



2007 Human Biology

Higher

Finalised Marking Instructions

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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 ✓ or ✗ 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.

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Marking scheme

Section A

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

Marking instructions

2007 Human Biology

Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1. (a) (i)	Circle must enclose one phosphate, sugar + base only in correct orientation	1	Phosphate circled <u>under</u> sugar	
	(ii) X – phosphate Y– deoxyribose (sugar)	1	sugar on its own	
(b)	Guanine and cytosine	1	guanine	
(c) (i)	AUA	1		
	(ii) Enzymes/polymerase or ATP DNA	1	protein ribosome	
(d)	2, 500	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2. (a)	X – Glycolysis Y – Krebs/citric acid/tricarboxylic acid cycle Z – Cytochrome chain or system/electron/hydrogen transport/ transfer system <i>(2 correct 1 mark, 1 correct = no mark)</i>	2	Cytochrome on its own Cytochrome Cycle	
(b) (i)	1 = pyruvic acid 2 = hydrogen (H ₂) or NADH ₂ or NADH FAD H ₂	2	Acetyl Co A FAD H on its own NAD reduced hydrogen carrier	
(b) (ii)	ATP and water	1	Energy	
(c)	It would have more cristae/folding. Word ‘cristae’ not essential. More convoluted. More infolds. Cristae have a larger SA Inside surface would be larger Longer/larger cristae (1) Needed for <u>higher</u> respiration/enzyme action/ <u>more/lots of</u> energy/ATP production (1)	2	Mitochondria would be bigger. It has a larger SA Cristae closer together. Needed for more activity	Any reference to mitochondrion as a cell, loses first mark

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3. (a)	$P = X^BY$ $Q = X^bY$ $R = X^BX^b$ $S = X^bX^b$ (2 or 3 correct = 1 mark)	2	All correct but small b on both Ys = 1 mark Wrong letter, one mark off	
(b) (i)	Because they always inherit a B /dominant allele/gene/X chromosome/trait <u>from their father</u> .	1	Because it is sex linked	
(b) (ii)	Because mother is heterozygous/ X^BX^b <u>and</u> father is unaffected	1		
(c)	<u>No</u> , because the expected ratio is 1:1 (the observed ratio is 3:1, affected to unaffected) <u>Yes</u> , because you would expect all females to get it and no males to get it.	1	<u>Yes</u> , because there are 3 girls and 3 boys/1:1	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<p>4. (a) (i)</p> <p>(ii)</p> <p>(iii)</p>	<p>The DNA/virus is damaged/changed <u>and</u> it cannot be replicated/reproduce/multiply duplicated</p> <p>The antigen/protein coat</p> <p><u>Artificial</u>: because it is (given by) injection/vaccination/immunisation.</p> <p><u>Active</u>: Body/she produces antibodies Her body initiates an immune response It stimulates a primary response</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Because it is a weakened form of the virus Because the virus has been denatured shape markers</p> <p>The virus has been tampered with. It was given to her. Not gained through natural infection. Definition of natural not accepted as alternative</p> <p>Memory cells recognise antigens</p>	
<p>(b)</p>	<p>Boxes 2, 4 and 5 ✓ (3 or 4 boxes correct = 1 mark)</p>	<p>2</p>		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
5. (a) (i)	X and Y – oestrogen/progesterone (1) Z – Prolactin (1)	2		
(ii)	The placenta is gone/shed/removed (after birth) (1) This removes/decreases the inhibition effect (on pituitary gland) or permits/allows pituitary to produce hormone Z (1)	2	non functional placenta. stimulates pituitary	Placenta deteriorates Reference to suckling Inhibition of hormone Z
(b) (i)	Colostrum	1		
(ii)	More protein/more antibodies/less fat/lower lactose/more minerals/more vitamin A. Contains a laxative.	1	more nutrients more vitamins no fat contains antibodies	
(c)	Increases/affects/controls permeability (of tubules) <i>or</i> (increases/affects) <u>re</u> absorption of <u>water</u> <i>or</i> osmoregulation/water regulation/balance <i>or</i> increases/affects urine concentration <i>or</i> decreases/affects volume of urine LH/ICSH Uterus/womb or breast/mammary gland (2 correct = 1 mark)	2	endometrium	Bowman's cap Glomerulus

