

CIE A-Level Biology 9700 Paper 2 Practice

Paper (AS structured questions) - ANSWERS

Total: 40 marks · 2 h · 2 questions · 11 parts

Q	Part	Answer	Mark points	marks
1	(a)	The concentration of the hydrogen peroxide solution (mol dm^{-3}).	concentration of hydrogen peroxide, 1 mark	1
1	(b)	rate = volume divided by time: 0.10 gives $12 / 60 = 0.20 \text{ cm}^3 \text{ s}^{-1}$ and 0.20 gives $24 / 60 = 0.40 \text{ cm}^3 \text{ s}^{-1}$, which is a 100 per cent increase.	0.10: $12 / 60 = 0.20 \text{ cm}^3 \text{ s}^{-1}$, 1 mark 0.20: $24 / 60 = 0.40 \text{ cm}^3 \text{ s}^{-1}$, 1 mark	2
1	(c)	Between 0.10 and 0.40 mol dm^{-3} the rate rises from 0.20 to 0.70 $\text{cm}^3 \text{ s}^{-1}$, roughly in proportion to concentration; above 0.40 the rate levels off, reaching only 0.733 $\text{cm}^3 \text{ s}^{-1}$ at 0.50 mol dm^{-3} .	rise between 0.10 and 0.40 with two quoted values, 1 mark plateau above 0.40 with a quoted value, 1 mark	2
1	(d)	All the active sites of the enzyme molecules are occupied, so enzyme concentration is the limiting factor; adding more substrate provides no extra active sites, so the rate of enzyme-substrate complex formation cannot increase further.	all active sites occupied, 1 mark enzyme / active site availability is the limiting factor, 1 mark	2
1	(e)	The rate falls to almost zero. Boiling denatures the enzyme: the extra kinetic energy breaks the hydrogen bonds and other forces holding the tertiary structure, so the active site changes shape, substrate molecules can no longer form enzyme-substrate complexes and no catalysis occurs.	predicts a rate of about zero, 1 mark denaturation / tertiary structure disrupted, 1 mark active site shape changed so no enzyme-substrate complexes form, 1 mark	3

2	(a)	magnification = image size divided by actual size; $48 \text{ mm} = 48000$ micrometres, so the magnification is $48000 / 0.75 = \times 64,000$.	formula image size divided by actual size, 1 mark $\times 64,000$, 1 mark	2
2	(b)	actual size = image size divided by magnification = $30 \text{ mm} / 5,000 = 0.006$ mm, which is 6.0 micrometres.	$30 / 5,000 = 0.006$ mm, 1 mark conversion to 6.0 micrometres, 1 mark	2
2	(c)	mean diameter = $0.20 \text{ mm} / 40 = 0.0050 \text{ mm} = 5.0$ micrometres.	$0.20 / 40 = 0.0050$ mm, 1 mark 5.0 micrometres, 1 mark	2
2	(d)	Electrons have a much shorter wavelength than visible light, so the resolving power is much higher and closer structures can be distinguished; the folded inner membrane (cristae) therefore becomes visible.	shorter wavelength / higher resolution, 1 mark cristae or inner membrane detail resolved, 1 mark	2
2	(e)	It is the site of aerobic respiration and ATP production; the inner membrane is folded into cristae, which increases the surface area for the enzymes of the respiratory chain and ATP synthase, so ATP is produced faster.	ATP production / aerobic respiration, 1 mark cristae increase surface area for enzymes, 1 mark	2
3	(a)	Drops of solution on the surface would add extra mass, so the change in mass would be inaccurate.	surface water would add mass, 1 mark	1
3	(b)	$(1.70 - 2.00) / 2.00 \times 100 = -15.0$ per cent, a loss of 15.0 per cent.	correct difference over 2.00 g, 1 mark -15.0 per cent, 1 mark	2
3	(c)	At low concentrations the mass increases (+18.0 per cent at 0.0 and +10.0 per cent at 0.2) because the solution has a higher water potential than the cells, so water enters by osmosis; at 0.6 and 0.8 mol dm ⁻³ the mass falls (-7.0 and -15.0 per cent) as water leaves the cells.	gain at low concentration explained by osmosis, 1 mark loss at high concentration explained, 1 mark	2
3	(d)	About 0.425 mol dm ⁻³ . The percentage change is positive at 0.40 (+1.0) and negative at 0.60 (-7.0), so there is no net water movement where it	identifies the zero point between 0.40	2

