

**2019 Biology 6093
Suggested Answers**

Paper 1

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

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

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

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

Feedback - Paper 1

6	This question was challenging for many candidates. A large number of candidates selected option D. This indicates they did not realise that during osmosis, water molecules move in both directions through the membrane; although, in this case, the net flow is into the Visking tubing bag
10	A significant number of candidates chose either option C or option D. This shows that these candidates did not realise that given a supply of mineral ions, plants are capable of synthesising any other chemical that they require. Many did not appreciate that glucose is the initial chemical from which plants can manufacture both proteins and cellulose, or that the glucose also has to be respired to release energy for the plant's use.
15	Many did not realise that both sides of the heart act together.
27	These candidates might have selected their answer on the basis of 'identical'. They did not realise that no zygotes are present in asexual reproduction.

Paper 2

Section A:

Q No	Suggested Answers	Marks	Feedback
1(a)(i)	cell membrane It is <u>partially permeable membrane</u> which <u>controls the movement of substances</u> into and out of the cell	1 1	Include the property of the membrane which enables it to carry out its function. Most candidates correctly identified A. Stronger performing candidates understood the idea of control over the entry and exit of substances.
1(a)(ii)	ribosome synthesise proteins	1 1	Most candidates could identify B and its function.
1(b)	detoxification/ secretion of important substances such as bile requires a <u>larger amount of energy</u> , hence, a large number of mitochondria is present to release the high amount of energy required.	1 1	The roles of both the liver and mitochondria were well known by almost all candidates. Weaker responses did not make the link between them.
1(c)	1. chloroplasts 2. cell wall	1 1	Almost all candidates could correctly identify the components of plant cells.
1(d)	Microvilli is an extensive folding of the cell membrane which <u>increases the surface area to volume ratio</u> of the cell. These cells are found on the epithelium of the small intestines, which <u>increases the rate of</u> absorption of nutrients/ digested food.	1 1	Candidates knew that the microvilli increased surface area to volume ratio. Weaker responses referred to the increased absorption of 'food' rather than of 'digested food'.

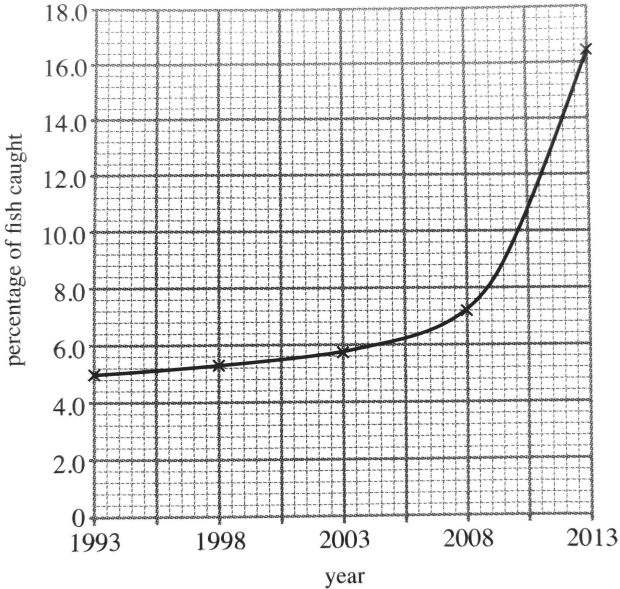
2(a)	A and B - atrium C - right ventricle D - left ventricle Identify: Chambers A and B are the atria of the heart as they have the lowest mean wall thickness of 3 mm. Chamber C is the right ventricle with the mean wall thickness of 5 mm. Chamber D is the left ventricle as it has the highest mean thickness of 12 mm. Explain: Atrial wall is the thinnest (less muscle) as blood flows into the ventricles and <u>does not require high pressure</u>. The <u>right ventricle</u> pumps blood <u>towards the lungs</u>, requires a smaller pressure as the blood travels a shorter distance. The left ventricle has the <u>thickest wall</u> and <u>pumps blood with most pressure</u> as the blood needs to travel to the <u>rest of the body</u>.	1 1 1	Use data. The stronger responses <u>correctly identified the four chambers and could relate their wall thickness to their function</u>. A common misconception was that chambers A and B were on the right side of the heart (atrium and ventricle respectively), while C and D were on the left. Weaker responses did not describe the pumping of blood to the appropriate place and simply described it in terms of the flow or transport of blood.
2(b)	The hole between the atria will <u>leads to mixing of; oxygenated and deoxygenated blood</u> Blood entering the LV and eventually the rest of the body will contain <u>significantly lesser oxygen than normal</u>. <u>Effects on the body: shortness of breath and fatigue</u>.	1 1	The majority of candidates knew that a hole between the right and left atria would result in <u>oxygenated and deoxygenated blood</u> being mixed.

