



2008 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.	B	16.	C
2.	C	17.	A
3.	A	18.	C
4.	B	19.	A
5.	B	20.	D
6.	D	21.	C
7.	A	22.	A
8.	A	23.	A
9.	A	24.	D
10.	B	25.	B
11.	D	26.	B
12.	D	27.	C
13.	D	28.	C
14.	B	29.	C
15.	D	30.	D

Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1. (a)	1. Thymine (T) in DNA and Uracil (U) in RNA 2. Deoxyribose in DNA and ribose in RNA 3. Double strand in DNA and single strand in RNA 4. DNA found in nucleus, RNA found in nucleus and cytoplasm 5. DNA can self replicate, RNA cannot (2 correct = 1 mark)	2	RNA has codons, DNA does not. RNA or DNA described on their own without reference to other = 1 mark DNA has double helix, RNA has single helix	
(b)	3 Uracil 8 Guanine 11 Thymine (correct spelling needed for thymine) (2 correct = 1 mark)	2	Letters: U G T	
(c)	Circle 1, 2, 3 or 4, 5, 6 inside or outside nucleus	1		
(d)	Ribosome/rough ER	1		
(e)	X – amino acid/peptide/polypeptide Y – tRNA	1	X – Protein Y – anticodon	
(f)	(i) Golgi body/apparatus	1		
	(ii) It is packaged/processed/altered/prepared	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates										
<p>2. (a) (i)</p> <table border="1" data-bbox="430 285 1158 657"> <thead> <tr> <th data-bbox="430 285 551 354"><i>Protein</i></th> <th data-bbox="551 285 1158 354"><i>Function</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="430 354 551 422">B</td> <td data-bbox="551 354 1158 422">Transports molecules by diffusion</td> </tr> <tr> <td data-bbox="430 422 551 491">A</td> <td data-bbox="551 422 1158 491">Acts as an enzyme/catalyst (1)</td> </tr> <tr> <td data-bbox="430 491 551 592">D</td> <td data-bbox="551 491 1158 592">Acts as an antigen/cell recognition site/hormone receptor (1)</td> </tr> <tr> <td data-bbox="430 592 551 657">C</td> <td data-bbox="551 592 1158 657">Transports molecules by active transport</td> </tr> </tbody> </table> <p data-bbox="430 694 813 727"><i>(1 mark for correct proteins B/C)</i></p> <p data-bbox="349 762 389 796">(ii)</p> <p data-bbox="430 762 629 796">X – phospholipid</p> <p data-bbox="430 831 801 865">Provides flexible/fluid boundary</p>	<i>Protein</i>	<i>Function</i>	B	Transports molecules by diffusion	A	Acts as an enzyme/catalyst (1)	D	Acts as an antigen/cell recognition site/hormone receptor (1)	C	Transports molecules by active transport		<p data-bbox="1234 694 1256 727">3</p> <p data-bbox="1234 831 1256 865">2</p>	<p data-bbox="1330 426 1727 459">A – builds up molecules/active site</p> <p data-bbox="1330 509 1760 542">D – stimulates production of antibody</p> <p data-bbox="1330 762 1384 796">lipid</p> <p data-bbox="1330 831 1686 865">Surrounds the cell/cell skeleton</p>	<p data-bbox="1785 831 1868 865">mosaic</p>
<i>Protein</i>	<i>Function</i>													
B	Transports molecules by diffusion													
A	Acts as an enzyme/catalyst (1)													
D	Acts as an antigen/cell recognition site/hormone receptor (1)													
C	Transports molecules by active transport													
(b)	<p data-bbox="430 903 1043 965">Engulfs/invaginates/encircles materials/takes into cell <i>(direction of movement required)</i> (1)</p> <p data-bbox="430 968 1025 1002">Particles/fluid enclosed in vesicle/vacuole/pouch (1)</p>	<p data-bbox="1234 935 1256 968">2</p>												

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3. (a)	AB	1	ab	
(b)	Grandson – BO Granddaughter – AO	1		sex linked
(c)	One	1		
(d)	Each <u>allele</u> has an equal effect/is expressed in the phenotype	1	Both alleles the same/dominant Both alleles show up	
(e)	True (<i>no mark – but must be present to gain following marks</i>) Group O/son 2 can give to Group A/son 1 (<i>or vice versa</i>) <i>or</i> O is the universal donor (1) Group A cannot be given to Group O because Group O has anti-a antibodies in the plasma. (1) (<i>or vice versa</i>)	2		Anti-a antigens Antibody on RBC

