

Preliminary Examination 2023 Secondary 4 Express Biology 6093 Mark Scheme

Paper 1							
1			2	3	4	5	
С			Α	В	Α	D	
6			7	8	9	10	
	В		Α	C	В	D	
	11		12	13	14	15	
	С		В	C	В	D	
	16		17	18	19	20	
	С		Α	C	C	С	
	21		22	23	24	25	
	Α		Α	В	Α	В	
	26		27	28	29	30	
	В		Α	D	Α	D	
	31		32	33	34	35	
	Α		Α	C	Α	D	
	36		37	38	39	40	
	Α		Α	D	В	D	
Se	ction A	1					-
1	(a)(i)	Tissue);				1
		reject:	incorrect spelling				
	max						1
	(a)(ii) circular / round shape + label 'chloroplast';						1
		airaula	r / round chone /lerg	or then drowing of ch	laraniaat) i lahal (ni	volovo'	4
			ir / round snape (larg	er than drawing of cr	iloropiast) + laber ht	icieus ;	1
large,			central obiolog shape		ii vacuole , mombrano'		1
					Inemplane		
		reject.	incomplete line / hrc	ken line/ wrong prop	ortional w r t other o	raanelle	
	reject: incomplete line / broken line/ wrong proportional w.r.t other organelle						
	ma na					max	4
(a)(iii) Label			a pair of guard cell:				1
						-	
	accept: one guard cell						
	max						1
	(b) Presence of thin film of moisture:						1
		<u>Water</u>	evaporates from the	thin film of moisture	and moves into the i	ntercellular	
	air spaces; AW						1
	Presence of intercellular air spaces; 1					1	

		Accumulation of water vapour, creating a water vapour concentration gradient between leaf and the surrounding air;			
2	(a)	Similarity: Lactic acid is produced as a by-product/ product : AW	Παλ	4 1	
		Difference: Carbon dioxide is produced in bacteria but is not produced in musc	le	1	
		cell of human ; AW			
		1m ea			
	(b)	From $t = 0$ to $t = 40h$, concentration of lactose decreases gradually; AW	nax	2 1	
		From $t = 40$ to $t = 48h$, concentration of lactose remains unchanged; AW			
		n	nax	2	
	(c)	Measure 2cm3 of milk and add equal amount of Benedict's solution;		1	
		n n	nax	2	
	(d)(i)	Mutation / Gene mutation ;		1	
		There is a change in the allele / gene / base sequence / DNA :		1	
		This result in change in the 3- dimensional shape of active site of the enzyme;		1	
		The substrate / lactose is unable to fit into the active site		1	
		n	nax	3	
	(d)(ii)	Yes;		1	
		Lactose concentration in yogurt is much low than milk, Aw		I	
		reject: no lactose			
2	(2)(i)	N Structure A: potwork of capillaries:	nax	2 1	
5		Maintains the concentration gradient for the absorption of digested food		1	
		sustances by the continual transport of digested food substances away; AW			
		Structure B: one cell thick epithelium:		4	
		Digested food substances take a shorter time to diffuse through, speed up the		1	
		n n	nax	4	
	(a)(ii)	Alveolus / Alveoli;		1	
	(b)(i)	Fxcess amino acids are transported to the liver for deamination:	nax	1	
	(~)(-)	The <u>amino group</u> will be removed and convert into <u>urea;</u>		1	
		Urea will be transported to the kidney and excreted from the body in <u>urine</u> ;		1	
		r ne remaining deaminated amino acids will be convert into giucose.	nax	3	
	(b)(ii)	Regulation of blood glucose concentration / carbohydrate metabolism;		1	
		Production of bile / metabolism of fats;		1	
		Detoxification / Break down alcohol; Break down of red blood colls/ iron storage;		1	
		Protein synthesis;		1	

