

2006 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 \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.

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Marking scheme

Section A

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

Marking instructions

2006 Human Biology

Section B

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
1. (a)	(i) Fluid mosaic	1		bilayer
	(ii) X Phospholipid Y protein	1	X - hydrophobic tail	Fat bilayer lipid fatty acid
	(iii) Antigen, receptor, enzyme, self marker, catalyst	1		Pore, marker, active transport. For structural support.
(b)	(i) Substance is more concentrated on one side of the (membrane) than the other.	1	Movement from high to low or low to high Difference in concentration across membrane	
	(ii) Active transport	1		
	(iii) Less/no oxygen → less/no respiration/less ATP. (1) ATP/energy needed for active transport/against concentration gradient (1)	2	Must mention ATP or respiration in first point	

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable												
2. (a)	<table border="1"> <thead> <tr> <th><i>Amino acid</i></th> <th><i>mRNA codons</i></th> <th><i>tRNA anticodons</i></th> </tr> </thead> <tbody> <tr> <td>alanine</td> <td>GCU</td> <td>CGA</td> </tr> <tr> <td>threonine</td> <td>ACC</td> <td>UGG</td> </tr> <tr> <td>cysteine</td> <td>UGU</td> <td>ACA</td> </tr> </tbody> </table>	<i>Amino acid</i>	<i>mRNA codons</i>	<i>tRNA anticodons</i>	alanine	GCU	CGA	threonine	ACC	UGG	cysteine	UGU	ACA	1		
<i>Amino acid</i>	<i>mRNA codons</i>	<i>tRNA anticodons</i>														
alanine	GCU	CGA														
threonine	ACC	UGG														
cysteine	UGU	ACA														
(b) (i)	TGG/CGA/ACA/CGA	1														
(b) (ii)	Peptide	1		any other bonds eg polypeptide												
(b) (iii)	Chain has folded/helical/spiral/twisted shape/has hydrogen bonds	1		any reference to tertiary structure eg spherical, globular, fibrous. Double helix, Disulphide bonds												
(c)	Golgi body/apparatus/complex	1		Vesicle (Golgi)												

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
3. (a) (i)	Nucleotides, amino acids, ATP, enzymes (<i>any two</i>)	1		Nucleic acid, glucose, oxygen, protein, energy reverse transcriptase
(ii)	They are released from/leave the cell/the cell bursts/cell lysis takes place/released	1	Budding, exocytosis	Multiplication, replication, Burst and release DNA excreted
(b)	Nucleic acid damaged to prevent further replication/reproduction/multiplication. reduces impact of disease/does not cause disease/illness/harm/make virus inactive/attenuate the virus protein coat undamaged to sensitise immune system/allow antigen recognition So the body can form antibodies	1 1	recognises virus memory cells produced stimulate antibody response	it kills the virusd cell negates
(c)	100	1		

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
4. (a) (i)	Dd and Dd	1		no other letters
(ii)	50% or 1 in 2 or 1/2	1		1:1 1:2 2 in 4
(b) (i)	The grandfather has an unaffected daughter/child/female If homozygous all children would be affected	1		Parental generation includes an unaffected person. plural negates
(ii)	If sex-linked, the grandfather would have given the condition to his daughters or If sex-linked, the grandfather would not have given the condition to his son	1		Both males and females have the condition Y's daughter has the condition
(c)	Autosomal/Autosomes	1		

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
5. (a)	(i) Negative feedback	1		Homeostatic control Homeostasis
	(ii) A. LH/ICSH B. FSH C. progesterone 1 or 2 correct = 1 mark	2		
	(iii) stimulates/causes/starts LH production	1		Any reference to effect on endometrium Produces/releases LH
	(iv) Interstitial cells (spelling variations OK) eg interstial, intertitial	1		intercentral/intersectial intercical
(b)	Male = permanently fertile. Female = fertile for a short (regular) periods of time Egg produced once per month + sperm all time	1	Must mention both sexes, or describe both key words using other words	Menstrual rather than menopause Female is sometimes fertile
(c)	Hormones/oestrogen/progesterone suppress pituitary gland (1) Lack of pituitary hormones/FSH/LH stops ovulation/development of Graafian follicle (1)	2	both points made for second mark	Mention of implantation Progesterone prevents ovulation Pituitary absent - lose 1

