



# **2014 Human Biology**

## **Higher**

### **Finalised Marking Instructions**

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## Part One: General Marking Principles for Human Biology Higher

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

- (a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question. If a specific candidate response does not seem to be covered by either the principles or detailed Marking Instructions, and you are uncertain how to assess it, you must seek guidance from your Team Leader/Principal Assessor.
- (b) Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

### GENERAL MARKING ADVICE Human Biology Higher

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<sub>2</sub>, H<sub>2</sub>O
  - 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  $7.3 \pm 0.1$ .

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 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.

**Part Two: Marking Instructions for each Question**

**Section A**

Question			Expected Answer(s)	Max Mark	Additional Guidance
1			A		
2			C		
3			A		
4			D		
5			B		
6			A		
7			D		
8			B		
9			D		
10			B		
11			C		
12			A		
13			C		
14			D		
15			B		
16			D		

Question			Expected Answer(s)	Max Mark	Additional Guidance
17			C		
18			B		
19			A		
20			B		
21			C		
22			C		
23			D		
24			A		
25			D		
26			D		
27			B		
28			D		
29			C		
30			B		

## Section B

Question		Expected Answer(s)	Max Mark	Additional Guidance
1	(a)	Actin and myosin.	1	
1	(b) (i)	Line goes through <b>all seven</b> filaments.	1	Line can be either to the left or right of centre.
1	(b) (ii)	They slide over/across/ between each other	1	Not they shorten / contract
1	(c)	Only Glycolysis can occur/Cytochrome system cannot occur. <b>OR</b> Glycolysis produces much less ATP/ only two ATP molecules. <b>1 mark</b>  There is no <u>oxygen</u> to act as the final hydrogen acceptor / combine with hydrogen to form water <b>1 mark</b>	2	Accept description of glycolysis – conversion of glucose to pyruvic acid.  Electron / hydrogen transport system acceptable instead of cytochrome system
2	(a)	Substance – sugar (or named sugar) <b>OR</b> yeast. Reason – (As soon as it is added) the reaction will start. <b>OR</b> So the reaction does not begin (until it is added).	1	Respiration / hydrogen release / colour change are acceptable alternatives for reaction.
2	(b)	Concentration of yeast. Volume / mass of yeast. Concentration of sugar solution. Volume of sugar solution / mass of sugar Concentration of (methylene blue) dye. Volume/number of drops of (methylene blue) dye. Temperature <u>of solutions</u> . Type of yeast.  <b>Any 3 for 2 marks, 1 or 2 for 1 mark</b>	2	Not - amount of yeast / sugar / methylene blue dye. Not – temperature Not - size of test tube. Not - mass of sugar <u>solution</u> . Not – time. Not - pH.
2	(c)	Repeat the investigation using each sugar solution. <b>OR</b> Repeat the investigation and take an average.	1	
2	(d) (i)	Correct scales and labels on axes. <b>1 mark</b> Plotting points correctly and drawing lines. <b>1 mark</b> Labelling/distinguishing the <u>three</u> lines. <b>1 mark</b>	3	

Question			Expected Answer(s)	Max Mark	Additional Guidance
2	(d)	(ii)	Glucose is the best/preferred <u>respiratory</u> substrate (for yeast). <b>OR</b> Glucose can be <u>respired</u> fastest/faster than maltose (and lactose) <b>OR</b> Lactose is not a <u>respiratory</u> substrate (for yeast but the others are).	1	Not - glucose reacts best (with yeast).  Not - lactose does not react (with yeast).  Must have some reference to respiration in answer
2	(e)	(i)	Maltose has to be digested / broken down before yeast could use it (for respiration).	1	Answer must suggest a two stage process – digestion then respiration. Not – the bigger molecule/ two glucose molecules take longer to respire.
2	(e)	(ii)	The yeast did not contain the enzyme necessary to break down lactose. <b>OR</b> The yeast was unable to digest / break down lactose. <b>OR</b> Lactose does not contain glucose <b>OR</b> Lactose is not broken down to glucose / respiratory substrates.	1	
3	(a)	(i)	Macrophage/monocyte/neutrophil.	1	White blood cell is not acceptable.
3	(a)	(ii)	Structure Y – lysosome. <b>1 mark</b>  Function – Attaches to/fuses with the vacuole/vesicle <u>and</u> releases <u>enzymes</u> into it. <b>1 mark</b>	2	Not – fuses with the bacterial cell.
3	(a)	(iii)	Exocytosis.	1	
3	(b)		<u>B-lymphocytes</u> are stimulated / recognise bacteria / multiply / produce plasma cells / produce antibodies. <b>1 mark</b>  <u>Antibodies</u> are produced / released which bind / attach to (bacterial) <u>antigens</u> . <b>1 mark</b>	2	