		Any 1 = 1m				
		max reject: answers from the same catergory /deamination of amino acids/ metabolism of proteins				
	(c)	Each transar	minase has a <u>unique 3-dimensior</u>	hal active site;	1	
		acids;	<u>binds/ complementary / hts / ma</u>	tcnes the shape of one type of amin	I	
		to form an er	nzyme-substrate complex.		•	
4	(a)(i)	D: aorta / ao	rtic arch:	max	2	
		E: pulmonary	y artery;		1	
	(a)(ii)	Any one from	n similarity and one from differen	max ce: max	2	
	(4)(1)				-	
			Auta			
		Similarity	Transport blood away from hea	rt		
			Presence of semi-lunar valve			
		Difference	Transport oxygenated blood;	Transported deoxygenated		
			AW	blood; AW		
			Blood at higher pressure than	Blood at lower pressure than		
			pulmonary artery	aorta;		
	(b)(i)	Fatty substa	nces such as cholesterol and sat	urated fats may <u>deposit</u> on the <u>inner</u>	1	
		surrace of the coronary arteries; This is known as atherosclerosis:				
		This <u>narrows the lumen</u> of these arteries and <u>increases blood pressure</u> ;				
		Rough inner surface may develops which increase the risk of <u>a blood clot</u> being trapped in the artery:				
		completely block off the artery.				
	(b)(ii)	inflating the balloon :				
		push / comp	ress the fats to widen the lumen of	of the blood vessel;	1	
		leaving the hollow metal mesh in the blood vessel:				
		maintain the lumen for blood flow;				
5	(a)	Organism (a named organism from Fig 5.1) that feeds on another organism (a			2 1	
		named organism from Fig 5.1)				
		e.g. Yellow-vented bulbuls feeds on ladybirds				
		accept any correct example from Fig. 5.1				
	(b)	Energy decreases down a food chain:			1	
		There will be insufficient energy/not enough energy to sustain; the organisms			1	
		beyond the fifth link. max			2	
	(c)	Population of brown hawk owls may decrease after some time; 1			1	

		Pesticides on rain tree will be consumed by the primary consumers				
		As the pesticides cannot be excreted and will accumulate on the bodies of the primary consumers:				
		This results in the pesticides being passed along the food chains.				
		Increasing the concentration in the bodies of the organisms along the trophic				
		levels;				
		Brown hawk owls is the top /apex consumer in many of the food chains, hence				
		will accumulate large amount of pesticides from eating the affected prey;				
		The brown hawk owls may be poison eventually by the pesticides.				
		max	1			
			4			
	(d)	Accurate drawing of the number (represent by rectangle);	1			
		max	2			
		Пах	L			
6	(a)	Label of axis;	1			
		Appropriate scale;	1			
		Accurate plot;	1			
	(b)	$\frac{\text{max}}{1000}$	3			
	(6)					
		Percentage lost through faeces: 160 / 3000*100				
		= 5.33% (3 s.f)	1			
		reject: no unit	1			
	(c)	Volume of water lost through sweat will decrease:				
	(-)	Sweat gland will become less active hence less sweat will be produced;	1			
		Less evaporation of water, and less latent heat of vaporization lost;	1			
		Volume of water lost through urine will increase;	1			
		Less ADH will be released, resulting in less water reabsorbed at the collecting				
		duct;				
		1m for suggesting the two ways				
	(d)	$\frac{190,000 - 740 - 189,260 \text{ cm}^3}{190,000 - 740 - 189,260 \text{ cm}^3}$	4			
	(4)	189 260 cm ³ of water will be reabsorbed along the tubules by osmosis:	1			
		max	2			
7	(a)	The nuclei of the sperm cell and egg cell will fuse; to form a fertilized egg / zygote	1			
		The fertilized egg will divide by mitosis;	1			
1		to form a dall of cells known as an embryo;	1			
1		Meiosis is involved in the formation genetically dissimilar egg and sperm cells	1			
		which increase variation in the species. This will increase the chance of survival	.			
		of the species during the change in the environment;				
1						
		ivieiosis is involved in the formation of the haploid; egg and sperm cells, this maintains the pormal diploid number of chromosomes in the species	1			
		maintaine the normal alphoid number of enromosomes in the species.	5			

