

2016 BIOLOGY O Level Paper 2

Answer Key

Section A			
Qn	Answer	Mark	Feedback
1(a)	A - fibrin thread B - red blood cell	1 1	
1(b)	1. damaged cells and platelets release thrombokinase which catalyses conversion of prothombin to thrombin 2. thrombin catalyses soluble fibrinogen to insoluble fibrin threads 3. the fibrin threads trap blood cells and forms a solid blood clot	1 1 1	
1(c)	1. blockage will stop or greatly reduce blood flow to the various parts of brain → less glucose and oxygen reach cells of brain 2. cellular respiration is reduced → less energy released for vital functions 3. cells die (affect), develops stroke	1 1 1	
2(a)	salivary amylase; small intestine and pancreas; polypeptides;	1 1 1	
2(b)	mouth - B pH in mouth about 7 and optimum for B is at 7, hence found in mouth stomach - A pH in stomach is highly acidic and optimum of A is around pH 2, hence found in stomach	1 1 1 1	Some candidates identified the correct enzymes, but did not make a clear link between the optimum pH of the enzymes and the pH of the regions of the mouth or stomach.
3(a)	sudden, spontaneous, random change in the structure of gene or number of chromosomes that may result in an altered form of the intended protein made	1	
3(b)(i)	dd, Dd	1	
3(b)(ii)	Pp, pp	1	The majority of candidates answered this question correctly. A few responses did not differentiate

			between D and P, so heterozygotes were written as Dp.												
3(b)(iii)	50% / 1/2	1													
4(a)(i)	root hairs (plural)	1													
4(a)(ii)	1. absorbs water from the soil around the roots via osmosis	1													
	2. takes in mineral salts from the soil via both diffusion and active transport depending on the concentration gradient	1													
4(a)(iii)	long and narrow protrusion; increase surface area to volume ratio to increase rate of diffusion;	1 1	This was well answered by many candidates. Root hairs and their function was well known; adaptations less so.												
4(b)	xylem; transports water and mineral salts from the soil up the stem to the leaves by transpiration pull;	1 1													
5(a)(i)	A – mitochondrion (singular) B – smooth endoplasmic reticulum	1 1													
5(a)(ii)	site of aerobic respiration where energy is released for use in cellular activities	1													
5(b)	any three from <table border="1"><tr><td>plant cell</td><td>animal cell</td></tr><tr><td>contains chloroplast</td><td>absence of chloroplast</td></tr><tr><td>has both cell wall and cell membrane</td><td>only has cell membrane</td></tr><tr><td>presence of large central vacuole</td><td>vacuoles are small and numerous in number</td></tr><tr><td>regular shape</td><td>irregular shape</td></tr><tr><td>cytoplasm pushed to the periphery</td><td>cytoplasm fill up entire cell</td></tr></table>	plant cell	animal cell	contains chloroplast	absence of chloroplast	has both cell wall and cell membrane	only has cell membrane	presence of large central vacuole	vacuoles are small and numerous in number	regular shape	irregular shape	cytoplasm pushed to the periphery	cytoplasm fill up entire cell	3 1m for each row	
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6(a)	1 fruit bat 2 banana plants 3 one arrow from macaw to python 4 one arrow from banana plants (2) to monkeys	1 1 1 1	This proved challenging for some candidates. The arrows were often not included in the response.												

6(b)	position/ role of organisms in a food chain/ food web organisms in the 1st trophic level are producers like orchids and seeds OR 2nd trophic level are the secondary consumers like macaw and monkey OR 3rd trophic level (jaguars, pythons) are consumers which feed on 2nd trophic level	1 1	The definition of trophic level and the grouping of organisms according to their mode of nutrition was less well understood
6(c)	any two from - lost through heat energy during respiration - excretion - movement - urine and faeces	2	
6(d)	upright pyramid; organisms labelled;	1 1	Good responses correctly represented the trophic levels for a pyramid of biomass rather than a pyramid of numbers
7(a)(i)	- as the concentration of ADH increases, the concentration of urine increases - walls of collecting duct becomes more permeable to water increases selective reabsorption of water into bloodstream → less water in urine/ increases concentration	1 1 1	Almost all candidates were able to identify the two main trends shown by Fig.7.1. Most could also explain the role of ADH in the reabsorption of water.
7(a)(ii)	as the concentration of ADH in blood increases, rate of flow of urine decreases	1	
7(b)	- increase in vigorous exercise will increase heat production → increase activity of sweat gland to increase sweat production to lose latent heat of vaporisation - blood water potential decreases → more ADH released from pituitary gland → increase ADH concentration in blood to conserve water	1 1	Candidates who performed well realised that more sweat would be produced; it was common for responses to omit to relate this to water loss. Good responses gave a logical sequence of events leading to increased ADH in the blood.

