National
Qualifications
2024

2024 Biology

Higher – Paper 1

Question Paper Finalised Marking Instructions

These marking instructions have been prepared by examination teams for use by SQA appointed markers when marking external course assessments.

Marking instructions for each question

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

[END OF MARKING INSTRUCTIONS]

National
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2024

2024 Biology

Higher – Paper 2

Question Paper Finalised Marking Instructions

These marking instructions have been prepared by examination teams for use by SQA appointed markers when marking external course assessments.

Marking Instructions for each question

Question			Expected response	Max mark	Additional guidance
1.	(a)		Translation **(1)** ribosome **(1)**	**2**	NOT cytoplasm
	(b)	(i)	1800	**1**	
		(ii)	alternative (RNA) splicing	**1**	NOT splicing
	(c)	(i)	his/histidine	**1**	
		(ii)	(results in a premature) stop codon **(1)** protein would be shorter **OR** protein would contain fewer amino acids **(1)**	**2**	NOT short protein NOT non-functional or different protein
2.	(a)		3187.5	**1**	
	(b)	(i)	deletion **(1)** duplication **(1)**	**2**	
		(ii)	protein is not made/missing **OR** gene is not expressed **OR** gene that codes for protein is removed	**1**	NOT non-functional/different protein is made
	(c)	(i)	gene/section of chromosome is added from/to homologous chromosome	**1**	
		(ii)	beneficial/advantageous mutations can occur in one copy of the gene **(1)** while the other copy of the gene can still be expressed **OR** while the other copy of the gene can still code for protein **(1)**	**2**	

Question			Expected response	Max mark	Additional guidance
3.	(a)	(i)	Phylogenetics	**1**	
		(ii)	fossils **(1)** sequence data **(1)**	**2**	
	(b)	(i)	computer/statistical	**1**	
		(ii)	they have a more recent common ancestor **OR** they diverged more recently **OR** there are fewer differences in their base sequences	**1**	
4	(a)		citric acid cycle	**1**	
	(b)	(i)	induced fit	**1**	
		(ii)	fumarate leaves so succinate can bind to the active site	**1**	
	(c)		**Type of inhibition:** Competitive **(1)** **Justification:** malonate/it has a similar shape/structure to succinate **OR** malonate/it is complementary to the active site **(1)**	**2**	NOT malonate has a similar shape to the active site

Question			Expected response	Max mark	Additional guidance
5.	(a)		concentration/mass of glucose in media **OR** type/age/surface area of muscle/tissue	**1**	NOT amount/quantity of glucose/muscle/tissue
	(b)	(i)	2.3/2.33/2.333… / $2\ ^{1}/_{3}$	**1**	
		(ii)	42	**1**	
	(c)		• good supply of glucose/oxygen • for respiration • provides ATP/energy required for temperature regulation/homeostasis **(Any 2)**	**2**	
	(d)		shivering **(1)** muscle contraction generates heat **(1)** **OR** vasoconstriction/narrowing of blood vessels **(1)** less blood flow to skin so less heat is lost **(1)** **OR** hair erector muscles contract/ hair raises **(1)** traps an insulating layer of air **(1)**	**2**	NOT blood vessels move away from the skin

Question			Expected response	Max mark	Additional guidance
6.	(a)	(i)	Any value from 5 to 5.2	**1**	
		(ii)	decreased heart/breathing/metabolic rate **OR** decreased oxygen consumption/CO_2 production/respiration/metabolic rate	**1**	NOT low heart rate etc… NOT decreased activity
	(b)	(i)	5.5 OR 6	**1**	
		(ii)	**Type of dormancy:** predictive **(1)** **Reason:** began before the decrease in (air) temperature **OR** began before the onset of adverse conditions **(1)**	**2**	
		(iii)	saves/conserves energy **OR** survive when metabolic costs would be too high	**1**	NOT avoids adverse conditions
7.	(a)		150	**1**	
	(b)	(i)	From 0 to 175 minutes it increases from 0 to 45 g/l **(1)** From 175 minutes (to 250) it remains constant/levels off **(1)**	**2**	Award one mark only for increases to 175 then levels off To achieve 2 marks both units must be given at least once.
		(ii)	100	**1**	
	(c)		ethanol concentration is 0(g/l) **OR** all ethanol has been used up	**1**	NOT no nutrients left
	(d)		40	**1**	
8.	(a)	(i)	vector	**1**	
		(ii)	Allows the plasmid to replicate/make copies of itself	**1**	
	(b)		restriction endonuclease	**1**	
	(c)		**Gene:** antibiotic resistance **(1)** **Explanation:** transformed bacteria/they will grow/survive in the presence of antibiotic **(1)**	**2**	Accept other correct examples e.g. fluorescence gene

