

2005 Human Biology

Higher

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 ADVICE: HUMAN BIOLOGY

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 \surd or x near answers will do.

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

- enter a correct and carefully checked total for each candidate
- do not use running totals as these have repeatedly been shown to lead to more errors.

2005 Human Biology Higher

Marking scheme

Section A

1.	A	16.	A
2.	C	17.	D
3.	C	18.	D
4.	D	19.	C
5.	D	20.	B
6.	B	21.	B
7.	D	22.	C
8.	D	23.	A
9.	A	24.	D
10.	B	25.	C
11.	C	26.	B
12.	B	27.	A
13.	B	28.	B
14.	D	29.	D
15.	A	30.	B

Marking instructions

2005 Human Biology

Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1 (a)	The nucleus	1		
(b)	X – phosphate Y – deoxyribose (sugar) Z – nucleotide <i>2 right – 1 mark 1 right – 0 marks</i>	2		
(c)	Guanine, uracil or cytosine	1		
(d)	Enzymes or polymerase or ATP	1		
(e) (i)	Codons	1		
(ii)	Serine – alanine (sequence not important)	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2 (a)	(i) B-lymphocyte	1		
	(ii) Antigens	1		
(b)	It divides/produces plasma cells/produces antibodies/ produces memory cells	1		
(c)	Rough ER is involved in protein synthesis/transport (1) Antibodies are proteins (1)	2		
(d)	To enable the immune system to respond more effectively /quickly to a future infection	1		
(e)	Exocytosis	1		
(f)	Across the placenta or in colostrum/in breast milk	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3 (a)	Glycolysis	1		
	(b) Acetyl CoA/coenzyme A	1		
	(c) 2	1		
	(d) To carry/combine with hydrogen (to cytochrome system)	1		
	(e) Because oxygen is needed as final hydrogen acceptor	1		
	(f) At glycolysis/conversion of glucose to pyruvic acid	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4 (a)	Sperm duct <i>or</i> vas deferens	1		
(b) (i)	In the pituitary gland	1		
(b) (ii)	It stimulates the production of sperm	1		
(c) (i)	<i>X in any of the interstitial cells</i>	1		
(c) (ii)	A high concentration of testosterone inhibits the production of LH/ICSH (1) Lower concentrations of LH/ICSH result in less production of testosterone (1) This is an example of negative feedback control (1) <i>Any two</i>	2		
(c) (iii)	Testosterone stimulates the production of sperm/ stimulates the seminiferous tubules.	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates																
5 (a)	<table border="1" data-bbox="454 331 1099 507"> <thead> <tr> <th><i>Individual</i></th> <th><i>Mass (kg)</i></th> <th><i>Height (cm)</i></th> <th><i>Surface area (m²)</i></th> </tr> </thead> <tbody> <tr> <td>W</td> <td>60</td> <td>180</td> <td>1.78</td> </tr> <tr> <td>X</td> <td>70</td> <td>160</td> <td>1.72</td> </tr> <tr> <td>Y</td> <td>56</td> <td>160</td> <td>1.58</td> </tr> </tbody> </table>	<i>Individual</i>	<i>Mass (kg)</i>	<i>Height (cm)</i>	<i>Surface area (m²)</i>	W	60	180	1.78	X	70	160	1.72	Y	56	160	1.58	1		
<i>Individual</i>	<i>Mass (kg)</i>	<i>Height (cm)</i>	<i>Surface area (m²)</i>																	
W	60	180	1.78																	
X	70	160	1.72																	
Y	56	160	1.58																	
(b)	Iain Because he has a higher SA/Vol ratio	1																		
(c)	alveoli/air sacs and (micro) villi	1																		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6 (a)	16	1		
(b)	In the capillaries	1		
(c)	Because of the pulse/the beating of the heart/systole and diastole	1		
(d)	1 Jugular vein (and vena cava) 2 Hepatic portal vein 3 Pulmonary artery <i>2 right – 1 mark 1 right – 0 marks</i>	2		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates																				
7 (a)	13 dm ³ (<i>unit essential</i>)	1																						
(b)	The rate of breathing is unaffected at first then rises (1) The change takes place at 2.4-2.6%CO ₂ (1)	2																						
(c) (i)	<table border="1"> <thead> <tr> <th>CO₂ concentration of inhaled air (%)</th> <th>Volume of air inhaled per minute (dm³)</th> <th>Breathing rate (breathes per minute)</th> <th>Mean volume of one breath (dm³)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>6</td> <td>12</td> <td>0.5</td> </tr> <tr> <td>2</td> <td>9</td> <td>12</td> <td>0.75</td> </tr> <tr> <td>4</td> <td>20</td> <td>18</td> <td>1.11</td> </tr> <tr> <td>6</td> <td>22</td> <td>26</td> <td>0.85</td> </tr> </tbody> </table> <p>(1 mark for the readings and 1 mark for the calculations)</p>	CO ₂ concentration of inhaled air (%)	Volume of air inhaled per minute (dm ³)	Breathing rate (breathes per minute)	Mean volume of one breath (dm ³)	0	6	12	0.5	2	9	12	0.75	4	20	18	1.11	6	22	26	0.85	2		
CO ₂ concentration of inhaled air (%)	Volume of air inhaled per minute (dm ³)	Breathing rate (breathes per minute)	Mean volume of one breath (dm ³)																					
0	6	12	0.5																					
2	9	12	0.75																					
4	20	18	1.11																					
6	22	26	0.85																					
(ii)	<i>Scales correct</i> 1 mark <i>Line plotted correctly (if error in table is plotted correctly, full marks awarded)</i> 1 mark	2																						
(iii)	That the mean volume of breath increases then decreases as the concentration of CO ₂ in inhaled air increases. + <i>Any correct value given.</i>	1																						

