



2015 Human Biology

Higher (Revised)

Finalised Marking Instructions

© Scottish Qualifications Authority 2015

The information in this publication may be reproduced to support SQA qualifications only on a non-commercial basis. If it is to be used for any other purposes written permission must be obtained from SQA's NQ Assessment team.

Where the publication includes materials from sources other than SQA (secondary copyright), this material should only be reproduced for the purposes of examination or assessment. If it needs to be reproduced for any other purpose it is the centre's responsibility to obtain the necessary copyright clearance. SQA's NQ Assessment team may be able to direct you to the secondary sources.

These Marking Instructions have been prepared by Examination Teams for use by SQA Appointed Markers when marking External Course Assessments. This publication must not be reproduced for commercial or trade purposes.

Part One: General Marking Principles for Human Biology Higher (Revised)

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 specific Marking Instructions for each question.

- (a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. 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 must seek guidance from your Team Leader/Principal Assessor.
- (b) Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

GENERAL MARKING ADVICE Human Biology Higher (Revised)

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. 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 on 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 questions ask 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 CO₂, H₂O
 - 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 the 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 is 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 7.3 ± 0.1 .

10. Extended response questions: if a candidate gives two answers where there 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 tick near answers will do.

12. Totalling scripts: errors in totalling can be more significant than errors in marking:

- enter a total mark for each double page on the bottom corner of the right hand page.
- add up these double page totals, at least twice, to get an overall total mark.
- enter this checked total on the front page of the candidate's script.

2015 Human Biology Higher (Revised)

Part Two: Marking Instructions for each Question

Section A

Question	Expected Answer(s)	Max Mark
1.	D	1
2.	B	1
3.	C	1
4.	B	1
5.	A	1
6.	D	1
7.	B	1
8.	C	1
9.	D	1
10.	D	1
11.	C	1
12.	C	1
13.	A	1
14.	A	1
15.	C	1

Question	Expected Answer(s)	Max Mark
16.	B	1
17.	D	1
18.	C	1
19.	A	1
20.	C	1
21.	D	1
22.	A	1
23.	A	1
24.	A	1
25.	B	1
26.	B	1
27.	C	1
28.	B	1
29.	D	1
30.	B	1

Section B

Question			Expected Answer(s)	Max Mark	Additional Guidance
1	(a)	(i)	Hydrogen	1	
1	(a)	(ii)	Y – deoxyribose Z – phosphate	1	
1	(a)	(iii)	ATP Enzymes/(DNA) polymerase Primer Ligase. Any 2	1	Accept helicase.
1	(b)		Ensures new cells have the same chromosomes/DNA/genes/ <u>genetic</u> information/are <u>genetically</u> identical/have a complete copy of the genome. Or To maintain the correct quantity/number complement of DNA/chromosomes.	1	Not – so cells contain the correct DNA.
2	(a)		Anabolic/anabolism/synthetic/biosynthetic/synthesis.	1	Not <u>protein</u> synthesis.
2	(b)	(i)	It will contain a different order/number of nucleotides/bases	1	Accept a specific <u>description</u> of a gene mutation eg insertion of a base.
2	(b)	(ii)	The protein/enzyme produced contains a different order/number of amino acids.	1	Not - It contains different amino acids.
2	(c)		Glucose is used up in respiration/to provide energy/ATP <u>and</u> they have no/less glycogen/stores to provide more glucose.	1	
2	(d)		Recessive – Disease skips generations Or Two unaffected parents can have an affected child. 1 mark Sex-linked – More males will be affected than females Or Affected males do not pass the condition to their sons. Or Affected females pass the condition to their sons. 1 mark	2	Not <u>heterozygous</u> parents. Not – <u>only</u> males are affected.

