Version

General Certificate of Education (A-level)
January 2013

Human Biology HBIO1

(Specification 2405)

Unit 1: The Body and its Diseases

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

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Question	Marking Guidance	Mark	Additional Guidance
1 (a)	S; P; R; T;	4	Accept correct names for structures instead of letters
1 (b)	Any 2 Golgi body/endoplasmic reticulum / lysosome / vesicle/ mitochondrion / nucleus / cilium;	2 max	Ignore 'rough' and 'smooth' in front of endoplasmic reticulum Accept larger/80S ribosomes Ignore references to function

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>2 (a)</td><td>
<table>
<tr><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td></td><td>✓</td><td></td></tr>
<tr><td>✓</td><td></td><td></td></tr>
</table>
</td><td>3</td><td>1 mark for each correct row</td></tr>
<tr><td>2 (b) (i)</td><td>18.4%;;</td><td>2</td><td>Allow 1 mark for 16.6/90 × 100% or for 0.184</td></tr>
<tr><td>2 (b) (ii)</td><td>One suitable suggestion;
eg
Different energy requirements for people of different mass/ different levels of activity/ different size;</td><td>1</td><td>Do not accept ‘everyone is different’ unless a reason is given
‘Lifestyle’ unqualified is too vague</td></tr>
</table>

Question	Marking Guidance	Mark	Additional Guidance
3 (a) (i)	pH at which enzyme works fastest / has fastest rate of reaction;	1	
3 (a) (ii)	1. Change in bonds; 2. Ionic/hydrogen bonds; 3. Active site denatures/ wrong shape/not complementary; 4. ES complex not formed;	2 max	
3 (b)	1. Stays (constantly) high/constant; 2. All active sites/enzymes being used;	2	2. Accept substrate concentration no longer a limiting factor

Question	Marking Guidance	Mark	Additional Guidance
4 (a)	1. (Relatively) high blood pressure at arterial end; 2. Caused by <u>contraction</u> of heart; 3. Hydrostatic pressure> water potential (at arterial end); 4. Water/small molecules/named molecules/ions leave; 5. Proteins/cells too large to pass out;	3 max	Do not award point 4 in incorrect context, eg diffusion Ignore fluid leaving capillary
4 (b)	1. WP less negative/higher in capillary; 2. So difference between hydrostatic pressure and water potential increased; 3. More tissue fluid formed at arterial end; 4. Less water reabsorbed (at venous end); 5. By osmosis; 6. Too much fluid to be drained by lymph;	3 max	5. Allow only in correct context

Question	Marking Guidance	Mark	Additional Guidance
5 (a)	(CFTR) protein wrong shape/does not get inserted in membrane;	1	Ignore active site
5 (b) (i)	1. Mucus contains pathogens/bacteria/viruses; 2. Descends into lungs/cannot be moved by cilia;	2	1. Do not accept dirt on its own Do not accept germs
5 (b) (ii)	1. (Thick mucus) blocks pancreatic duct; 2. Reduces secretion of enzymes; 3. (So) less digestion/hydrolysis of food; 4. (Thick mucus) reduces absorption (of products of digestion);	2 max	

Question	Marking Guidance	Mark	Additional Guidance
6 (a)	RNA/ribonucleic acid/RNA with reverse transcriptase attached;	1	Do not accept DNA
6 (b)	1. Protein; 2. Acts as antigen; 3. T-cell activated; 4. T-cells activate B-cells; 5. Plasma cells produce antibodies;	3 max	Allow reference to antigen presentation by macrophage for 1 mark
6 (c)	1. Antibodies are proteins; 2. Ribosomes synthesise antibodies/proteins; 3. ER transports (antibodies);	2 max	If functions of ribosomes and ER are given but not assigned to a structure award 1 mark
6 (d)	1. Antibodies specific in shape; 2. Antibody won't bind to antigen with different shape /structure X; 3. Vaccine unlikely to be effective against HIV with different antigen/structure A;	2 max	Specific alone is not enough

Question	Marking Guidance	Mark	Additional Guidance
7 (a) (i)	1. Mucus/sputum production; 2. Blocks/irritates airways;	2	
7 (a) (ii)	1. Alveoli break down/ lung tissue destroyed; 2. Reduced surface area; ***OR*** 3. Take in less air per breath/breathe less deeply; 4. Because of scar tissue/fibrous tissue/loss of elastic tissue;	2 max	
7 (b)	1. Difficult for antibiotics/T-cells/antibodies to penetrate; 2. Because of dead tissue/ fibrous tissue; 3. Acts as reservoir of infection;	3	2. Accept capsule as fibrous tissue
7 (c)	Active (no mark) Person makes own antibodies;	1	Passive = 0 Accept makes memory cells/plasma cells