Question			Expected Answer(s)	Max Mark	Additional Guidance
4	(a)	(i)	Individual 3 – $X^{d}Y$ Individual 4 – $X^{D}X^{d}$	1	Must use letter d. Must use superscript. Accept – $X^{d}X^{D}$
4	(a)	(ii)	The allele is carried on the X chromosome <u>and</u> the father/indiv1 passes the Y chromosome to his son. <b>OR</b> The allele is carried on the X chromosome and the father/indiv1 does not pass it to son <b>OR</b> The allele is carried on the X chromosome <u>and</u> the father/indiv1 passes the X chromosome to his daughter.	1	Accept condition / it / gene for allele.
4	(a)	(iii)	50	1	
4	(b)		The <u>sequence</u> / <u>order</u> of amino acids is changed (from that point). <b>OR</b> <u>Different</u> amino acids (in enzyme). <b>1 mark</b>  The <u>shape/active site</u> of the enzyme will change. <b>1 mark</b>	2	Not – <u>structure</u> of enzyme changes.
4	(c)		250	1	



Question		Expected Answer(s)	Max Mark	Additional Guidance
5	(a)	A – oviduct / fallopian / uterine tube. B – endometrium / endometrial lining.	2	Not – uterus lining
5	(b)	FSH – causes growth/development/ maturation (of follicle). <b>OR</b> (stimulates) release/production of oestrogen.  LH – causes development of/maintains (corpus luteum). <b>OR</b> (stimulates) release/production of progesterone.	2	
5	(c)	Cleavage.	1	
5	(d)	The zygote develops into two embryos/balls of cells. <b>OR</b> Two cells divide/splits into two embryos/balls of cells <b>OR</b> One ball of cells divides/splits into two embryos/balls of cells.	1	Mention of two zygotes forming is wrong.
6	(a)	120	1	
6	(b)	Relaxed <b>AND</b> relaxed.	1	
6	(c)	Open – semilunar (valve). Closed – atrioventricular/AV/bicuspid (valve).	1	
6	(d)	<u>Longer time</u> for diastole/between the peaks/ for each stage. <b>OR</b> Peaks further apart. <b>OR</b> <u>Less frequent</u> peaks/systole. <b>OR</b> Cardiac cycle takes <u>more time</u> /is longer.	1	Heart rate / beat would be slower is not sufficient.  Trace more spread out/ lengthened is not sufficient.

Question			Expected Answer(s)	Max Mark	Additional Guidance
7	(a)	(i)	13.8 µl/ml	1	Units are essential.
7	(a)	(ii)	96.8	1	
7	(b)		<p>Insulin stimulates the conversion of glucose to <u>glycogen</u> <b>OR</b> less glucose is stored as <u>glycogen</u>. <b>1 mark</b></p> <p>This results in glucose being used for respiration/ATP/energy production (in muscle tissue). <b>1 mark</b></p>	2	Not – insulin converts glucose to glycogen.
7	(c)	(i)	300	1	
7	(c)	(ii)	29 : 1	1	
7	(c)	(iii)	<p>Volume – increased heart rate /cardiac output / vasodilation (of arterioles/arteries). <b>1 mark</b></p> <p>Distribution – vasodilation (of arterioles/arteries in muscles). <b>1 mark</b></p>	2	Not - Vasodilation in capillaries
8	(a)	(i)	Tissue fluid.	1	
8	(a)	(ii)	It contains no/little protein.	1	Not - It contains no blood cells.
8	(b)		<p>Interstitial cells – testosterone. Pancreas – insulin/glucagon. Leg muscle (after a sprint) – lactic acid.</p> <p><b>All 3 for 2 marks, 1 or 2 for 1 mark</b></p>	2	
8	(c)		<p>Valves prevent the backflow of lymph. <b>1 mark</b></p> <p>Contraction/movement of (skeletal) <u>muscles</u>. <b>1 mark</b></p>	2	Movements of body / breathing is insufficient