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<p>6. (a) (i)</p> <p>(ii)</p> <p>(iii)</p>	<p>22</p> <p>1:3</p> <p>The <u>number</u>/% of individuals of high BP increases <u>with age</u>/ as they get older or the <u>number</u> of individuals treated increases <u>with age</u> or the <u>number</u> of individuals with normal BP decreases <u>with age</u>. <i>(Not reference to end result – trend important)</i></p> <p>Long term/accumulated effect of bad diet/smoking/ stress/lack of exercise/obesity or lining of the arteries/blood vessels become clogged up/ atherosclerosis described or because it is known that older men suffer from high BP, a higher proportion are treated</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>25:75</p> <p>Normal blood pressure decreases with age. As you get older blood pressure increases.</p> <p>Health problems more common in old people Reference to taking more exercise when young.</p>	<p>Reference to old people more stressed, smoke more, have a poor diet.</p>
<p>(b)</p>	<p>One is contraction and the other for relaxation of heart/ ventricles Heart pumping and heart resting One is systolic, the other diastolic</p>	<p>1</p>		
<p>(c) (i)</p> <p>(ii)</p>	<p>Makes it easier for blood to flow or more space/room for blood to flow or decreased resistance to flow of blood or reduces friction</p> <p>Pacemaker/SAN/sino-atrial node/AVN</p>	<p>1</p> <p>1</p>	<p>Capillaries/arterioles widen (description of vasodilation on its own)</p> <p>AV right atrium</p>	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7. (a)	(i) X – hepatic artery <i>and</i> Z hepatic vein (1) Y – hepatic portal vein (1)	2		
	(ii) X has more oxygen/oxygenated (than Z), and less CO ₂ (than Z), or vice versa. (Must refer to both gases) X is high in O ₂ and Z is high in CO ₂	1		Z has no CO ₂ Y
(b)	(i) It contains microvilli <i>or</i> villi <i>or</i> is long <i>or</i> folded/convoluted <i>or</i> walls are thin <i>or</i> has rich supply of blood capillaries (<i>any 2</i>)	1	High surface area must be qualified. Moist surface. Thin membranes/cell walls It is twisted villi are one cell thick	
	(ii) Used in respiration/to provide energy/ ATP Passed straight through (out through Z) Converted to <u>glycogen</u> <i>or</i> <u>fat/lipid</u> Stored as glycogen Used to increase blood glucose levels <i>any 2</i>	1	Stored as energy reserve Stored in the liver <u>Stored</u> as fat Absorbed by the liver. Used instantly Reabsorbed into the blood	
(c)	(i) Bilirubin/bile/bile salts (eg errors with vowels/two Ls OK) Bile pigment	1		
	(ii) Proteins/amino acids/enzymes	1	Hormones. NH ₃	and glucose

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8. (a) (i)	105 or 106 mg/100cm ³ (<i>units necessary</i>)	1		
(ii)	Pancreas/Islets of Langerhans	1		
(b)	10	1		
(c)	4	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates												
9. (a)	<table border="1" data-bbox="432 285 1149 767"> <thead> <tr> <th data-bbox="432 285 551 323"><i>Label</i></th> <th data-bbox="551 285 837 323"><i>Name</i></th> <th data-bbox="837 285 1149 323"><i>Function</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="432 323 551 459">P</td> <td data-bbox="551 323 837 459">Cerebrum/ cerebral hemisphere Motor area/strip</td> <td data-bbox="837 323 1149 459">Controls voluntary actions</td> </tr> <tr> <td data-bbox="432 459 551 528">T</td> <td data-bbox="551 459 837 528">Corpus callosum</td> <td data-bbox="837 459 1149 528">Links left and right side of brain</td> </tr> <tr> <td data-bbox="432 528 551 767">Q</td> <td data-bbox="551 528 837 767">Spinal cord</td> <td data-bbox="837 528 1149 767">To transport/send nerve impulses/signals to/from body Carries signals to/from body Links brain to <u>PNS</u></td> </tr> </tbody> </table> <p data-bbox="432 804 678 836"><i>1 mark for each row.</i></p>	<i>Label</i>	<i>Name</i>	<i>Function</i>	P	Cerebrum/ cerebral hemisphere Motor area/strip	Controls voluntary actions	T	Corpus callosum	Links left and right side of brain	Q	Spinal cord	To transport/send nerve impulses/signals to/from body Carries signals to/from body Links brain to <u>PNS</u>	3	<p data-bbox="1330 292 1536 323">Cortex on its own</p> <p data-bbox="1330 528 1731 624">Carries nerve fibres down the body Connects brain to the body Controls reflex actions</p>	<p data-bbox="1785 528 1939 624">Messages transmissions information</p>
<i>Label</i>	<i>Name</i>	<i>Function</i>														
P	Cerebrum/ cerebral hemisphere Motor area/strip	Controls voluntary actions														
T	Corpus callosum	Links left and right side of brain														
Q	Spinal cord	To transport/send nerve impulses/signals to/from body Carries signals to/from body Links brain to <u>PNS</u>														
(b)	Autonomic, medulla, slow down	1														
(c)	A myelin sheath/myelinated (sp. myline, mylean, mylyn)	1	insulated axons													

