National
Qualifications
2016

2016 Human Biology

Higher

Finalised Marking Instructions

General Marking Principles for Higher Human Biology

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 detailed marking instructions, which identify the key features required in candidate responses.

(a) Marks for each candidate response must always be assigned in line with these General Marking Principles and the Detailed Marking Instructions for this assessment.

(b) Marking should always be positive. This means that, for each candidate response, marks are accumulated for the demonstration of relevant skills, knowledge and understanding: they are not deducted from a maximum on the basis of errors or omissions.

(c) 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.

(d) There are no half marks awarded.

(e) Where a candidate makes an error at an early stage in a multi stage calculation, credit should normally be given for correct follow on working subsequent stages, unless the error significantly reduces the complexity of the remaining stages. The same principle should be applied in questions which require several stages of non-mathematical reasoning.

(f) Unless a numerical question specifically requires evidence of working to be shown, full marks should be awarded for a correct final answer (including units) on its own.

(g) Bulleted lists should not be used for extended response questions. Candidates must respond to the "command" word as appropriate and write extended answers in order to communicate fully their knowledge and understanding. Candidate responses in the form of bulleted lists may not be able to access the full range of available marks.

(h) In the mark scheme, if a word is **underlined** then it is essential; if a word is **(bracketed)** then it is not essential.

(i) In the mark scheme, words separated by/are **alternatives**.

(j) If two answers are given that contradict one another the first answer should be taken. However, 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.

(k) Where the candidate is instructed to choose one question to answer but instead answers both questions, both responses should be marked and the better mark awarded.

(l) The assessment is of skills, knowledge and understanding in Human Biology, so marks should be awarded for a valid response, even if the response is not presented in the format expected. For example, if the response is correct but is not presented in the table as requested, or if it is circled rather than underlined as requested, give the mark.

(m) Unless otherwise required by the question, use of abbreviations (eg DNA, ATP) or chemical formulae (eg CO_2, H_20) are acceptable alternatives to naming.

(n) Content that is outwith the course assessment specification should be given credit if used appropriately eg metaphase of meiosis.

(o) 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.

(p) Incorrect **spelling** is used:

- if the term is recognisable then give the mark
- if the term can easily be confused with another biological term then **do not** give the mark eg ureter and urethra
- if the term is a mixture of other biological terms then **do not** give the mark, eg mellum, melebrum, amniosynthesis

(q) **Presentation of data:**

- if a candidate provides two graphs or bar charts, in response to one question (eg one in the question and another at the end of the booklet), mark both and give the higher score
- for marking purposes no distinction is made between bar charts (used to show discrete features, have descriptions on the x-axis and have separate columns) and histograms (used to show continuous features, have ranges of numbers on the x-axis and have contiguous columns)
- other than in the case of bar charts/histograms, if the question asks for a particular type of graph or chart and the wrong type is given, then do not give the mark(s) for this. Where provided, marks may still be awarded for correctly labelling the axes, plotting the points, joining the points either with straight lines or curves (best fit rarely used), etc.
- the relevant mark should not be awarded if the graph uses less than 50% of the axes; if the x and y data are transposed; if 0 is plotted when no data for this is given (ie candidates should only plot the data given)

(r) Marks are awarded only for a valid response to the question asked. For example, in response to questions that ask candidate to:

- **identify, name, give** or **state**, they need only name or present in brief form;
- **describe**, they must provide a statement or structure of characteristics and/or features;
- **explain**, they must relate cause and effect and/or make relationships between things clear;
- **compare**, they must demonstrate knowledge and understanding of the similarities and/or differences between things;
- **calculate**, they must determine a number from given facts, figures or information;
- **predict**, they must suggest what may happen based on available information;
- **evaluate**, they must make a judgement based on criteria;
- **suggest**, they must apply their knowledge and understanding of Human Biology to a new situation. Marks will be awarded for any suggestions that are supported by knowledge and understanding of Human Biology

Marking Instructions for each question

Section 1

Question	Answer	Mark
1.	C	**1**
2.	D	**1**
3.	C	**1**
4.	B	**1**
5.	D	**1**
6.	C	**1**
7.	B	**1**
8.	A	**1**
9.	B	**1**
10.	A	**1**
11.	C	**1**
12.	B	**1**
13.	A	**1**
14.	D	**1**
15.	C	**1**
16.	A	**1**
17.	B	**1**
18.	D	**1**
19.	C	**1**
20.	B	**1**

