Mark Scheme (Results)

January 2022

Pearson Edexcel International GCSE in Human Biology (4HB1) Paper 02

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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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear

  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter

  iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

Question number	Answer	Notes	Marks
1 (a) (i)	• first convoluted tubule; • loop of Henlé; • second convoluted tubule;	diagram only, no labels required	3
(ii)	44mm; 44 ÷ 650; = 0.068mm;	ecf from mp1 max 2 marks Allow 0.0676	3
(iii)	• protein; • red/white blood cells/platelets;		2
(iv)	glucose;		1
(b) (i)	Any 2 from: • same person; • same activity levels; • same volume of water; • same food eaten;		2
(ii)	710 ÷ 4; = 178 cm^3 per hour;	Allow 1 mark if division by 4 is shown Allow 177.5	2
(iii)	• less urine production/lower urine loss on day two; • more ADH secreted on second day; • more water reabsorbed; • more water lost by sweating;	Allow reverse argument for all marking points	3

Total 16 marks

Question number	Answer	Notes	Marks
2 (a) (i)	an answer that makes reference to three of the following: • warms air; • moistens air; • layer of (sticky) mucus; • removes/traps, pathogens/bacteria/microorganisms/dust / dirt (from entering lungs); • reference to 1st line of defence;	Mp3 must be linked to mp4 for mark	3
(ii)	• prevents collapse; • to allow air to flow freely (to lungs/alveoli); • allows neck to bend;		2
(iii)	B; (bronchi)		1
(b)	D; (medulla oblongata)		1
(c)	$17 \times 0.50 = 8.5\ dm^3$; 4×8.5; $= 0.34\ dm^3$;		3
(d)	• reduced oxygen uptake by haemoglobin/forms carboxyhaemoglobin; • less oxygen to developing fetus; • lower rate of respiration/less energy released (by fetus); • less growth/lower birth mass;		4

Total 14 marks

Question number	Answer	Notes	Marks
3 (a)	any two from • protection/named example/barrier against pathogens; • sensory reception/named example; • excretion		2
(b)	• looks red; • vasodilation/more blood in skin capillaries/blood flows closer to skins surface; • allows more heat loss/heat energy released; • to lower body temperature;		4
(c) (i)	• as temperature increases, rate of sweating increases; • up until 34°C/ between 32 °C – 35.9 °C, little/no change; • increases, rapidly/significantly from 35.9 °C - 38 °C;	Allow any temperature between 34°C and 35.9 °C for 35.9 °C e.g. between 32°C and 34 °C	2
(ii)	• absorb sweat with cotton wool/absorbent paper; • fixed area of skin/under arm pits; • reference to measuring mass of absorbent material before and after; or • measure time; • for cobalt chloride paper to change colour;		2
(d)	• enzymes affected/to maintain enzyme activity/ref to body temperature being optimum for enzymes; • too high a temperature denatured/prevent denaturation; • too low, inactive/less active/prevent enzymes becoming inactive;		3

Total 13 marks

Question number	Answer	Notes	Marks
4 (a) (i)	method 1 = passive; method 2 = active;		2
(ii)	• method 1 because antibodies injected; • immediate high level in blood/faster response; • to destroy, pathogen/disease organism;	Do not allow destroy / kill/attack disease	3
(b)	• catch disease/pathogens enter body; • antibodies produced; • by white blood cells/lymphocytes; • memory cells produced; • rapid production of antibodies on re-infection/faster secondary immune response;		5

Total 10 marks

Question number	Answer	Notes	Marks
5 (a)	*near* *distant* lens thick thin; circular ciliary muscle contracted relaxed; suspensory ligaments loose stretched;		3
(b)	• two eyes; • each giving slightly different view; • allows better judgement of distances / depth;		3
(c)	any six from • test with two eyes then one; • use same person/people of similar age/same eye condition; • (throw and) catch a ball; • 10 times/suitable repeats; • record number of catches • ref control variable e.g. lighting/wind condition/same size ball/throw from the same distance;		6

Total 12 marks

Question number	Answer	Notes	Marks
6 (a)	<table><tr><th>Nervous system</th><th>Hormonal system</th></tr><tr><td>nerve fibres/cells;</td><td>blood;</td></tr><tr><td>electrical/electrochemical;</td><td>chemical;</td></tr><tr><td>fast;</td><td>slow;</td></tr></table>	Allow nerves / neurones Reject hormone	3
(b) (i)	arrow drawn left to right;		1
(ii)	• neurotransmitter; • released from synapse/synaptic knobs; • diffuses across gap; • bind to receptors on next cell;		4
(iii)	• neurotransmitter only released at one side of synapse; • can only diffuse in one direction; • from high to low concentration; • receptors only present on post synaptic membrane;		4

Total 12 marks

Question number	Answer	Notes	Marks
7 (a) (i)	• appears in both males and females; • in similar numbers;		2
(ii)	• condition present in heterozygous genotype/only one allele needed/affected are carriers; • only some children (from affected and unaffected parents) are affected/not affected;		2
(b) (i)	• probability of a boy is 0.5/50%; • probability of no Huntington's is 1.0; • overall probability is 0.5 × 1.0 = 0.5/50%/1;		3
(ii)	person 3 must be hh/homozygous recessive; does not carry a faulty allele; person 2 is Hh/heterozygous/carries a faulty allele / carries one normal allele; as father not affected; offspring either Hh or hh; half with condition and half without/50% chance of being affected;	marks can be awarded for suitable genetic crosses that are annotated	6

Total 13 marks

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