

PAPER 2 / SECTION A [30 Marks]

Q 1		Answer	Guidance
(a)	F	Formula / working shown (actual length = 10.6cm / 2.1) Accept 10.6 ± 0.1cm	1
	A	Answer (actual length = 5.0cm) Accept 5.1cm, if length measured is 10.7cm Minus 1 overall if no units in working / sf of final answer not 1dp / if no proper statements / incomprehensible 'floaty' numbers.	1
(b)	S	Sorting/ modification of proteins stops / slows down	1
	E	Export of materials / packaging of materials slows down / stops (accept: export of materials increases [due to increased surface area as the flattened sacs are spread out all over the cell])	1
			[Total: 4]

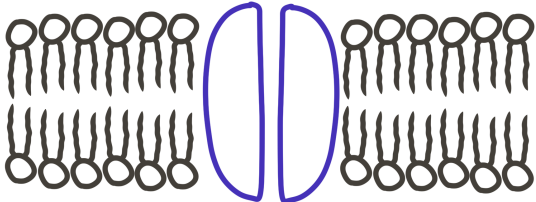
Q 2		Answer	Guidance
(ai)		water	1
(a ii)		hydrolysis	1
(b)		Product C: glycerol Products D: fatty acids	1 both correctly identified for 1m
(c)		Fats provide more energy for the same mass/ per unit mass as compared to proteins or carbohydrates. Can be stored for heat insulation.	1 any for 1m
			[Total 4]

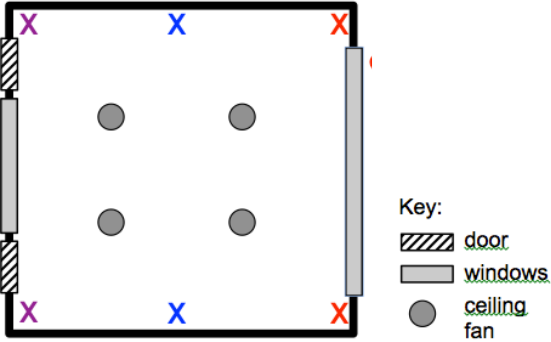
Q 3	Answer	Guidance																
(a)	Mycoprotein contains 36.2 g less fats per 100 g than beef/ Beef contains 36.2 g more fat per 100 g than mycoprotein + reduces risk of contracting coronary heart/ diseases/atherosclerosis/ heart attacks/ obesity. Mycoproteins contains fibre (21.4 g) while beef contains none. Fibre helps prevent constipation.	1 1 must compare data + give reason why it is better for 1 m																
(b)	Takes time for fats to be emulsified. Takes time for chyme to be made alkaline by the digestive juices in the small intestine before digestion by lipase can occur. Takes time for action of lipase on fats to fatty acids and glycerol.	1																
(c)	<table><tr><th>nutrient</th><th>buccal cavity</th><th>stomach</th><th>duodenum and ileum</th></tr><tr><td>fat</td><td colspan="3"></td></tr><tr><td>protein</td><td colspan="3"></td></tr><tr><td>protein (blocked pancreatic duct)</td><td colspan="3"></td></tr></table>	nutrient	buccal cavity	stomach	duodenum and ileum	fat				protein				protein (blocked pancreatic duct)				
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(ci)	Draw uniform area in buccal cavity + decrease in stomach + decrease in area in duodenum and ileum. Refer to above for example.	1																

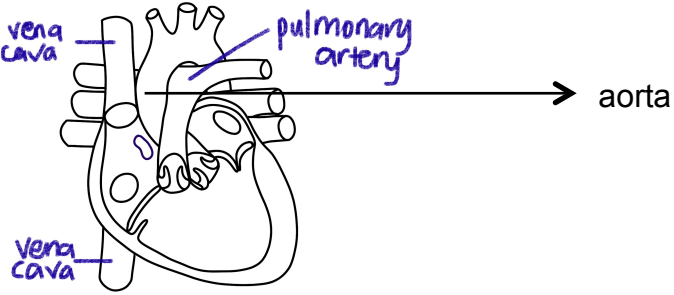
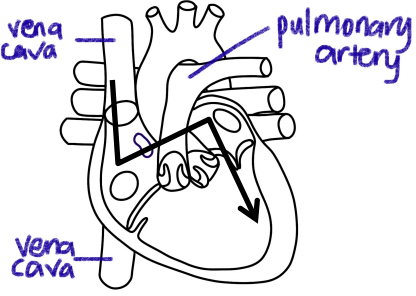
(cii)	Draw uniform area in buccal cavity + decrease in stomach + slower decrease in the area/ less decrease in area. Refer to above for example.	1 ecf if (c)(i) for buccal cavity and stomach were drawn wrongly; mark for the small intestine region.
(ciii)	Pancreatic proteases cannot enter the duodenum to digest the proteins (to polypeptides) thus rate of digestion slows down.	1
		[Total: 6]

