Pearson Edexcel

Mark Scheme (Results)

Summer 2025

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

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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.

Subject specific marking guidance
Symbols, terms used in the mark scheme

- Round brackets ( ): words inside round brackets are to aid understanding of the marking point but are not required to award the point
- Curly brackets { }: indicate the beginning and end of a list of alternatives (separated by obliques), where necessary, to avoid confusion
- Oblique /: words or phrases separated by an oblique are alternatives to each other and either answer should receive full credit.
- ecf: indicates error carried forward which means that a wrong answer given in an early part of a question is used correctly to a later part of a question.

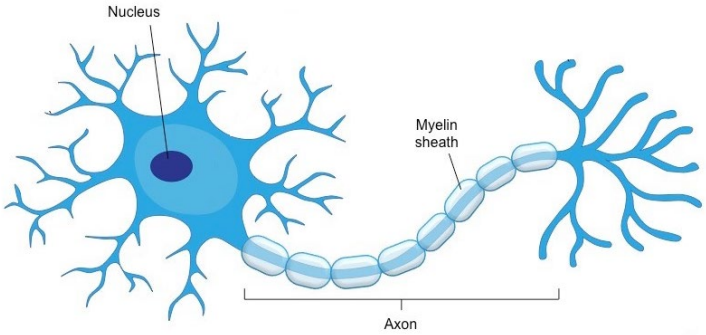
You will not see 'owtte' (or words to that effect). Alternative correct wording should be credited in every answer unless the mark scheme has specified specific.

The Additional Guidance column is used for extra guidance to clarify any points in the mark scheme. It may be used to indicate:

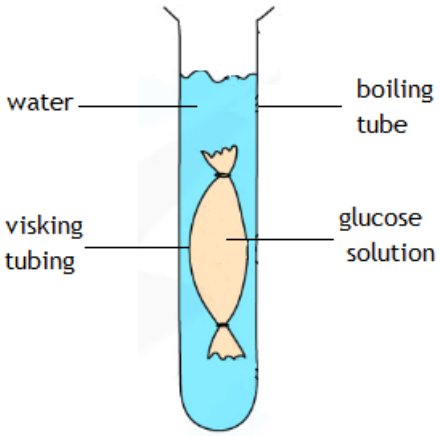
- what will not be accepted for that marking point in which case the phrase 'do not accept' will be alongside the relevant marking point
- it might have examples of possible acceptable answers which will be adjacent to that marking point

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>1 (a) (i)</td><td>long (bone)</td><td></td><td>1</td></tr>
<tr><td>(ii)</td><td>
<table>
<tr><th></th><th colspan="3">Function</th></tr>
<tr><th>Part</th><th>reduces friction</th><th>produces red blood cells</th><th>provides strength</th></tr>
<tr><td>compact bone</td><td></td><td></td><td>✓</td></tr>
<tr><td>spongy bone</td><td></td><td>✓</td><td></td></tr>
<tr><td>cartilage</td><td>✓</td><td></td><td></td></tr>
</table>
</td><td></td><td>3</td></tr>
<tr><td>(iii)</td><td>• provides nutrients/named nutrient/oxygen;
• removes waste/named waste</td><td></td><td>2</td></tr>
<tr><td>(b) (i)</td><td>In the following order:
• tendons;
• contracts;
• relaxes;
• pulls;</td><td></td><td>4</td></tr>
<tr><td>(ii)</td><td>0.5 x 125;
62.5 (J);</td><td>Accept 63 (J)</td><td>2</td></tr>
<tr><td colspan="4">Total for Question 1 = 12 marks</td></tr>
</table>

Question number	Answer	Notes	Marks
2 (a)	**C (endoplasmic reticulum)** The answer is not A as the cell membrane transports substance into and out of the cell B cytoplasm as this is a base for chemical reactions D as ribosomes provide sites for protein synthesis		1
(b) (i)	Z Y W X;		1
(ii)	growth/repair;	Ignore repair of body cells	1
(c)	Any two from • mitosis produces diploid cells/46 chromosomes, meiosis produces haploid cells/23 chromosomes; • mitosis produces 2 (daughter) cells, meiosis produces 4 cells/gametes; • (daughter) cells from mitosis are genetically identical, (daughter) cells from meiosis show variation;		2
		Total for Question 2 = 5 marks	

