2009 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 ✓ 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.	D	16.	D
2.	B	17.	A
3.	C	18.	B
4.	A	19.	C
5.	C	20.	A
6.	D	21.	A
7.	C	22.	B
8.	A	23.	A
9.	B	24.	B
10.	D	25.	C
11.	A	26.	D
12.	B	27.	D
13.	C	28.	C
14.	C	29.	B
15.	D	30.	B

Section B

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
1. (a) (i)	Ribose	**1**		
(ii)	Cytosine	**1**	C	
(iii)	Nucleus/cytoplasm/ribosome/rough ER/mitochondria RER ***Any 2***	**1**	Nucleolus ER/smooth ER Golgi apparatus	
(b) (i)	Thymine Adenine Cytosine	**1**	T Thiamine A Adenosine C	
(ii)	ATP/enzymes/RNA polymerase	**1**	Energy Glucose	
(iii)	1. mRNA is constructed using DNA as a template/the DNA code/from transcription of DNA 2. mRNA attaches/moves/travels to a ribosome *or* mRNA carries code from nucleus to ribosome/rough ER. 3. Anticodon on tRNA joins with codon on mRNA *or* (Complimentary) base pairing occurs between mRNA and tRNA 4. Order of mRNA codons/bases determines order of amino acids in protein/polypeptide. ***Any 3 from 4***	**3**	mRNA copies DNA mRNA is constructed alongside DNA	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
2. (a) (i)	An altered gene/a mutated gene/a faulty gene/genetic mutation *or* Alteration of base type or sequence or example described (insertion) *or* mutation or alteration of DNA.	**1**	Mutations Non disjunction Chromosome mutation Insertion etc on own Pathway is blocked	
(ii)	An enzyme is not produced/changed/defective/missing. ***Check if both correct answers appear in part (i) or part(ii).***	**1**		
(b) (i)	Enzyme 1 is not produced/does not function *or* Phenylalanine builds up *or* Tyrosine is not produced	**1**		Enzyme 1 is not produced so tyrosine builds up
(ii)	Noradrenaline is not produced/production is reduced (1) Noradrenaline is a neurotransmitter (1) Phenylalanine builds up and leads to brain damage/impaired brain/mental development (1) ***Any 2 points for 2 marks***	**2**		
(c)	Post-natal screening Guthrie Test	**1**	Screening Post-natal testing Amniocentesis	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
3. (a) (i)	<table><tr><td></td><td></td><td colspan="2">mother's gametes</td></tr><tr><td></td><td></td><td>M</td><td>N</td></tr><tr><td rowspan="2">father's gametes</td><td>M</td><td>MM</td><td>MN</td></tr><tr><td>N</td><td>MN</td><td>NN</td></tr></table> NM is acceptable	**1**		
(ii)	50% ***(if wrong check answer for a(i) and accept correct percentage based on it)***	**1**		
(iii)	Son has <u>only</u> M <u>or</u> N antigens/M <u>or</u> N blood groups *or* Son has <u>only</u> one antigen ***If do not use only, must contrast son with parents.***	**1**	Son homozygous while parents are heterozygous Son has only M antigens Son has only N antigens	
(b) (i)	autoimmunity/autoimmune	**1**		
(ii)	allergy/allergic reaction	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
4. (a)	Oxygen is produced (becoming trapped in the filter paper causing it to float).	**1**		
(b)	1. size/surface area/diameter/mass (weight ok)/thickness/type of filter paper/disc 2. concentration of hydrogen peroxide 3. height/depth/volume of hydrogen peroxide *or* height/depth/volume/size/shape/dimensions of beaker 4. soaking time 5. temperature of the solution 6. pH ***Any 3 points for 2 marks, 2 points needed for 1 mark***	**2**	Length/shape of filter paper Volume of catalase Time (*on own*)	amount
(c)	Ten discs were used at each concentration *or* The experiment was repeated at each concentration *or* An average time was taken for each concentration	**1**		
(d)	Use discs soaked in water (added to hydrogen peroxide) *or* Use discs containing no catalase (added to hydrogen peroxide)	**1**	Dry disc Disc by itself	
(e) (i)	Correct scales, labels and units on axes (average time(s) is okay) Points correctly plotted and line drawn	**1** **1**	-1 for using less than 50% of either axis -1 for transposing axes -1 for drawing a bar graph -1 for extrapolating to zero	