2(c)	Atherosclerosis/ fatty diet/ sedentary lifestyle/ smoking	1	Almost all candidates could give a correct reason for the occlusion
3(a)	1. water molecules are entering the leaf via xylem due to transpiration pull 2. from xylem, <u>water molecules diffuse</u> into the spongy mesophyll cells via <u>osmosis</u>, down water potential gradient 3. excess water diffuses out to <u>form a thin film of moisture</u> will then 4. <u>evaporate</u> into the intercellular air spaces. 5. guard cells control the <u>opening of the stomata</u> 6. when stomata are widened, as the concentration of water vapour is higher in the <u>intercellular air spaces</u> compared to the environment, water vapour <u>diffuses</u> out of the leaf.	1 1 1 1 1	Direction from A to B stated clearly. Include processes and difference in concentration. The stronger responses used scientific terms correctly, differentiating between <u>diffusion</u>, <u>osmosis</u>, <u>evaporation</u> and <u>concentration gradient</u>. Weaker responses referred to water 'dissolving' in the layer on the surfaces of mesophyll cells or did not refer to water diffusing from the leaf as water vapour.
3(b)	J is an <u>upper epidermal cell</u> Secretes waxy cuticle layer that provides a waterproof layer to prevent excessive water loss/ the cells are <u>transparent, allowing sunlight</u> to pass through for photosynthesis to take place K is a <u>palisade mesophyll cell</u> Contains a <u>large number of chloroplasts</u> to <u>increase light absorption</u> for higher rate of photosynthesis	1 1 1 1	Most candidates correctly identified cell J; stronger responses went on to describe its correct function. Weaker responses identified the cell as 'epithelial' or 'cuticle' cell, and its function as waterproofing. Cell K was identified correctly by most candidates and a correct adaptation was also seen.
3(c)	During photosynthesis, <u>plants convert the light energy to chemical energy</u> . During the day, plants are actively photosynthesising due to the <u>presence</u>	1	Advantage to plants: Link back to photosynthesis Many candidates referred to the intake of carbon dioxide

	<u>of sunlight.</u> Stomata stay open to <u>allow gaseous exchange</u> to take place. <u>Carbon dioxide (raw material)</u> diffuses into the leaf through the stomata and dissolves in the moisture layer on the spongy mesophyll cells. Oxygen produced from photosynthesis can also diffuse out. <u>Opening of stomata</u> reduces the water potential in the leaf as water is lost <u>through transpiration</u>, and more water(raw material) will enter the leaf. The abundance of carbon dioxide and water allows the plant to photosynthesise effectively hence enabling <u>optimal growth</u>.	1 1 1	and its use for <u>photosynthesis</u>. Many stated that carbon dioxide would diffuse into the leaf but did not refer to oxygen also diffusing out. A large proportion of candidates answered in terms of transpiration, suggesting that the open stomata would allow the transpiration stream to deliver water to be used in photosynthesis.
4(a)	Dd x Dd D d D d (circled) DD Dd Dd dd UA UA UA A	1 1 1 1	Most candidates could correctly complete the genetic diagram. Weaker responses described the phenotype of the heterozygotes as 'carriers'.
4(b)	The gametes are independently assorted and since the sample size is very small, hence, there is a chance of both of them are not diseased.	1	Stronger responses were in terms of randomness or small sample size. This was well answered by most candidates.
4(c)	A mutation is a change in the nucleotide sequence of a gene or chromosomal number	1 1	Most candidates answered this well.

