Preliminary Examination 2024 Secondary Four Express Science (Biology) 5087/01/04

Answers

21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
В	Α	D	D	С	Α	В	В	D	В
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
С	Α	С	С	С	Α	Α	Α	С	Α

Paper 4

Qn		Answers	Marks
1.	(a)	<u>mass decrease</u> of beet root in test-tube A decreases [1] explanation: beetroot cells has <u>higher water potential compared to</u> <u>30% sucrose solution</u> [1]. <u>Water move out</u> of beet root by <u>osmosis</u> [1]	3
	(b)(i)	Cell membrane of beet root cells were <u>damaged by heat</u> The purple colour in the beet root <u>move out to the surrounding</u> water causing it to turn purple. [1]	1
	(ii)	The colour of liquid in test-tube B will <u>remain unchanged</u> /will not turn purple.[1] The beet root cells will become turgid but <u>will not burst</u> because there is <u>cell wall to protect the cell from bursting</u> . [1]	2
		Total	6
2	(a)	There are <u>more albumen still present in test-tube B than C</u> at the end of experiment.[1] As <u>temperature is higher in test-tube C</u> , enzymes and substrate gain kinetic energy <u>which increases the effective collisions</u> between the molecules thus <u>increasing rate of digestion of albumen</u> . [1] <u>(Do not write temperature affect rate of digestion)</u>	2
	(b)	As temperature increases beyond optimum temperature, pepsin gets <u>denatured</u> ; [1] Heat destroys the chemical bonds as a result pepsin loses its <u>3D</u> <u>structure</u> and its <u>active site [1].</u> Pepsin <u>cannot bind</u> to the <u>complementary shape</u> found on the albumen <u>to form the enzyme-substrate complex</u> . [1] As a result, albumen <u>remains undigested</u> in test-tube D. [1]	4

	(c)(i)	Polypeptides/amino acids	1
	(ii)	Pepsin is a protease which <u>digests protein</u> found in albumen into polypeptides/amino acids.	1
		Total	8
3	(a (i)	Left atrium contracts, blood is pushed into the left ventricle [1]	1
	(ii)	If the flap B is not closed properly, some blood will <u>backflow into left</u> <u>atrium</u> when left ventricle contracts.[1] <u>Less oxygenated blood</u> is sent out to aorta and to other parts of body [1]. OR Pressure of blood is also reduced [1].	2
	(iii)	Left ventricle has a thicker muscular wall <u>to push blood at high speed</u> <u>& pressure</u> so that it can be transported to all parts of body efficiently [1].	1
	(b)	Blood in the coronary artery is at <u>higher pressure</u> [1] OR <u>higher oxygen content</u> [1] than blood in the coronary vein.	1
		Total	5
4	(a)	Anaerobic respiration is the <u>breakdown of glucose in the absence of</u> oxygen to release <u>energy and lactic acid</u>	1
	(b)	Glucose <u>decreases rapidly from 0-10 minutes</u> (during exercise) and lactic acid concentration increases from 0 to 10 minutes.[1] During vigorous exercise in the first 10 minutes, muscles cells carry out <u>aerobic respiration and anaerobic respiration</u> to release large amount of energy to carry out the vigorous activities .[1] The rapid rate of <u>aerobic respiration</u> causes the level of <u>glucose</u> <u>decreases so rapidly</u> during exercise and <u>anaerobic respiration</u> releases <u>lactic acid</u> which causes the increased in lactic acid concentration [1]	3
	(C)	During resting, lactic acid is removed from cells and transported to the liver [1] to be converted to glucose and little energy[1]	2
		Total	6
5	(a)	 X: by droplets (1) Y: by direct contact (1) Z: by contaminated food and water (1) 	2
	(b)	Washing hands with soap and water or rub with disinfectant after touching objects suspected to be contaminated with the bacteria (1). Keep a safe distance from others, thus avoiding close contact with people (1).	2
	(c)	The food was not covered and was <u>left exposed to the environment</u> (1). Hence, the food could have become <u>contaminated with</u> <u>pathogens</u> (1). As he did not reheat the food, Larry probably ate the live pathogens together with his food.	2
		Total	6