Question			Expected Answer(s)	Max Mark	Additional Guidance
9	(a)	(i)	Q – Hepatic Artery. R – Hepatic Portal Vein.	2	
9	(a)	(ii)	Glucose – R / hepatic portal vein Urea – P / hepatic vein	1	
9	(b)		Iron is stored in the <u>liver</u> / recycled / reused.  Haem is converted to bilirubin / bile / bile pigments <b>OR</b> Bilirubin is removed in faeces/excreted <b>OR</b> Bile is stored in gall bladder.  Amino acids are deaminated / used in protein synthesis.  <b>Any 2 from 3</b>	2	Not – bilirubin/bile is used to emulsify fats.  Description of deamination is okay – breakdown to urea.
9	(c)		Detoxification.	1	
10	(a)		It can be suppressed / resisted / controlled (so that it does not occur all the time). <b>OR</b> An alternative neural pathway can override the reflex pathway. <b>OR</b> The brain can be trained / conditioned to stop / ignore the reflex response.	1	
10	(b)		Myelination / presence of the myelin sheath.	1	
10	(c)	(i)	<u>Vesicles</u> move to membrane and release acetylcholine / neurotransmitter into the <u>synapse</u> / <u>synaptic cleft</u> . <b>OR</b> Acetylcholine / neurotransmitter is released by <u>exocytosis</u> into the <u>synapse</u> / <u>synaptic cleft</u> . <b>1 mark</b>  Acetylcholine/neurotransmitter combines with/joins <u>receptors</u> (on muscle fibres). <b>1 mark</b>	2	
10	(c)	(ii)	Broken down/digested/removed by an <u>enzyme</u> / <u>acetylcholinesterase</u> .	1	

11	(a)		2	1	
11	(b)		Social Facilitation.	1	Not – audience effect
11	(c)		<p>Repeat the experiment with <u>different</u> individuals who do the task in front of an audience before doing it without an audience.</p> <p><b>OR</b></p> <p>One group performs the task with an audience first while another group performs the task without the audience first.</p> <p><b>OR</b></p> <p>Two groups of <u>similar</u> ability, one of which does the task with the audience while the other does it without the audience.</p>	1	
11	(d)		Individuals should each repeat it more than once with <u>either</u> the audience or without the audience.	1	

Question			Expected Answer(s)	Max Mark	Additional Guidance
12	(a)	(i)	Group 1 – elaboration (of meaning). Group 2 – organisation. Group 3 – rehearsal.  <b>3 for 2 marks, 1 or 2 for 1 mark</b>	<b>2</b>	Not - grouping Not - repetition
12	(a)	(ii)	Contextual cues – same environment/time/ seat/location/people/group of children /presenter/clothes worn/scent.  Explanation – It reminds them when the memory was made / encoded.	<b>1</b>	Not a photo of objects / pictures on card.
12	(b)		Limbic System / hippocampus	<b>1</b>	