Question			Expected Answer(s)	Max Mark	Additional Guidance
3	(a)		It makes it easier for the sperm to swim.	1	Answer must refer to movement of sperm.
3	(b)	(i)	The (cancer) cells divide excessively Or There are more cells (to produce PSA).	1	Answer must indicate an increase in cell numbers
3	(b)	(ii)	The (cancer) <u>cells</u> fail to attach to each other/ break off from the tumour. 1 mark (The cancer cells) spread through the body. 1 mark	2	
3	(c)		False positive.	1	
4	(a)		<ul style="list-style-type: none"> • Volume/mass of yeast cells/suspension. • Concentration of yeast suspension/solution/ number of yeast cells. • Type/age/source of yeast cells. • Area/size/diameter/volume/thickness/type of gel or dish. • Concentration of nutrients in gel/pH of gel. • Strength or intensity of lamp/use same lamp/ distance of lamp. • Temperature of incubator. • Time for yeast to grow/dishes left in incubator. Any 2	2	Do not accept amount but do not penalise twice if used in both answers.
4	(b)	(i)	Correct scales and labels on axes. 1 mark Points correctly plotted and line drawn. 1 mark	2	Remove 1 mark if less than half the graph paper is used. Transposed axes - remove 1 mark
4	(b)	(ii)	Increasing <u>the exposure (to UV radiation)</u> <u>increases</u> the number of <u>yeast</u> cells/colonies <u>that</u> <u>die/are damaged</u> .	1	Answer must not refer to the number of yeast cells growing.
4	(b)	(iii)	Repeat the investigation <u>at each exposure</u> (time). Or Repeat the investigation and calculate averages.	1	

Question			Expected Answer(s)	Max Mark	Additional Guidance
4	(c)	(i)	400	1	
4	(c)	(ii)	The number of yeast cells/colonies surviving at SPF 15 is much more than with no sunscreen/at SPF 6 <u>and</u> almost as much as with higher SPF values.	1	
4	(c)	(iii)	350 minutes/5 hours 50 minutes.	1	Units are essential.
5	(a)		ATP is broken down/used up/converted to ADP.	1	Accept phosphorylation occurs twice/at steps 1 and step 3.
5	(b)		It changes the shape of the active site (to suit the substrate molecule). Or It induces a better fit of the substrate.	1	Accept – it lowers the activation energy.
5	(c)		Enzyme 1 or Enzyme 3 Explanation – the transfer/addition of phosphate (from ATP).	1	
5	(d)		When there has been a build-up of fructose-6-phosphate.	1	
5	(e)		This ensures the cell only produces <u>ATP</u> when required. Or This ensures <u>glucose</u> is only used when it is required.	1	

Question			Expected Answer(s)	Max Mark	Additional Guidance
6	(a)	(i)	Seminiferous tubule.	1	Phonetic – semiferous no semenifyrus yes
6	(a)	(ii)	It releases/produces <u>FSH</u> . 1 mark It releases <u>LH/ICSH</u> which causes <u>interstitial cells</u> to produce <u>testosterone</u> . 1 mark	2	
6	(b)	(i)	Meiosis.	1	
6	(b)	(ii)	1. X chromosome – 2/half of them/50%. 2. Autosomes – 4/all of them/100%.	1	
6	(c)		1	1	
6	(d)	(i)	1	1	
6	(d)	(ii)	Sperm obtained from donor. Or Concentrated sperm sample collected. 1 mark Sperm then introduced into female reproductive tract/vagina/uterus/oviduct (by tube/syringe). 1 mark	2	Accept - multiple sperm samples are collected.