6	(a)	Rate of transpiration (g/min)	
		14 12 10 10 10 10 10 10 10 10 10 10	
		Scale (at least 75% of space given) -1 Line join points – 1 Axis (correct labels, labels at fixed intervals) – 1 Points (correctly plotted) – 1	4
	(b)	Between <u>0830 hrs to 1030 hrs</u> + rate of transpiration increases from <u>5.0 mg/min to 12.8 mg/min</u> <u>1030 hrs up till 1230 hrs</u> + transpiration rate drops from <u>12.8</u> <u>mg/min to 12.0 mg/min</u>	2
	(c)	Light intensity increases; More photosynthesis + stomata opens bigger ;, higher rate of transpiration OR <u>Temperature gets higher</u> as morning gets later/sun rises higher; <u>Increased rate of evaporation of water</u> from mesophyll cell surface, more water vapour to diffuse out ;	2
		Total	8
7	(a)	A [1] shortest food chain/least trophic levels so less energy is lost in between the trophic levels [1]	2
	(b)	Pyramid of number – represents the <u>number of living thing in the</u> <u>food chain</u> creating an <u>inverted pyramid shape</u> this is due to there being only <u>one singular bush tree</u> in which the green flies feed on. [1] Pyramid of biomass - represents the <u>total mass of each trophic</u> <u>level</u> so creating a pyramid this is due that <u>bush tree in the lower</u> <u>trophic level has a broader base as it provide food for the animals</u> which prey on them. [1]	2
		Total	4

8	(a)	X: oestrogen Y: progesterone	2
	(b)	X causes repair and growth / thickening of uterus lining.[1]	2
	X - 7	Y maintains the thickness of uterus lining.[1]	
	(c)	uterus lining thickness maintains at thickest for embryo implantation and growth [1]	2
		concentration of destrogen and progesterone remains high [1]	•
		lotal	6
9	(a)	Noah inherited a <u>recessive allele</u> each from <u>both father and mother</u> . He is <u>homozygous recessive</u> , pp, so he expressed PKU His father and mother are <u>both heterozygous</u> , Pp, so they do not express the PKU	2
	(b)	Noah (pp) P P P	4
		Probability of child getting PKU is 50% [1]	^
		lotal	6

Section B

8	(a)	From 0000 to 0600 h, sugar concentration in the leaves	6
		decreases; [1]	
		No sunlight during the period, photosynthesis did not occur;	
		sugar in the leaves was oxidised/ used during respiration [1]	
		 From 0600 to 1500 h, sugar concentration in the leaves 	
		increases to maximum of 20 units/ highest [1]	
		As light intensity increases to noon, the rate of photosynthesis	
		increases. Thus, more sugar is produced [1]	
		 From 1500 to 2400 h, sugar concentration in the leaves 	
		decreases from 20 to 9 units [1]	
		Light intensity decreases in the night, rate of photosynthesis	
		decreases. Thus, lesser sugar is produced [1]	
		[Students must explain the relationship between light intensity	
		and rate of photosynthesis]	

	(b)	When <u>more sugar is made in the leaves</u> , more sugar will be present in <u>the stem</u> ; [1] More sugar will be <u>translocated/transported to other parts</u> of the stems through <u>the phloem</u> in the stem. This causes the increase in the sugar in stem.[1]	2
	(C)	 Any two of the following: oxidised to released energy during respiration; component of cellulose cell walls; combined with nitrogen to form amino acids; stored as starch 	2
		Total	10
9	a	 A is Respiration. Respiration is a chemical process that <u>releases energy from</u><u>food substances</u> in all living cells through oxidation process and in the process releases carbon dioxide into the environment. [1] This process <u>increases the amount of carbon</u> in the atmosphere. [1] B is Photosynthesis. Photosynthesis is a process by which cells containing chlorophyll convert light energy to chemical energy by synthesizing (put together) <u>glucose from carbon dioxide and water and releasing oxygen</u>. [1] Photosynthesis is the only process which <u>removes the carbon from atmosphere. [1]</u> C is Combustion. Combustion is the <u>burning of trees</u> results in reduced plant life results so less carbon dioxide being removed from the atmosphere via photosynthesis. [1] Less trees to take in CO2, <u>more CO2 remain in atmosphere</u> [1] [Must explain what is the process and how the process affect the amount of carbon dioxide in the atmosphere] 	6
	b	 A carbon sink is an area that stores <u>carbon compounds over a long period of time</u>; [1] The plants in the forests and vegetated areas carry out <u>photosynthesis</u> [1] which converts <u>carbon dioxide to carbon compounds in the leaves and stems of the plants.[1]</u> Carbon compounds are also found in <u>dead/fallen branches and trees/deadwood; in leaf litter; in forest soil + roots of the forests and vegetated areas are rich source of carbon. [1]</u> 	4
		Total	10