Pearson

Mark Scheme (Results)

Summer 2021

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

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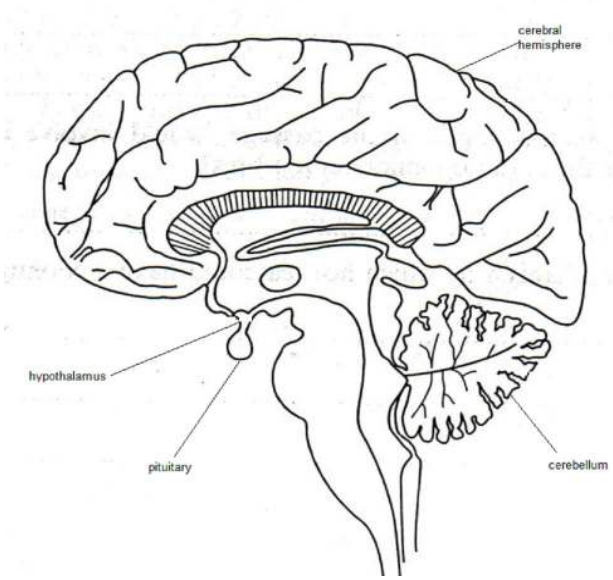
General Marking Guidance

- 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.

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>1 (a)</td><td> 

correct labels ;;;;</td><td></td><td>4</td></tr>
<tr><td>(b)</td><td><table>
<tr><th>Function</th><th>Structure</th></tr>
<tr><td>control of muscle tone and posture</td><td>cerebellum</td></tr>
<tr><td>intelligence and thought</td><td>cerebral hemisphere</td></tr>
<tr><td>monitoring of body temperature</td><td>hypothalamus</td></tr>
<tr><td>release of ADH</td><td>Pituitary</td></tr>
</table></td><td></td><td>4</td></tr>
</table>

Total 8 marks

Question number	Answer	Notes	Marks
2 (a)	• oxygen; • glucose; • water; • carbon dioxide;	in any order in any order	2 2
(b) (i)	• A to B = 60 seconds; • 10 breaths during that period = 10 per minute;	Allow 60 anywhere in response	2
(ii)	• 19.5 - 13.5 squares of movement = 6 squares; • $1dm^3$ = 4 squares; • $6/4 = 1.5dm^3$;		3
(c)	• peaks/troughs higher/lower; • closer together;	Allow increase in amplitude Allow increase in frequency Answers must relate to peaks/waves/curves Ignore details relating to scientific details such as number or depth of breaths.	2

Total 11 marks

Question number	Answer	Notes	Marks
3 (a) (i)	water;		1
(ii)	• allows urea to pass; • prevents other larger molecules from passing;	Allow small molecules go through	2
(iii)	• breaks down urea; • to produce ammonium ions; • to react with/stimulate sensor;	Allow ammonia Allow idea of being picked up/detected by sensor	3
(b)	• enzyme activity increases/enzyme works faster/higher rate of reaction; • at higher temperatures; • more ammonium ions produced; • higher reading;	Ignore details related to enzyme denaturing / collision theory/kinetic energy ORA for lower temperature	4
(c)	any two from • can be reused; • products not contaminated; • enzymes more stable; • cost effective justified;	Allow can withstand temperature/pH changes	2

Total 12 marks

Question number	Answer	Notes	Marks
4 (a) (i)	• eat too much; • too little exercise; • increased fat storage;		3
(ii)	• heart disease/attacks/strokes;	Allow high blood pressure/hypertension	
	• causes joints in legs to develop arthritis;		2
(b) (i)	C (pancreas); A is for excretion B is site of insulin action D produces other hormones		1
(ii)	B (liver); A is for excretion C is site of production D produces other hormones		1
(c) (i)	26378 – 22092 = 4286;	Allow $\frac{26378 - 22092}{22092}$ for 2 marks	
	$\frac{4286 \times 100;}{22092}$ = 19.4%;	Ecf from first calculation max 2 marks	3
(ii)	0.9 x 3.8 = 3.4(2) million;		1
(d)	any three from • less blood flows; • death of tissues; • increased risk of infection; • less white blood cells to deal with infection;		3

Total 14 marks

Question number	Answer	Notes	Marks
5 (a) (i)	A (DNA); B/C/ and D are found in or associated with other structures.		1
(ii)	correct circles of pair;		1
(iii)	only two pairs of homologous chromosomes/ would be 23 in a human cell;		1
(b)	• prophase, metaphase, anaphase and telophase; • (prophase) chromosomes become thicker/visible; • (metaphase) chromatids line up at equator; • (anaphase) chromatids separate and migrate to poles; • (telophase) nucleus/nuclear membrane reforms;	Allow condense Allow chromosomes throughout Allow clear annotated diagrams showing stages	5

Total 8 marks

Question number	Answer	Notes	Marks
6 (a)	C (fovea); A/B /D have no light sensitive cells		1
(b) (i)	Any 5 from • light becomes less/becomes darker; • reference to dim light detected by retina; • radial muscles in iris contract; • circular muscles relax; • widen/increase diameter of pupil; • to keep a constant amount of light entering the eye	Allow reference to B being in dimmer light allow more light entering the eye	5
(ii)	• occurs when bright light is shone into eye; • too much light could damage retina; • occurs quickly to protect eye/prevent too much light entering;		3

Total 9 marks

Question number	Answer	Notes	Marks
7 (a) (i)	• temperature of incubation; • volume of milk; • composition of nutrients in agar/type of agar;		3
(ii)	size of bacterial growth;		1
(b) (i)	$\frac{7.1}{5} = 1.42$; $\frac{36.5}{5} = 7.3$;	One mark for each correct answer	2
(ii)	• more bacteria in B;	Allow more growth in B/growth increases more quickly in B	4
	• at start of investigation; • because extra added to tube; • some bacteria in A/milk which grew;	Allow reference to contamination e.g.from air	
(c)	• transfer loop sterilised/heated in flame; • transfer performed quickly;	Allow reference to sterilised in context / sterile technique / sterilise equipment / named equipment	2
(d)	• repeat investigation; • using other organisms;		2

Total 14 marks

Question number	Answer	Notes	Marks
8 (a) (i)	absorbs uv light; reduces/prevents risk of skin cancer;	Allow protects against (UV) radiation	2
(ii)	eye/ retina/ choroid/ red blood cell/ haemoglobin ;		1
(b) (i)	mother x father Hh hh; gametes H h h; fertilisation Hh hh; phenotype white forelock normal;	Reject diagrams that show sex linkage	4
(ii)	chance of producing a boy is 0.5/½; chance of producing offspring with condition 0.5/½; chance of producing boy with condition is ½ × ½ = ¼;	Allow 50% or equivalent anywhere in calculation Full marks for correct final answer	3
(c)	Any 4 from different (genetic) code produced; different order of amino acids; codes for different proteins/enzymes; enzyme substrate complex not formed; causes change in pigment;	Allow change in base sequence/genetic code Allow any reference to change in amino acids	4

Total 14 marks

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