Question			Expected response	Max mark	Additional guidance
9.	**A**		1. complete double circulatory system 2. two atria and two ventricles 3. no mixing of oxygenated and deoxygenated blood 4. blood is (pumped out) at high pressure 5. efficient oxygen delivery to cells/tissues/organs 6. enables/supports high metabolic rates **(Any 4)**	**4**	NOT no mixing of blood
	B		1. occurs in the absence of oxygen 2. takes place in the cytoplasm 3. glucose broken down/converted to pyruvate 4. pyruvate is converted to ethanol and CO_2 5. pyruvate to ethanol and carbon dioxide is irreversible 6. less ATP produced than aerobic respiration **OR** ATP produced **OR** net gain of 2 ATP **(Any 4)**	**4**	

Question			Expected response	Max mark	Additional guidance
10.	(a)	(i)	rate of photolysis	**1**	NOT absorbance
		(ii)	so that no other/external/sun light affects the experiment/algae **OR** so that only the coloured light affects the experiment/algae	**1**	NOT so no light affects the experiment
	(b)		axes correctly labelled and scale correct **(1)** points correctly plotted and joined **(1)**	**2**	
	(c)		blue light results in the highest rate of photolysis **OR** photolysis is fastest with blue light	**1**	NOT rate of photosynthesis
	(d)		green light is not absorbed/less green light is absorbed **OR** green light is reflected/transmitted **(1)** fewer/few/no hydrogen ions (to decolourise DCPIP) **OR** less/no/little photolysis/photosynthesis **(1)**	**2**	

Question			Expected response	Max mark	Additional guidance
11.	(a)	(i)	less photosynthesis **OR** less light absorbed for photosynthesis **(1)** less energy/ATP/glucose for growth/fruit production **(1)**	**2**	Award 1 mark for: insects spread diseases which damage the plants/strawberries when no other mark is awarded NOT insects cause disease
		(ii)	(Introduce) a predator/pathogen/parasite (of the pest) **OR** it would prey on/eat/infect the insects/pest	**1**	
		(iii)	it could harm/prey on/compete with other/non-target species **OR** it could become invasive	**1**	
		(iv)	chemical and biological control **OR** chemical and cultural control **OR** cultural and biological control **OR** chemical, biological and cultural control	**1**	NOT examples
	(b)	(i)	open ends/air flow/ventilation reduce humidity	**1**	
		(ii)	(prevention is) more effective than treating diseased crops **OR** decreases use of fungicide/pesticide/chemicals **OR** less harmful chemicals in the environment	**1**	
	(c)	(i)	increased/high yield/vigour/growth rate	**1**	
		(ii)	too much variation in F_2	**1**	

Question			Expected response	Max mark	Additional guidance
12.	(a)		naturalised	**1**	
	(b)		(an introduced species which) spreads rapidly and eliminates native species	**1**	
	(c)		no/less/few predators/competitors/pathogens/ parasites that were found in their native/original habitat/Central America	**1**	
	(d)	(i)	95	**1**	
		(ii)	**native frogs:** decrease close to the lake **OR** increases further away from the lake **OR** overall numbers decrease **(1)** **cane toads:** increase close to the lake **OR** increased more closer to the lake than further away from the lake **OR** overall numbers increase **(1)**	**2**	If values are used they must be correct.

Question			Expected response	Max mark	Additional guidance
13.	(a)	(i)	2:7	**1**	
		(ii)	A – More time spent in misdirected behaviour	**1**	NOT lots of time spent in misdirected behaviour NOT more misdirected behaviour
	(b)		More (pigs) in each group/farm **OR** more groups (of pigs) in each farm	**1**	NOT more pigs/groups NOT repeat and calculate an average NOT more farms
	(c)		failure in sexual/parental behaviour **OR** stereotypy **OR** apathy/hysteria/altered levels of activity	**1**	NOT examples
	(d)		reduced cost/cheaper/increased profit/less land required/less labour intensive **OR** more cost effective	**1**	NOT low cost/cheap etc…
	(e)		energy is lost at each/between trophic level/levels of food chain **(1)** fewer trophic levels/levels of food chain with cereal/crop production **(1)**	**2**	

