2011 Human Biology

Higher

Finalised Marking Instructions

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 CO_2, H_2O
    - 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 $7{\cdot}3 \pm 0{\cdot}1$.

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.

2011 Human Biology Higher

Marking scheme

Section A

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

Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1. (a) (i)	Nucleus	**1**		
(ii)	U G U A C U G U G C U C	**1**		
(iii)	4	**1**		
(b) (i)	They result in a short/incomplete protein/polypeptide **OR** The mRNA cannot bind to the ribosome **OR** They prevent translation/tRNA molecules <u>binding</u> to mRNA	**1**	Changes the protein produced Changes mRNA sequence	
(ii)	The body/immune system/antibodies attacks body <u>cells</u>/own <u>cells</u> **OR** A disease in which the body/immune system recognises body cells/self antigens as foreign/non-self	**1**	The body attacks itself Body does <u>not</u> recognise its own cells as self	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2. (a)	Phospholipid	**1**	lipid	
(b)	Antigen/antigenic marker/enzyme/receptor	**1**	carrier/support/catalyst/self marker	
(c)	30 : 1	**1**		
(d)	Diffusion	**1**		
(e) (i)	(The concentration) would become equal/closer **OR** (The concentration) decreases inside/in the cytoplasm and increases outside/in the plasma	**1**		
(ii)	No/less ATP/energy production and no/less active transport **OR** Active transport stops/decreases and diffusion equalises the concentrations **OR** Respiration is needed to make ATP which is needed for active transport	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3. (a) (i)	DNA/chromosomes <u>replicate</u> **OR** Two <u>chromatids</u> are produced (from one chromosome)	**1**	Cells replicate/replication on its own DNA/chromosomes doubles/copied/ duplicates	
(ii)	<u>Homologous</u> chromosomes/pairs separate **OR** Cells go from <u>diploid</u> to <u>haploid</u>	**1**		
(b) (i)	Chiasma/chiasmata	**1**		
(ii)	RT Rt rT rt	**1**		
(iii)	Independent assortment	**1**	non-disjunction	
(c)	Seminiferous tubules/sperm mother cell	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4. (a) (i)	1 – BO 3 – OO	**1**		
(ii)	Blood group = AB – 1 mark Individual 6 can only pass on allele O <u>to their children and</u> therefore both alleles A and B must have come from person 5 O **OR** She must provide both A and B alleles <u>to her children as</u> her partner has O alleles/is OO **OR** She produced an A and B blood group <u>child</u> with an OO male. *(Answer must refer to the alleles or genotype of father <u>and</u> alleles or blood groups of the children)*	**2**	partner is O.	
(iii)	6	**1**		
(b)	1, 3, 6 and 8. (*Check answer is correct for a(ii), if wrong and O or B is given then 1, 3, 5, 6 and 8 is correct*)	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
5. (a) (i)	C	**1**		
(ii)	A/B – Graafian follicle – 1 mark F – Seminiferous tubule/sperm mother cell – 1 mark	**2**		
(iii)	Stimulates/promotes/causes/increases sperm production	**1**	Activates sperm production	
(b) (i)	Pituitary (gland)	**1**		
(ii)	Stimulates/causes contraction of the uterus/womb	**1**	Dilation of cervix Contraction of the vagina	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6. (a) (i)	Bowman's capsule	**1**		
(ii)	Process – ultrafiltration – 1 mark Explanation – Blood vessel/arteriole entering is wider than blood vessel leaving – 1 mark **OR** Blood flows from an artery/arteriole at high pressure – 1 mark	**2**	Filtration	Thicker Use of capillary as vessel entering
(b) (i)	Proximal convoluted tubule	**1**		
(ii)	Reabsorption (or description of reabsorption) of glucose/water/salts/amino acids/vitamins/minerals *(Any acceptable substance)*	**1**	Absorption Urea/proteins/useful substances/ nutrients/hormones	
(c) (i)	Urine solute concentration increases and urine production rate/volume decreases	**1**		
(ii)	19 mg/ml *(units essential)*	**1**	19 (no units)	
(iii)	0.34	**1**		
(iv)	1600	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7. (a) (i)	E – pulmonary artery F – aorta	**1**		
(ii)	1 – B has more carbon dioxide 2 – D has more oxygen/D is oxygenated while B is deoxygenated 3 – B has more glucose *any 2 from 3*	**1**		
(iii)	X placed anywhere inside the right atrium/A **OR** touching **outer** walls of the right atrium/A	**1**		
(iv)	Sympathetic increases rate of impulses (from SAN)/ heart rate – *1 mark* Parasympathetic/decreases rate of impulses (from SAN)/heart rate – *1 mark* *(If candidates name sympathetic and parasympathetic systems but indicate wrong effect given 1 mark)*	**2**	Sympathetic speeds up SAN Sympathetic increases heartbeat	
(b)	Supplies the heart (muscle) with oxygen/glucose	**1**	Supplies heart muscle with blood/ nutrients	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8. (a)	199 800	**1**		