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4. (a)	Pituitary gland	1		
(b)	X – Oestrogen Y – Progesterone	1		
(c)	70	1		
(d)	Day 16 or 17 The concentration of LH peaks/high at around this point	1 1		ref to FSH
(e)	FSH – Stays the same/low <i>or</i> decreases/goes down Y – Stays the same/high <i>or</i> rises/goes up	1 1	No FSH	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6. (a)	P artery Q arteriole R venule (2 correct = 1 mark)	2		
(b)	The variation is due to the beating of the <u>heart</u> or diastolic/systolic pressure	1	Arteries have a pulse Arteries are elastic	
(c)	There are many arterioles/vessels have smaller diameter, so high friction/high surface area reduces pressure or they give more space for blood flow	1		
(d)	Veins have valves to prevent backflow (1) The movement of the body/muscles squeezes veins (1)	2	Valves pump blood	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7. (a)	80	1		
(b)	He has a low <u>resting</u> heart rate (<i>bpm values not required</i>)	1	His heart rate rises steadily	
(c)	At low intensity, fat consumption is higher than carbohydrate consumption <i>or</i> At high intensity, fat consumption is lower than carbohydrate consumption (1) Carbohydrate consumption increases (steeply) for almost the entire range (1) while fat consumption increases, and levels off then decreases (1) (<i>any two of the above = 2 marks</i>) One correct value for fat + one correct value for carbohydrate including units for both – g/hr and watts (1)	3		
(d) (i)	90 - 95	1	100	
(ii)	Because fats have more energy (2x) than carbohydrates <i>or</i> because the body's carbohydrate energy store is much less than the fat store <i>or</i> because fat stores last longer	1		
(e)	240	1		
(f) (i)	Liver/muscle	1		
(ii)	Glucagon or adrenaline	1		Misspelling of glucagon
(iii)	Protein <i>or</i> amino acids <i>or</i> muscle protein	1	Muscle	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8. (a) (i) (ii)	A – Central (Nervous System) <i>or</i> CNS B – Peripheral (Nervous System) <i>or</i> PNS C – Autonomic (Nervous System) D – Spinal Cord (2 <i>or</i> 3 correct = 1 mark) Required for conscious control of activities/movement <i>or</i> Controls skeletal muscle/sensory reception <i>or</i> Receives/interprets information from body sensors	 2 1	 Spine	
(b) (i) (ii)	Corpus callosum To allow space for more nerve cells/nerve cell connections	1 1	 Can store more information	
(c) (i) (ii) (iii)	Medulla (oblongata) They work in opposition/they have opposite effects Heart – speeds up Sweat glands – sweat production increases/stimulated Small intestine – reduces blood flow/activity/peristalsis <i>or</i> redirects blood flow away from intestine	1 1 2	 They cancel one another out Relaxes intestine	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9. (a)	It flows/leached from farmland/fields/soil into rivers <i>or</i> run-off from farmland	1	Sprayed on the water Blown in the wind	
(b) (i)	37.5	1		
(ii)	Insecticide is non-biodegradable/cannot be metabolised <i>or</i> Insecticide is retained in tissues/not excreted (1) Each organism eats <u>many</u> more organisms below it in the food chain (1)	2		
(c)	100 - 105 years	1		
(d)	Fertiliser/nitrates/manure increases yield/growth in plants Herbicides kill weeds and reduce competition Pesticides kill pests which might eat crops Fungicides kill fungi which might damage crops (<i>In each, both points are needed</i>)	1	Makes soil fertile	ref to herbs bacteria
(e)	Inhibits/denatures	1		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10. (a)	22 = 39% and 28 = 18%	2		Decimals given
(b)	<i>one mark for correct choice of axes with units one mark for points correctly plotted with line one mark deducted for using less than 50% of graph paper If error is made in (a) but correctly plotted – mark is given</i>	2		
(c)	(i) Pepsin works best at a pH 2/optimum pH for pepsin is 2	1	Pepsin works best at low pH	
	(ii) 0	1		
	(iii) Because the starting lengths are different	1	It's easier to compare results	
	(iv) With egg white but no pepsin/pepsin replaced with water	1	A tube with distilled water	
	(v) temperature, duration, width of tube, concentration/volume of enzyme, type of pepsin, egg boiled for same time, type of egg (white) (<i>any two for one mark</i>)	2	Size of tube/beaker Time	
	(vi) Repeat investigation/test additional pH values	1		
(d)	Because it would destroy/digest the cells in which it is produced/destroy the cells lining the stomach	1	It would digest the stomach	