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10. (a)	18 and 6 or 9 months	1		
(b)	30	1		
(c) (i)	Departure of mother has more effect (than departure of father) or <i>vice versa</i> Departure of mother leads to less play (compared with departure of father.) <u>Comparison/description</u> not an explanation	1	Children were more distraught when the mother left.	
(ii)	Reason: child more <u>attached</u> to mother/has formed a (strong) <u>bond</u>	1	Child did not feel as safe when mother left Spends more time with mother/mother is primary carer/mother breast feeds. More used to father leaving Child is closer to/more dependent on mother	
(d) (i)	Child plays <u>more</u> when stranger departs <u>and</u> plays <u>less</u> when parents depart	1	Child stopped playing when parents left A change in play increases/decreases	
(ii)	Departure of parents causes anxiety. (less comfortable/insecure/worried/distressed) <i>or</i> Spent time looking for their parents (1) Departure of stranger reduces anxiety so child plays more (<i>or similar</i>) More relaxed after stranger left (1) <i>Must relate to departure of adults</i>	2	Implication that the stranger is not important. When stranger leaves the child does not mind. The child stops playing sooner Happy for stranger to leave Child cares about departure of parents Scared/neglected	
(e)	By repeating the experiment with <u>other</u> children/families <i>or</i> child (singular OK)	1	Repeat the experiment Try with different strangers	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11. (a)	3	1		
(b)	<p>Questions same <i>or</i> difficulty equal Duration <i>or</i> length of test Equal use of calculators Room layout/temperature <i>or</i> ventilation Age/sex of students/motivation/ability <i>or</i> intelligence of students/no copying Same time of day (2 = 1 mark) (any three of the above)</p>	2	<p>Loud noise Lighting/Time Same food intake No stimulants Students Number of students Number of questions Similarly rested Same environment</p>	
(c) (i)	<p>1 mark for correct axes scale/label/units 1 mark for correct plot (joined points - <u>one</u> line or ruler) 1 mark <u>off</u> for: - transposed axes - using less than 50% of graph paper both ways - a correct <u>bar</u> graph (OK to start at 1 or 19) <u>Average percentage error on y-axis ways</u></p>	2		
(ii)	<p>Students are getting used/adapted to the environment/ distractions/conditions (<i>or similar</i>) Students becoming more familiar with/better at calculations. They have improved with practice They have learned how to do the calculations/cope with the conditions/ignore the distractions</p>	1	<p>Their concentration increased with more trials Learning has occurred</p>	
(d)	<p>Reward success Carry out test with <u>spectators/others</u> watching Tell the students they are taking part in a competition</p>	1	<p>Tested as a group Oral answers so that others can hear</p>	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
12. (a)	0.8°C (<i>units needed</i>)	1		
(b)	Increasing population or <u>more</u> industrialisation/power/electricity demand or <u>more</u> transport/cars/planes or <u>more</u> domestic use/houses/urbanisation/electricity (<i>electricity must be qualified</i>) (any 2)	1	Cheap and easy to obtain More oil fields discovered Alternatives not so efficient Technology/machines Industrial revolution Increase in use of energy	
(c)	Increase in one matches an increase in the other Any anomaly described Any relevant data (x/y data from two graphs) (<i>all 3 = 2 marks</i>) (any 2 = 1 mark)	2	As temp rises we are using more fossil fuels. (cause and effect transposed)	
(d)	Methane/CFC/nitrous oxides/ozone/nitrogen oxide/NOX /O ₃	1	SO ₂ Carbon monoxide Nitrogen	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
<p>13. (a) (i)</p>	<p>1 For timber/fuel/wood as raw material 2 For fields/agriculture/farming 3 For space for building houses/roads/rail/industry/access to mineral deposits <i>(any 2)</i></p> <p>(ii)</p> <p>1 Loss of binding effect (of roots) on soil (1) 2 Removal/blowing away of soil/erosion (1) 3 Drying of soil/unable to retain water (1) 4 Loss of humus/less decay/no leaves for decomposition (1) 5 Reduction in rainfall/transpiration/reduced evaporation (1) <i>(any 2)</i></p>	<p>2</p> <p>2</p>	<p><i>Note that the <u>two</u> items must come from <u>two</u> different lines.</i> medicines</p> <p>Loss of nutrients</p>	<p>fossil fuels</p>
<p>(b)</p>	<p>Extinction/death of animals (and plants) <i>or</i> disruption to food chains <i>or</i> destruction of habitat <i>or</i> silting of rivers <i>or</i> flooding/erosion/mud slides <i>or</i> loss of biodiversity <i>or</i> fertility of soil decreases/loss of nutrients <i>(if not mentioned in part a)</i></p>	<p>1</p>	<p>Unable to grow crops Unable to find/produce new medicines Shift in oxygen/CO₂ balance Ref to climatic change <i>(as it is not <u>local</u>)</i></p>	

