

SECTION A

QUESTION 1

NO.	SUGGESTED ANSWER
(a)(i)	J : Lactase M : Glucose/ Galactose
(a)(ii)	Lactase-lactose complex
(b)	Catabolism
(c)	- Enzymes/ J/ lactase have specific active sites - Substrate K does not complement/ fit to the active site of J/ lactase - Substrate K cannot bind to the active site of J/ Lactase
TOTAL: 6 marks	

QUESTION 2

NO.	SUGGESTED ANSWER
(a)	Phosphate
(b)	Mitochondrion
(c)	- ATP molecules have weak (phosphate) links/ bonds (Phosphate) links on ATP molecules are broken/ decomposed - Produce ADP and phosphate - Through glucose oxidation
(d)	- No increase in dough size// Bread dough does not rise - There is no alcohol fermentation - No carbon dioxide is released
TOTAL: 6 marks	

QUESTION 3

NO.	SUGGESTED ANSWER
3(a)(i)	P : Vascular cambium Q : Xylem <i>Reject : lateral cambium</i>
(a)(ii)	• Vascular cambium (can) divide by mitosis • To form secondary growth/ secondary xylem/ secondary phloem. • Increase diameter/ circumference of stem
(b)	Substances : Sucrose// amino acids/ hormones/ organic substances/ product of photosynthesis Process : Translocation <i>Reject: food/ glucose/ nutrient/ starch</i>
(c)	• Arrange longitudinally from end to end// Form a long continuous tube/ connected form end to end// Vessel do not contain any cytoplasm/ dead cell • Allows water to flow upward continuously from one cell to the next • Wall of xylem contain lignin// Have uneven lignin thickening • Give strength// To prevent from collapsing
TOTAL: 7 marks	

QUESTION 4

NO.	SUGGESTED ANSWER
4(a)	

(b)

- Correct drawing of at least **three** cells without chloroplast
- Label of upper epidermis

Accept : Drawing without cuticle layer

Reject : Cell with chloroplast

(c) S : Light independent reaction.

(d)

Tindak balas di R <i>Reaction at R</i>	Aspek <i>Aspect</i>	Tindak balas di stroma <i>Reaction at stroma</i>
Photolysis of water	Proses terlibat <i>Process involved</i>	Reduction of carbon dioxide
Water	Bahan tindak balas <i>Reaction substance</i>	Carbon dioxide
Oxygen (and water)	Hasil tindak balas <i>Reaction products</i>	glucose

TOTAL: 7 marks

QUESTION 5

NO.	SUGGESTED ANSWER						
(a)(i)	Cervical vertebrae						
(ii)	12						
(iii)	<table> <tr> <th>Vertebra U <i>Vertebra U</i></th><th>Vertebra V <i>Vertebra V</i></th></tr> <tr> <td>Cuaran spina yang panjang <i>Long spinous process</i></td><td>Cuaran spina yang pendek <i>Short spinous process</i></td></tr> <tr> <td>Tidak mempunyai foramen melintang <i>No transverse foramen</i></td><td>Tidak mempunyai foramen melintang <i>No transverse foramen</i></td></tr> </table>	Vertebra U <i>Vertebra U</i>	Vertebra V <i>Vertebra V</i>	Cuaran spina yang panjang <i>Long spinous process</i>	Cuaran spina yang pendek <i>Short spinous process</i>	Tidak mempunyai foramen melintang <i>No transverse foramen</i>	Tidak mempunyai foramen melintang <i>No transverse foramen</i>
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(b)(i)	Ball and socket (joint)						
(c)	• All directional/ rotational movement cannot be carried out// Leg cannot swing/ move in circular motion • Femur/ lower limb is unable to be lifted • Unable/ limited/ difficult to walk/ move (properly)/ Accept any example of difficult movement • Leg cannot be straighten/ bend						
TOTAL: 8 marks							