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable								
6. (a)	Urea and carbon dioxide	1		Urine/water								
(b)	<table border="1"> <thead> <tr> <th><i>Substance</i></th> <th><i>Method of transport</i></th> </tr> </thead> <tbody> <tr> <td>oxygen/CO₂</td> <td>diffusion</td> </tr> <tr> <td>glucose</td> <td>active transport</td> </tr> <tr> <td>antibodies</td> <td>pinocytosis</td> </tr> </tbody> </table>	<i>Substance</i>	<i>Method of transport</i>	oxygen/CO ₂	diffusion	glucose	active transport	antibodies	pinocytosis	2	1 correct = 1 mark 2 correct = 1 mark	endocytosis
<i>Substance</i>	<i>Method of transport</i>											
oxygen/CO ₂	diffusion											
glucose	active transport											
antibodies	pinocytosis											
(c)	B It is carrying deoxygenated blood	1	type of blood must be mentioned	It is coming from the fetus								
(d)	A first (Rhesus +ve) child might have sensitised the mother/immune system/caused the mother to make antibodies/memory cells (1). Mother produces <u>antibodies</u> against second child (which cross the placenta) (1)	2	anti-D	immune response								
(e)	Poisons/Phenylalanine is/are removed across the <u>placenta/into</u> the mother	1		Mention of substances moving from mother to child								

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable															
7. (a) (i)	A hepatic vein B hepatic artery	1																	
(ii)	Small intestine/ileum	1	Intestine/gut	Stomach/large intestine															
(b)	<table border="1"> <thead> <tr> <th><i>Product of digestion</i></th> <th><i>Vessel of transportaion</i></th> <th><i>Possible fate</i></th> </tr> </thead> <tbody> <tr> <td>glucose</td> <td>capillaries</td> <td>respiration/stored as glycogen/fat</td> </tr> <tr> <td>amino acids</td> <td>capillaries</td> <td>deamination in the liver</td> </tr> <tr> <td>fatty acids/ glycerol</td> <td>lacteal</td> <td>respiration/stored/ membrane structure</td> </tr> <tr> <td>(1)</td> <td>(1)</td> <td>(1)</td> </tr> </tbody> </table> <p>(1 mark per column)</p>	<i>Product of digestion</i>	<i>Vessel of transportaion</i>	<i>Possible fate</i>	glucose	capillaries	respiration/stored as glycogen/fat	amino acids	capillaries	deamination in the liver	fatty acids/ glycerol	lacteal	respiration/stored/ membrane structure	(1)	(1)	(1)	3	Energy production for respiration Returned to blood near heart. Transported by lymph system Converted to lipid Accept any correct function of fat Vitamins don't need to be named	Blood stream instead of capillaries Glucose stored in liver Lipid
<i>Product of digestion</i>	<i>Vessel of transportaion</i>	<i>Possible fate</i>																	
glucose	capillaries	respiration/stored as glycogen/fat																	
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fatty acids/ glycerol	lacteal	respiration/stored/ membrane structure																	
(1)	(1)	(1)																	
(c)	1. Glucagon when shortage of (blood) glucose/sugar/ when hypoglycaemic 2. Adrenaline when stressed/exercising/frightened/ excited/glucose is required quickly	1 1	Spelled correctly Fight - flight syndrome both hormones correct but nothing else = 1	Thyroxine/starvation hunger/prolonged exercise															

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
8. (a)	1 mark for axes with units 1 mark for two line graphs 1 mark identifying different lines (key)	3		1 mark deducted if less than 50% of graph paper used. 1 mark deducted if Bar-chart drawn. Lines badly drawn
(b)	P – 32% Q – 60%	1		
(c)	(1) position of thermometer is not the same in each (2) different volumes of water in each	1		Thermometer reading can't be seen
(d) (i)	Shape/material of flask/thickness of glass/duration/ <u>starting</u> temperature/room temperature (2)	1	Same amount of cotton wool Depth of thermometer	Same conditions Same environment Size of flask Time of experiment Type of thermometer Shape + type = 0
(d) (ii)	50(cm ³) flask/small one It has a larger SA/VOL ratio (mass OK) or smaller VOL/SA ratio	1		Small flask has less hot water
(e)	Hypothalamus (hypothalmus)	1		Hippothalamus