Section C
Essay Answers

- 1A**
- (i) 1 Synapse is a gap between neurones/nerve cells/nerve and muscle
(*labelled diagram with both nerve endings OK*)
2 Neurotransmitter contained in vesicles
3 in pre-synaptic knob/neurone
(*directional diagram OK without pre-synaptic label*)
4 Mitochondria provide energy/ATP (for synthesis)
5a (Arrival of) impulse triggers release (of neurotransmitter)
5b Vesicles join with membrane/fuse/exocytosis **3 marks**
- (ii) 6 Neurotransmitter diffuses across gap
7 Binds/joins with receptor
8 Impulse then passed on/triggers muscle contraction
9 Can be excitatory or inhibitory (*both needed*)
10 providing a threshold is reached **3 marks**
- (iii) 11 Need for removal to prevent continuous action/to allow discrimination between weak
and strong stimuli
12 Acetylcholine
13 removed by enzyme (degradation/activity)
14 Noradrenaline
15 removed by reabsorption **4 marks**
- 1b**
- (i) 1 Encoding – eg to convert a nerve signal into a form which can be received/interpreted
by the brain.
2 Acoustic encoding/by sound
3 Visual encoding/by pictures/images
4a Semantic encoding/by meaning
4b Olfactory/by smell **2 marks**
- (ii) 5 STM capacity – limited capacity/approx 7 items
6 Chunking – breaking down into groups eg phone numbers/car numbers
7 Time in STM very short/30 secs
8 Will be displaced if other information comes in
9 Rehearsal – repeating or practising
10 Elaboration –adding meaning or more information
11 Organisation – putting into categories
12 Unlimited capacity of LTM **6 marks**
- (iii) 13 Contextual cues
14 Example or description – related information aids retrieval
15 Named memory aid. eg Mnemonics/Mind maps/Spider maps/acrostics
16 Any example of a memory aid (eg letters and what they stand for) **2 marks**

- 2A**
- 1 **Failure to ovulate**
 - 2 Cause: hormone imbalance/lack of hormones (FSH and LH)
 - 3 Prolonged use of contraceptive pill
 - 4 Health reasons: anorexia/obesity/drug misuse/smoking/stress/poor diet
 - 5 Treatment: fertility drugs/hormone treatment/donor egg GIFT/improved life style

 - 6 **Blockage/spasm of uterine tubes**
 - 7 Cause: STD/infection/cancer
 - 8 Treatment: surgery/laser treatment/anti-spasmodic drugs
 - 9 IVF
 - 10 IVF = Fertilisation outside woman's body/in glass/Petri dish

 - 11 **Failure of implantation**
 - 12 Cause: hormone imbalance (*but not awarded twice unless qualified*)
 - 13 Treatment: fertility drugs (*but not awarded twice unless qualified*)
- + 2 marks for coherence and relevance** **8 marks**
-
- 2B**
- 1 Function: to carry oxygen
 - 2 Biconcave shape (*drawing acceptable*)
 - 3 Increased surface area for oxygen exchange/uptake/release
 - 4 Contains haemoglobin
 - 5 Small size allows cells to:
 - 6 Flexibility allows cells to:
 - 7 squeeze through narrow capillaries
 - 8 Lack of nucleus (and other organelles)
 - 9 gives more room for haemoglobin/to carry oxygen
 - 10 Oxygen carried as oxyhaemoglobin
 - 11 Iron is structural component/part of haemoglobin
- + 2 marks for coherence and relevance** **8 marks**

[END OF MARKING INSTRUCTIONS]