Section B			
8(a)	16.0; 0.8;	1 1	Good responses used the same level of precision as already in the table
8(b)	size is at least 50% of grid axes labelled with units bars equal width + equal width apart accurate plots, allow 1 misplot	1 1 1 1	Good responses showed a gap between the bars
8(c)	increase in number of leaves within a certain period / height of tree	1	Better candidates include a time reference
8(d)	light energy is trapped by chlorophyll to convert raw materials + light energy to form chemical energy, glucose glucose is the main substance used to manufacture other substances e.g. carbohydrates, fats, proteins to manufacture new protoplasm.	1 1	Good responses offered more detail and expanded their answers beyond the fact that light was essential for photosynthesis and only offered relevant points
8(e)	temperature; carbon dioxide concentration;	1 1	
9(a)	1. excess amino acids are broken down in liver via deamination to form urea 2. urea diffuses from liver cells to surrounding tissue fluid into surrounding capillaries 3. back to the heart (via hepatic vein, then vena cava) from heart it is transported (via aorta, then renal artery) to kidney 4. filtered through glomerulus and Bowman's capsule by ultrafiltration + enters into nephron to collecting duct (in kidney) 5. transported to ureter as urine to bladder and out via urethra	1 1 1 1 1	Good responses showed a clear understanding of the processes involved. Less well planned responses gave a lot of detail that was not relevant to the question, such as the processes involved in the digestion of protein or details of the circulation between the liver and kidney beyond what was required.
9(b)	1. carbon dioxide released from (respiring) cells diffuse into tissue fluid enters blood plasma and red blood cells → carbonic anhydrase in RBC catalyses	1	

	conversion of carbon dioxide and water into carbonic acid 2. carbonic acid converted to bicarbonate ions in plasma 3. carried to the lungs, enters RBC red blood cell 4. reconverted to carbon dioxide by carbonic anhydrase → carbon dioxide diffuses into lung and removed during exhalation	1 1 1																												
10E(a)	<table><tr><td></td><td>aerobic</td><td>anaerobic</td></tr><tr><td>products</td><td>large amount of energy</td><td>much less energy</td></tr><tr><td>raw materials</td><td>oxygen and glucose</td><td>glucose only</td></tr><tr><td>oxygen</td><td>occurs in surplus oxygen environment</td><td>occurs in very limited oxygen environment</td></tr><tr><td>waste materials</td><td>water and carbon dioxide</td><td>lactic acid</td></tr><tr><td>occurrence</td><td>takes place all the time in all cells</td><td>only during vigorous muscle activity</td></tr><tr><td></td><td colspan="2">both are enzyme-driven reactions</td></tr><tr><td></td><td colspan="2">both require glucose as a raw material</td></tr><tr><td></td><td colspan="2">both reactions release energy</td></tr></table>		aerobic	anaerobic	products	large amount of energy	much less energy	raw materials	oxygen and glucose	glucose only	oxygen	occurs in surplus oxygen environment	occurs in very limited oxygen environment	waste materials	water and carbon dioxide	lactic acid	occurrence	takes place all the time in all cells	only during vigorous muscle activity		both are enzyme-driven reactions			both require glucose as a raw material			both reactions release energy			Some responses showed confusion between energy release and energy production. Few referred to both of the similarities. The products of the two processes were correctly identified by most candidates.
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10E(b)	1. vigorous muscular activity → high demand for energy 2. requires more oxygen to oxidise glucose to release more energy, breathing rate cannot supply sufficient oxygen for aerobic respiration, energy limited 3. muscles go into aerobic respiration to supplement/supply extra energy required, lactic acid forms as a result of incomplete oxidation due to insufficient oxygen 4. accumulation of lactic acid in muscles may result in muscle fatigue → may result in muscles inability to contract and relax	1 1 1 1	Good responses recognised the conditions required for anaerobic respiration in humans. Candidates often appeared to have some idea about the balance between supply and demand; they were often less clear about what was being supplied and what was demanded. Most candidates referred to 'pain', 'fatigue' or 'cramp'; it was not always clear that this would occur in the muscles. Many candidates also gave detailed descriptions of how an oxygen debt would be 'paid back', which were not relevant to the question.																											

100(a)	adrenal gland secretes adrenaline, a hormone directly into the bloodstream (ductless gland) (during a stressful situation) transported by the blood to target organs e.g. muscles of ribs, heart, iris muscles to overcome stress when situation addressed, adrenaline transported to the liver to be destroyed	1 1 1 1	
100(b)	both help in the regulation of blood glucose level to achieve homeostasis high conc of blood glucose level pancreas detects and secretes <u>more</u> insulin & <u>less</u> glucagon directly into the bloodstream (ductless gland) insulin is transported to the target organs, liver and muscles where liver cells are stimulated to convert excess glucose to glycogen blood glucose level drops negative feedback low blood glucose cells in pancreas release <u>more</u> glucagon & <u>less</u> insulin stimulates liver to convert glycogen to glucose increase blood glucose negative feedback maintains balance	1 1 1 1 1 1 1 1	