

IB Biology SL Paper 2 Practice Paper

(structured questions) - ANSWERS

Total: 50 marks · 1 h 15 min · 7 questions · 20 parts

Q	part	Answer	Mark points	marks
Section A				
1	(a)	Percentage increase = $(28 - 14) / 14 \times 100\% = 100\%$ (1 for working, 1 for the answer with % sign).	working $(28 - 14) / 14 \times 100\%$ answer 100%	2
1	(b)	$46 / 10 = 4.6 \text{ cm}^3 \text{ per minute}$ (1 for dividing by 10 minutes, 1 for the unit).	$46 / 10 = 4.6$ unit $\text{cm}^3 \text{ min}^{-1}$	2
1	(c)	Oxygen rises by only 1 cm^3 (about 2.2%) from 30 to 40 klx, so the curve plateaus (1); limiting factor: carbon dioxide concentration or temperature (1).	only 1 cm^3 rise from 30 to 40 klx, curve plateaus limiting factor: CO_2 concentration or temperature	2
1	(d)	Ambient light was not fully excluded so a little photosynthesis still occurred (1); or residual bubbles / dissolved oxygen and reading error (1).	ambient light not fully excluded residual bubbles or reading error	2
2	(a)	Too large to pass through the phospholipid bilayer (1); charged or water-soluble molecules are repelled by the hydrophobic tails (1).	molecule too large for the bilayer charged or water-soluble, blocked by hydrophobic tails	2
2	(b)	$(2.10 - 2.40) / 2.40 \times 100\% = -12.5\%$ (1); the solution is hypertonic (1).	-12.5% hypertonic	2
2	(c)	Ion concentration in the soil is lower than inside the cell, so movement is against the gradient (1); active transport requires energy from ATP hydrolysis (1).	against the concentration gradient active transport needs ATP	2

3	(a)	$A = 240 \times 30\% = 72$, $T = 72$ (1); $G + C = 96$, so $C = 48$ (1).	A and T are 72 each $G + C = 96$, so $C = 48$	2
3	(b)	$(183 - 3) / 3 = 60$ (1 for the codon calculation, 1 for the answer).	subtract the 3 stop codon bases $(183 - 3) / 3 = 60$	2
3	(c)	Gene expression is regulated, so each cell type transcribes only the genes it needs (1); alternative splicing of mRNA gives different sequences (1).	gene expression is regulated, only needed genes transcribed alternative splicing	2
4	(a)	Dominant = $400 \times 3/4 = 300$ (1); recessive = $400 \times 1/4 = 100$ (1).	dominant 300 recessive 100	2
4	(b)	chi-squared = $(310 - 300)^2 / 300 + (90 - 100)^2 / 100 = 1.33$ (1); $1.33 < 3.84$ so the deviation is not significant (1).	chi-squared = 1.33 $1.33 < 3.84$, not significant, 3:1 accepted	2
4	(c)	All F1 are heterozygotes so the recessive allele is masked by the dominant allele (1); homozygous recessive individuals appear in F2 (1).	F1 heterozygous, recessive masked homozygous recessive in F2	1
5	(a)	$4,500 / 45,000 \times 100\% = 10\%$.	10%	1
5	(b)	$(45,000 - 45) / 45,000 \times 100\%$ (1) = 99.9% (1).	$(45,000 - 45) / 45,000$ $\times 100\%$ 99.9%	2
5	(c)	Respiration releases energy as heat (1); some biomass is not eaten, or energy remains in faeces and excretory products (1).	energy lost as heat in respiration uneaten biomass or energy in faeces	2

Section B

6	(a)	Two marks each (any four): (i) large surface area from many alveoli (~75 m ²), increasing diffusion; (ii) one-cell-thick squamous epithelium, short diffusion distance; (iii) dense capillary network and blood flow maintaining a gradient; (iv) moist surface so gases dissolve first; (v) ventilation-perfusion matching.	large surface area speeds diffusion thin single-layer wall, short distance dense capillaries keep a gradient moist surface dissolves gases	8
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			ventilation matched to blood flow	
6	(b)	Mark points (2 each): (i) haemoglobin has four haem groups, each binding one O ₂ ; (ii) oxyhaemoglobin forms at high partial pressure in the lungs; (iii) O ₂ is released at low partial pressure in tissues; (iv) cooperative binding gives the S-shaped curve; (v) during exercise CO ₂ rises and pH falls (Bohr effect), shifting the curve right; (vi) higher temperature also shifts it right, unloading more oxygen.	four haem groups each bind one O ₂ oxyhaemoglobin forms at high ppO ₂ in lungs O ₂ released at low ppO ₂ in tissues cooperative binding gives an S-shaped curve CO ₂ up and pH down (Bohr effect) shifts right higher temperature shifts right, more O ₂ unloaded	12
7	(a)	Two marks each: (i) signal: nerve impulse vs hormone; (ii) route: neurone vs blood; (iii) speed: fast vs slow; (iv) duration and target: brief and local vs longer and widespread; (v) specificity of target cells (any five).	signal: impulse vs hormone route: neurone vs blood speed: fast vs slow duration: brief vs long range: local vs widespread	10
7	(b)	Two marks each: (i) high pressure in the glomerulus forces water and small molecules into the capsule; (ii) podocytes and basement membrane keep cells and large proteins in the blood; (iii) the proximal tubule reabsorbs glucose, amino acids and most Na ⁺ by active transport; (iv) water follows solutes by osmosis; (v) after drinking a lot, less ADH is secreted so the collecting duct is less permeable and dilute urine is produced.	ultrafiltration by high glomerular pressure podocytes and basement membrane block large molecules active transport of glucose and Na ⁺ in proximal tubule water follows by osmosis less ADH, large volume of dilute urine	10