(ii)	1. As (catalase) concentration increases reaction rate/rate of hydrogen peroxide breakdown increases. 2. At higher concentrations/above 1% the reaction rate levels off. ***Award 1 mark only if both answers mention time for disc to rise instead of reaction rate***	**1** **1**	Any explanations eg limiting factors/optimum conditions	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
(f)	Inhibitor binds to the enzyme/catalase altering the shape of the active site *or* Inhibitor binds to/blocks the active site of the enzyme/catalase *or* Inhibitor competes with the substrate/hydrogen peroxide for the active site.	**1**	Denatured	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
5. (a)	X placed or labelled anywhere on the oviduct down to the start of the endometrium.	**1**		
(b) (i)	Corpus luteum.	**1**		
(ii)	It maintains/thickens/proliferates/prepares the uterus or womb lining/endometrium/wall *or* It stops menstruation *or* It inhibits/prevents ovulation *or* It inhibits/reduces FSH/LH production (from the pituitary gland) *or* It inhibits maturation of the egg/follicle	**1**	Stops FSH/LH production	
(c)	Oxygen – diffusion Glucose – active transport Antibodies – pinocytosis ***Any 2 correct for 1 mark***	**2**	Facilitated diffusion Endocytosis	
(d)	Cells become specialised/are given specific functions *or* Genes are being switched on/off	**1**	Mention of fetus	
(e)	Cleavage *or* Implantation	**1**		
(f)	Identical Only one sperm and one egg are involved *or* One fertilised egg/zygote (has divided into two)	**1**	They contain the same genes.	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
6. (a) (i)	Intrinsic Factor	**1**		
(ii)	Haemoglobin/cytochrome	**1**	Haem	
(b)	120 days/90-120 days/3 months-4 months/4 months	**1**	90/3 months	
(c)	27,500 (million)	**1**		
(d) (i)	Biconcave shape provides a large surface area (to volume ratio) *or* No nucleus provides more space for haemoglobin	**1**	Concave shape	
(ii)	Small (size)/flexible	**1**	Thin shape/biconcave shape	
(e)	Spleen/bone marrow	**1**		
(f) (i)	Gall bladder	**1**		
(ii)	Bile emulsifies lipids/breaks lipids/fats down into smaller globules/pieces/micelles (1) This provides a larger surface area for (digestive) enzymes/ lipase (1) *or* Bile neutralises stomach acid (1) This provides an optimum/suitable pH for (digestive) enzymes/lipase (1) ***Two separate functions of bile. Must relate function to digestion for second mark.***	**2**	Bile breaks down/digests lipids. Breaks into smaller molecules	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
7. (a) (i)	48 ml/kg/min 48 VO_{2max} ml/kg/min	**1**	48 (**no units**) 48 $VO_{2\ max}$	
(ii)	More/lots of oxygen for respiration/ATP production *or* More oxygen/less oxygen debt so lactic acid does not build up	**1**	Energy	
(b)	14·28 litres	**1**	14280 litres 14/14·3 litres	
(c)	Men have larger lungs/a larger heart/larger muscles/more muscle mass (than women)	**1**	Men are larger/weigh more than women.	
(d) (i)	196	**1**		
(ii)	3·6	**1**		
(e)	Runner	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
8. (a)	**A** – vena cava **B** – pulmonary artery **C** – carotid artery ***2 correct = 1 mark***	**2**		
(b)	The arrows must clearly show the correct direction of movement **into and out** of the left ventricle.	**1**		Any arrows on the right side
(c)	Prevent backflow of blood into the <u>left ventricle</u> *or* prevents backflow of blood from <u>the aorta</u>	**1**		
(d)	Ventricular systole	**1**	Systole (***on own***)	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
9. (a) (i)	In the right atrium.	**1**		
(ii)	The neurotransmitter binds/attaches/to it *or* It acts as a receptor for the neurotransmitter *or* To determine whether a signal is excitatory or inhibitory	**1**	collects/detects	
(b)	It is broken down by enzymes *or* Acetylcholinesterase (action) *or* Enzyme degradation.	**1**	By an enzyme Removed by an enzyme	
(c) (i)	The medulla.	**1**		
(ii)	"Fight or Flight" situation *or* Fighting or running (away) *or* Any sporting action/exercising *or* Any emotional/stress situation (eg excitement/fear/anxiety/ anger)	**1**	Single words like stress, exercise.	