		crosses zero; interpolating gives $0.40 + 0.20 \times (1.0 / 8.0) = 0.425 \text{ mol dm}^{-3}$.	and 0.60, 1 mark interpolates to 0.425 mol dm^{-3} , 1 mark	
3	(e)	The solution has a lower water potential than the cell sap, so water leaves the cell by osmosis through the partially permeable membrane; the vacuole shrinks and the protoplast pulls away from the cell wall. This is plasmolysis, so the mass of the tissue falls.	compares water potentials, 1 mark water leaves by osmosis through a partially permeable membrane, 1 mark names plasmolysis with vacuole shrinking, 1 mark	3
4	(a)	The root tip is meristematic tissue where cells are actively dividing, so cells at every stage of mitosis can be found; mature leaf cells are differentiated and no longer divide, so almost all would be in interphase.	meristem / actively dividing cells, 1 mark leaf cells differentiated and not dividing, 1 mark	2
4	(b)	mitotic index = cells in mitosis divided by total cells = $50 / 200 = 0.25$, which is 25 per cent.	50 over 200, 1 mark 0.25, 1 mark	2
4	(c)	The chromosomes, each of two sister chromatids, are lined up along the equator of the cell, and they are so condensed that individual chromosomes can be seen.	chromosomes at the equator, 1 mark chromosomes condensed and individually visible, 1 mark	2
4	(d)	anaphase is $8 / 200 = 0.040$ of the cycle; 24 hours is 1440 minutes, so $0.0400 \times 1440 = 57.6$ minutes, about 58 minutes.	ratio and 1440 minutes, 1 mark 57.6 minutes, 1 mark	2
4	(e)	Choosing dark or large cells is subjective and would systematically over-represent dividing cells, whose condensed chromosomes stain more strongly, so the mitotic index would be too high; cells should be selected at random or systematically across the field so the sample is representative.	systematic bias towards dividing cells, 1 mark random or systematic sampling, 1 mark	2
5	(a)	The volume of blood pumped out by one ventricle each minute, measured in cm^3 per minute or dm^3 per minute.	volume per minute with a unit, 1 mark	1

5	(b)	cardiac output = stroke volume x heart rate = $70 \times 75 = 5,250 \text{ cm}^3$ per minute, which is 5.25 dm^3 per minute.	$5,250 \text{ cm}^3$ per minute, 1 mark $= 5.25 \text{ dm}^3$ per minute, 1 mark	2
5	(c)	$110 \times 150 = 16,500 \text{ cm}^3$ per minute (16.5 dm^3 per minute); the increase is $(16,500 - 5,250) / 5,250 \times 100 = 214$ per cent, about 3.14 times the resting value.	$16,500 \text{ cm}^3$ per minute, 1 mark 214 per cent, 1 mark	2
5	(d)	Respiration in muscle releases more carbon dioxide, so blood pH falls; the affinity of haemoglobin for oxygen decreases, so the dissociation curve shifts to the right (the Bohr shift) and more oxygen is unloaded at the same partial pressure of oxygen.	more carbon dioxide / lower pH, 1 mark lower affinity, curve shifts right, 1 mark more oxygen unloaded at the same partial pressure, 1 mark	3
5	(e)	Rising carbon dioxide concentrations stimulate the respiratory centre in the medulla and the chemoreceptors, increasing ventilation; this maintains the concentration gradients of oxygen and carbon dioxide between alveoli and blood so that diffusion can supply the extra oxygen and remove the extra carbon dioxide.	carbon dioxide stimulates the respiratory centre, 1 mark maintains diffusion gradients, 1 mark	2
6	(a)	A pairs with T, so thymine is also 28 per cent; the remaining 44 per cent is shared equally between G and C because they pair with each other, giving 22 per cent each.	T = 28 per cent, 1 mark G = C = 22 per cent, 1 mark	2
6	(b)	The bases are joined by hydrogen bonds: two between A and T, three between G and C, so G-C pairs are stronger; the fixed complementary pairing allows each strand to act as a template during replication, so the genetic information is copied accurately.	hydrogen bonds, two for A-T and three for G-C, 1 mark template for accurate replication, 1 mark	2
6	(c)	codons = $1215 / 3 = 405$; one of these is a stop codon that codes for no amino acid, so the polypeptide has $405 - 1 = 404$ amino acids.	405 codons, 1 mark 404 amino acids after removing the stop codon, 1 mark	2
6	(d)	It is the site where mRNA and tRNA bind and it moves along the mRNA reading the codons; it catalyses the formation of peptide bonds between adjacent amino acids, building the polypeptide chain.	binding site and movement along mRNA, 1 mark catalyses peptide bond formation, 1 mark	2

6	(e)	<p>The codon may change so that a different amino acid is inserted, altering the primary structure and therefore the hydrogen and ionic bonds that hold the tertiary structure, which can distort the active site and make the protein non-functional; however the genetic code is degenerate, so the new codon may still code for the same amino acid or the change may be in a non-critical region, leaving the protein unaffected.</p>	<p>amino acid may change and alter tertiary structure or active site, 1 mark degenerate code or non-critical position, may have no effect, 1 mark</p>	2
---	-----	---	---	---