Question		Expected Answer(s)	Max Mark	Additional Guidance
7	(a)	(Pulmonary) artery. Carries blood from the right ventricle/right side of the heart. Or Carries blood to the lungs.	1	Not – simply that it carries blood from the heart. Accept it carries <u>deoxygenated</u> blood from the heart.
7	(b)	Arteries have a thicker <u>er</u> (muscular) wall/ <u>ore</u> elastic fibres. Or Arteries do not contain valves but veins do. Or Arteries have a narrower <u>er</u> lumen.	1	Accept correct answers that refer to veins.
7	(c)	Carbon dioxide is produced by <u>respiration</u> (in brain cells). Or Carbon dioxide diffuses/moves/passes into the blood.	1	Diffusion can be described in terms of concentration gradient.
7	(d)	Name – tricuspid/AV/atrioventricular Function – Prevents backflow of blood into the (right) atrium/from the (right) ventricle. Or Ensures blood flows into the pulmonary artery/vessel P.	1	
8	(a)	Fatty material/cholesterol/fat/lipids/fibrous material/calcium.	1	Do not accept plaque.
8	(b)	There is a reduced diameter of the lumen. Or There is a narrower space within the artery. Or There is reduced elasticity of the (muscular) wall (of the artery).	1	Accept - the artery is partially blocked.

Question			Expected Answer(s)	Max Mark	Additional Guidance
8	(c)	(i)	<u>Clotting factors</u> are released/produced/secreted.	1	
8	(c)	(ii)	Substance A – prothrombin. Substance B – fibrinogen.	1	
8	(d)	(i)	An embolus.	1	
8	(d)	(ii)	The clot blocks a <u>coronary artery</u> . 1 mark This results in a <u>lack of oxygen</u> being supplied to the <u>muscle/tissue</u> . 1 mark	2	
9	(a)		Between work levels 1 to 5 the stroke volume increased <u>and</u> then it remained constant between levels 5 and 7. 1 mark It increased from 88 cm ³ to 140 cm ³ . Or It remained constant at 140 cm ³ . 1 mark	2	Accept – stroke volumes increase up to work level 5 and then level out.
9	(b)		102	1	
9	(c)		19 600	1	
9	(d)	(i)	4.5	1	
9	(d)	(ii)	120 beats/min	1	Units essential. Accept bpm.
9	(d)	(iii)	23.8/23.81/24	1	

Question		Expected Answer(s)	Max Mark	Additional Guidance
10	(a)	Name – dendrite. Function – receives impulses (from other nerve cells). Or Carries impulses into the <u>cell body</u> .	1	
10	(b) (i)	Glial cells.	1	
10	(b) (ii)	They (physically) support neurons/axons. Or They maintain a homeostatic environment around neurons. Or They remove debris by phagocytosis.	1	
10	(c)	1. (Impulse stimulates) <u>vesicles</u> to move to/fuse with membrane. 2. <u>Neurotransmitter</u> released <u>and</u> then diffuses/ moves across gap/synapse. 3. Neurotransmitter attaches to <u>receptors</u> (on muscle). 4. Threshold of neurotransmitter must be achieved for muscle contraction. Any two for 1 mark, any three for two marks.	2	Accept acetylcholine for neurotransmitter. Accept description of threshold.
11	(a)	Organisation – <u>related</u> information is grouped together. Or Information is put into categories/headings. 1 mark Elaboration – additional information is given (about each term). Or Meaningful information is given (about each term). 1 mark	2	Do not accept - put information into groups. Do not accept - put information into a story or into context.
11	(b)	<u>Short-term</u> memory/STM has a limited capacity/ span/only holds around 7 items of information.	1	Accept anything between 5 and 9 items.
11	(c)	Cerebrum/cortex/limbic system.	1	

Question			Expected Answer(s)	Max Mark	Additional Guidance
12	(a)	(i)	Histamine.	1	
12	(a)	(ii)	It increases the number of phagocytes. Or It increases the delivery of antimicrobial proteins. Or It increases the number of clotting elements. (at the site of infection).	1	
12	(b)		Production of self-destructive <u>enzymes</u> (so cell is destroyed).	1	
12	(c)		1. B – lymphocytes can be activated by <u>cytokines</u> . 2. B-lymphocytes detect <u>antigens</u> on virus-infected/antigen-presenting cells. 3. B – lymphocytes clone/multiply themselves. 4. B – lymphocytes secrete <u>antibodies</u> which react with/attach to the <u>antigen/virus</u> . 5. Some B – lymphocytes become <u>memory cells</u> (that provide a long- term response). Any 3 points from 5	3	
13	(a)		26 million/26 000 000	1	
13	(b)		0.6 million/600 000	1	
13	(c)		5.14/5.1/5	1	
13	(d)		The <u>steepest</u> part of the (HIV infected) line (was between 1993 and 1995).	1	Not - the greatest increase in rate occurs between 1993 and 1995. Answer must refer to the gradient of the line. Answer must indicate a comparison to other areas. So not line rises steeply between 1993 and 1995.