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
10. (a) (i)	**A –** diverging/divergent **B –** converging/convergent	**1**		
(ii)	Impulses go to <u>many</u>/<u>a number of</u> effectors/muscles/ fingers (1) This allows <u>fine motor control</u> *or* This allows <u>coordination</u> of the muscles/movements/ fingers (1)	**2**	General destinations	
(b) (i)	An involuntary/automatic/unconscious <u>response/reaction</u> *or* A <u>response/reaction</u> that is not under conscious control/that does not involve thinking	**1**	Action (must describe reaction/ response)	
(ii)	Plasticity (of response)	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
11. (a)	1. As age increases the number of deaths (from lung cancer) increases (1) 2. More males than females die (from lung cancer) after the age of 49/from the age of 50 (1)	**2**	Reference to smokers	
(b) (i)	45 – 49 years = 1 : 1 60 – 64 years = 5 : 3	**1**		
(ii)	Lung cancer develops faster/earlier in men compared to women. *or* More older men smoke compared to older women while similar numbers of younger men and women smoke. *or* More women stop smoking as they get older (compared to men). *or* More younger women smoke compared to older women. *or* Less younger men smoke compared to older men.	**1**	Description of each ratio without smoking explanation.	
(c)	190	**1**		

Question	Acceptable Answer	Mark	Unacceptable Answer	Negates
12. (a) (i)	A – increase *and* (Sewage) It provides food for bacteria/contains bacteria	**1**		
	B – decrease *and* Sewage is diluted/becomes less concentrated/is used up by bacteria *or* Less food is available for bacteria	**1**	Related to low oxygen	
(ii)	Increase *and* <u>Decomposition/break down</u> of sewage provides nutrients/ nitrates/phosphates *or* Less cloudy/turbid water so more light/photosynthesis *or* Fertiliser/nitrate/phosphates run-off/leached/washed from farmland	**1**	Algal Bloom on own	
(b) (i)	Chemical/substance that kills weeds/plants *or* A weedkiller.	**1**	Herbs	
(ii)	Reduces competition for light/water/nutrients/nitrates/ phosphates/minerals *or* Crops get more light/water/nutrients/nitrates/phosphates/ minerals	**1**	Space/room	
(c)	Genetic engineering/modification/manipulation/ Recombinant DNA technology.	**1**	GM	

Section C Essay Answers

1A Discuss how other people can affect an individual's behaviour under the following headings

(i) The influence of groups **6**

1 Social facilitation **and** deindividuation (**not deindividualisation**)
2 (Social facilitation) **described** – performance improves in the presence of others
3 This occurs when competing with others (coactor effect) ***OR***
This occurs when spectators are present (audience effect)
4 Suitable example, showing better performance **and** the presence of others
5 (Deindividuation) **described** – Individual loses personal identity/gains anonymity when in a group
6 Behaviour deteriorates/individual behaves atypically/commits acts they would not do on their own
7 Suitable example, to include reference to group **and** poorer behaviour

(ii) Influences that change beliefs **4**

8 Internalisation **and** identification
9 (Internalisation) **described** – individuals change their beliefs/behaviour through persuasion
10 Suitable example described to show change in belief **and** source of persuasion
11 (Identification) **described** – individuals change their beliefs to be like someone they admire
12 Suitable example described to show change in belief/behaviour **and** focus of admiration

If descriptions of internalisation and identification are transposed do not award point 11.