Question			Expected Answer(s)	Max Mark	Additional Guidance
13	(a)		<p><b>Condition 1</b>            Poor sanitation - <i>Contaminated or dirty <u>drinking/washing</u> water.</i>  <b>OR</b>            Contaminated <u>drinking/washing</u> water – <i>contact with bacteria / virus / parasites / cholera / typhoid / dysentery.</i>  <b>OR</b>            Sewage not treated – <i>contaminates <u>drinking</u> water / contact with bacteria / virus / parasites / cholera / typhoid / dysentery.</i></p> <p><b>Condition 2</b>            Poor hygiene –<i>contact with bacteria / virus / contaminated food</i>  <b>OR</b>            Poor cleanliness of work surfaces - <i>contaminated food / contact with bacteria / presence of pests.</i></p> <p><b>Condition 3</b>            Overcrowding - <i>bacteria can easily pass from person to person / increased chance of contact with bacteria/ fungus / virus.</i>  <b>OR</b>            Lack of ventilation / damp housing – <i>increased chance of contact with bacteria / fungus / virus.</i></p>	2	<p>Examples must come from two separate conditions</p> <p>Two correct examples with incorrect reasons – one mark.</p>
13	(b)	(i)	<p>Harmless / dead / attenuated / weakened microbes /pathogens / bacteria / viruses  <b>OR</b>            Damaged viral DNA <u>and</u> intact protein coat/antigen.</p>	1	Not - disease
13	(b)	(ii)	<p>It allows the <u>quick</u> production of <u>antibodies</u> (against it).</p>	1	
13	(b)	(iii)	<p>Non-vaccinated people are more likely to get the disease / meet an infected person.  <b>OR</b>            Infected people are more likely to spread the disease / meet a non-vaccinated person.</p>	1	

Question		Expected Answer(s)	Max Mark	Additional Guidance
13	(c)	Given/injected with antitoxin / antibodies. <b>OR</b> Antibodies passed across the placenta / in breast milk / colostrum.	1	
14	(a) (i)	324.4	1	
14	(a) (ii)	329.6	1	
14	(b)	<u>More</u> fossil fuel use. <b>OR</b> Deforestation.	1	
14	(c)	Gas – methane.  Reason – <u>more</u> sewage/landfill/paddy fields/cattle/livestock.  <b>Also accept</b> CFCs – <u>more</u> aerosols/fridges/freezers. <b>OR</b> Nitrous oxides – burning <u>more</u> fossil fuels. <b>OR</b> Water vapour – <u>increased</u> evaporation/plane travel.	1	

## Section C

### 1A

#### (i) Events that occur in the nucleus

- |   |   |   |
|---|---|---|
| 1 | DNA unzips/hydrogen bonds break/DNA strands separate.                               | 1 |
| 2 | <u>RNA nucleotides</u> pair with DNA bases.   | 1 |
| 3 | Guanine pairs with cytosine, uracil pairs with adenine. ( <i>not base letters</i> ) | 1 |
| 4 | Sugar phosphate bonds form /sugar phosphate backbone forms.                         | 1 |
| 5 | This requires ATP/enzymes/RNA polymerase.   | 1 |
| 6 | <u>mRNA</u> leaves the nucleus.   | 1 |

**Max 4**

#### (ii) Events that occur in the ribosome

- |    |   |   |
|----|---|---|
| 7  | mRNA attaches / moves to the ribosome.                          | 1 |
| 8  | tRNA carries amino acid to mRNA /ribosome.                      | 1 |
| 9  | Each tRNA molecule is attached to a <u>specific</u> amino acid. | 1 |
| 10 | tRNA/mRNA has a anticodon/codon of <u>three bases</u> .         | 1 |
| 11 | Anticodon binds to / aligns with codon.                         | 1 |
| 12 | Order of codons/bases determines the order of amino acids.      | 1 |
| 13 | <u>Peptide</u> bonds form between amino acids.                  | 1 |
| 14 | Ribosome moves along the mRNA strand.                           | 1 |
| 15 | Transcription <u>and</u> translation terms used correctly.      | 1 |

**Max 6**

**Total 10**



**1B****(i) Events that occur in the matrix of a mitochondrion**

- |   |  |   |
|---|--|---|
| 1 | The Krebs Cycle/Citric Acid Cycle/TCA Cycle (occurs here).                                     | 1 |
| 2 | Pyruvic acid enters (the matrix)/ is produced during glycolysis.                               | 1 |
| 3 | Pyruvic acid is converted to acetyl-Co A / acetyl compound.                                    | 1 |
| 4 | Acetyl (-Co A) combines with a 4 carbon compound/oxaloacetic acid to form <u>citric acid</u> . | 1 |
| 5 | Citric acid is converted back into the 4 carbon compound.                                      | 1 |
| 6 | Carbon dioxide is released.  | 1 |
| 7 | Hydrogen is picked up by/combines with NAD/coenzyme.   | 1 |