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7 (d) (i)	To allow time for their breathing rate to stabilise.	1		
(ii)	The amount of exercise taken/activity levels The food/drink intake.	1		
(e)	To make the results more reliable or To reduce the effect of atypical/unusual results	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8 (a) (i)	proximal convoluted tubule	1		
(ii)	reabsorption	1		
(b)	Protein molecules are too large to pass through membranes/filter.	1		
(c) (i)	5	1		
(ii)	Water is removed from the urine/reabsorbed	1		
(iii)	1.11	1		
(d)	1	1		
(e) (i)	Increase	1		
(ii)	Decrease	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates												
9 (a)	<table border="1"> <thead> <tr> <th data-bbox="454 331 546 368"><i>Label</i></th> <th data-bbox="546 331 741 368"><i>Name</i></th> <th data-bbox="741 331 1099 368"><i>Function</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="454 368 546 507">P</td> <td data-bbox="546 368 741 507">Cerebrum</td> <td data-bbox="741 368 1099 507"><i>Any correct cerebral function eg conscious control, memory, reasoning, sensory/motor control</i></td> </tr> <tr> <td data-bbox="454 507 546 571">S</td> <td data-bbox="546 507 741 571">Pituitary gland</td> <td data-bbox="741 507 1099 571">Hormone production/eg any named hormones</td> </tr> <tr> <td data-bbox="454 571 546 608">T</td> <td data-bbox="546 571 741 608">Hypothalamus</td> <td data-bbox="741 571 1099 608">Temperature regulation</td> </tr> </tbody> </table>	<i>Label</i>	<i>Name</i>	<i>Function</i>	P	Cerebrum	<i>Any correct cerebral function eg conscious control, memory, reasoning, sensory/motor control</i>	S	Pituitary gland	Hormone production/eg any named hormones	T	Hypothalamus	Temperature regulation	3		
<i>Label</i>	<i>Name</i>	<i>Function</i>														
P	Cerebrum	<i>Any correct cerebral function eg conscious control, memory, reasoning, sensory/motor control</i>														
S	Pituitary gland	Hormone production/eg any named hormones														
T	Hypothalamus	Temperature regulation														
(b)	Its large surface area/its folded/convoluted nature	1														
(c)	Particular/specific areas of the brain are involved in particular/specific tasks	1														
(d)	Because the hands are capable of much more fine motor control than the feet <i>or</i> because there are many more nerve endings in the hands than in the feet	1														

