Jurongville Secondary School
Science Department 2024
Marking Scheme & Marker's Report

Assessment: **Preliminary Examination** **Level:** **4 Express**
Biology P2 (6093)

Qn	Marking Scheme	Remarks	Marks
1ai	1: brown 2: colourless	Accept 1: colourless if explained in 1aii about optimum pH of enzyme being acidic	[1] [1]
1aii	1. In test-tube 1, phenol can bind with active site of polyphenol oxidase to form enzyme-substrate complex and hence break down to form melanin, which is brown; 2. In test-tube 2, polyphenol oxidase is denatured; 3. The 3D shape of the active site will be altered and will no longer be able to fit the substrate of phenol;	Also accept if 1 colourless, but explains that from 3, optimum pH for enzyme seems acidic. (however at normal conditions, the break down is still catalysed, so original marking scheme still valid)	[1] [1] [1]
1b	Polyphenol oxidase is denatured by alkaline condition/ high pH;		[1]
1c	It acts as a control to show that the colour change is due to the presence of polyphenol oxidase;		[1]
1d	Any 2 of Temperature, concentration of phenol/polyphenol oxidase solutions, volume of solutions, duration of experiment		[2]
2a	More than one raisin was used to find average results to ensure reliability/ consistency of results;		[1]
2b	12.8-8.0= 4.8 cm^3 Percentage increase = 4.8/ 8 x 100% = 60%		[1] [1]
2c	The concentration of cell sap in cells of the raisin was the same as in 10% sugar solution/ the water potential of cell sap in cells was the same as in the 10% sugar solution; There was no net movement of water molecules in or out of the raisin;		[1] [1]
3a	A: aorta; B: pulmonary artery;		[1] [1]
3b	Blockage of coronary arteries reduces the supply of oxygen and glucose to the heart muscles for respiration; The heart muscles would contract with lesser force/ heart pumps blood less powerfully around the body/ heart muscles die, leading to heart attack;		[1] [1]
3c	If X was blocked, more parts of the heart muscles would have less oxygen and glucose than if Y was blocked;		[1]
3d	There would not be issues with tissue rejection/ it is a less risky operation than removing the heart and replacing it with a new heart;		[1]
3e	Any 2		[2]

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	Have a diet low in cholesterol and saturated fats, exercise regularly, manage low stress levels, do not smoke;		
4a	Glucose + oxygen → carbon dioxide + water		[1]
4b	20		[1]
4c	From 20 min to 40 min, the oxygen concentration decreased, causing an increase in anaerobic respiration; Lactic acid is a product of anaerobic respiration and the lactic acid concentration increases more the lower the oxygen concentration; OR Increased lactic acid concentration means more anaerobic respiration has taken place; Increased anaerobic respiration is a result of a decreased concentration of oxygen to carry out aerobic respiration;		[1] [1]
4d	1. Lactic acid concentration will decrease; 2. The rate of breathing will be high so that more oxygen can be taken in/ increase heart rate/ blood flow to muscles; 3. Oxygen is used to break down lactic acid into carbon dioxide and water;	Cannot just mention pay off oxygen debt	[1] [1] [1]
5ai	Difference= 138-122 = 16 Percentage difference = 16/138 x 100 = 11.6%		 [2]
5aii	Any 2 Glucose does not need to be digested, but starch needs to be digested; Glucose is absorbed into the bloodstream faster/ immediately; Glucose absorption from starch continues for a longer time as it takes time for digestion before absorption can take place;		[2]
5b	Insulin is released in response to increased blood glucose concentrations; As such, after eating glucose, there will be a greater increase in insulin concentration at 30 min (8.7) than after eating rice (4.4); Insulin increased faster when glucose was consumed as blood glucose concentration increased faster than when starch was consumed	Must quote some data from graph for full award of 3 marks	[1] [1] [1]
5c	1. Insulin stimulates liver to <u>convert excess glucose to glycogen</u>; 2. <u>Glycogen is stored in liver cells</u>; 3. Insulin also <u>increases uptake of glucose by cells</u> and <u>increases tissue respiration</u>;		[1] [1] [1]
6a	Increasing light intensity increases the rate of photosynthesis;	R: reverse argument	[1]
6b	Carbon dioxide concentration a limiting factor; Carbon dioxide is a raw material needed for photosynthesis;		[1] [1]
6c	1. Due to insufficient water in leaves as water is a raw material needed for photosynthesis; 2. stomata close and less carbon dioxide would be taken into the leaves to be used for photosynthesis; 3. drooping leaf position decreases the amount of light energy absorbed for photosynthesis;		[1] [1] [1]
7a	Any set of The blood capillaries have one-cell thick walls/ tiny pores in the membranes; to speed up the process of ultrafiltration; OR The blood capillaries have a thin partially permeable membrane;		[2]

