

SUGGESTED MARK SCHEME – BIOLOGY 2018

Answer Key – Paper 1

1	2	3	4	5	6	7	8	9	10
A	A	B	B	C	D	C	A	B	A

11	12	13	14	15	16	17	18	19	20
C	B	C	D	A	B	C	C	B	D

21	22	23	24	25	26	27	28	29	30
B	D	A	D	C	C	D	B	B	A

31	32	33	34	35	36	37	38	39	40
C	D	A	C	D	A	C	B	D	D

Paper 2

Section A			
Qn No	Answers	Mark	Feedback
1(a)(i)	chromatid	1	
1(a)(ii)	stage 3: metaphase stage 4: anaphase	1 1	
1(b)(i)	2	1	
1(b)(ii)	plant 1: AA plant 3: aa	1 1	
2(a)(i)	any three from 1. produces bile for emulsification 2. deamination of excess amino acids 3. detoxification of alcohol 4. onverts excess glucose to glycogen	1 1 1	Most knew the 2 correct functions. Some weaker answers lacked precision e.g. ref to maintaining blood glucose levels.
2(a)(ii)	C	1	C = pancreas exocrine: secretes enzymes in pancreatic juice) endocrine: secretes insulin & glucagon
2(a)(iii)	bile emulsifies large fat molecules to smaller fat globules to <u>increase SA:V</u> (for efficient digestion by <u>lipase</u>)	1 1	
2(b)(i)	40 °C	1	
2(b)(ii)	rennin has denatured at 60 °C and is no longer able to catalyse the clotting of milk.	1	Denaturation was invariably correctly stated. Some candidates included a detailed description of denaturation which was not required.
2(c)	clotting of the milk proteins <u>allows the proteins to retain longer in the stomach;</u> <u>provides more time for proteins to be digested to polypeptides.</u>	1 1	Many candidates correctly referred to rennin causing milk to clot or become solid
3(a)(i)	3 minutes	1	units required

3(a)(ii)	increase of temperature from 15°C to 25°C results in a <u>decrease</u> of time from <u>24 to 6 minutes</u> (<u>manipulated data</u>);	1	Correctly quoted data in support of their statement
	further increase of temperature from 25°C to 35°C reduces time from 6 to 2.5 minutes.	1	
3(b)	clotting of blood <u>stops the loss of blood</u> when wounds occur;	1	Weaker students ref to prevention of unqualified 'foreign n harmful particles'
	<u>prevents bacteria</u> and <u>other pathogens from entering the body</u> ;	1	
4(a)	1. each alveolus has a <u>one-cell thick wall</u> and is very thin → short distance for higher rate of diffusion of oxygen and carbon dioxide between alveoli and capillaries	1	Most candidates knew the adaptations of alveoli for the exchange of gases. Imprecise answers included stating that the alveolus itself was one cell thick (rather than referring to its wall) or not emphasising that the alveolus was well supplied with blood.
	2. inner wall of each alveolus has a <u>thin film of moisture</u> on it → allows oxygen to dissolve before diffusing	1	
	3. each alveolus is <u>surrounded by a network of capillaries</u> → to maintain a steep concentration gradient for higher rate of diffusion of gases	1	
4(b)	carbonic anhydrase, found in RBC, catalyses the reaction of <u>carbon dioxide with water to form carbonic acid</u> , which allows it to be <u>transported in blood</u>	1	
	with reduced carbonic anhydrase, <u>less carbon dioxide can be excreted at the lungs</u> .	1	
	high concentration of carbon dioxide in the blood stimulates breathing; leads to hyperventilation/ breathing excessively	1	
4(c)(i)	during breathing in the 1st sec, <u>pressure in alveoli decreases</u> from 0 to <u>-1.0 arbitrary units</u> ;	1	Almost all candidates chose the correct part of the graph to describe and identified a pressure decrease followed by an increase. Data quotes were usually correct; the most common error was to omit the time from the quote.
	in the 2nd sec, pressure <u>increases by 1 unit gradually</u> back to <u>0</u>	1	

4(c)(ii)	when breathing in, <u>diaphragm muscle contracts and flattens</u>; <u>external intercostal muscles contract</u> (internal intercostal muscles relax); <u>ribcage swings upwards and outwards</u>; lungs volume increases which leads to drop in pressure in the thoracic cavity; <u>atmospheric pressure > pressure in the thoracic cavity</u>; <u>air rushes in</u>	1 1 1	There were some good responses to this question, with candidates showing a sound understanding of the roles of the external intercostal muscles and the diaphragm. Weaker responses omitted the role of the ribcage or contained contradictions, e.g. the diaphragm contracts and rises.
5 (a)(i)	173.5 (glucose/ g)	1	
5 (a)(ii)	percentage of water that was excreted $= 180.0 - 175.5 / 180.0 \times 100\%$ = 2.5 %	1	
5 (a)(iii)	urea	1	
5(b)	Ultrafiltration: <u>A has minute pores allowing only small substances to pass through</u> Ultrafiltration occurs at A to force <u>small substances like glucose, urea and water</u> out of the glomerulus into the Bowman's capsule, due to the high <u>hydrostatic pressure formed</u>. <u>Large substances like proteins are unable to pass through the basement membrane</u>. <u>Selective reabsorption</u>: blood circulating constantly through B creates a steep concentration gradient <u>Useful substances such as water and glucose</u> are then <u>selectively reabsorbed back into the capillaries</u> at the proximal convoluted tubule by <u>diffusion and active transport</u>. <u>Blood passes through B and returns to the main circulation via renal vein</u>. Waste materials including excess water, salts and nitrogenous waste that are not reabsorbed form urine.	1 1 1	Candidates showed a good knowledge of the role of structure A; imprecise answers were often seen. For example, the description of the blood in the glomerulus as having 'hydrostatic pressure', rather than having 'high hydrostatic pressure'; or small molecules being forced out of the glomerulus, without identifying where they were going. The term ultrafiltration was well known. The role of structure B was less well known with many describing it as simply 'returning blood to the body or the heart.'
6(a)	<u>Contains xylem vessel and phloem vessel</u> ;		Almost all candidates knew that A transported water and food, which was

