2012 Human Biology

Higher (Revised)

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.

2012 Human Biology Higher Revised

Marking scheme

Section A

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

Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1. (a)	Unspecialised cells that can develop into any / a number of / different / other cell types *or sense of (oso)*	**1**	Undifferentiated / unspecialised cells on their own	
(b)	(Red) bone marrow	**1**		
(c)	Cells become specialised / specific types of cell are formed (*must mention cell somewhere in answer*) Differentiation is when genes are switched on and off to allow the cell to function in a certain way.	**1**		
(d)	Embryonic stem cells can become any type of cell <u>while</u> tissue stem cells give rise to a more limited range of cell types.	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2. (a)	Trypsin / the enzyme digests / breaks down gelatine / protein <u>and</u> releases the (dark) chemicals.	**1**	Trypsin digests the colour	
(b)	Temperature <u>of solution / trypsin</u> pH Volume / depth of solution / trypsin Size / length / area of film Age / type/ thickness of film / thickness of gelatin Age of trypsin **Any 2**	**2**	Temperature of room/test-tube Test-tube dimensions Mass of film Volume of gelatine Source of trypsin	Amount
(c)	Repeat the procedure <u>at each concentration</u> (and then calculate an average).	**1**	Repeat the investigation Repeat with different solutions	
(d)	Axes correctly drawn and labelled **1 mark** *Must have trypsin conc (%) and time for film to clear (s)* Points correctly plotted and line drawn **1 mark**	**2**	Remove one mark for bar graph **or** for using less than half of the graph paper	
(e)	There is <u>more</u> trypsin / enzyme (molecules) / active sites to react with the gelatine / protein / substrate.	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(f)	Surface area of film / size of film / thickness of gelatine is limiting the rate of reaction **OR** The size of the film / gelatine is too small to allow all enzyme molecules to react with it **OR** The reaction / clearing the film requires a minimum time to occur / is going as fast as it can	**1**	Enzyme is no longer limiting the reaction Substrate concentration is limiting the reaction Other factors are limiting the reaction	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3. (a)	Introns	**1**		
(b)	The wrong / extra amino acids are not placed in the protein / polypeptide formed **or** So that the correct / functional protein is formed	**1**		
(c)	5	**1**		
(d)	1. RNA single stranded and DNA double stranded 2. RNA contains ribose and DNA contains deoxyribose 3. RNA contains uracil and DNA contains thymine. **Any 2**	**2**	Not U and T	
(e)	Mouse	**1**		
(f)	Genome	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4. (a) (i)	R = X^DX^d and S = X^DY	**1**		
(ii)	33 / 33.3 / 33⅓	**1**		
(iii)	Son of T = 0 / none and Son of U = 50	**1**		
(b) (i)	Mutation	**1**	Inborn error of metabolism	
(ii)	Alter/change the sequence / order of bases /nucleotides **OR** A specific base / nucleotide change is described. (insertion, deletion, substitution described)	**1**	Bases are changed	Codon
(c)	Genetic screening / genetic counselling / pedigree chart (analysis	**1**		

uestion	Acceptable Answer	Mark	Unacceptable Answer	Negates
5. (a) (i)	A = Glycolysis B = Citric acid cycle / Krebs cycle / TCA cycle	**1**		
(ii)	Oxaloacetate / oxaloacetic acid	**1**		
(b)	ATP	**1**		
(c)	1. ATP 2. $FADH_2$ 3. Carbon dioxide **Any 2**	**1**		
(d)	ATP is only produced / used when it is required **OR** Glucose is only used up when required **OR** It allows synchronisation of glycolysis and the citric acid cycle.	**1**		
(e)	1. Hydrogen is transferred to pyruvate / pyruvic acid 2. Lactic acid is then produced 3. Regenerates NAD for glycolysis / ATP production **Any 2**	**2**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6. (a)	Progesterone	**1**		
(b) (i)	(Causes the) repair / thickening / proliferation / vascularisation / further development of the endometrium / lining	**1**	Wall / inner layer	
(ii)	Stimulates / causes LH / FSH release / production	**1**	Stimulate LH / FSH LH / FSH release	Inhibits LH / FSH
(c)	Progesterone / hormone X remains high / constant / does not decrease **OR** Oestrogen remains high / does not decrease during the second half of the cycle / after day 24/25	**1**	Progesterone production increases	
(d) (i)	P – (Graafian) follicle Q – Corpus luteum	**1**		
(ii)	Ovulation / release of egg from ovary **OR** Surge in LH concentration	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7. (a) (i)	Y – lumen Z - endothelium	**1**		
(ii)	(Smooth) muscle	**1**		
(iii)	They stretch / recoil **OR** Help the artery (wall) to expand / contract	**1**	Contract and relax Vasodilation / vasoconstriction	
(b)	Valves - prevent backflow of blood / allow unidirectional flow of blood **OR** (Relatively) wide lumen - reduces friction / resistance to flow	**1**		
(c)	Aorta <u>and</u> pulmonary artery	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8. (a) (i)	X = SAN/ SA node / sino-atrial node / pacemaker Y = AVN / AV node / atrio-ventricular node	**1**		
(ii)	The atria contract / atrial systole	**1**		
(iii)	Arrows must travel <u>down</u> the central wall of the heart from Y and <u>up each</u> side of the ventricles.	**1**		If arrows continue up into wall of atria
(b) (i)	Bicuspid / AV / atrio-ventricular / mitral	**1**		Right AV valve
(ii)	Ventricular systole	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9. (a)	Breathing rate remains constant <u>and</u> volume of each breath increases. **1 mark** <u>Correct figures and units</u> quoted for at least <u>one</u> change, eg breathing rate remains constant at 14 breaths / min **OR** volume of each breath increases from 480 to 1240 cm^3 **1 mark.**	**2**		
(b)	18	**1**		
(c)	14 000	**1**		
(d) (i)	1800 to 1840 <u>cm^3</u> (**units essential**)	**1**		
(ii)	Lung volume is nearing its maximum capacity **OR** He is breathing as deeply as possible **OR** Lungs have a limited capacity / can only hold so much air	**1**	Breathing rate is too fast to take deep breaths Lungs cannot inhale any more	
(e)	(Carbon dioxide is produced) by <u>respiration</u> / <u>the Citric acid cycle</u> (in body cells).	**1**		anaerobic

