G0 checkpoint
			9. at G1 cells may enter G0/non-dividing state **Any 6**		
		(ii)	a. cyclins accumulate (during G1)	4	
			b. cyclins combine with cyclin-dependent kinases (Cdks)		
			c. cyclins activate Cdks		
			d. (active) CdKs phosphorylate proteins that stimulate the cell cycle		Pt.d **NOT**: regulate
			e. if sufficient threshold of phosphorylation, cell cycle progresses/passes checkpoint **OR** Insufficient phosphorylation, cell cycle arrested/held at checkpoint		
			f. retinoblastoma/Rb (protein)/ transcription factor inhibitor controlled by/phosphorylated by (G1) Cdk **Any 4**		

[END OF MARKING INSTRUCTIONS]