National Qualifications 2025

2025 Human 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.	A	**1**
2.	B	**1**
3.	A	**1**
4.	D	**1**
5.	B	**1**
6.	C	**1**
7.	C	**1**
8.	D	**1**
9.	B	**1**
10.	B	**1**
11.	A	**1**
12.	D	**1**
13.	C	**1**
14.	C	**1**
15.	D	**1**
16.	B	**1**
17.	D	**1**
18.	B	**1**
19.	C	**1**
20.	A	**1**
21.	B	**1**
22.	D	**1**
23.	A	**1**
24.	C	**1**
25.	A	**1**

[END OF MARKING INSTRUCTIONS]

National
Qualifications
2025

2025 Human 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.

General marking principles for Higher Human Biology

Always apply these general principles. Use them in conjunction with the detailed 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 CO_2, H_20) 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**, 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

Marking instructions for each question

Question			Expected response	Max mark	Additional guidance
1.	(a)	(i)	Mitosis	**1**	
		(ii)	Testes/seminiferous tubules/ovaries	**1**	
	(b)		(The cells) switch on/express/ Activate. Specific genes/ genes for that cell/corneal cells. **OR** (The cells) produce/express specific proteins/proteins characteristic for that cell/corneal cells.	**1**	
	(c)	(i)	As age increases (from 0-17) to 70-79, the number of donors increases from 5 to 700/by 695. **(1)** then decreases to 394 (at ages 80-99)/by 306. **(1)**	**2**	Award 1 mark for as age increases to 70-79 the number of donors increases and above 79 it decreases.
		(ii)	There are fewer/not enough donors for the recipients. **OR** The patient would not need to wait to find a donor.	**1**	
	(d)		(Used as model cells) to study disease development. **OR** (Used as model cells) for drug testing. **OR** Provide information on cell processes/cell growth/ differentiation/gene regulation.	**1**	If candidate provides more than one answer, all answers must be correct to award the mark.

Question			Expected response	Max mark	Additional guidance
2.	(a)		Cytosine	**1**	
	(b)		DNA has (two) complementary strands. **OR** DNA has a different order of bases/sequences on each strand. **OR** The strands have a different order of bases/sequences. **(1)** The primers/they bind/attach/are added/are joined/are complementary to each strand/different strands/the 3′ end. **(1)**	**2**	
	(c)		50 – 65	**1**	Accept any temperature within this range.

Question			Expected response	Max mark	Additional guidance
3.	(a)	(i)	Sex linked	**1**	
		(ii)	2100	**1**	
	(b)	(i)	Inversion	**1**	
		(ii)	Coding region (of a gene/DNA/ mRNA). **OR** Codes for amino acids/protein.	**1**	Accept it forms/makes up the mature mRNA/transcript.
		(iii)	(The exons are in the wrong order so) a different sequence/order of amino acids. **(1)** The protein shape/structure is changed. **OR** The protein does not fold correctly. **OR** The bonds do not form (between the amino acids) correctly. **(1)**	**2**	Do not accept peptide bonds.
	(c)		Different mature mRNA transcripts are produced. **OR** Different exons are retained/ removed.	**1**	

Question			Expected response	Max mark	Additional guidance
4.	(a)		It has a large surface area.	**1**	
	(b)		Cytoplasm	**1**	
	(c)		They release/provide energy to pump/move hydrogen (ions) across/through the membrane. **OR** Join with hydrogen (ions) and oxygen to form water.	**1**	Do not accept energy is produced but does not negate second answer.
	(d)		ATP synthase	**1**	

Question			Expected response	Max mark	Additional guidance
5.	(a)		catabolic	**1**	
	(b)	(i)	1. temperature of solutions 2. pH of solutions 3. concentration of catalase/enzyme/copper nitrate/ inhibitor 4. source of catalase 5. size/thickness/type/weight/ mass/diameter of disc 6. same size/diameter/depth of beaker 7. same person timing **OR** same timer/stopwatch **Any 2**	**2**	If the candidate lists 3 or more variables and at least 1 is correct they score 1 mark for the question. If all answers are correct they score 2.
		(ii)	To show/compare the rate of the reaction/catalase activity/results without inhibition. **OR** To show/compare the effect of the inhibitor. **OR** To show copper nitrate is inhibiting catalase.	**1**	

<table>
<tr><th colspan="3">Question</th><th>Expected response</th><th>Max mark</th><th>Additional guidance</th></tr>
<tr><td>5.</td><td>(c)</td><td></td><td>Axes have correct scales and labels. (1)

Points correctly plotted and line drawn. (1)

<table>
<tr><td rowspan="2">Concentration of hydrogen peroxide (%)</td><td>Time for disc to float to surface (seconds)</td></tr>
<tr><td>Catalase + copper nitrate solution</td></tr>
<tr><td>0.5</td><td>192</td></tr>
<tr><td>1.0</td><td>136</td></tr>
<tr><td>2.0</td><td>72</td></tr>
<tr><td>3.0</td><td>52</td></tr>
<tr><td>5.0</td><td>28</td></tr>
</table>
</td><td>2</td><td>No key required.