QUESTION 6

NO	SUGGESTED ANSWER						
(a)	Polypeptide						
(b)(i)	Small intestine/ ileum						
(ii)	Lipase						
(c)	<table> <tr> <th>6.2(a)/ Healthy individual</th><th>6.2(b)/ Liver cirrhosis patient</th></tr> <tr> <td>Plasma protein/ enzyme can be synthesised</td><td>Plasma protein/ enzyme less/ cannot be synthesised</td></tr> <tr> <td>Deamination process occur // excess amino acids are broken down to form urea</td><td>Deamination process less/ does not occur// excess amino acids are not/ less broken down to form urea</td></tr> </table>	6.2(a)/ Healthy individual	6.2(b)/ Liver cirrhosis patient	Plasma protein/ enzyme can be synthesised	Plasma protein/ enzyme less/ cannot be synthesised	Deamination process occur // excess amino acids are broken down to form urea	Deamination process less/ does not occur// excess amino acids are not/ less broken down to form urea
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(d)	- Population of (large intestine's probiotic) bacteria decreases - Balance between beneficial and less beneficial bacteria disrupted (Antibiotic) destroyed beneficial bacteria// increased less beneficial bacteria/ pathogen - Can cause diarrhea - Metabolic byproducts of some bacteria/ vitamin - B/ vitamin K/ folic acid decrease/ less absorbed - The patient suffers lack of vitamin// any symptom lack of vitamin B/ vitamin K.		
TOTAL: 8 marks			

QUESTION 7

NO.	MARKING SCHEME											
(a)	<table><tr><th>Aspek <i>Aspect</i></th><th>Sel X <i>Cell X</i></th><th>Sel Y <i>Cell Y</i></th></tr><tr><td>Jenis pembahagian sel <i>Type of cell division</i></td><td>Mitosis</td><td>Meiosis</td></tr><tr><td>Bilangan kromosom dalam sel anak <i>Chromosome number in daughter cell</i></td><td>6</td><td>3</td></tr></table>			Aspek <i>Aspect</i>	Sel X <i>Cell X</i>	Sel Y <i>Cell Y</i>	Jenis pembahagian sel <i>Type of cell division</i>	Mitosis	Meiosis	Bilangan kromosom dalam sel anak <i>Chromosome number in daughter cell</i>	6	3
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(b)	<table border="1"> <thead> <tr> <th data-bbox="451 335 982 409">Cell X</th><th data-bbox="982 335 1507 409">Cell Y</th></tr> </thead> <tbody> <tr> <td data-bbox="451 409 982 572">Chromosomes are arranged at the equatorial plane</td><td data-bbox="982 409 1507 572">Homologous chromosomes are arranged at the equatorial plane</td></tr> <tr> <td data-bbox="451 572 982 706">(Each) chromatid is tied to the spindle fibres</td><td data-bbox="982 572 1507 706">Chromosome is tied to the spindle fibres</td></tr> <tr> <td data-bbox="451 706 982 899">The sister chromatids are still tied together (at the centromere)</td><td data-bbox="982 706 1507 899">The sister chromatids of the homologous chromosome are still tied/ joint/ attach together (at the centromere)</td></tr> </tbody> </table>	Cell X	Cell Y	Chromosomes are arranged at the equatorial plane	Homologous chromosomes are arranged at the equatorial plane	(Each) chromatid is tied to the spindle fibres	Chromosome is tied to the spindle fibres	The sister chromatids are still tied together (at the centromere)	The sister chromatids of the homologous chromosome are still tied/ joint/ attach together (at the centromere)
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(c)	• Spindle fibre fail to form/ incomplete • Homologous chromosome fails to separate// • non-disjunction of chromosome occurs • (Abnormal) gamete with less/ extra chromosome are produced. • (Chromosomal) mutation// causes genetic disease/ incomplete meiosis								
(d)	• Technique : Tissue culture • Explant are placed in a sterile culture/ medium/ contain nutrient in lab/ petri dish. • Promotes by hormone/ growth hormone/ cytokinin/ auxin/ • Involved mitosis/ cell division								
TOTAL: 9 marks									

