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Mark Scheme (Results)

January 2017

Pearson Edexcel International GCSE
in Human Biology (4HB0) Paper 01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Accept	Reject	Marks
1	(a) A; (b) A; (artery, vein, capillary, vein) (c) C; (moving mucus to the throat) (d) D; (decreases, no change) (e) A; (chlorination) (f) D; (tuberculosis, bacterium) (g) B; (G – C and T – A) (h) B; (50%) (i) C; (49.5, 60.1) (j) D; (they are each specific to one type of reaction)			1 1 1 1 1 1 1 1 1 1 Total 10

Question number	Answer	Accept	Reject	Marks
2	<p>During inhalation (breathing in) the intercostal; muscles contract and pull the ribs upwards and out (wards); . At the same time the diaphragm; contracts and becomes flattened.</p> <p>Both of these processes increase the volume; of the thoracic cavity and decrease the pressure; .</p> <p>This causes air from the atmosphere to be forced; into the trachea; and then into the lungs.</p>	<p>drawn/pushed</p> <p>mouth/nose/windpipe</p>	<p>ignore internal/external</p> <p>inhaled/breathed</p>	<p>Total 7</p>

Question number	Answer		Accept	Reject	Marks
3	Function of substance	Function of substance			1
	stored under the skin and around some organs	lipids;			1
	used to strengthen tooth enamel	calcium;			1
	broken down into amino acids during digestion	protein;			1
	assists peristalsis	fibre;			1
	used for the formation of visual purple in the retina	vitamin A;			1
	used in the formation of haemoglobin	iron;			1
	a medium in which chemical reactions occur in a cell	water;			1
	needed for the growth of tissues	protein;			1
					Total 8

Question number	Answer	Accept	Reject	Marks
4 (a) (i)	A = cartilage; B = compact bone; C = bone marrow;			3
	(ii) <ul style="list-style-type: none"> • shock absorber/cushions; • to reduce friction/prevents bones rubbing/grinding; 			2
(b) (i)	Two of <ul style="list-style-type: none"> • safety glasses; • wipe up spills of liquid/wash hands; • use tongs; 	Ignore gloves forceps		2
	(ii) <ul style="list-style-type: none"> • (acid) dissolves calcium salts/named salt/compact bone; • these provide strength/rigidity to bone; • if they are not present remaining material is soft/bendy; 			3

Question number	Answer	Accept	Reject	Marks								
4 (c) (i)	X = ulna; Y = radius;			2								
	(ii) <ul style="list-style-type: none"> • muscle must be attached to structure that will move/it allows bone Y to move; • humerus would not move if both ends attached; 			2								
	(iii) two of <ul style="list-style-type: none"> • (biceps) relaxes; • becomes elongated/stretching; • becomes thinner/flattens; 			2								
	(iv) two of <ul style="list-style-type: none"> • ligaments; • synovial fluid/capsule; • synovial membrane; 			2								
(d)	two of <table border="1" data-bbox="405 971 1164 1294" style="margin-left: 20px;"> <thead> <tr> <th data-bbox="405 971 781 1043">Muscles</th> <th data-bbox="781 971 1164 1043">Tendons</th> </tr> </thead> <tbody> <tr> <td data-bbox="405 1043 781 1152">1 attaches to tendons</td> <td data-bbox="781 1043 1164 1152">attaches muscles to bones;</td> </tr> <tr> <td data-bbox="405 1152 781 1224">2 can contract</td> <td data-bbox="781 1152 1164 1224">can't contract;</td> </tr> <tr> <td data-bbox="405 1224 781 1294">3 fibres</td> <td data-bbox="781 1224 1164 1294">no fibres</td> </tr> </tbody> </table>	Muscles	Tendons	1 attaches to tendons	attaches muscles to bones;	2 can contract	can't contract;	3 fibres	no fibres			2
Muscles	Tendons											
1 attaches to tendons	attaches muscles to bones;											
2 can contract	can't contract;											
3 fibres	no fibres											
				Total 20								

Question number	Answer	Accept	Reject	Marks
5 (a)	(i) mouth;			1
	(ii) blue-black/black;			1
	(iii) 20 minutes;	Any number over 18 and up to 20 minutes		1
	(iv) <ul style="list-style-type: none"> enzyme in saliva/(salivary) amylase; digests/breaks down starch; 			2
	(v) <ul style="list-style-type: none"> repeat with boiled saliva/enzyme/amylase or no saliva/enzyme/amylase/starch (solution) only; 	Use denatured enzyme		1
	(vi) <ul style="list-style-type: none"> uses saliva; risk of disease/AIDS transmission/saliva may contain pathogens/bacteria/viruses; 		Causes disease/infection	2
(b)	(i) <ul style="list-style-type: none"> tube heated; in water bath/for (less than) 2 minutes; 			2
	(ii) <ul style="list-style-type: none"> <u>starch</u> converted to maltose; (maltose is) a reducing sugar; 	Accept glucose		2