Major gridline tick marks should be increments of 0.5 on x-axis and increments of 20 on y-axis.

Ignore any extension beyond 5% hydrogen peroxide.</td></tr>
<tr><td></td><td>(d)</td><td></td><td>As substrate concentration increases, inhibition (of catalase by copper nitrate) decreases.</td><td>1</td><td>Accept hydrogen peroxide for substrate.</td></tr>
<tr><td></td><td>(e)</td><td></td><td>28</td><td>1</td><td></td></tr>
</table>

Question			Expected response	Max mark	Additional guidance
6.	(a)		Low and obese	**1**	
	(b)	(i)	27/26.6/26.64	**1**	
		(ii)	18	**1**	
		(iii)	**Treatment:** Intra-cytoplasmic sperm injection/ICSI. **(1)** **Description:** Head of sperm is (drawn into a needle and) injected/inserted directly into the egg. **(1)** **OR** **Treatment:** Artificial insemination/AI. **(1)** **Description:** Several samples of semen/sperm are collected. **OR** donor semen/sperm is used **and** injected into the uterus/female reproductive tract. **(1)**	**2**	

Question			Expected response	Max mark	Additional guidance
7.	(a)	(i)	Aorta	**1**	
		(ii)	The atrio-ventricular/AV valves are open (and the semi-lunar valves are closed).	**1**	
	(b)		Impulses/they (from the SAN) travel to/are detected by the AVN. **OR** Impulses/they travel from/are produced by the AVN. **(1)** Impulses/they (from the AVN) travel to the fibres/the central wall/the septum/ventricles. **(1)**	**2**	
	(c)		50	**1**	
	(d)		(The medulla) regulates/controls (the rate of) the SAN/pacemaker. **OR** (The medulla) regulates/controls/activates the autonomic nervous system/ANS/ parasympathetic nerves/system. **(1)** The parasympathetic nerves/system release acetylcholine. **(1)**	**2**	

Question			Expected response	Max mark	Additional guidance
8.	(a)	(i)	(A build-up of) fatty material/ cholesterol/fibrous material/ calcium. **(1)** Occurs beneath the endothelium. **(1)**	**2**	
		(ii)	The lumen becomes wider. **OR** The atheroma is pushed back/compressed/held back.	**1**	
	(b)		Thrombus/clot breaks loose/forms an embolus and travels to/blocks the coronary artery. **(1)** This/the embolus/thrombus/clot restricts blood flow to the (heart) muscle/tissue/cells. **OR** This/the embolus/thrombus/clot deprives the (heart) cells/tissue/ muscle of oxygen. **(1)**	**2**	
	(c)	(i)	800	**1**	
		(ii)	To allow a valid/fair comparison between countries/populations. **OR** As the countries/they have different population (sizes/numbers).	**1**	

Question			Expected response	Max mark	Additional guidance
9.	(a)	(i)	Cell membrane component. **OR** (Needed to) make/produce sex hormones/testosterone/oestrogen/ Progesterone.	**1**	
		(ii)	Liver	**1**	
	(b)	(i)	Statins/competitive inhibitors/they bind to/block the active site and prevent the substrate from binding/cholesterol being produced. **OR** Statins/competitive inhibitors/they compete with the substrate for the active site and prevent the substrate/it from binding/cholesterol being produced.	**1**	
		(ii)	1. both sexes are affected equally 2. can occur in each generation/does not skip a generation 3. individuals with FH have at least one affected parent 4. a homozygous dominant parent can only have an affected child 5. two affected/heterozygous parents can have an unaffected child 6. two unaffected/homozygous recessive parents can only have unaffected children **OR** cannot have affected children **Any 2**	**2**	If the candidate lists 3 or more ways and at least 1 is correct they score 1 mark for the question. If all answers are correct, they score 2.

Question			Expected response	Max mark	Additional guidance
10.	(a)		X – peripheral (nervous system)/PNS Y – somatic (nervous system)/SNS	**2**	
	(b)		Motor	**1**	
	(c)		1. glial cells produce the myelin (sheath) 2. myelin (sheath) increases the speed of impulse (transmission)/ insulates the axon 3. myelination/it continues from birth to adolescence/occurs in the early years of life **OR** myelination/it is incomplete at birth/in early years of life/until adolescence 4. myelination/it increases a child's coordination/ability to walk/ ability to respond **OR** coordination improves as myelination occurs/ progresses/continues **Any 3**	**3**	

Question			Expected response	Max mark	Additional guidance
11.	(a)	(i)	Encoding	**1**	
		(ii)	1. rehearsal 2. organisation 3. elaboration **Any 2**	**2**	
	(b)		Cerebral cortex/cerebrum	**1**	
	(c)	(i)	1. words at the start can be rehearsed/repeated and transferred to long-term memory **OR** words at the start have been encoded in long-term memory 2. words in the middle of the list are displaced from short-term memory 3. words at the end of the list are still in/have not been displaced from the short-term memory **Any 2**	**2**	Accept STM/LTM
		(ii)	Repeat with another/a different group (of participants). **OR** Repeat with another/a different list of words. **OR** Repeat the investigation and calculate an average.	**1**	