(b)	Not all countries have the same <u>population</u> **OR** England has a much bigger <u>population</u> **OR** The <u>population</u> distribution in the (four) <u>countries</u> is not equal	**1**		
(c)	1. (Increased spending on) provision of doctors/ nurses/hospitals/healthcare 2. (Increased spending on) manufacture of insulin/ drugs 3. (Increased) education/advertising about diet/ exercise (and diabetes) 4. (Increased spending on) research into diabetes 5. Reduce advertising of sugar-rich foods *(any two)*	**1**		
(d) (i)	1. Age – More people <u>consult their doctor</u> about diabetes as they get older 2. Gender – More males <u>consult their doctor</u> about diabetes than females *(both needed – at least **one** answer must mention diabetes)*	**1**	More older people get diabetes. More males get diabetes. Males are consulting their doctors more.	
(ii)	110	**1**		
(iii)	11.76/11.8/12	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(e) (i)	Pancreas	**1**		
(ii)	Insulin causes/stimulates the conversion of <u>glucose into glycogen</u>	**1**	Insulin converts glucose to glycogen	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9. (a) (i)	X – rehearsal Y – retrieval Z – encoding *(3 correct = 2 marks, 1 or 2 correct = 1 mark)*	**2**	Y = Recall	
(ii)	Visual/Images/sight <u>and</u> Acoustic/Sounds/audio/ auditory **OR** any reference to two <u>sensory</u> inputs – smell, taste, touch **OR** Semantic/Meaning (from LTM) <u>and</u> one sensory input.	**1**	Words/written/text/verbal/ listening	
(iii)	They serve as a reminder to the time/occasion <u>when</u> the information was originally experienced/encoded *(Answer must convey that the cue triggers thoughts about the time when the memory was created. This could be described by the use of an example*)	**1**		
(b)	The nine digits are divided into groups <u>so</u> there are fewer items/chunks to remember.	**1**		
(c) (i)	Limbic System/hippocampus	**1**	cerebrum	
(ii)	NMDA	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10. (a)	75 and 55	**1**		
(b)	Similar – cards contain the same words Different – words arranged randomly/not organised/ not in categories	**1**	Both contain 25 words Same information	
(c)	1. Individuals of a similar age range are in each group 2. Individuals with similar intelligence/ability 3. Each group has a similar gender/sex balance 4. Each group has the same time to write down the words 5. Investigation carried out in same environmental conditions *(eg same room/at same time of day/in same temperature/in silence with no distraction)* 6. Words/cards same size/font/colour *(any two)*	**2**	Same time to look at cards Same time before recalling Same words on each card – *only give if not correct in part b.* Complexity/length of words	
(d)	Organisation (of words into branching diagrams) improves their recall/were better remembered	**1**	Restatement of results. Organisation improves memory	
(e)	Repeat the (same) experiment using more/different students/more groups of students	**1**	Using students of a different age Calculate an average	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(f)	So all students do their best/are more motivated/ concentrate more due to social facilitation/competition.	**1**		
(g)	Prediction – Number of words recalled increases Explanation – Rehearsal/repetition improves transfer into long-term memory (LTM)	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11. (a)	A – cell body B – axon C – dendrite *(3 correct for two marks, 1 or 2 for one mark)*	**2**		
(b) (i)	Acetylcholine <u>and</u> noradrenaline *Additional acceptable neurotransmitters include dopamine/serotonin/histamine/glutamate/endorphin/ glycine*	**1**		
(ii)	Insufficient secretion/not enough of neurotransmitter **OR** Threshold level of neurotransmitter not reached **OR** Insufficient receptors stimulated	**1**	Threshold is not reached	
(iii)	Protein – <u>Actin</u> and <u>myosin</u> – *1 mark* Description – They slide between/over/across each other – *1 mark* *Answer must convey movement.*	**1** **1**	Interlock/overlap	
(c) (i)	Speeds up (the transmission of nerve impulses)	**1**	Insulates axon More efficient transmission	
(ii)	Maturation	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
12. (a) (i)	Axes correctly drawn and labelled – 1 mark *Vertical axis must have biomass (thousand tonnes)* *Vertical axis need not start at zero.* *Horizontal axis must have Year* Points correctly plotted and line drawn – 1 mark *Remove one mark for bar graph **OR** using less than half of the graph paper **OR** extending line to 1960.*	**2**		
(ii)	22/23	**1**		
(b) (i)	800	**1**		
(ii)	Less disease/decreased predation/increase in food/ fishing quotas or bans introduced/mesh size of fishing nets increased/reduced demand for herring/less competition with cod	**1**	Less pollution/global warming/ Less cod so more herring Less fishing	
(c)	Carrying capacity	**1**		