Question	Marking Guidance	Mark	Additional Guidance
8 (a)	To make a comparison (with new diet);	1	
8 (b)	1. Lower blood glucose concentration; 2. Same pattern of rise and fall as old diet; 3. Lower peaks/less fluctuation; 4. Maintains blood glucose concentration (mainly) in normal range;	2 max	
8 (c)	1. Less starch to digest to glucose; 2. So less glucose to absorb/take up from gut; 3. No enzymes to digest cellulose/fibre; 4. No processed food which contains a lot of sugars/glucose; 5. Fibre reduces (rate of) absorption;	3 max	Ignore low GI
8 (d)	1. Don't know sample size/whether repeated/ ages/ sex/ ethnicity/ range/SD; 2. Blood glucose only measured for one day/not long enough; 3. Peaks still go above normal range; 4. Diet may not control blood glucose concentration in the long term/ may not work on long-term diabetics;	2 max	

Question	Marking Guidance	Mark	Additional Guidance
9 (a)	1. Lower blood pressure; 2. High blood pressure leads to heart disease; 3. (Betablocker has) complementary shape to receptor site; 4. Heart rate cannot increase/lowers heart rate;	2 max	3. Accept fits into, blocks
9 (b) (i)	1. CK released from damaged muscle cells in heart; 2. Different number of muscle cells were damaged in each patient; 3. Concentration of CK related to number of cells damaged/related to severity of myocardial infarction/ amount of heart muscle damaged;	2 max	
9 (b) (ii)	Idea that cells die over a period of time/ cells don't break open immediately on death;	1	
9 (c)	(Yes) 1. Overall, people given betablockers release less CK; 2. Several/(any number between 1 to 6) patients on betablockers release very little CK; (No) 3. Some patients given betablockers release more CK than those given placebo; 4. Betablockers (might) have side effects/have any valid named side effect; 5. CK is only one indicator of severity of myocardial infarction;	4 max	3 max if only one side of the argument is addressed

Question	Marking Guidance	Mark	Additional Guidance
10 (a) (i)	Produce vitamins/compete with harmful bacteria/pathogens/bind carcinogens;	1	Ignore 'bad bacteria'
10 (a) (ii)	1. Kills all bacteria; 2. Kills beneficial bacteria; 3. Avoids bacteria becoming resistant; 4. People likely to get better anyway;	2 max	2. Accept good bacteria 3. Reject immune
10 (b)	1. Salmonella present in gut/faeces/eggs (of unvaccinated chickens); 2. Example of food contamination; 3. Person eats food/drink containing bacteria; 4. Food/drink raw or only partially cooked; 5. Salmonella infects small intestine; 6. Multiply/large infective dose; 7. Toxin; 8. Released when bacteria die; 9. Lowers WP in gut; 10. Causes diarrhoea/vomiting;	6 max	

10 (c) (i)	3 suitable precautions, e.g. 1. Wash hands after every patient; 2. Disposable gloves/aprons thrown away after each patient; 3. Keep infected patients away from non-infected patients/isolate sufferers; 4. Dispose of infected faeces/body fluids safely; 5. Doctors not wearing ties/lower part of arm bare; 6. Sanitising linen/utensils; 7. Cleaning of wards;	3 max	1. Accept frequently 2. Accept washed/cleaned/ sterilised
10 (c) (ii)	1. Put faecal sample on (sterile) agar (plate); 2. Incubate; 3. Examine bacteria grown/ colonies; 4. Identify bacteria, eg by microscopic examination/ monoclonal antibodies; 5. Compare growth with sterile faecal sample;	3 max	4. Allow up to 2 additional marks for further details

10 (d)	(Yes) 1. In trial patients recovered; 2. Faecal samples studied showed *C. diff(icile)* no longer present; 3. Symptoms /diarrhoea no longer present; 4. Antibiotics not effective; (No) 1. Small sample size; 2. No control group; 3. 2 patients only reported they recovered/ not examined by doctor; 4. Don't know that *C. diff(icile)* disappeared from faeces in every case; 5. People might refuse faecal transplants/ might find (the idea of) faecal transplants distasteful/invasive; 6. Might not have suitable donor/live alone;	5 max	4 max for only one side of the argument