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10. (a)	Controls muscles / movement in the <u>right side</u> of the body	**1**	Left side	
(b)	Transfers / shares information / impulses <u>between</u> the two (cerebral) hemispheres / sides of the brain. **OR** So brain acts as an integrated whole.	**1**	Connects the two sides of the cerebrum Transfers messages	
(c) (i)	The autonomic (nervous system) / ANS	**1**		Peripheral
(ii)	Sympathetic speeds it up <u>and</u> parasympathetic slows it down	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11. (a)	51 <u>weeks</u> (unit essential)	**1**		
(b)	3, 4, 5 and 6.	**1**		
(c) (i)	Glial cells	**1**		
(ii)	Myelination increases the speed of impulse conduction (from node to node).	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
12 (a)	Use people of similar age / gender or gender balance / memory ability or span / use the same number of people / same first language **Any 2**	**1**	Same intelligence / IQ Same book Random allocation Same environmental conditions Same occupation	
(b)	Short-term memory / STM holds on average seven / 5-9 words / items **or** capacity / span of STM **OR** Short-term memory / STM can retain words for 30 seconds. / a short time **or** duration of STM	**1**	Words are still in STM Recency effect	
(c)	To prevent rehearsal of the words **OR** To displace / remove the words from short-term memory.	**1**	To prove the words are in LTM Displace into LTM	
(d)	1. The meaning of words has no effect on their recall / retrieval from short-term memory. 2. Related (meaning) words are harder to recall / retrieve from long-term memory (than unrelated words). **OR** Unrelated (meaning) words are easier to recall / retrieve from long-term memory (than related words).	**2**	Answers that relate to storage or encoding Answers must not simply restate the results Remember used instead of recall	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
13. (a)	Active immunity	**1**	Humoral response	
(b) (i)	B-lymphocyte / plasma cell	**1**	Lymphocyte B cell	
(ii)	Attaches / recognises / identifies / detects the (polio) virus (Divides to) produce cell Q / lymphocytes/plasma cells (Divides to) produce memory cells **Any 2**	**1**	Traps virus Identifies pathogen	Destroys virus Attracts the virus
(c)	To respond <u>quickly</u> to <u>another / a second</u> invasion of a virus / bacterium / pathogen / toxin / antigen	**1**	Disease	
(d)	The measles virus carries different <u>antigens</u> / proteins (to the polio virus) **OR** antigenic variation **OR** <u>Antibodies</u> are specific to one virus / polio / antigen **OR** The <u>receptor</u> on cell P / the B-lymphocyte / the memory cell does not match the measles virus antigen.	**1**	Vaccine is specific Antibodies are specific (on own)	
(e)	To enhance / prolong / maximise / boost / aid the immune response. **OR** To increase the efficiency of the vaccine	**1**		
(f)	Neither the subject in the trial nor the researchers know whether the subject has been given the vaccine or a <u>placebo</u>.	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
14. (a)	Mast (cell)	**1**		
(b)	Vasodilation **OR** widening of arteries / arterioles **1 mark** Increased capillary permeability **1mark**	**2**		
(c)	Cytokines – result in the build up of phagocytes **OR** Proteins / antibodies – are antimicrobial / kill bacteria **OR** Clotting Factors – clot prevents microbes entering the bloodstream	**2**		

Section C

1A Give an account of infectious diseases under the following headings:

(i) the classification of the spread of diseases **3 marks**

1. Sporadic – disease occurs occasionally
2. Endemic – regular cases occur in an area **or** disease is typical of an area
3. Epidemic – (unusually) high number of cases in an area
4. Pandemic – global epidemic
5. *Any three types named but no/incorrect description.*

(ii) the transmission of disease **3 marks**

6. Diseases are caused by pathogens eg viruses, bacteria, fungi, protozoa, any multicellular organism **Any 2 examples named**
7. Diseases are transmitted by direct physical contact / indirect contact / bodily fluids / inhaled air / droplets in air (coughing/sneezing)
8. Diseases are transmitted by food / water
9. Diseases are transmitted by animal vectors
10. One example of a named disease and how it is spread.