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
9. (a)	(i) Golgi (<u>vesicle</u>)	1		Lysosome
	(ii) Carries <u>neurotransmitter</u> (named) or releases/secretetes <u>neurotransmitter</u>	1		Particles/hormones excrete...
(b)	acts as a receptor/determines whether a signal is excitatory or inhibitory/to receive neurotransmitter	1	combines/pick up/collect/joins with neurotransmitter	Any mention of Y being a cell, <u>negates</u> Attracts/absorbs nerve impulse/information <u>negates</u>
(c)	Provides energy/ATP for synthesis of neurotransmitter/moving vesicle (1) and <u>contraction</u> of muscle (1) energy or ATP must be mentioned once	2	First part can refer to any aspect of dealing with neurotransmitter. Second must relate to muscle contraction	Both areas require energy Movement of muscle
(d)	(i) myosin (miosin/myosine)	1		Actin
	(ii) nothing/no change	1	Answer must relate to change in length	Slide over one another.

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
<p>10. (a) (i)</p> <p>(ii)</p>	<p>The earlier and later pictures are remembered better/best (than those in between.)</p> <p>pictures at start can be rehearsed/transferred to long term memory (1)</p> <p>pictures in middle are displaced/pushed out from short term memory (1)</p> <p>pictures at end are not displaced/retained in short term memory (1)</p> <p>primacy and recency effect – unexplained = 1 mark</p>	<p>1</p> <p>3</p>		<p><u>Forgotten</u> instead of displaced or pushed out</p>
<p>(b)</p>	<p>Social facilitation</p>	<p>1</p>		

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
11. (a)	(i) 1.8	1		
	(ii) increase the size of sample/number of women surveyed	1	Study/check more years	experiment could be repeated ask more people
	(iii) because older women are more likely to have had more children or (younger) mothers may still go on to have more children	1		
(b)	41 million +/- 1 million (units necessary) Check carry over of incorrect answer eg 2 = 58 +/-1 1.9 = 47 +/-1 1.7 = 30 +/-1	1		
(c)	(i) 3.2	1		
	(ii) More use of contraception in UK children more expensive to raise in UK Children of economic value in Thailand. Mothers more likely to be in employment/have a career in UK More availability of family planning in UK	1	Must specify country Higher infant mortality in Thailand, so mothers compensate by having more children	
(d)	Emigration or immigration	1	Migration	
(e)	Demography/demographics	1	Demographic trend	

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
12. (a)	$4.9/58 \times 100 = 8.4\%$ 8.45% (any correct version up to 8.44827)	1	Calculation correct but final answer is 8 or 8.5	8.5 and 8
(b)	14:15	1		No other variation
(c)	980,000 0.98 million (11.6 is fifth of 58. $1/5$ of 4.9 = 980,000) (8.4% of 11.6 million or variation)	1	Accept any between 970,000 and 980,200	m for million

Question	Acceptable Answer	Mark	Also acceptable	Unacceptable
13. (a)	To make protein/nucleic acid/nucleotides/amino acids	1		ATP
(b)	Denitrifying (bacteria)/denitrification	1		anaerobic
(c)	(Nitrates) cause(s) algal bloom/increased plant growth (1) increased/decay/decomposition/increased population of bacteria use up oxygen (1)	2		Causes eutrophication Algal bloom cutting out light algal bloom using up oxygen (must mention night if this is offered)
(d)	Nitrogen fixation/lightning/nitrification/decay or decomposition of plants or animals/manure (animal waste)/clover or leguminous crops	1	plant + animal decay counts only as one way	Fertiliser Crop rotation