**Max 5****(ii) Events that occur in the cristae of a mitochondrion**

- |    |  |   |
|----|--|---|
| 8  | The cytochrome/electron transfer/hydrogen transfer system occurs here.                                     | 1 |
| 9  | Hydrogen/electrons are passed from <u>NAD</u> / <u>coenzyme</u> to a carrier/hydrogen acceptor/cytochrome. | 1 |
| 10 | Hydrogen/electrons are passed along a chain of carriers/hydrogen acceptors.                                | 1 |
| 11 | <u>Energy</u> is released to make ATP.   | 1 |
| 12 | ATP is generated from ADP and phosphate/P <sub>i</sub> .   | 1 |
| 13 | <u>Oxygen</u> acts as the final hydrogen acceptor / combines with hydrogen.                                | 1 |
| 14 | Water is formed.   | 1 |

- 15 36 ATP (molecules) are made

**If either points 11 or 12 are awarded do not give point 15**

**Max 5****Total 10**

2A

- |    |   |   |
|----|---|---|
| 1  | <u>Maturation</u> is a sequence of stages in development.   | 1 |
| 2  | An example of maturation showing at least three stages.   | 1 |
| 3  | Determined by development of nervous system/increased myelination.  | 1 |
| 4  | Inheritance / genes affect development.   | 1 |
| 5  | An example of a genetic condition that affects development – PKU/<br>Huntingdon's chorea/Down's syndrome. | 1 |
| 6  | <u>Environment</u> and the effects of friends / peers / family / teacher <u>described</u> .               | 1 |
| 7  | <u>Imitation</u> described.   | 1 |
| 8  | Reinforcement / shaping / extinction <u>and</u> description.  | 1 |
| 9  | Generalisation / discrimination <u>and</u> description.   | 1 |
| 10 | Internalisation / identification <u>and</u> description.  | 1 |
| 11 | Identical twin studies are useful as they show the effect of the <u>environment</u> .                     | 1 |
| 12 | Identical twins are <u>genetically</u> identical.   | 1 |
| 13 | All behaviour is influenced by a <u>combination</u> of environmental and genetic factors.                 | 1 |

**Any 8**

The coherence and relevance marks are only awarded when at least five 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 two or more of the following will lose this mark:*

*references to memory/structure of brain* 1

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

**Total 10**

2B

- Chemical-use*
- 1 Fertiliser use to improve plant growth / yield. 1
  - 2 Pesticide/insecticide use to kill / reduces damage by pests/insects. 1
  - 3 Herbicide use to kill weeds/used to reduce competition between weeds and crops. 1
  - 4 Fungicide use to kill / reduce damage by fungi/fungal infections. 1
- Maximum of 2 points from 2, 3 and 4**
- Genetic improvement*
- 5 Selective breeding explained. 1
  - 6 Example of increased yield from selective breeding, eg more grain, more milk. 1
  - 7 Genetic engineering/genetic manipulation/genetic modification/GM explained in terms of gene transfer/insertion 1
- OR**
- Somatic fusion described.
- 8 Results in faster growth / disease resistance / drought resistance / herbicide resistance (which increases yield) 1
- Land-use*
- 9 Deforestation to create land for crops/farming. 1
  - 10 Land reclamation / terracing hillsides (to create more farmland) 1
  - 11 Irrigation described. 1
  - 12 Removal of hedgerows / creation of large fields / monoculture use. 1
  - 13 Mechanisation has allowed more efficient use of land 1
- OR** example of mechanisation described.

**Max 8**

The coherence and relevance marks are only awarded when at least five 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 two or more of the following will lose this mark:*

*food preferences / over-fishing / disease / desertification.* 1

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

**Total 10**

[END OF MARKING INSTRUCTIONS]