	(b)	Function of the amniotic sac Encloses the fetus in the amniotic cavity, containing amniotic fluid;				
		Function of amniotic fluid (Any 2)				
		It supports and cushions the fetus before b	birth;	1		
		It is a shock absorber;		1		
		It protects the fetus against physical injury	/ mechanical shock as it cannot be	1		
		compressed;	amont which promotos muscular	1		
		development:	ement, which promotes muscular	'		
		It lubricates, and reduces friction in the birt	h canal;	1		
			max	3		
	(c)					
		Sexual reproduction	Asexual reproduction			
		involves 2 parents	involves only i parent			
		Produce genetically dissimilar	Produce genetically similar			
		offsprings	offsprings			
		Any two = 2m				
		-	max	2		
8	(a)	When blood glucose level is higher than no	orm, insulin will be secreted by islets of	1		
F		Langemans in the pancreas;	to liver:	1		
				1		
		Any 2 from:		1		
		It will stimulates liver to converts excess gl	ucose to glycogen for storage;			
		It will also increase the permeability of the cell membrane to glucose, thereby				
		Increase the rate of uptake of glucose.				
		It will also increase oxidation of glucose during tissue respiration,				
		Blood glucose level will decrease back to normal.				
		When blood glucose level is lower than norm, glucagon will be secreted by islets				
		of Langerhans in the pancreas;				
		Glucagon will be transported in the bloodstream to the liver;				
		Any 1 from:				
		Any 1 from:				
		It will stimulate conversion of fats and amino acids into glucose;				
		Blood glucose level will increase back to normal.				
		Award islet of Langerhans in the pancreas & transported in the bloodstream to the				
		liver only once				
	(b)(i)	A restriction enzyme is used to cut the frac	mement of DNA in human chromosome	1		
	(5)(1)	that contains the insulin gene:				
		The same restriction enzyme is used to cut the plasmid from a bacterium.				
		This will produce complementary sticky ends for the gene and plasmid;				
		I ne plasmid and DNA fragment is mix so that the insulin gene will bind to the				
		DNA ligase is added to seal the human insulin gene to the plasmid:				
1	1	DNA ligase is added to seal the numan insulin gene to the plasmid;				

		A recombinant plasmid is formed.			
		The recombinant plasmid is mix with E.coli bacterium. A heat-shock is applied to insert the plasmid into the E.coli bacterium;			
		The transgenic bacterium will make insulin using the new gene.	3		
	(b)(ii)	(mouth) trachea \rightarrow Bronchus \rightarrow bronchiole \rightarrow alveolus	1		
		By diffusion ;	1		
		max	2		
8	(a)	In the presence of light, the radioactive carbon dioxide <u>diffused from surrounding</u>	1		
		and dissolved into the thin film of moisture in the intercellular air spaces;			
		The dissolved radioactive carbon dioxide will react with water, in the presence of light and chlorophyll to form glucose, and oxygen in a process known as	1		
		The radioactive carbon in carbon dioxide will be incorporated into glucose molecules.			
		Any 1 from: Glucose forms in the green leaves will be converted to sucrose and translocated to other parts of the plants, as well as for storage in the roots through <u>phloem</u> .			
		Glucose can also reacts with nitrates to form amino acids in leaves. The excess amino acids will also be transported via phloem to other parts of the plant, and roots for synthesis of new protoplasm, or for storage as protoins:			
		max	5		
	(b)(i)	<u>Trapped</u> light energy from the sun; <u>Converts light energy to chemical energy</u> ; for storage in the plants max	1 1 2		
	(b)(ii)	Cow feeds on the leaves containing radioactive carbon;	1		
		The leaves is digested into smaller soluble nutrients such as glucose, amino acids and fats;	1		
		The radioactive carbon is present in the nutrients, will be absorbed into the blood stream;	1		
		The nutrients will be assimilated, such as for growth and repair; Resulting in the radioactive carbon to be present in the tissue of the cow:			
		max	3		