Section C

Essay Answers

A Respiration

(i) Role of ATP

- 1 ATP supplies cells with energy
- 2 Conversion to/from ADP + Pi
- 3 Produced as fast as it is used up/constant level
- 4/5/6 examples: *maximum 3 marks for any three*
eg muscle contraction/phagocytosis/metabolism *or* chemical reactions/active transport/nerve impulse transmission/glycolysis/sperm swimming/mitosis *or* meiosis/cell division/DNA replication

(ii) Respiratory substrates

- 7 Defined: substance used as a source of energy for respiration
- 8 Glucose is principal substrate
- 9 + amino acids/proteins/fats/fatty acids (*any two for a mark*)
- 10 Mention of glycogen + stored in liver/muscle
- 11 Any one entry point. eg amino acids → pyruvic acid eg glucose → glycolysis
- 12 Sequence of usage glucose/carbohydrate → fats → protein
- 13 Conditions under which this occurs:
switch to fats during dieting/marathon running
or switch to protein during starvation
- 14 Relative energy content. fats x2/more than that of carbohydrates (and proteins)
or carbohydrates similar energy content to protein

Enzymes

(i) Factors affecting activity

- 1 Enzymes are catalysts/speed up metabolism/chemical reactions/lower activation energy
affected by: (each with a brief description)
- 2 temperature: a rise in temperature causes an increase in activity up to an optimum/point, thereafter a decline. (or graph)
- 3 pH: a change in pH causes an increase in activity up to an optimum/point, thereafter a decline. (or graph)
- 4 Denaturing – change in enzyme structure with high temp/pH change
- 5 Inhibitors – slows up/stops enzyme activity
- 6 Competitive – attach to active site (labelled diagram OK)
- 7 non-competitive – other part of enzyme, distorts active site
- 8 substrate concentration, with explanation/graph
- 9 enzyme concentration, with explanation/graph

(ii) Activation of enzymes

- 10 Definition of activation
- 11 Vitamins/minerals/change in pH activate enzymes
- 12 Vitamins/minerals act as co-enzymes/co-factors
- 13 Co-factor/co-enzyme enables substrate to fit active site(diagram)
- 14 any example of/or reason for need for activation
eg activation of trypsin
eg prevention of digestion of cells producing the enzyme

B Experience on learning

- 1 Practice eg repetition of motor skills
- 2 Imitation. eg copying/observing others
- 3 Trial and error – simple description
max of 1 mark for any example of above
- 4 Reinforcement – rewarding of positive/good behaviour
- 5 Shaping – rewarding intermediate/approx stages towards desired behaviour
- 6 Extinction – no reward given to poor/bad behaviour leads to its disappearance
max of 1 mark for any example of above
- 7 Generalisation + description
example. eg child bitten by Alsatian subsequently fears all dogs
- 8 discrimination + description
example. eg child bitten by Alsatian subsequently fears only Alsatis
- 9 Long period of dependency in humans to permit learning

Irrelevance: eg Any forms of group behaviour/social influence eg. social facilitation, deindividuation, maturation

Water supply

- 1 Increasing population creates more demand
drinking/washing/agriculture/industrial usage (*any two*)
- 2 Agriculture: requirement for increased irrigation of farmland
- 3 diversion of rivers/dams can lead to problems of supply further downstream
- 4 Loss of underground water/lowering of water table/subsidence
- 5 Desertification/drying of land/loss of vegetation/soil blown away
- 6 Deforestation because of need for agricultural/building land/raw materials
- 7 can reduce rainfall, cause drought
- 8 leads to localised flooding/silting
- 9 Global warming/greenhouse effect due to increased CO₂/burning of fossil fuels
- 10 leads to change in weather patterns/drought/flooding/rise in sea level
- 11 Pollution of water by fertiliser/pesticides/sewage
- 12 Pollution of water by industrial waste/acid rain

*Irrelevance: eg Reasons for human population growth. Effect of disease on population
Impact of shortages of food. Ozone depletion.*

Single short reference to irrelevant point is not penalised, but development of the point is penalised. However, two irrelevant points without development are penalised.

Threshold - 5 marks

[END OF MARKING INSTRUCTIONS]