4(d)	any one from 1. UV light 2. X-rays 3. carcinogens 4. formaldehyde	1	This was well answered by most candidates.
5(a)(i)	C C G A T A	1	Many candidates did not attempt this part-question. Those candidates who provided a response were able to correctly complete the base sequence.
5(a)(ii)	Nucleotide	1	The majority of candidates correctly identified the labelled part of the DNA molecule. Weaker responses only referred to separate components of the nucleotide.
5(b)	Social: Reduce cost of medicine for consumers, making them more affordable Potential health issues may arise, example transfer of antibiotic resistance Ethical: Modifying germ lines may cause negative effect on health of chickens eg, shorter lifespan Forcing chickens to produce high number of eggs to meet human demand, cause stress and trauma to chicken → infertility	1 1 1 1	Implication: the conclusion that can be drawn from something although it is not explicitly stated. Many responses were well-phrased and the stronger responses considered the pros and cons of genetic engineering. Several responses focused on <u>only negative implications</u>. Weaker responses used examples that were not relevant such as 'playing God', that this would be an example of cannibalism, or that this technology could be somehow used in biological warfare. Some candidates did not appreciate how the protein medicine would be obtained, making reference to killing the chickens or having to eat the eggs to obtain the medicine.

6(a)	any two from: 1. movement and metabolic processes such as respiration in the form of heat loss 2. parts of the animal that are inedible, unconsumed and undigested, such as bones and feathers 3. through excretion	1 1	Most candidates correctly describe how energy could be lost between trophic levels. Weaker responses confused egestion and excretion, referring to excretion of faeces.
6(b)	$1600 - 90 / 1600 \times 100\%$; = 94.375 = ~94%.	1 1	Most candidates correctly completed the calculation question. A few candidates did not express their answer to the nearest whole number.
6(c)	A large percentage (~90%) of the energy is lost at each trophic level, leading to only a small amount of energy available at the highest trophic levels. The low supply of energy that the predators can obtain from the tertiary consumers means that there can only be few predators as the ecosystem cannot support large numbers of these predators.	1 1	Stronger responses referred to the percentage loss of energy between trophic levels which left tertiary consumers with very little energy to be passed on.

7(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	Most candidates showed good graph skills and made full use of the graph grid. Some candidates chose inappropriate scales, which made it more difficult for them to correctly read off the answer for (a)(ii). A small minority of candidates did not label the axes.
7(a)(ii)	10.2 % + dotted line	1	The majority of candidates were able to correctly read their answers from the graph.
7(b)(i)	General increasing trend. The percentage of fish caught that had a body length of 40 cm and longer <u>increased gradually</u> from 5.0% in 1993 to 7.2 % in 2008, by 2.2%. The percentage of fish caught that had a body length of 40 cm and longer <u>increased sharply</u> from	1 1	Most candidates could correctly describe the relationship between the percentage of fish caught with time. Several gave good descriptions of the changing rate of increase in percentage of fish caught, such as 'increasing at an increasing rate' and 'increasing exponentially'.

	7.2% in 2008 to 16.3% in 2013, by 9.1%		
7(b)(ii)	A larger percentage of big fishes indicates a large proportion of secondary and tertiary consumers. This implies a healthy, large population or organisms able to support high trophic level consumers. Absence of diseases → able to survive and reach adulthood	1 1 1	Several candidates incorrectly answered this question in terms of why it would be beneficial to humans in terms of sustainable fishing.
8(a)	General function: Nephrons are found in the kidneys, responsible for the formation of urine. They filter out waste products such as urea and excess water through ultrafiltration and selective reabsorption Processes: Ultrafiltration: Ultrafiltration occurs in the glomerulus, where water and solutes including urea are forced out of the plasma at high pressure into the Bowman's	1 1	The majority of candidates were able to describe, often in detail, the functions of the nephron. There was good use of scientific terminology for the different functions and examples given for each function. Many candidates did not state that water was filtered out, or that the filtered solutes were entering the Bowman's capsule. Some candidates talked in general terms such as 'waste products', rather than naming urea. Weaker responses incorrectly described neurones rather than nephrons.