QUESTION 8

NO	SUGGESTED ANSWER									
(a)	• Soft/ muddy soil/ silted • Strong wind blows • Strong/ high light intensity • Waves/ water tides • Soil with high salt content/ high salinity/ low dissolved oxygen									
(b)	<table> <tr> <th></th> <th>Zone X</th> <th>Zone Y</th> </tr> <tr> <th>P</th> <td>Pneumatophor</td> <td>Prop root</td> </tr> <tr> <th>D1</th> <td>Short root projection/ for aeration/ allow gaseous exchange (through cuticle)</td> <td>Branch out from the lower part of stem/ for support/ to overcome strong wind and wave</td> </tr> </table>		Zone X	Zone Y	P	Pneumatophor	Prop root	D1	Short root projection/ for aeration/ allow gaseous exchange (through cuticle)	Branch out from the lower part of stem/ for support/ to overcome strong wind and wave
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P	Pneumatophor	Prop root								
D1	Short root projection/ for aeration/ allow gaseous exchange (through cuticle)	Branch out from the lower part of stem/ for support/ to overcome strong wind and wave								
(c)	• Succession process occur • Enlarged root system/ pneumatophore root trap mud/ organic substances (during high tide) • Accumulation of mud/ sediments/ organic substances • Soil become higher/ denser • <i>Rhizophora</i> sp succeeds/ replaces the <i>Avicennia</i> sp/ <i>Sonneratia</i> sp.									
(d)	• Prop root traps garbage/ plastics waste/ paper waste • Breeding site of small aquatic animals/ small fish/ shrimps/ crabs destroyed// protected site/ habitat for small fish/ shrimps / crabs disturbed// small fish exposes to predation • Population size of small aquatic animals/small fish/ shrimps/ crabs decrease// aquatic animals extinct • Disrupt the food chain/ food web • Reduce source of income for fisherman • Reduce charcoal timber • Ecotourism distruputed/ eyesore view									
TOTAL: 9 marks										

SECTION B

QUESTION 9

NO.		SUGGESTED ANSWER
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E9

(a)(i) Valve M : Tricuspid valve
Valve N : Bicuspid valve

(a)(ii)

C1:

Valve M	Valve N
Consists of three leaflets	Consists of two leaflets
Valve is between right atrium and right ventricle	Valve is between left atrium and left ventricle
Allows the flow of deoxygenated blood	Allows the flow of oxygenated blood
Prevent backflow of blood from right ventricle to right atrium// To ensure one direction of blood flow from right atrium to right ventricle	Prevent backflow of blood from left ventricle to left atrium// To ensure one direction of blood flow from left atrium to left ventricle

C2:

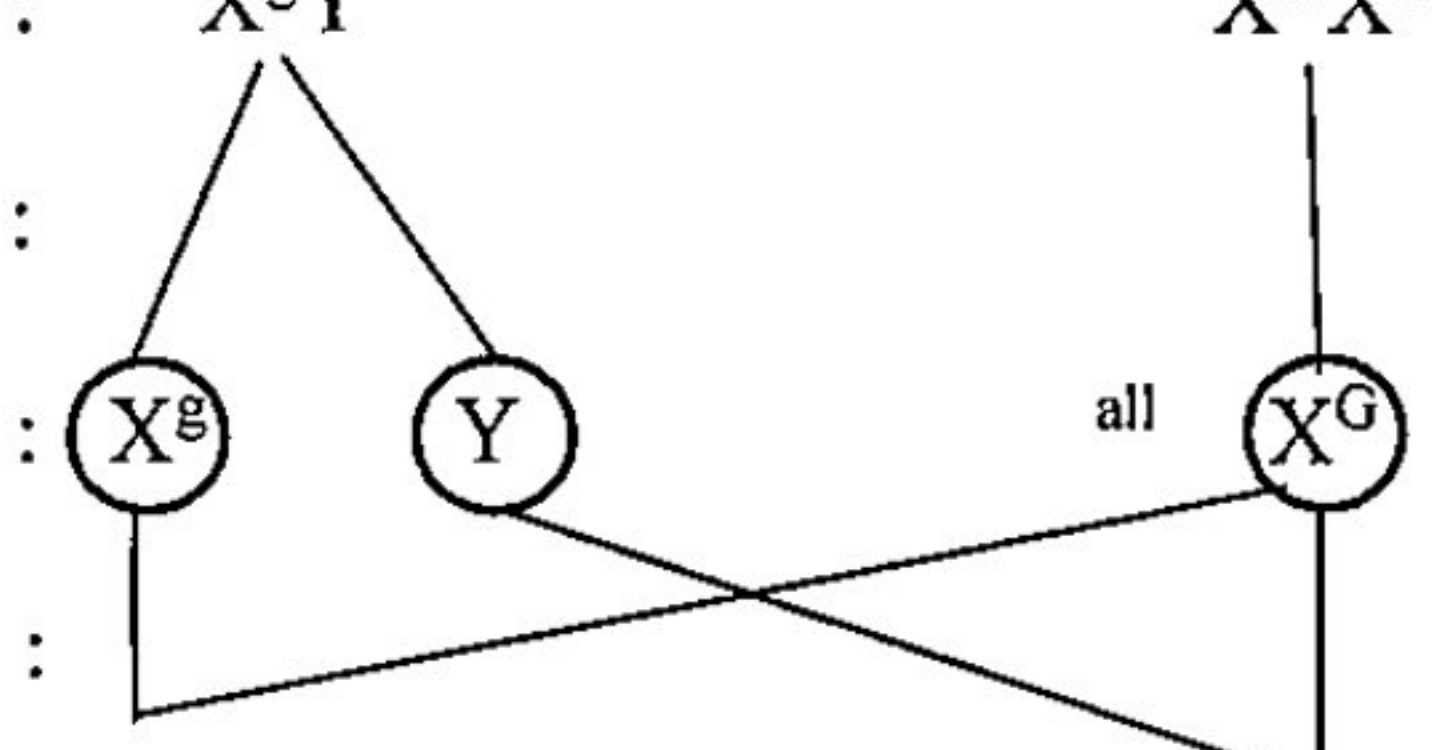
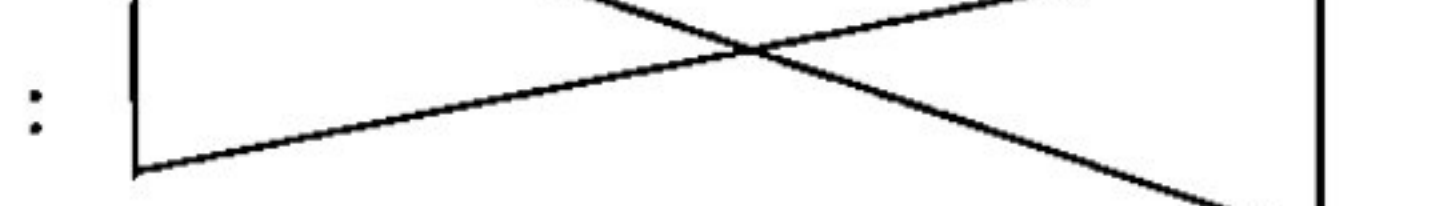
Vessel P	Vessel Q
Vena cava	Aorta
Thin wall	Thick wall
Less elastic/ muscular wall	More elastic/ muscular wall
Large lumen	Small lumen
Blood pressure is low	Blood pressure is high
Transport blood (from body cells) back to the heart	Transport blood out of the heart (to body cells)
Contains deoxygenated blood (except pulmonary vein)	Contains oxygenated blood (except pulmonary artery)