Question number	Answer	Accept	Reject	Marks
5 (c) (i)	<ul style="list-style-type: none"> • body temperature; • so optimum temperature of enzyme / maximum reaction rate; 			2
	three of <ul style="list-style-type: none"> • test A will take longer for no blue-black colouration to appear/no colour change/iodine gives a positive result for longer; • because enzyme/(salivary) amylase catalyses more slowly; • test B would give the same results (as before); • since the same concentration of maltose would be produced in test A; 			3
				Total 17

Question number	Answer	Accept	Reject	Marks
6 (a)	A; (adrenal)			1
(b)	<ul style="list-style-type: none"> • endocrine gland; • secretion straight into blood; 			2
(c) (i)	ureter;			1
(ii)	bladder;	urinary bladder		1
(d)	renal vein;			1
(e)	two of <ul style="list-style-type: none"> • less urea in Y/more urea in X; • more carbon dioxide in Y/less carbon dioxide in X; • less oxygen in Y/Y deoxygenated/more oxygen in X/X oxygenated; 			2
				Total 8

Question number	Answer	Accept	Reject	Marks
7 (a)	<ul style="list-style-type: none"> • sulfur dioxide dissolves/combines/reacts; • in water/vapour/rain water in clouds; • sulphurous/sulfuric acid formed; 			3
(b)	<p>three of</p> <ul style="list-style-type: none"> • collect rainwater in a container; • use pH meter/<u>universal</u> indicator; • note reading/colour change/correct colour change described; • lower the reading greater the acidity/use chart to determine value; 			3
(c) (i)	<ul style="list-style-type: none"> • reference to respiratory disease / damage/irritation of lungs/breathing difficulties; 			2
(ii)	<ul style="list-style-type: none"> • bronchitis/asthma; 			2
(iii)	<p>two of</p> <ul style="list-style-type: none"> • leaf die back/dissolves waxy cuticle; • stunted growth; • causes root damage; <p>two of</p> <ul style="list-style-type: none"> • lowers pH/increases acidity of lake; • food shortage for animals/fish; • kills phytoplankton/plants/ fish; 		marine	2 Total 12

Question number	Answer	Accept	Reject	Marks																
8 (a) (i)	<p>1 mark for each correct row.</p> <table border="1" data-bbox="405 301 1476 558"> <thead> <tr> <th data-bbox="405 301 672 339">Feature of cell</th> <th data-bbox="672 301 940 339">Red blood cell</th> <th data-bbox="940 301 1207 339">Lymphocyte</th> <th data-bbox="1207 301 1476 339">Phagocyte</th> </tr> </thead> <tbody> <tr> <td data-bbox="405 339 672 411">has a nucleus</td> <td data-bbox="672 339 940 411"></td> <td data-bbox="940 339 1207 411">✓</td> <td data-bbox="1207 339 1476 411">✓</td> </tr> <tr> <td data-bbox="405 411 672 483">contains haemoglobin</td> <td data-bbox="672 411 940 483">✓</td> <td data-bbox="940 411 1207 483"></td> <td data-bbox="1207 411 1476 483">;</td> </tr> <tr> <td data-bbox="405 483 672 558">produces antibodies</td> <td data-bbox="672 483 940 558"></td> <td data-bbox="940 483 1207 558">✓</td> <td data-bbox="1207 483 1476 558">;</td> </tr> </tbody> </table>	Feature of cell	Red blood cell	Lymphocyte	Phagocyte	has a nucleus		✓	✓	contains haemoglobin	✓		;	produces antibodies		✓	;			3
Feature of cell	Red blood cell	Lymphocyte	Phagocyte																	
has a nucleus		✓	✓																	
contains haemoglobin	✓		;																	
produces antibodies		✓	;																	
(ii)	<ul style="list-style-type: none"> • transport oxygen; • produces antibodies; • engulfs/digests/destroys bacteria; 			3																
(iii)	<p>Three of:</p> <ul style="list-style-type: none"> • biconcave shape gives greater surface area for gaseous exchange / to absorb oxygen; • contains haemoglobin to combine with/transport oxygen; • lack of nucleus/other cellular structures to allow more space for haemoglobin; • elastic membrane/flexible shape to allow cell to squeeze through capillaries; 	Accept points from suitably labelled diagram		3																