(iii) The control of disease transmission **4 marks**

11. Vaccination or immunisation / drug therapy / antibiotic use / antiviral drugs / antiseptics / disinfectants **Any 2**
12. Maintaining clean water / sanitation (separating sewage and drinking water)
13. Quarantine **or** description
14. Good (personal) hygiene / care in sexual health / education about hygiene
15. Safe storage / handling of food
16. Control of vectors e.g. use of pesticides.

1B Give an account of the nervous system under the following headings:

(i) the role of neurotransmitters at the synapse **6 marks**

1. The synapse / synaptic cleft is the junction / gap between neurones / nerve cells*
2. Neurotransmitters are stored in/ released from vesicles*
3. Neurotransmitters are released on arrival of impulse
4. Neurotransmitters diffuse across the gap
5. Neurotransmitters bind with/reach receptors*
6. A threshold / minimum number of neurotransmitters is needed (for the impulse to continue)
7. Neurotransmitters are removed by enzymes **and** reuptake / reabsorption
8. Neurotransmitters must be removed to prevent continuous stimulation
9. **Two** named neurotransmitters – acetylcholine, noradrenaline, dopamine, endorphins.

(ii) the structure and function of neural pathways **4 marks**

10. A converging pathway has several neurones linked to one neurone (if diagram must show direction of impulse)*
11. This increases the neurotransmitter concentration / chances of impulse generation / sensitivity to excitory or inhibitory signals
12. A diverging pathway has one neurone linked to several neurones (if diagram must show direction of impulse)*
13. This means that impulses are sent to/influence several destinations <u>at the same time</u>
14. Reverberating pathways – neurones later in pathway synapse/link with neurones earlier in the pathway
15. New neural pathways can bypass areas of brain damage / create new responses / suppress reflexes / create plasticity
16. *Converging, diverging and reverberating pathways all named but no correct description.*

*Can be given on **labelled** diagram

2A Describe the exchange of substances between plasma and body cells **10 marks**

1. Plasma is the liquid part of the blood
2. **(Any 3)** named dissolved substances carried – oxygen, carbon dioxide, glucose, amino acids, urea, vitamins, minerals, etc
3. Site of exchange is at the capillaries
4. Capillaries have a large surface area / thin walls / narrow diameter
5. High pressure (at the arterial end) forces fluid/plasma out of capillaries / pressure filtration
6. Tissue fluid (that bathes the cells)
7. Plasma proteins / blood cells do not pass through capillary walls / stay in blood
8. (Dissolved) substances diffuse / move from tissue fluid into body cells
9. Waste products / named example diffuse / move out of the cells
10. To be excreted / carbon dioxide breathed out
11. Liquid / water / tissue fluid returns into the plasma / blood
12. (Excess) tissue fluid enters lymphatic vessels/lymph
13. This lymph/ fluid is carried back to the blood (by lymphatic system).

The coherence and relevance marks are only awarded when at least **5 marks** have been scored from points 1 to 13 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 **2 or more** *of the following will lose this mark:*
A description of arteries or veins, a description of the heart, the cardiac cycle **1 mark**

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

Note - After the candidate response in the paper write an R and a C and place a tick or cross beside each before totalling the marks for the question.

2B Discuss the screening and testing procedures which may be carried out as part of antenatal care. **10 marks**

1. Mother's blood pressure / blood type / blood tests / urine tests / general health check **(any 2 named)**
2. Ultrasound (imaging / scan)
3. Dating scan / scan at 8-14 weeks is used to determine stage of pregnancy / due date
4. Anomaly scan / scan at 18-20 weeks for serious physical problems
5. Biochemical / chemical tests detect (physiological) changes of pregnancy
6. Marker chemicals / named chemical can indicate medical conditions / can give a false positive result
7. Diagnostic / further testing can follow from routine testing / named test
8. Amniocentesis / cells from amniotic fluid used to produce karyotype / to test for Down's Syndrome / chromosome abnormalities
9. Chorionic villus sampling / CVS – cells from placenta / chorion used to produce karyotype / to test for Down's syndrome / chromosome abnormalities
10. *If both amniocentesis and CVS named but no description given so not getting 8 or 9*
11. CVS carried out earlier in pregnancy than amniocentesis
12. Allows immediate karyotyping
13. CVS has higher risk of miscarriage
14. Rhesus antibody testing described (for sensitisation of Rh- mother by Rh+ antigens).

The coherence and relevance marks are only awarded when at least **5 marks** have been scored from points 1 to 13 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 **2 or more** *of the following will lose this mark*
any post-natal screening / PKU / counselling / IVF **1 mark**

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

Note - After the candidate response in the paper write an R and a C and place a tick or cross beside each before totalling the marks for the question.

[END OF MARKING INSTRUCTIONS]