Section C

1A

- (i) 1 Distinction between voluntary and involuntary (*given in i or ii*)
2 Curling up to reduce surface area of skin
3 *Any three marks from: eg Increased activity or movement (1)
Additional clothing (1) or taking hot drinks(1)
Switching on heating or seeking shelter/warm areas (1)*
- (ii) 6 Temperature monitored/responses triggered by hypothalamus
7 Hair raised to trap air (which is a good insulator)
8 Vasoconstriction (*must be correctly described in 9 to gain mark here*)
9 Blood flowing deeper/diverted away from skin surface/vessels smaller to carry heat further away from skin surface
10 Shivering is contraction of muscles to generate heat
11 Increase in metabolic rate to generate heat
12 Decrease in sweat production
- (iii) 13 Hypothermia is a failure of the body temperature regulating mechanisms *or* occurs when body temp falls below a critical level/33, 34, *or* 35°C
14 Symptoms of hypothermia – *any two for one mark from*
- Slowing down of movement
 - Difficulty walking – stumbling
 - Slurring of speech
 - Violent shivering
 - Poor vision
 - Irrational behaviour/falls asleep/slows down
 - False experience of warmth
 - Unconsciousness
- 15 Reasons for above – *any two for one mark from:*
infants: regulation mechanisms not well developed
lack of voluntary responses
large surface area: volume ratio
old: slow metabolic rate
inactive
regulation mechanisms deteriorating

1B

- (i) 1 Growth of facial/pubic/body hair
2 Growth of bones and muscle accelerated *or* growth spurt takes place
3 Development of sex organs/testes/penis
4 Deepening of voice
5 Production of sperm *or* seminal vesicles/prostate activity begins
- (ii) 6 LH/ICSH produced by pituitary gland
7 FSH produced by pituitary gland
(ie both hormones + pituitary = 2 marks 1 hormone + pituitary = 1 mark
two hormones without pituitary = 1 mark)
8 FSH promotes sperm production
9 LH/ICSH promotes testosterone production
10 Testosterone stimulates development of sperm/secondary sexual characteristics
11 Increase in testosterone inhibits pituitary gland *or* ICSH/LH production
12 This is an example of negative feedback control – *must be linked to 11*
13 Growth hormone from pituitary gland
14 Promotes protein synthesis/elongation of bones/muscle growth
15 Any mention of over/under production leading to dwarfism/gigantism

- 2A**
- 1 Controlled by a programme of vaccination
 - 2 Principle of vaccination: weakened pathogen stimulates immune system
 - 3 Control of measles/polio/whooping cough/smallpox (*any 2 examples*)
 - 4 Control of malaria by use of insecticide/drugs/draining standing water/nets
 - 5 Improved education eg in control of spread of HIV/use of condoms/smoking/breast feeding
 - 6 Improved hygiene/sanitation
 - 7 Provision of clean drinking water eg control of spread of cholera
 - 8 Use of chemicals/sterilising agents eg chlorine in drinking water
 - 9 Effective sewage treatment
 - 10 Improved diet/storing/handling of food eg refrigeration
 - 11 Improved medical facilities/provision of hospitals/doctors (*any two*)
 - 12 Work of aid agencies around the world eg WHO
(*examples required to gain marks above*)

*Irrelevance: references to improved farming techniques – fertilisers, herbicides
global warming/greenhouse effect*

- 2B**
- 1 Maturation
 - 2 An ordered sequence of stages in development: eg standing→crawling→walking
 - 3 Determined by development of nervous system/increased myelination
 - 4 Inherited/genetically determined
 - 5 Any example of inherited condition + brief description of condition (eg Down's)
 - 6 Environmental effects
 - 7 Monozygotic/identical twin studies useful because twins are genetically identical.
Social effects = no marks
 - 8 Influence of parents/family/good/bad upbringing
 - 9 Peer pressure/deindividuation described
 - 10 Social facilitation with description
 - 11 Internalisation *or* identification described
 - 12 Shaping *or* imitation *or* reinforcement/reward/punishment described
 - 13 Generalisation and discrimination described

Irrelevance: references to memory, structure of brain/types of nerves

[END OF MARKING INSTRUCTIONS]