	Both of them are parts of the plant transport system; xylem vessel transports water and dissolved mineral salts from the leaf stalk to the different parts of the leaf for photosynthesis; while phloem transports excess manufactured food like sucrose and amino acids away from the leaf to other parts of the plant.	1 1	sometimes clarified as sucrose. A common misconception was that glucose, rather than sucrose, was transported by the phloem.
6(b)(i)	sucrose	1	
6(b)(ii)	phloem (tissue)	1	
6(b)(iii)	rate of movement = 65 cm / 2.5 h ; = 26 cm per hour ;	1 1	
7(a)	During the process P, living organisms like animals and green plants oxidise glucose to release energy for their life processes; respiration, they will also give out carbon dioxide into the atmosphere. During process Q, which is photosynthesis, plants take in CO ₂ to manufacture glucose, which is essential as a source of food for all organisms and the locked C serves as a carbon sink. Process S, combustion, where energy is released from fossil fuel and CO ₂ is released to the atm contributing to global warming.	1 1 1	Most candidates understood the concept of cycling carbon dioxide between the three processes; some were unable to express their ideas succinctly. Some responses were in terms of oxygen rather than carbon dioxide. The stronger responses appreciated the role of photosynthesis in creating carbon sinks and the role of combustion in global warming.
7(b)	1. Bacteria and fungi are decomposers 2. Which help to break down dead and decaying organic matter into simpler substances back to the environment e.g. soil 3. CO ₂ is released back to the environment during decomposition	1 1 1	The majority of candidates knew that bacteria and fungi were decomposers. Most candidates knew that this resulted in the release of carbon dioxide.

Section B			
Qn No	Answers	Mark	Feedback
8(a)(i)	size at least 50% of grid axes labelled with units points accurately plotted, allow 1 misplot line of best-fit, or point-to-point line	1 1 1 1	
8(a)(ii)	change in sensitivity = 100 - 15		

	= 85 arbitrary units	1	
8(a)(iii)	When the wavelength increases from 420 to 500 nm, the sensitivity of the retina increases from 5 to 100 arbitrary units by 95au. (Retina is most sensitive to light of wavelength 500 nm.) When the wavelength of light further increases from 500 to 600 nm, the sensitivity of the retina decreases from 100 to 5 arbitrary units by 95au.	1 <	

9(b)(iii)	Root hair cells absorb water and mineral salts from the surrounding soil solution for the plant; they <u>contain many mitochondria</u> which carry out aerobic respiration to release energy for the <u>active transport</u> of the ions into the cells. Thus the cell sap in the vacuoles has a high ion concentration. Cell membrane of the root hair cells constantly maintains a low water potential inside the cell relative to the surrounding soil solution → steeper water potential gradient so that <u>water can constantly move into them at a higher rate by osmosis to serve as a raw material for photosynthesis</u>	1 1 1	Very few candidates were able to develop their answer in terms of ions moving from the root hair cells towards the xylem. Some candidates realised that there were many mitochondria present in the root hair cells, which released the energy required for active transport.
10E(a)	1. light energy is trapped by chlorophyll in chloroplast 2. converted to chemical energy in the form of glucose 3. occurs in mesophyll cells and guard cells of the leaves where chlorophyll is present 4. requires water and carbon dioxide as a raw material 5. water is transported to the leaves via the roots and CO₂ is taken from the environment or is released from respiring cells, accumulating in intercellular air spaces 6. CO₂ dissolves in moisture lining and diffuses into mesophyll cells where photosynthetic enzymes catalyse the reaction	1 1 1 1 1 1	Almost all candidates demonstrated good knowledge of the reactants and products of photosynthesis. Candidates often supported their answers with correct chemical equations. Weaker candidates answered in terms of light rather than light energy and did not mention the conversion of light energy to chemical energy.
10E(b)	1. higher temperature will increase kinetic energy of substrates; 2. increases collision between photosynthetic enzymes and substrates; 3. increase in effective collisions will result in greater formation of glucose 4. on a cold day, less kinetic energy → less ES complexes formed, less products formed 5. on a warm day, rate of transpiration will also increase to increase water uptake → more raw materials for photosynthesis	1 1 1 1	
10O(a)	Describe process, outline development any six from: 1. haploid sperm fuses with haploid ovum; forming a diploid zygote;	1	Stronger responses referred to fusion of the gamete nuclei or referenced the action of the

	2. zygote undergoes mitosis to form a ball of cells, embryo; 3. while it is pushed along the oviduct by cilia and peristalsis; 4. in the uterus, embryo implants itself in the thickened endometrium/ uterine lining; 5. forming villi which grows from embryo into the uterine lining; 6. this forms the placenta with rich blood capillaries from maternal spaces to embryo; 7. development of amniotic sac with amniotic fluid which encloses the embryo to protect the embryo as it develops;	1 1 1 1 1	acrosome enzymes. A few responses confused the terms zygote and embryo.
10O(b)	1. allows diffusion of oxygen, glucose and nutrients from maternal spaces to the foetus; 2. carbon dioxide and waste can also diffuse from foetal to maternal blood spaces to be removed; 3. it can also secrete progesterone to maintain the uterine lining during pregnancy; 4. allows protective antibodies to diffuse from mother's blood to the foetal blood;	1 1 1 1	Many candidates were able to correctly describe the transport of glucose and oxygen to the fetus and waste products from the fetus to the mother.