Section 2

Question			Expected Answer(s)	Max Mark	Additional Guidance
1.	(a)	(i)	Hydrogen	**1**	Do not accept H.
		(ii)	Phosphate	**1**	Do not accept P/Pi.
	(b)		Nucleotides can only be added to the 3′/deoxyribose end (of a new strand/primer). **OR** DNA/strands can only be replicated from 5′ to 3′.	**1**	Do not accept bases instead of nucleotides.
	(c)		DNA polymerase adds nucleotides (to the new strand/primer) **(1)** Ligase joins fragments (of DNA/ lagging strand) **(1)**	**2**	Do not accept bases instead of nucleotides. Accept alternatives to 'adds' as long as it is clear that the nucleotide is being added to the new strand/primer/sugar-phosphate backbone.
2.	(a)	(i)	GUG CUA GCU AUC CUA	**1**	
		(ii)	exons	**1**	
		(iii)	(RNA/alternative) splicing.	**1**	Do not accept DNA splicing
		(iv)	G C U A	**1**	
	(b)		ribosome	**1**	
	(c)		Polypeptide chains can be cut/ cleaved (and recombined). **OR** Phosphate/carbohydrate groups may be added (to the polypeptide).	**1**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
3.	(a)	(i)	742	**1**	
		(ii)	Between 0 and 7 years after diagnosis the percentage of surviving patients decreased and then it remained constant between 7 and 9 years. **(1)** It decreased from 100% to 62% **OR** It decreased by 38%. **OR** It remained constant at 62%. **(1)**	**2**	Accept – the percentage surviving decreases to/for 7 years and then levels out.
	(b)		1. (Cancer) cells divide excessively and this leads to a mass of abnormal cells/tumour. 2. These cells don't respond to regulatory signals. 3. Cells fail to attach to each other/the tumour. **OR** Cells detach from each other/ the tumour. 4. They/cells spread to form secondary tumours/undergo metastasis. **(Any 3)**	**3**	1. Accept replicate/multiply for division but do not accept reproduce. Accept rapidly/uncontrollably – answer must indicate more than normal.

Question			Expected Answer(s)	Max Mark	Additional Guidance
4.	(a)		1. Volume of solution. 2. Concentration of solution. 3. Initial pH of solution. 4. Diameter of tube/length of tube/size of tube/position of tube in indicator/size of bottle. 5. Temperature of air/bottle/ solution. **(Any 2)**	**2**	
	(b)		40	**1**	Accept if 40 is written in Table 1
	(c)		They repeated the investigation/ experiment and took an average/ averages. **OR** They repeated the investigation/ experiment at each activity.	**1**	Accept they used six/several individuals and took an average/ averages. Accept they used six/several individuals for each activity.
	(d)		Correct scale on vertical axis and correct labels on both axes. **(1)** Bars are correctly drawn. (33, 25 and 18) **(1)**	**2**	Candidate cannot access the scale mark if they use less than half of the graph paper. Minimum label for Y axis is 'Average time taken (s)'. Label for X axis must contain Activity 1 resting, Activity 2 walking, Activity 3 running, unless some of this information is given in a key. If the vertical scale starts at zero there must be a zero entered at the bottom. A common zero is incorrect. The scale does not have to start at zero. There must be a number equal to or above 33 on the scale.
	(e)		Increasing physical activity increases the respiration rate. **OR** Running produces the highest respiration rate.	**1**	Any correct conclusion must mention respiration rate.

Question			Expected Answer(s)	Max Mark	Additional Guidance
	(f)		**Increased respiration/activity produces more carbon dioxide.** **OR** Increased exercise/physical activity uses more ATP/energy. **OR** Running produces the most carbon dioxide/uses the most ATP (or opposite for resting).	**1**	Do not accept answers that refer only to breathing.
5.	(a)		Label correctly showing pulmonary artery.	**1**	Label can be anywhere on the artery above the semilunar valve. Label can be just above the end of the artery. Label can contain the full name instead of P.
	(b)		The blood would contain a lower concentration of oxygen/less oxygen. **(1)** Deoxygenated blood enters the left ventricle/side of the heart. **(1)**	**2**	Do not accept less oxygen would leave the heart.
	(c)	(i)	Right atrium/atria.	**1**	
		(ii)	Electrocardiogram/ECG.	**1**	
	(d)		They have a higher heart rate/ pulse rate.	**1**	Do not accept increased heartbeat. Do accept increased heartbeat per minute.