Q 4	Answer	Guidance
(a)	More alveoli for man living at high altitude. More bronchioles for man living at high altitude. Wider bronchioles for man living at high altitude. More capillaries surrounding alveoli/ better supplied with capillaries for the alveoli of men living at high altitudes.	Any 2 R: more bronchi R: bigger alveoli
(bi)	More vigorous muscular contractions energy/ ATP demand by muscles increases Respiration (rate) increases to release more energy. Breathing rate increases / depth of breathing increases to absorb more oxygen / heart rate increases Breathing rate increases to remove the increased amount of carbon dioxide produced.	1 1 1 1 1 Any 3
(ii)	Maximum heart rate and breathing rate has been reached/ maximum volume of oxygen sent to muscles. Highest aerobic respiration rate achieved. Anaerobic respiration also occurs now to release the extra energy required for the exercise.	1 1 1 Any 2
(iii)	Because of anaerobic respiration that has occurred, an oxygen debt is incurred/ need to repay oxygen debt. Lactic acid produced from anaerobic respiration has built up in the muscles More oxygen is required after exercise to break down/ oxidise the lactic acid/convert lactic acid to glucose.	1 1 1

[Total: 10]

Q5		Answer	Guidance
(a)		X: exocytosis (Accept: active transport) Y: osmosis / diffusion / facilitated diffusion (Accept: simple diffusion)	1 1
(b)		Aquaporin drawn spanning bilayer, and showing a “channel” through it 	1
(c)	C V E	colour: yellow / brown / dark yellow [reject: clear, colourless, white] volume: low / small / decreased [reject: increased, high] explanation: water moves from solution U into cells / blood by diffusion / osmosis, which causes urine to become <u>more concentrated / less diluted</u> (Accept: less water in U + reference to urochrome / waste products)	1 1 1
			[Total: 6]

Q 6		Answer	Guidance
(a)	S E	Suggest: Shorter plant / bent stem / plant unable to stand upright / thinner stem; (R: “weak” is not appearance) Explain: Less cellulose available for building cell walls for support / Less lignin results in less support for the plant / xylem may collapse and cannot support the plant (accept: cellulose for cell wall + for turgidity + for support) (R: mechanical “protection” – it should be SUPPORT)	1 1
(bi)		Transpiration is the loss of <u>water vapour</u> from the <u>aerial parts of a plant</u> , through the <u>stomata of leaves</u> . [MUST HAVE EXACT PHRASING] [this is a syllabus SIO]	1
(bii)		X placed away from windows / doors and fans (in <u>blue</u>) (Accept: X placed in corners of walls)  Key:  door  windows  ceiling fan	1
(biii)		Wind from fans will increase <u>transpiration rate</u> / light coming through increases <u>transpiration rate</u> / wind coming through doors or windows will increase <u>transpiration rate</u> (Answer must refer to room / context + <u>transpiration rate</u>)	1 [any 1]
			[Total: 5]

Q 7		Answer	Guidance
(a)		Bluish-looking / pale appearance/ skin; difficulty in breathing; weak/lethargic/easily tired; faint easily / dizzy; unable to perform vigorous exercise; rapid breathing; faster heart rate; (R: low metabolic rate, malnutrition, stunted growth, chest pain, weaker heartbeat)	2 [any 2]
(bi)		Labels aorta and pulmonary artery 	1 for each correct label
(bii)			1
			[Total: 5]