	capsule. Selective reabsorption: The glomerular filtrate is transported along the nephron to the proximal convoluted tubule, where all amino acids and glucose are <u>selectively reabsorbed</u>. Reabsorption of water continues in the loop of Henle and water and salts are reabsorbed in the distal convoluted tubule. Formation of urine: The concentrated filtrate then passes through the collecting duct where water reabsorption takes place again before passing through the ureter to the bladder to be stored as urine.	1 1	
8(b)	Blood from the patient is pumped into the dialysis tubing, which consists of a partially permeable membrane, to allow urea, excess salt and water to pass through. The dialysis tubing is highly coiled to increase the surface area to allow maximum removal of waste materials. The tubing is surrounded by the dialysis fluid, which contains the same concentrations of glucose, amino acids, salts and proteins. This is to ensure important substances do not diffuse out of the blood.	1 1 1	The majority of candidates could describe kidney dialysis but did not always use correct scientific terminology. Stronger responses referred to 'urea' rather than just 'metabolic waste', to a 'partially permeable membrane' in the dialysis machine and to the concept of 'maintaining' a concentration gradient with the counter-current flow. Weaker responses made reference to the dialysis fluid containing a normal concentration of nutrients rather than the correct concentration of glucose and salts.

	Dialysis fluid does not contain urea, which creates a steep concentration gradient across the membrane, for higher rate of diffusion of urea. The direction of the fluid flow is opposite of the blood, to maintain a steep concentration gradient and allow maximum removal of waste materials. The constant supply of dialysis fluid also removes any urea that diffuses out into the dialysis fluid thus maintaining the steep conc. gradient.	1 1 1	
9E(a)	When glucose level exceeds the normal level, islets of Langerhans are stimulated to secrete <u>more</u> insulin, to decrease the blood glucose level. Insulin increases the permeability of the liver cell membrane to increase glucose uptake. Insulin stimulates the liver cells to convert excess glucose to glycogen, to be stored in the liver. As the glucose level decreases back to normal, the insulin secretion decreases. When glucose level falls below the normal level, <u>more</u> glucagon is released, to increase the blood glucose level. Glucagon stimulates the liver cells to break down the stored glycogen to glucose. As the glucose level increases back to normal, the glucagon secretion decreases.	1 1 1 1 1	This option was chosen by the vast majority of candidates. There was some confusion about the detection of the increased or decreased blood glucose level, with some candidates attributing the role to the liver or brain. Most candidates were able to discuss the events involved in both a rise and a fall in the blood glucose level. Key terms were often used and usually spelled correctly. <u>Weaker responses referred to insulin and glucagon directly converting glucose to glycogen or glycogen to glucose.</u> Homeostatic mechanism: Stimulus stimulates receptor Corrective mechanism Negative feedback

9E(b)	Hypothalamus is stimulated and sends nerve impulses to various body parts. Corrective mechanisms: 1. Vasoconstriction of blood arterioles → reduces blood flow to the capillaries near the skin and hence, decreases heat loss to the environment via R,C,C. 2. Sweat gland becomes less active → less sweat released → reduces latent heat loss through evaporation of sweat. 3. Increase metabolism to release heat 4. Shivering to release heat	1 1 1 1 1	Most candidates showed a good understanding of the temperature control mechanisms. Weaker responses misunderstood vasoconstriction, for example by stating that the 'capillaries constrict'.
9O(a)	Enzymes are biological catalysts which speed up the rate of chemical reactions in the body by lowering the activation energy. Enzymes have an active site which are complementary to the specific substrate. Enzyme and substrate bind at the active site to form enzyme-substrate complexes. The complex promotes the breaking of bonds and the formation of new bonds. Once the reaction is completed, the products are released from the active site and the enzyme is free to catalyse another reaction.	1 1 1 1 1	Only a small proportion of candidates attempted this option. Many candidates could explain enzyme action in terms of the lock and key hypothesis. Weaker responses referred to the substrate having an active site as well as the enzyme.
9O(b)	Enzymes in human digestion are responsible for catalysing the breakdown of large molecules such as carbohydrates, proteins and fats into their	1	Many candidates were able to give correct examples of enzyme action in the digestive system. Fewer candidates referred to chemical digestion, or to large molecules being

	monomers. Salivary amylase in the saliva and the pancreatic amylase in small intestines are responsible to catalyse the breakdown starch to maltose. Maltase, sucrase and lactase are responsible for catalysing the breakdown down the disaccharides to monosaccharides such as glucose, so that they can be absorbed by the body. Pepsin in the stomach and trypsin secreted by the pancreas catalyse the breakdown proteins to polypeptides. And erepsin in the small intestines catalyse the breakdown of polypeptides to amino acids. Pancreatic lipases are responsible for catalysing the breakdown of fats to fatty acids and glycerols.	1 1 1 1	digested to smaller molecules.
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