Section C

1A Give an account of communication under the following headings:

(i) The use of language **4**

1. Language can be written/spoken/uses symbols (to represent information)
2 Language enables information to be organised (into categories/hierarchies)
3 Language allows the transfer of information/skills/instructions/ideas
4 Language/tone of voice allows communication of views/feelings/moods
5 Language allows learning/intellectual development/cultural development
6 Language allows unique human behaviour/distinguishes humans from animals
7 Language development is dependent on your environment/imitation/parents

(ii) Non-verbal communication **6**

8 Non-verbal communication is important in early life <u>before speech possible</u>
9 It is important in forming <u>bonds/attachment</u> between infant and parents
10 Example described of non-verbal signal by a baby <u>and</u> the feeling conveyed eg crying for attention
11 Non-verbal communication/body language/facial expression in adults involves signals that they can be <u>unaware</u> that they are giving/<u>subconscious</u> signalling
12 Non-verbal communication/body language/facial expression can aid/replace/ contradict verbal communication **OR** sign language use by the deaf **OR** signs used for direction/instruction
13 Non-verbal communication/body language/facial expression can signal <u>attitudes/ emotions/feelings</u>
14/15. Two examples of non-verbal communication in <u>adults</u> <u>and</u> the feeling/attitude conveyed eg smiling – pleasure, eye contact – attraction, fidgeting – boredom *(Give 1 mark for the mention of any two (adult) non-verbal signals without mention of the feeling/attitude conveyed)*

1B Give an account of the environmental effects of an increasing human population under the following headings:

(i) Deforestation **6**

1. Deforestation involves clearing forests for agriculture/building/transport/raw materials/wood/fuel (*2 reasons needed for this mark*)
2. (Cleared) trees/wood burning releases <u>carbon dioxide</u> (into the atmosphere)
3. More carbon dioxide in atmosphere as less <u>photosynthesis</u> occurs
4. <u>Global warming</u>/<u>Greenhouse effect</u> (as less heat escapes from Earth)
5. Loss of <u>roots</u> (which hold/bind soil) causes <u>erosion</u>/<u>loss of soil</u>
6. (Increased) flooding/silting of rivers/blockage of irrigation systems
7. Deforestation leads to less rainfall/desertification
8. <u>Loss of habitat</u> so species extinction/reduction in numbers occurs **OR** <u>reduction in biodiversity</u>

(ii) Increasing atmospheric methane levels **4**

9. (Increased numbers of) cattle/livestock (to feed population)
10. (Increased) growth of rice/paddy fields (to feed population)
11. (Increased) landfill sites (to deal with waste)
12. Methane produced under <u>anaerobic</u> conditions
13. <u>Bacteria</u> produce methane
14. Methane is a greenhouse gas/causes global warming
15. Methane is produced by <u>biomass</u> burning/burning <u>tropical/rain forests</u> (to clear land for farming)

2A Discuss factors that affect enzyme activity **10**

1. Enzymes are catalysts/speed up metabolism/chemical reaction/lower activation energy
2. Temperature: enzymes have an optimum temperature/temperature at which they work best/work best at 37^{o}C *(or labelled graph to illustrate)*
3. pH: all enzymes have an optimum pH/pH at which they work best *(or labelled graph to illustrate)*
4. Denaturing: a change occurs in the structure/shape/active site of the enzyme at high temperatures/when the pH changes
5. Inhibitors: slow up/stop enzyme activity
6. Competitive inhibitors: attach to/block the active site so keeping out the substrate molecule **OR** inhibitor competes with substrate for active site
7. Non-competitive inhibitors: attach to another part of an enzyme and changing the shape of the active site/enzyme (so the substrate molecule does not fit)
8. Substrate concentration: increasing substrate concentration increases activity until a point when activity levels off *(or labelled graph to illustrate)*
9. Explanation that activity levels off when all enzyme active sites are reacting with substrate molecules/enzymes are working at fastest rate possible
10. Enzyme concentration: increasing enzyme concentration increases the rate of reaction *(or labelled graph to illustrate)*
11. Explanation that activity increases due to more active sites being added
12. Vitamins/minerals/cofactors/coenzymes/other enzymes activate enzymes

The coherence and relevance marks are only awarded when at least five marks have been scored from points 1 to 12 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:
Inborn errors of metabolism, chemical structure of enzymes, protein function **1 mark**

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

2B Discuss the production and use of ATP in the body. 10

1. ATP is built up from ADP and phosphate (*or equation*)
2. ATP is produced during glycolysis
3. From the conversion of glucose to pyruvic acid
4. ATP is produced from/by the cytochrome system/electron transport chain
5. This is found/takes place on the cristae of the mitochondrion
6. Hydrogen/electrons passed from carrier to carrier, generating (energy to form) ATP
7. Less ATP produced during glycolysis compared to the cytochrome system
8. During anaerobic respiration/lack of/absence of oxygen two molecules of ATP is produced
9. ATP is broken down into ADP and phosphate releasing energy (*or equation*)
10. ATP is produced as fast as it is used up/remains at a constant level in the body

Maximum 7 marks from points 1 to 10

11/12. Uses of ATP – muscle contraction/phagocytosis/protein **OR** chemical synthesis/ active transport/nerve impulse transmission/glycolysis/sperm swimming/mitosis **OR** meiosis **OR** cell division/DNA replication
Any two mentioned for 1 mark, any three mentioned for 2 marks.

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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:
Transport to and from body cells/red blood cells/absorption of nutrients/role of the lungs/blood sugar control. **1 mark**
Coherence – Response should contain paragraphs/subheadings, have a logical sequence and be written in sentences (not bullet points). **1 mark**

[END OF MARKING INSTRUCTIONS]