Q 8		Answer	Guidance
(a)	a b c d e f g	DNA has a double helix structure. It consists of two <u>polynucleotide</u> chains running in opposite direction/ <u>Polynucleotide</u> chains/strands are anti-parallel The basic unit is the nucleotide consisting of: a (deoxyribose/pentose) sugar, a phosphate group and a nitrogenous base. The anti-parallel polynucleotide chains are held in position by <u>hydrogen bonds</u> formed between complementary base pairs. Adenine pairs with Thymine; Guanine pairs with Cytosine (reject binds, bonds, links) Phosphodiester bond forms between nucleotides Sugar-phosphate backbone is formed by (deoxyribose/pentose) sugars and phosphate groups	1 1 1 1 1 1 1 Any 4
(b)(i)	a b c d e	Amylase is the lock + Starch is the key Starch has a conformation that is complementary to the conformation of the <u>active site</u> of amylase Starch <u>binds to/fits into active site</u> to form the <u>enzyme-substrate</u> (ES) <u>complex</u> <u>Maltose</u> form no longer fit the active site and leaves Amylase converts <u>starch to maltose</u>	1 1 1 1 1 Any 3
(b)(ii)	a b	Prepare two test tubes containing 2 cm³ (appropriate volume) of the chemical + Prepare two test tubes containing 1 cm³ of starch Prepare a water bath maintained at (suggest temperature of 36 – 40 °C) Place one test tube in the water bath/ Leave at room temperature Heat the other test tube in a boiling water bath for ~ 5 mins + allow time to cool Add starch to each of the test tubes containing the amylase. After 1 minute, remove some of the contents in each test tube and test with iodine solution. Results are the same for both test tubes – bottle does not contain amylase Results are not the same for both test tubes – bottle contains amylase <u>Experimental setup</u> - Starch + water (control) - Starch + chemical - Starch + boiled chemical <u>Test to conduct</u>	1

	- Iodine test OR - Benedict's test c <u>Interpretation of results</u> - Iodine test: If iodine in potassium iodide solution turns from yellowish brown to blue-black, starch is present. If iodine in potassium iodide solution remains yellowish brown, starch is absent. OR - Benedict's test: If the blue mixture turns green/yellow/orange/reddish-brown with ppt, reducing sugars are present. If the mixture remains blue, reducing sugars are absent	1 1

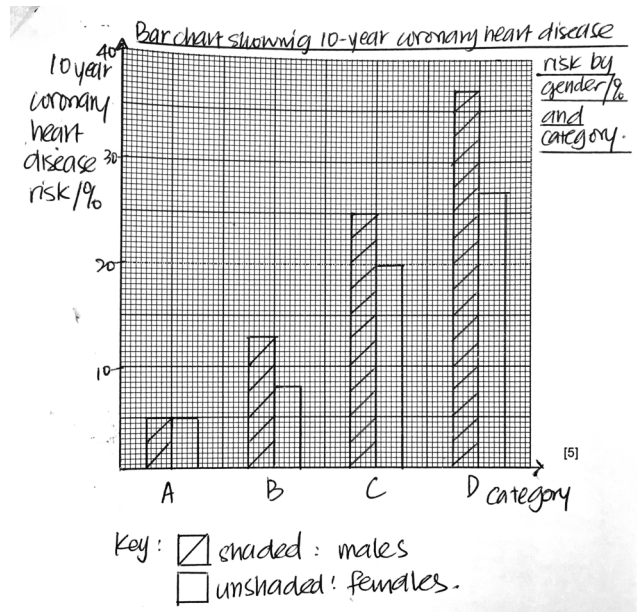
Q 9	Answer	Guidance
(a)	identity of cell X: (Palisade) mesophyll cell Adaptation: <u>Large numbers of chloroplasts to absorb more light for photosynthesis</u>	1
(b)	Stomata on upper epidermis only for diffusion of carbon dioxide for photosynthesis Air spaces in spongy mesophyll to allow gaseous exchange/ allow rapid diffusion of carbon dioxide into mesophyll cells for photosynthesis Air space in palisade mesophyll layer to enable the leaf to float so that more light can be absorbed/ Many large air spaces in spongy mesophyll layer to enable leaf to float so that more light can be absorbed	1 1 1 Any 2
(c)	At 6 am, the light intensity is low hence rate of photosynthesis is also low The rate of photosynthesis is the same as the rate of respiration/ Compensation point Oxygen produced from photosynthesis is used for respiration	1 1 1 Any 2
(d)	As light intensity increases (from 6 am), the rate of photosynthesis increases. Hence volume of oxygen released is increased At midday, the light intensity is the highest. Rate of photosynthesis is the highest. Thus the highest volume of oxygen is released	1 1 1