Question			Expected response	Max mark	Additional guidance
14.	(a)	(i)	353 600	**1**	
		(ii)	can kill/catch larger prey **OR** less energy used per individual **OR** more successful hunts	**1**	NOT can hunt larger prey NOT can kill/catch large prey
	(b)	(i)	rank (order) **(1)** (with) dominant and subordinates **(1)**	**2**	
		(ii)	ritualistic (display) **OR** appeasement	**1**	NOT examples
		(iii)	increases the chance of dominant animal's favourable/advantageous genes being passed on to offspring	**1**	

Question			Expected response	Max mark	Additional guidance
15	**A**		1. occurs before cell division 2. DNA unwinds/untwists 3. hydrogen bonds between bases/strands break **OR** hydrogen bonds break separating the strands/unzipping the DNA 4. primers join to (3' end of) template DNA **OR** primer provides a start point for DNA replication/ DNA polymerase 5. primer is a short strand of nucleotides 6. DNA polymerase adds nucleotides to 3' end of the primer/new strand 7. complementary base pairing occurs **OR** A – T and C - G 8. sugar of one nucleotide joins phosphate of next **OR** sugar phosphate backbone forms 9. leading strand is replicated continuously 10. lagging strand is replicated in fragments/discontinuously 11. (DNA) ligase joins fragments 12. two identical DNA molecules produced. **Any 8**	**8**	

Question			Expected response	Max mark	Additional guidance
15.	**B**		1. population/species is split/divided/separated (by an isolation barrier/mechanism) 2. isolation barriers can be geographical, ecological or behavioural 3. prevents one population breeding with the other population **OR** prevents populations interbreeding **OR** prevents gene flow between populations 4. geographical leads to allopatric speciation 5. ecological/behavioural leads to sympatric speciation 6. different mutations occur on each side of barrier/in each population 7. some mutations may be beneficial/advantageous 8. different selection pressures exist in each population 9. natural selection occurs 10. some individuals survive and pass on favourable alleles/genes to offspring **OR** (natural selection is) the non-random increase in frequency of DNA sequences/alleles that increase survival 11. populations can no longer breed with each other/ interbreed to produce fertile young 12. (this results in) two/different/ new species **Any 8**	**8**	All 3 barriers required NOT prevents populations breeding NOT populations can no longer breed to produce fertile young

[END OF MARKING INSTRUCTIONS]

General marking principles for Higher Biology

Always apply these general principles. Use them in conjunction with the marking instructions, which identify the key features required in candidates' responses.

(a) Always use positive marking. This means candidates accumulate marks for the demonstration of relevant skills, knowledge and understanding; marks are not deducted for errors or omissions.

(b) If a 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.

(c) Do not award half marks.

(d) Where a candidate makes an error in the first part of a question, award marks for subsequent answers that are correct with regard to this original error. Do not penalise candidates more than once for the same error.

(e) Unless a numerical question specifically requires evidence of working to be shown, award full marks for a correct final answer (including units, if appropriate) on its own.

(f) Candidates should not use bulleted lists to answer extended-response questions. They must respond to the 'command' word as appropriate and provide extended answers to communicate fully their knowledge and understanding. Candidate responses in the form of bulleted lists may not be able to access the full range of available marks.

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

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

(i) A correct response can be negated if the candidate includes:
- an extra, incorrect, response
- additional information that contradicts the correct response

(j) Where the candidate is instructed to choose one question to answer but instead answers two questions, mark both responses and award the higher mark.

(k) Unless otherwise required by the question, the use of abbreviations (for example DNA, ATP) or chemical formulae (for example CO2, H20) are acceptable alternatives to naming.

(l) 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, do not penalise candidates repeatedly.

(m) If incorrect spelling is given:
- If the correct word is recognisable then award the mark.
- If the word can easily be confused with another biological term then **do not** award the mark, for example glucagon and glycogen.

(n) Presentation of data:

- If a candidate provides two graphs, in response to one question, mark both and award the higher mark.
- If a question asks for a particular type of graph/chart and the candidate gives the wrong type, do not award full marks. Candidates cannot achieve the plot mark but **may** be able to achieve the mark for scale and label. If the x and y data are transposed, then do not award the scale and label mark.
- If the graph uses less than 50% of the axes then do not award the scale and label mark.
- If 0 is plotted when no data for this is given, then do not award the plot mark — candidates should only plot the data given.

(o) Only award marks 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 answer or present in brief form
- **describe**, they must provide a statement as opposed to simply one word
- **explain, justify,** they must provide a reason for the information given
- **compare**, they must demonstrate knowledge and understanding of the similarities and/or differences between topics being examined
- **calculate**, they must determine a number from given facts, figures or information
- **predict**, they must indicate what may happen based on available information
- **suggest**, they must apply their knowledge and understanding to a new situation