<p>(b) (i)</p>	<p>A = tissue fluid; B = lymph;</p>			<p>2</p>
<p>(ii)</p>	<ul style="list-style-type: none"> • contraction; • of left ventricle; 			<p>2</p>
<p>(iii)</p>	<ul style="list-style-type: none"> • resistance of blood/red blood cells/resistance of (walls) of blood vessels; • loss of water/fluid; 			<p>2</p>
<p>(iv)</p>	<p>Two of</p> <ul style="list-style-type: none"> • BP greater than OP (at the beginning); • forces fluid out of capillary; • through pores in capillary wall; • OP greater than BP (at the end); 			<p>2</p>
				<p>Total 17</p>

Question number	Answer	Accept	Reject	Marks																
9 (a) (i)	A = axon; B = cell body; (ii) arrow drawn pointing from top to bottom; (iii) Two of <ul style="list-style-type: none"> • shorter axon; • longer dendron/dendrite; • cell body in middle not at end; • sensory transmits impulse to CNS, motor away from CNS; 			2 1 2																
(b)	<table border="1" data-bbox="389 826 1505 1264"> <thead> <tr> <th data-bbox="389 826 667 863">Stimulus</th> <th data-bbox="667 826 965 863">Receptor</th> <th data-bbox="965 826 1205 863">Effector</th> <th data-bbox="1205 826 1505 863">Response</th> </tr> </thead> <tbody> <tr> <td data-bbox="389 863 667 1007">(hit below knee)</td> <td data-bbox="667 863 965 1007">(stretch receptor)</td> <td data-bbox="965 863 1205 1007">(thigh muscle)</td> <td data-bbox="1205 863 1505 1007"><i>knee jerk/lower leg raised/leg straightens;</i></td> </tr> <tr> <td data-bbox="389 1007 667 1118">(change from dim to bright light)</td> <td data-bbox="667 1007 965 1118">(retina)</td> <td data-bbox="965 1007 1205 1118"><i>iris/circular muscles;</i></td> <td data-bbox="1205 1007 1505 1118">(smaller pupil)</td> </tr> <tr> <td data-bbox="389 1118 667 1264"><i>Touching a hot object/heat/high temperature;</i></td> <td data-bbox="667 1118 965 1264">(temperature receptor in fingers)</td> <td data-bbox="965 1118 1205 1264">(biceps muscle)</td> <td data-bbox="1205 1118 1505 1264"><i>arm raised / hand moved away from object/biceps contract;</i></td> </tr> </tbody> </table>	Stimulus	Receptor	Effector	Response	(hit below knee)	(stretch receptor)	(thigh muscle)	<i>knee jerk/lower leg raised/leg straightens;</i>	(change from dim to bright light)	(retina)	<i>iris/circular muscles;</i>	(smaller pupil)	<i>Touching a hot object/heat/high temperature;</i>	(temperature receptor in fingers)	(biceps muscle)	<i>arm raised / hand moved away from object/biceps contract;</i>			4 Total 9
Stimulus	Receptor	Effector	Response																	
(hit below knee)	(stretch receptor)	(thigh muscle)	<i>knee jerk/lower leg raised/leg straightens;</i>																	
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Question number	Answer	Accept	Reject	Marks
10 (a)	<ul style="list-style-type: none"> • carried on X/sex chromosome; • passed onto next generation/inherited with sex chromosome; 			2
(b) (i)	<p>$\frac{2500 \times 0.8}{100}$ 20 (males);</p> <p>(ii) four of</p> <ul style="list-style-type: none"> • greater percentage/numbers of males have condition; • use of figures from table; • only possible if carried on X chromosome; • can be more readily expressed in males/only need one chromosome/allele to be affected; • females don't show condition in heterozygous/two chromosomes affected/two alleles present; 	2 marks for correct answer without working Ecf 5000		2

Question number	Answer	Accept	Reject	Marks
10 (c) (i)	<p>(parents) $X^B X^b$ x $X^B Y$;</p> <p>(gametes) X^B X^b X^B Y;</p> <p>(fertilisation) $X^B X^B$ $X^B Y$ $X^B X^b$ $X^b Y$;</p> <p>(phenotype) (3 normal vision) 1 colour blind boy;</p>			<p>4</p> <p>Total 12</p>

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