Question			Expected Answer(s)	Max Mark	Additional Guidance
6.	(a)	(i)	28	**1**	
		(ii)	It allows groups <u>of different sizes</u> to be compared. **OR** It allows <u>different populations</u> to be compared.	**1**	
		(iii)	4284	**1**	
		(iv)	3:2	**1**	
	(b)		A blockage/clot/embolism in an artery/blood vessel leading to/in the brain.	**1**	Mentioning carotid artery indicates candidate knows it is the brain that is affected.
	(c)		Lack of oxygen kills (brain) <u>cells/ tissues.</u> Stroke/damage/lack of oxygen occurs in the <u>right side</u>/<u>hemisphere</u> of the brain/motorcortex/cerebrum. Impulses/signals are not transmitted/ sent to the muscles (on the left side of the body). **OR** Impulses/signals are not transmitted/ sent so preventing movement (on the left side of the body). **(Any 2 from 3)**	**2**	Accept description of stroke – blood clot in an artery.

Question			Expected Answer(s)	Max Mark	Additional Guidance
7.	(a)	(i)	26 or 26·0	**1**	Do not accept answers to more than one decimal place.
		(ii)	Their BMI is greater than 30.	**1**	
	(b)		Exercise increases energy expenditure/increases respiration rate/uses up (stored) fats.	**1**	Accept exercise burns fat. Accept exercise increases metabolism. Accept exercise increases HDLs/ HDL:LDL ratio and so removes fat. Do not accept exercise increases their muscle to fat ratio.
	(c)		They have a (relatively) high muscle mass.	**1**	Accept they have more muscle. Do not accept that they have more muscles. Accept muscle is heavier more dense than fat. Accept that lean tissue is muscle tissue.

Question			Expected Answer(s)	Max Mark	Additional Guidance
8.	(a)		**Recommended** – It lowers cholesterol levels. **(1)** **Not recommended** – It takes a long time to work. **(1)**	**2**	Accept any figures that specify six months or above.
	(b)		A placebo **OR** A capsule containing no statin/ no drug.	**1**	Do not accept a sugar pill/dummy pill/fake pill. Answers like this do not negate if the term placebo is given.
	(c)		**Randomised –** All individuals have an equal chance of being in either group. **OR** Example describing this. **(1)** **Double-blind –** Neither the participants/patients or the researchers/doctors should know which group participants are placed into/who is getting the drug. **(1)**	**2**	Do not accept that individuals are <u>randomly</u> placed in each group unless qualified by an example. Examples could be drawing numbers out of a hat or using a computer program to allocate them. Must mention <u>both</u> groups of individuals.
	(d)		The error bars overlap. **OR** There is no <u>significant</u> difference between the group results.	**1**	
	(e)		Found in cell membranes. **OR** Forms hormones/forms (other) steroids/is a precursor for steroids (being synthesised).	**1**	

Question			Expected Answer(s)	Max Mark	Additional Guidance
9.	(a)		Cerebrum/cerebral hemisphere(s)/cerebral cortex.	**1**	
	(b)		Different/some areas of the brain are used/active during different aspects/parts of the task.	**1**	Accept – different parts of the brain are involved in description and completion of the task.
	(c)		These areas are receiving signals/ impulses from eyes/ears. **OR** These are the hearing/auditory/ visual areas. **OR** These are areas where sounds/ language/images are processed.	**1**	
	(d)		**Sensory area** – individual was touching/feeling (the paper). **(1)** **Motor area** – individual was using (muscles in) hands/fingers (to fold the paper). **(1)**	**2**	Accept – individual uses muscles to fold the paper.
10.	(a)		Axon	**1**	
	(b)		It attaches to a receptor/ diffuses into the receptor (on the postsynaptic membrane).	**1**	Additional information does not negate if receptor is mentioned.
	(c)		Fast twitch/Type 2.	**1**	
	(d)	(i)	Agonists (bind to and) stimulate (neurotransmitter) receptors. **OR** Agonists mimic (the action of) neurotransmitters.	**1**	Accept nicotine in place of agonist and acetylcholine in place of neurotransmitter.
		(ii)	Nicotine triggers/causes the (increased) release of/activates dopamine/endorphins. **OR** Nicotine acts as an agonist of/ mimics dopamine. **OR** Nicotine stimulates/reinforces the reward pathway/circuit. **OR** Nicotine blocks/prevents/inhibits the reuptake of dopamine.	**1**	Do not accept nicotine releases dopamine.