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10 (a)	Non-verbal (communication)	1		
(b)	(i) Babies cannot talk/it is the only way in which they can communicate with their parents <i>or</i> allows babies to make strong bond with parents at an early stage (ii) <i>Any appropriate non-verbal signal, eg smiling or crying</i>	1 1		
(c)	Because they are understood by all, without the use of language	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11 (a)	Imitation – copying the instructor’s technique	1		
	Generalisation – “She refused to use any of the latest graphite-shafted clubs because she had no confidence in her putter”	1		
(b)	Rewarding behaviour which is close to the desired behaviour	1		
	There was an expectation of improvement with putter before any driving was allowed	1		
(c)	Reinforcement	1		
(d)	<p>1 Social facilitation – “She played better in front of a crowd”</p> <p><i>Or</i> “She found herself relying on their presence to raise her game”</p> <p>Or</p> <p>2 Deindividuation – “Her school friends, uncharacteristically, tried to distract her opponents”</p> <p>Or</p> <p>3 Identification – “Her sporting success resulted in an improvement in her friends’ behaviour”</p> <p><i>(Direct quotation not necessary, but examples must be from text)</i></p>	2		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(iii)	eg. fertilisers are being used less/fertilisers contain less phosphate/better treatment of sewage/less phosphates in detergents/legislation controlling use of phosphates/consumer demand for 'organic' food/crops require less fertiliser.	1		
(c)	(i) Active transport	1		
	(ii) Protein	1		

Section C

1A

- (i) • Excess proteins/amino acids are not stored
• There is a need to remove nitrogenous waste from the body
• Amino acids are broken down by deamination. (2)
- (ii) • Excess glucose stored as glycogen
• Glycogen is insoluble
• Insulin stimulates conversion of glucose to glycogen
• Glucagon stimulates conversion of glycogen to glucose
• Adrenaline stimulates conversion of glycogen to glucose
• Carbohydrates can be converted to fats
• Carbohydrates can be oxidised/respired to release energy. (5)
- (iii) • Bilirubin is breakdown product of haemoglobin
• Red blood cells have limited life span (c 120 days)
• Bilirubin a component of bile
• Protein component broken down to amino acids
• Iron stored from breakdown of haemoglobin. (3)

1B

- (i) • Controlled by autonomic nervous system
• Sympathetic speeds up
• Parasympathetic/vagus slows down
• Medulla is centre of control in the brain
• Adrenaline speeds up heart rate
• Thyroxine speeds heart rate (4)
- (ii) • Pacemaker/SAN in right atrium
• Initiates contraction on its own/is myogenic
• Impulse spreads across atria
• Leads to atrial systole/contraction of atria
• AVN at junction of atria/ventricles
• Conducting fibres/bundle of His
• Branch over ventricles/Purkinje fibres
• Synchronised contraction of ventricles/ventricular systole. (6)

2A

- Synapse is a small gap between two nerve cells
- Synapses can filter out weak stimuli/threshold required
- Impulses cause release of neurotransmitter, which diffuses across gap
- Released from vesicles
- Any example eg acetylcholine/noradrenaline
- Bind with receptor on post-synaptic neurone
- Impulse in next neurone can be excitatory or inhibitory
- It is the receptor which determines nature of signal
- Removed by reabsorption or degradation by enzyme activity
- Acetylcholine by degradation
- Noradrenaline by reabsorption
- Need for much energy/mitochondria.

(10)

2B

- Transfer of carbon along food chain
- Photosynthesis described
- Respiration described
- Respiration in plants noted
- Decomposition described
- Burning of fossil fuels increases CO₂ in the air eg Mechanisation/industrialisation/ transport
- Deforestation increases CO₂ in the air
- Global warming/greenhouse effect
- Increased microbial activity eg in paddy fields
- Increase in organic waste/landfill sites
- Domestic animals produce methane and CO₂.

(10)

[END OF MARKING INSTRUCTIONS]