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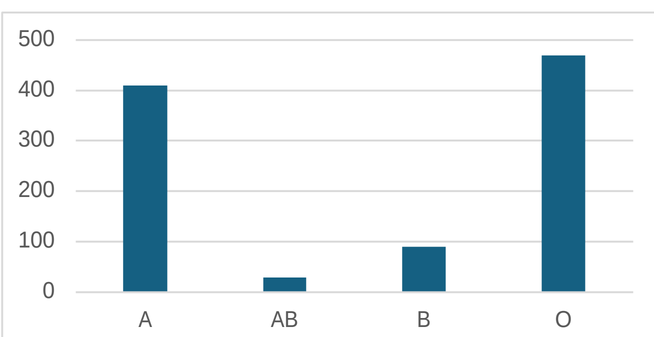
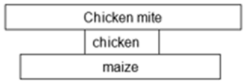
	that allows only small soluble molecules or ions to pass through;		
7bi	Label Bowman’s capsule G;		[1]
7bii	There is a decrease in the concentration of glucose as all the glucose is reabsorbed back into the blood stream; There is a decrease in the concentration of sodium chloride as some mineral salts are reabsorbed back into the blood stream; Urea concentration increases in urine as it is not reabsorbed back into the blood stream;		[1] [1] [1]
7biii	After consuming a meal rich in meat, there would be increased amino acids in the bloodstream; Excess amino acids would be deaminated in the liver to form more urea; In glomerular filtrate, there would be a higher level of urea;		[1] [1] [1]
8a	Mitosis; Identical copies of original bacterium are produced at the end of stage M/ All copes have the same identical genetic material; All cells will have the ability to be able to produce the same insulin;		[1] [1] [1]
8b	Any 2 Advantages Yield of genetically modified crops is good/ plants can grow quickly; Able to grow in environmental extreme conditions/ new areas; Able to transfer beneficial genes or characteristics between species; Can be resistant to diseases or pests; Any 2 Dangers Risk of genetic spread to other species; Expensive and costly to do genetic engineering; Possible health risks to humans or other organisms when consuming genetically modified crops;		[2] [2]
9a	Number of people  Blood Group - Clean, clear bars drawn/point plotted correctly; - Correct axis labels; - Appropriate scale with regular intervals;		[1] [1] [1]
9b	Discontinuous variation; There are a few clear-cut phenotypes/ genes do not show additive effect;		[1] [1]

Qn	Marking Scheme	Remarks	Marks
9ci	Parent Phenotype: blood group A × blood group B [1] Parent Genotype: I^AI^O x I^BI^O [1] Gamete: I^A, I^O, I^B, I^O Offspring Genotype: I^AI^B I^AI^O I^BI^O I^oI^o Offspring Phenotype: AB A B O [1] Probability of child with blood type AB: 25%/ 1/4 [1]		
9cii	B or O		[1]
10a	Bacterial cell as a cell wall, but an animal cell does not; [1] Bacterial cell does not have the DNA or genetic material enclosed within a membrane, but an animal cell has a nucleus containing genetic material; [1]		
10b	Any 3 [3] Age group trend: more hospitalisations for group aged 75 (in 1998, around 110) and above/ 15-74 year olds (in 1998, less than 45), fewer hospitalisations; Those above 75 may have weaker immune system/ more prone to tuberculosis; There is a larger difference in hospitalisations between those aged 75 (and above from 1998 to 2000 (60 to 105 a year) as compared to 2001 to 2004 (around 40 a year); Vaccines could have been administered in 2020 to those aged 75 and above;		
10c	1. Antibiotics given during infection/ to help treat the disease/ destroy pathogen; [1] 2. It acts on pathogen directly to prevent synthesis of cellular structures; [1] 3. Vaccines are given before infection/ to prevent disease/ increase immunity; [1] 4. Vaccines contain an agent that resemble pathogen; [1] 5. Vaccines stimulate white blood cells to produce antibodies quickly when pathogen is present; [1]		
11a	Maize → Chicken → Chicken mite		[1]
11b	Pyramid of numbers [1]  Pyramid of biomass [1]		

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11c	Uneaten parts of organisms are not eaten by consumers; Egestion of faeces which contains undigested food substances; Energy is lost as heat (via respiration);		[1] [1] [1]
11d	- Pesticides can be consumed by organisms and not be excreted out of the organism, leading to bioaccumulation in organisms; - This can lead to bioamplification/ biomagnification where the toxins in one organism accumulate in organisms further up the food chain; All 3 for 2 marks, 2 for 1 mark - Fertilisers can cause algae growth in rivers resulting in eutrophication - There will be a lack of sunlight for submerged plants, causing them to die - Increase bacteria and decomposition cause dissolved oxygen levels to decrease, causing death of other aquatic life such as fish		[1] [1] [2]