Question			Expected Answer(s)	Max Mark	Additional Guidance
11.	(a)		3·1 million/3 100 000	**1**	Do not accept 3·1
	(b)		30	**1**	
	(c)		70	**1**	Accept − 70
	(d)	(i)	They have a very low chance of coming into contact with/being exposed to someone who has measles/the disease/is carrying the pathogen.	**1**	Answer must indicate coming into contact with an individual who has the disease.
		(ii)	Malnutrition/poverty/rejection by some of the population/lack of education/lack of access to medical resources or vaccines/ geographical remoteness.	**1**	
	(e)		1242	**1**	
	(f)		If the rate of decrease in the number of measles cases remains the same there will be no cases of measles (by 2020). **OR** Between 2005 and 2010 the number of cases decreased by 300 000. This suggests that measles will be eliminated (by 2015/2020).	**1**	Use of alternative correct figures is acceptable eg a decrease of 500 000 occurred between 2000 and 2010.

Question			Expected Answer(s)	Max Mark	Additional Guidance
12.	(a)	(i)	The receptors on the lymphocyte bind to the antigen (on the pathogen). **(1)** This leads to (repeated) division (of the lymphocyte to form a clone). **(1)**	**2**	 Accept mitosis for division. Accept lymphocyte creates many copies of itself for division.
		(ii)	Phagocytes capture/engulf pathogens/bacteria/viruses and display antigens/become antigen-presenting cells. **(1)** These activate/stimulate T-lymphocytes. **OR** These cause the production of T-lymphocytes. **(1)**	**2**	
	(b)		*Allergy or example eg hayfever* B lymphocyte. **(1)** Attack/respond to a harmless antigen. **(1)** **OR** *Autoimmune disease or example eg arthritis* T lymphocyte. **(1)** Attack/respond to self-antigens. **(1)**	**2**	If both answers are correct but no condition indicated give 1 mark. Do not accept mast cells. Accept recognises own antigens as foreign and attacks them.

Question			Expected Answer(s)	Max Mark	Additional Guidance
13.	A		<u>Causes</u> Too much fat/cholesterol in the diet/blood. **(1)** High LDL levels/low HDL levels **or** High LDL:HDL or Low HDL:LDL. **(1)** Lack of exercise/inactive lifestyle. **(1)** Genetic condition/familial hypercholesterolaemia/FH. **(1)** Diabetes/high blood glucose levels. **(1)** <u>Development</u> There is an accumulation of fatty/ fibrous material/ cholesterol/calcium**.** **(1)** The atheroma/plaque forms beneath the <u>endothelium</u> of an artery. **(1)** Artery (wall) thickens/lumen narrows. **(1)** Blood flow is reduced/ restricted/prevented. **(1)** Loss of elasticity in artery (wall)/hardening of the arteries occurs. **(1)** <u>Health Problems</u> Raises blood pressure/causes hypertension. **(1)** Causes CHD/angina/ heart attack/stroke/PVD **(any 2)**. **(1)** Description of CHD/angina/ heart attack/stroke/PVD. **(1)**	**8**	*In order to score 8 marks candidate must mention at least one point from each of the three areas.* Do not give marks for any points that indicate prevention eg reduce fat in the diet/increase exercise. Do not accept in/on the endothelium. Do not accept arteries narrow. Do not accept CVD unless two specific examples are given. Do not accept heart disease for CHD.

Question			Expected Answer(s)	Max Mark	Additional Guidance
13.	B		<u>Diagnosis</u> Glucose presence in urine suggests diabetes. **(1)** (Diagnosis made by carrying out a) <u>glucose tolerance test</u>. **(1)** Individual fasts/does not eat prior to the test. **(1)** Individual drinks a glucose solution/drink. **(1)** Blood glucose concentration that remains high indicates diabetes. **(1)** Type 1 diabetes tends to be diagnosed in children <u>while</u> type 2 diabetes tends to be diagnosed in adults/later in life. **(1)** <u>Treatment</u> Type 1 diabetes is treated with regular doses/ injections of insulin. **(1)** Type 2 diabetes is treated/controlled by lifestyle changes/weight loss/exercise/ dietary changes. **(1)** <u>Role of Insulin</u> Insulin is produced in the <u>pancreas</u>. **(1)** Type 1 diabetics are unable to produce insulin. **(1)** Insulin converts <u>glucose into glycogen</u>. **(1)** Type 2 diabetics can produce insulin <u>but</u> cells are less sensitive/ resistant to it. **(1)** In Type 2 diabetics there are <u>less insulin receptors</u> on cells. **(1)**	**8**	*In order to score 8 marks candidate must mention at least one point from each of the three areas.* Ignore any times for fasting. Ignore any values for the concentration/volume/of the glucose solution. Accept glucose cannot be converted to glycogen (due to a lack of insulin). Glycogen must be spelt correctly. Accept <u>insulin receptors</u> are desensitised/less sensitive to insulin.

[END OF MARKING INSTRUCTIONS]