1B Discuss global warming under the following headings

(i) Possible causes of global warming **6**

1 Carbon dioxide is increasing (in concentration) in the atmosphere
2 This is due to the activities of an <u>increasing</u> human population
3 CO_2/greenhouse gases retain (the sun's) heat causing the greenhouse effect/ global warming
4 (Increased) burning of fossil fuels/coal/oil/gas produces CO_2/greenhouse gases **OR**
Increased use of fossil fuels by industry/transport releases more CO_2/greenhouse gases
5 Deforestation/removal of trees
6 Means less CO_2 is being absorbed/used by plants/for photosynthesis
7 Methane (a greenhouse gas) is released from paddy fields/cattle/landfill sites
8 CFCs (greenhouse gases) are released from aerosols/fridges (**ozone layer negates**)

(ii) Potential effects of rising sea levels **4**

9 (Melting of the polar ice caps/expansion of sea water) causes <u>flooding</u>
10 This will result in homelessness/lack of building land/migration/death of people
11 This will lead to famine/less food production/fertile land being submerged/ destroyed
12 Habitats for wildlife will be destroyed/example described of a specific animal's habitat being destroyed
13 Weather patterns will change/description of winds/storms/rainfall etc

2A Describe how immunity is naturally acquired **10**

1 Active immunity is when the body makes its own antibodies in response to an infection/pathogen/disease.
2 Invading viruses/bacteria/microbes contain antigens (on their surface).
3 Lymphocytes recognise foreign/non-self antigens (on the invading microbes).
4 B lymphocytes produce antibodies.
5 Antibodies are specific/have receptor sites which bind/attach to foreign antigens.
6 T lymphocytes kill the infected cell/produce chemicals that destroy microbes.
7 Following an infection memory cells are produced/remain in the body.
8 These detect a reinvading microbe and destroy it (before it can cause infection).
9 This (secondary) response is faster/stronger (than the first primary response).
10 Passive immunity occurs when the body gains antibodies (from the mother).
11 A fetus gains antibodies (from the mother) through the placenta.
12 Babies gain antibodies from colostrum/breast milk.

Irrelevance: references to artificially acquired immunity, vaccination, autoimmunity, viral reproduction.

2B Describe the nature and reproduction of viruses **10**

Nature

1 Viruses can only reproduce inside a cell of another organism/cannot reproduce without the help of another cell/are obligate parasites.
2 Viruses are specific in the type of cell that they attack **OR** example described.
3 Viruses are transmitted to other people through sneezing/coughing/insect bites/sexual fluids/contact/drinking.
4 Diseases caused by viruses include the Common Cold, Influenza, AIDS, Polio, Smallpox, Hepatitis, Rabies etc (***must mention 2 for this mark***)
5 Viruses contain a nucleic acid/DNA/RNA surrounded/enclosed by a protein (coat/ capsid).

Reproduction

6 Virus enters host cell ***OR*** injects/inserts DNA/RNA into the cell.
7 Virus uses cell's ATP/nucleotides/amino acids/enzymes (***must mention 2 for this mark***)
8 (Many) copies of viral nucleic acid/DNA/RNA are made/transcribed.
9 (Many) protein coats are formed/translated.
10 Nucleic acid/DNA/RNA enters protein coat ***OR*** viruses are assembled.
11 Host cell bursts/lysis/budding occurs releasing viruses.
12 Viruses can then infect other cells/can remain dormant for long periods.

Irrelevance: reference to history of viral diseases, vaccination, immunity.

A s*ingle short reference to an irrelevant point is not penalised, but development of the point is penalised.*
However, two irrelevant points without development are penalised.

*The coherence mark is awarded if sentences are **logically** linked (no bullet points).*

*A threshold of **5 marks** must be reached before relevance and coherence marks can be awarded.*

[END OF MARKING INSTRUCTIONS]