(e)		Light intensity varies throughout the day while respiration rate remains relatively constant	1
			[Total 10]

Q10 Either		Answer	Guidance
(ai)	S	Size (at least 75% of gridlines)	1
	P	Plotting of points for A and B	1
	L	Lines for A and B (with labelled lines). Line of best fit for A . (R: extension beyond data)	1
	A	Axes with units: Y-axis (volume of water lost/cm ³) X-axis (time / min)	1
	T	Title with units: <u>Graph of volume of water lost/cm³ against time / min</u>	1
		Minus 1 mark for formatting – missing “Graph of...”, incorrect units in title and axes, major gridlines not labelled, (units) instead of /units, use of “arbitrary units”	

		(a) (i) Draw a graph to represent the results. Graph of volume of water lost/cm³ against time/min Handwritten notes on the graph: 'volume of water lost/cm³' on the y-axis and 'time/min' on the x-axis. The title is 'Graph of volume of water lost/cm³ against time/min'.	
(aii)	F C A	Concept of calculating gradient (eg $\frac{\Delta \text{volume}}{\Delta \text{time}}$) Calculations [correct substitution] ($1.8 \text{ cm}^3 / 15 \text{ min}$) or ($1.2 \text{ cm}^3 / 10 \text{ min}$) Answer with <u>units + 2sf</u>: Rate of B = $0.12 \text{ cm}^3 \text{ per min}$ If C calculated for incorrect species, Only F mark awarded. Minus 1 if floaty numbers seen without proper statements [working not clear]	1 1 1
(b)	a b	Evaluate: B (is more suitable) Explain: B has a lower transpiration rate (of $0.12 \text{ cm}^3 \text{ per min}$), less water loss is advantageous in a hot and dry environment. Accept: B has lower transpiration rate, implying that it may have less stomata, which can reduce water loss in hot and dry environment	1 1 (should link lower transpiration rate to environment)
			[Total: 10]

Q10	Answer	Guidance
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Or			
(a)	S Size (at least 75% of gridlines) P Drawing of bars L Within each category, male next to female for comparison (R: gaps between M & F columns / no gaps between categories) A Axes with units: Y-axis (10-year rate of heart disease/%) X-axis (category) T Title with units: <u>Bar chart of 10-year coronary heart disease rate/% against category</u> Accept: <u>Bar chart showing 10-year coronary heart disease rate/% by category</u> Accept: <u>Bar chart showing 10-year coronary heart disease rate by gender/% and category</u> Minus 1 mark for formatting – missing “Bar chart of...”, incorrect units in title or axes, major gridlines not labelled, (units) instead of /units, “arbitrary units” 	1 1 1 1 1	

(b)	G D S a b d	Gender: Except for Cat A, males have higher 10-year rates than females, eg Cat D, 37% is more than 27% Diabetes increases 10-year rate for both males and females, eg Cat C, both males and females at 20% or above Smoking increases 10-year rate for both males and females, eg Cat D, both are high risk at 37% and 27%. Category A: BP at 120/80 mmHg, cholesterol at 200 mg/dL, no diabetes AND no smoking poses low 10-year rate at 5% (for both genders) Category B: Higher Cholesterol & BP levels increases 10-year rate from 5% in Cat A, to 13% and 8% for males and females respectively Category D: with high cholesterol, high BP, diabetes AND smoking, there is highest risk of heart disease at 37% and 27% for males and females respectively. Minus 1 mark if data not quoted at all. [Quote must show % risk + assessment (eg lowest, highest, increased, decreased)]	3 [any 3]
(c)	E F S M D	Exercise: He should increase his level of exercise + to reduce his cholesterol / blood pressure / increase cardiovascular fitness Food: He should cut down on fried food / eat more fruits and veg + to reduce his cholesterol / reduce chance of atherosclerosis Smoking: He should stop smoking / smoke less + to reduce his risk from 37% to 25% (Cat D to Cat C) [Accept: nicotine narrows arteries] [Accept: nicotine increases risk of blood clots + relate to how that causes heart disease] Medication: He can take medication + to reduce cholesterol levels / to control diabetes Diabetes: He should control his sugar intake + to control his diabetes	2 [1 mark for each suggestion + explanation]
			[Total: 10]