Question			Expected response	Max mark	Additional guidance
12.	(a)		(Induces) feelings of pleasure. **OR** Reinforces particular behaviour.	**1**	
	(b)		Enzyme degradation **OR** Reuptake	**1**	
	(c)	(i)	(Drug) tolerance **OR** Decrease in the number/sensitivity of receptors. **OR** Desensitisation (of receptors).	**1**	
		(ii)	Double-blind **(1)** Prevents/reduces bias (of interpretation of results). **(1)** **OR** Placebo(-controlled) **(1)** To ensure valid comparisons/results/ trial/investigation. **(1)**	**2**	
		(iii)	Suitable/large group/sample size.	**1**	

Question			Expected response	Max mark	Additional guidance
13.	(a)	(i)	(Antigen/surface/membrane) receptor.	**1**	
		(ii)	(Lymphocyte R) produces/releases antibodies.	**1**	
	(b)		(Phagocytes) engulf and digest/destroy the (antigen and antibody) complex/(inactivated) pathogen/it.	**1**	
	(c)		1. (memory) cells/they rapidly/quickly divide **OR** (memory) cells/they form clones/ identical lymphocytes/a clonal population 2. antibody production is rapid/ greater/faster 3. antibodies destroy/inactivate the pathogen (before the individual shows symptoms) **Any 2**	**2**	
	(d)		They release proteins (into the cell) causing cell death/apoptosis. **OR** They cause the production of self-destructive enzymes causing cell death/apoptosis.	**1**	Use of pathogen rather than infected cell negates.

Question			Expected response	Max mark	Additional guidance
14.	(a)	(i)	75	**1**	
		(ii)	96/96.2/96.23	**1**	
		(iii)	From 1980-1990 vaccination coverage increases from 20% to 75%/by 55%. **(1)** From 1990-2000 it remains constant/at 75%. **(1)**	**2**	Answer must use % for at least one figure. Award one mark if candidate states it increases to 75% and then it levels off/remains constant if no other marks are awarded.
	(b)	(i)	100 : 3	**1**	
		(ii)	1 700 000/1.7 million	**1**	
		(iii)	Poverty/malnutrition . **OR** Rejection/refusal of the vaccine/ lack of education. **OR** Difficulty in population accessing the vaccine/geographical remoteness/ access to doctors.	**1**	

Question			Expected response	Max mark	Additional guidance
15.	**A**		1. follicle stimulating hormone/FSH is released from the pituitary gland AND stimulates the maturation/development of a follicle (in the ovary) 2. the follicle/ovarian tissue secretes oestrogen 3. oestrogen stimulates proliferation/growth/repair/ regeneration/thickening/ development of the endometrium/uterus lining 4. oestrogen affects the consistency of cervical mucus/makes cervical mucus thinner 5. high/peak levels of oestrogen trigger a surge in/release of LH (from the pituitary gland) 6. (surge of) LH causes/triggers ovulation/release of an egg from the follicle 7. this/ovulation occurs midway through in the menstrual cycle/marks the start of the luteal phase/end of the follicular phase 8. the follicle develops/turns into/becomes the corpus luteum which secretes progesterone 9. progesterone promotes/causes development/vascularisation of the endometrium/uterus lining **OR** progesterone maintains/thickens/ increases the endometrium/uterus lining 10. progesterone/oestrogen have a negative feedback effect on the pituitary gland **OR** progesterone/oestrogen inhibit the secretion/release/production of FSH/LH (from the pituitary gland) 11. drop in/lack of FSH prevents further follicles from developing/ maturing 12. drop in/lack of LH leads to degeneration of the corpus luteum and a drop/reduction in progesterone 13. this/low levels/concentrations of progesterone lead to menstruation	**9**	

Question			Expected response	Max mark	Additional guidance
15.	**B**		1. women show cyclical fertility and men show continuous fertility/are continuously fertile 2. women are only fertile for a few days (during each menstrual cycle) 3. men continually produce sperm (in their testes) 4. fertile period is identified by a woman's body temperature rising (by around 0.5°C after ovulation) **OR** fertile period is identified by cervical mucus becoming thin/ watery 5. physical/barrier methods (of contraception) prevent sperm reaching the egg 6. **two** examples of physical/barrier methods 7. chemical/hormonal methods (of contraception) include the oral contraceptive pill, progesterone-only pill/mini pill, and emergency contraceptive/ morning after pill (any two) 8. the oral contraceptive pill contains (synthetic) oestrogen and progesterone 9. the oral contraceptive pill mimics negative feedback effect (of oestrogen and progesterone) and prevents the release of FSH/LH 10. the progesterone only pill/mini pill causes thickening of the cervical mucus 11. emergency contraceptive pills/morning after pill prevent/ delay ovulation 12. emergency contraceptive pill/morning after pill can be taken up to 72-120 hours after (unprotected) sex	**9**	

[END OF MARKING INSTRUCTIONS]