Question			Expected Answer(s)	Max Mark	Additional Guidance
14	(a)	(i)	<p>Each group should contain individuals of similar ages.</p> <p>Or</p> <p>Each group should contain the same number of males and females.</p> <p>Or</p> <p>Individuals in groups should have no recent history of influenza.</p> <p>Or</p> <p>Individuals should not be allowed to travel abroad during the study.</p> <p>Or</p> <p>Individuals should all be in good general health.</p>	1	
14	(a)	(ii)	Did not suffer = 453 <u>and</u> total = 470.	1	
14	(a)	(iii)	R	1	
14	(b)		It enhances/improves the immune response.	1	
14	(c)		A pandemic.	1	

Section C

1A

(i) Events leading to ovulation

- | | | |
|---|--|---|
| 1 | Pituitary gland secretes/produces FSH/LH. | 1 |
| 2 | FSH stimulates growth of <u>follicle</u> (in the ovary). | 1 |
| 3 | Follicle/ovary produces oestrogen. | 1 |
| 4 | Oestrogen stimulates/repairs the endometrium/uterus lining. | 1 |
| 5 | Oestrogen stimulates production of LH. | 1 |
| 6 | LH (surge) brings about ovulation/release of the egg. | 1 |
| 7 | <u>Rising/high levels</u> of oestrogen inhibit FSH production. | 1 |
| 8 | This is negative feedback. | 1 |

Max 6

(ii) Events following ovulation

- | | | |
|----|--|---|
| 9 | The follicle develops into the corpus luteum. | 1 |
| 10 | Corpus luteum secretes progesterone (and oestrogen). | 1 |
| 11 | Progesterone maintains/increases/thickens the endometrium/uterus lining. | 1 |
| 12 | Progesterone/oestrogen inhibits <u>FSH/LH</u> production.
(Point 8 may be awarded here if linked to Point 12) | 1 |
| 13 | Progesterone/oestrogen levels decrease towards the end of the cycle. | 1 |
| 14 | This/corpus luteum degeneration triggers menstruation/breakdown of the endometrium. | 1 |

Max 4

Total 10

1B**(i) The conducting system of the heart**

- | | | |
|---|--|---|
| 1 | SAN/pacemaker contains autorhythmic cells/is where the heart beat originates/is found in the (wall of the) right atrium. | 1 |
| 2 | <u>Impulses</u> spread across the atria/cause the atria to contract/cause atrial systole. | 1 |
| 3 | (Impulses) reach/stimulate the atrioventricular node/AVN. | 1 |
| 4 | AVN found at junction of atria and ventricles. | 1 |
| 5 | Impulses from AVN spread through ventricles. | 1 |
| 6 | Cause contraction of ventricles/ventricular systole. | 1 |
| 7 | (This is followed by) relaxation/resting/diastolic phase/diastole. | 1 |

Max 5**(ii) Nervous control of the cardiac cycle**

- | | | |
|----|--|---|
| 8 | <u>Medulla</u> controls the cardiac cycle/regulates the SAN. | 1 |
| 9 | <u>Autonomic nervous system</u> (carries impulses to the heart). | 1 |
| 10 | <u>Sympathetic</u> nerve speeds up heart rate. | 1 |
| 11 | Sympathetic nerves release noradrenaline/norepinephrine. | 1 |
| 12 | <u>Parasympathetic</u> /vagus nerve slows down heart rate. | 1 |
| 13 | Parasympathetic nerves release acetylcholine. | 1 |
| 14 | Sympathetic and parasympathetic systems are <u>antagonistic</u> to each other. | 1 |