Question number	Answer	Notes	Marks
3 (a) (i)		1 mark for diagram 3 marks for labels	4
(ii)	• transmits electrical/nerve impulses; • from CNS/brain/spinal cord/relay neurone, to effector organs/named effector organ;		2
(b) (i)	Any six from 1 (student X) holds up the ruler between the thumb and forefinger (of other student); 2 then drops/releases the ruler; 3 (other) student catches the ruler; 4 record the reading on the ruler/distance fallen when caught; 5 repeat for <u>this</u> student; 6 using the same distance between thumb and forefinger; 7 find mean/average value of reading on ruler; 8 calculate reaction time (using formula); 9 repeat with <u>other</u> students;		6
(ii)	the reading on the ruler/ reaction time;		1
(iii)	independent variable not continuous/is discrete;		1
(iv)	reaction time = √(0.15 ÷ 5); reaction time = 0.17 (s);	accept 0.173(2)	2
		Total for Question 3 = 16 marks	

Question number	Answer	Notes	Marks
4 (a) (i)	• decreases; • from 82% to 72%/by 10%		2
(ii)	79:21; 3.76:1;	accept 3.7612:1 accept 3.762:1 accept 3.8/4:1	2
(iii)	any two from • passive smoking/ex- smokers already have damaged lungs; • (air) pollution; • genetics/heredity;		2
(iv)	tar;		1
(b) (i)	bronchiole;		1
(ii)	alveolus;		1
(iii)	any four from • damaged alveoli/alveoli walls broken; • less surface area (for gas exchange); • difficulty breathing/shortness of breath; • less oxygen passing into the blood/ less carbon dioxide removed from blood/less gaseous exchange; • reduced (aerobic) respiration; • fatigue/less energy/not very active;		4
		Total for Question 4 = 13 marks	

Question number	Answer	Notes	Marks
5 (a)	• greater concentration gradient/high concentration in small intestine; • (more) glucose collides/in contact with, wall/epithelium, of small intestine; • faster rate of diffusion;	allow reverse argument	3
(b) (i)	Benedict's (solution);		1
(ii)	(heated) water bath/Bunsen burner/measuring cylinder;		1
(iii)	• diagram; • labels;; 	1 mark for each set of two correct labels. ignore any inclusion of a water bath in diagram accept sugar solution and glucose/sugar solution	3
(c)` (i)	villus/villi		1
(ii)	any three from • many/large number of villi/have microvilli; • increase surface area; • thin walls; • for shorter diffusion distance; • capillaries; • to maintain diffusion/concentration gradient;	explanation must be linked to feature	3
		Total for Question 5 = 12 marks	

Question number	Answer	Notes	Marks
6 (a)	An observable characteristic/trait of an individual		1
(b) (i)	any two from • caused by a mutation; • (giving a) recessive allele; • both/two alleles need to be present/homozygous recessive genotype;		2
(ii)	any four from • produces/build up of (thick sticky) mucus (on membranes); • in lungs/small intestine/pancreas/sperm ducts; • coughing/difficulty breathing/less gas exchange/oxygen absorbed; • reduced (aerobic) respiration/less energy; • reduced digestion/ absorption of nutrients; • infertility in males;		4
(iii)	• some people are carriers/have a heterozygous genotype; • one allele passed on from each parent;		2
	Total for Question 6 = 9 marks		

Question number	Answer	Notes	Marks
7 (a)	amylase;		1
(b)	Any two from • enzymes are immobilised on testing strip; • react with/breaks down glucose (in urine); • (catalyse a chemical reaction that) causes a colour change (in strip);		2
(c)	pancreas;		1
(d)	• rejection/immune response/allergies; • (immune system) recognised it as foreign/antigen;		2
(e)	any two from • use restriction enzymes; • cut out insulin gene from human DNA; • insert human insulin gene into yeast genome/plasmid/genetic material;		2
	Total for Question 7 = 8 marks		

Question number	Answer	Notes	Marks
8 (a) (i)	cilia/skin/mucus	allow other suitable answers	1
(ii)	kills/inhibits growth of pathogens/damage cell membranes;		1
(iii)	• (phagocytes) engulf pathogens/microorganisms / bacteria; • digest/breakdown pathogens/microorganisms / bacteria;		2
(iv)	antigen/immunogen;		1
(v)	• antibodies have a particular shape /are complementary (to antigen); • only recognise/attach/bind to, one particular/specific pathogen / antigen/receptor;		2
(vi)	• natural passive immunity the body receives antibodies naturally;	accept through breast milk/placenta	
	• artificial passive immunity are when antibodies are injected into the body;	accept e.g. to give immediate protection against a disease;	2
(b) (i)	360 ÷ 30 = 12; 108 ÷ 12; 9;		3
(ii)	reduce the risk of disease transmission/infection;		1
(iii)	any two from • improper/overuse of antibiotics/over prescribed; • bacterial DNA mutates/bacteria adapt; • some survive and reproduce		2
	Total for Question 8 = 15 marks		

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