



Mark Scheme (Results)

Summer 2021

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

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Summer 2021

Question Paper Log Number 66433

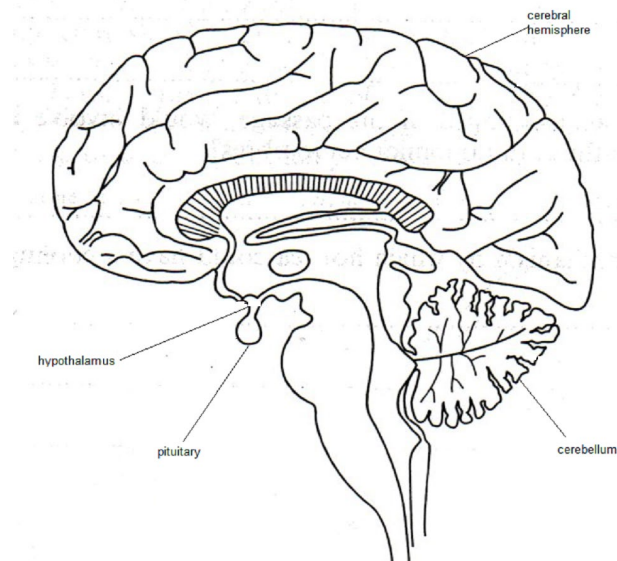
Publications Code 4HBI_02_2106_MS

All the material in this publication is copyright

© Pearson Education Ltd 2021

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	Notes	Marks										
1 (a)	 correct labels ;;;;		4										
(b)	<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>	Function	Structure	control of muscle tone and posture	cerebellum	intelligence and thought	cerebral hemisphere	monitoring of body temperature	hypothalamus	release of ADH	Pituitary		4
Function	Structure												
control of muscle tone and posture	cerebellum												
intelligence and thought	cerebral hemisphere												
monitoring of body temperature	hypothalamus												
release of ADH	Pituitary												

Total 8 marks

Question number	Answer	Notes	Marks
2 (a)	- oxygen; - glucose;	in any order	2
	- water; - carbon dioxide;	in any order	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; 1dm³ = 4 squares; 6/4 = 1.5dm³;		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; - causes joints in legs to develop arthritis;	Allow high blood pressure/hypertension	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; - at start of investigation; - because extra added to tube; - some bacteria in A/milk which grew;	Allow more growth in B/growth increases more quickly in B Allow reference to contamination e.g. from air	4
(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;	Allow protects against (UV) radiation	2
(ii)	reduces/prevents risk of skin cancer; 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 $0.5/1/2$; chance of producing offspring with condition $0.5/1/2$; chance of producing boy with condition is $1/2 \times 1/2 = 1/4$;	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