Max 5**Total 10**

2A

- | | | |
|----|---|---|
| 1 | Perception occurs in the cerebral cortex/cerebrum. | 1 |
| 2 | Perception allows us to segregate/separate objects from one and other. | 1 |
| 3 | Perception allows us to segregate/separate objects from their background/
into figure and ground. | 1 |
| 4 | Perception allows the organisation of stimuli into coherent patterns/
ordered relationships. | 1 |
| 5 | Perception allows us to judge distances. | 1 |
| 6 | This involves <u>visual cues</u> . | 1 |
| 7 | Example of visual cue given such as relative size/superimposition/relative
height/texture gradient/converging parallel lines. | 1 |
| 8 | <u>Binocular disparity</u> allows judgement of distance. | 1 |
| 9 | Perceptual constancy exists despite the object becoming nearer/the
viewing angle changing <u>or</u> example of perceptual constancy. | 1 |
| 10 | Perception allows us to recognise objects. | 1 |
| 11 | The importance of <u>shape</u> (rather than detail) in recognising objects. | 1 |
| 12 | Perceived shapes are matched to shape descriptions <u>in memory</u> . | 1 |
| 13 | <u>Inference</u> is important in recognising objects/completing shapes. | 1 |
| 14 | Past experience/context/expectation influences how stimuli are perceived. | 1 |
| 15 | These form the <u>perceptual set/a perceptual expectancy/a predisposition to</u>
perceive objects in a certain way. | 1 |

Max 8

The coherence and relevance marks are only awarded when at least five marks have been scored from points 1 to 15 and the following criteria are met.

Relevance – A single short reference to an irrelevant point is not penalised but development of the point is penalised. However, two irrelevant points without development are penalised.

For example, mention of two or more of the following will lose this mark:

references to the nervous system/neurotransmitters/structure of memory 1

Coherence – Response should contain paragraphs/subheadings, have a logical sequence and be written in sentences (not bullet points). 1

Note – After the candidate response in the paper write an R and a C and place a tick or cross beside each before totalling the marks for the question.

Total 10

2B

- | | | |
|----|--|---|
| 1 | Infectious diseases are caused by <u>pathogens</u> . | 1 |
| 2 | Name of three types of pathogens from viruses/bacteria/fungi/protozoans/parasites. | 1 |
| 3 | Infectious diseases are transmitted by physical contact/body fluids/inhaled air. | 1 |
| 4 | Infectious diseases are transmitted in water/food. | 1 |
| 5 | Infectious diseases are transmitted by <u>vector</u> (organisms). | 1 |
| 6 | Disease control by <u>quarantine</u> . | 1 |
| 7 | Disease control by antiseptics/use of antiseptics/disinfectants. | 1 |
| 8 | Two examples of individual responsibility for disease control from good hygiene/sexual health/needle exchange/food storage/face masks. | 1 |
| 9 | Two examples of community disease control from - quality water supply/safe food webs/appropriate waste disposal/vector control. | 1 |
| 10 | Immunisation/vaccination <u>and</u> description. | 1 |
| 11 | Herd Immunity <u>described</u> . | 1 |
| 12 | Use of antivirals/antibiotics/antifungals/drug therapy. | 1 |

Max 8

The coherence and relevance marks are only awarded when at least five marks have been scored from points 1 to 15 and the following criteria are met.

Relevance – A single short reference to an irrelevant point is not penalised but development of the point is penalised. However, two irrelevant points without development are penalised.

For example, mention of two or more of the following will lose this mark:

Non-specific body defences, specific cellular defences. **1**

Coherence – Response should contain paragraphs/subheadings, have a logical sequence and be written in sentences (not bullet points). **1**

Note – After the candidate response in the paper write an R and a C and place a tick or cross beside each before totalling the marks for the question.

Total 10

[END OF MARKING INSTRUCTIONS]