C3:

Wall R	Wall S
Right ventricle	Left ventricle
Thinner muscular wall	Thicker muscular wall
Lower pressure to pump blood to the lung	To generate greater/ higher pressure to pump blood out to the whole body

	(b)	• Machine used is electrocardiogram/ ECG • To record electrical activity (that triggers every heartbeat) • (Electrical activity) is detected by putting electrodes on the skin • Used to identify symptoms of heart disease / breathing • difficulty/ palpitations/ chest pain • Can detect heart problem/ arrhythmia/ coronary heart disease/ angina/ myocardial infarction/ atherosclerosis / heart attack
	(c)	• Involves inserting stent • Into the blocked artery • A small balloon placed at the end of stent • Balloon is inflated • To widen the lumen in blocked artery • Enable blood to flow normally// Reduce resistance to blood flow// Procedure to treat blocked blood vessel/ coronary artery
TOTAL: 20 marks		

QUESTION 10

NO.		SUGGESTED ANSWER
E10	(a)(i)	• G6PD is sex-linked inherited disease// Genes of G6PD are located at X chromosome • Y chromosome is shorter than X chromosome/ does not contain G6PD gene/ carry less genes • Men has one X chromosome/ XY chromosomes// Women has two X chromosomes/ XX chromosomes • Men need only one recessive allele to inherit the disease // Women need two recessive alleles on both X chromosomes to inherit the disease
	(a)(ii)	Father X Mother Parent genotype : X^gY X^GX^G Meiosis :  Gametes : X^g Y all X^G Fertilisation : 

	F1 genotype : $X^G X^g$ $X^G Y$ F1 phenotype : normal daughter (carrier) normal son The probability of having G6PD son is 0 or 0%														
(b)	Similarities: • Both are genetic diseases • Both involve chromosome defect • Both cause by mutation Differences: <table border="1"> <thead> <tr> <th>Disease R</th><th>Disease S</th></tr> </thead> <tbody> <tr> <td>Gene mutation</td><td>Chromosomal mutation</td></tr> <tr> <td>Number of chromosomes is 46/ $2n$ /normal / not change / $44 + XY$ / $44 + XX$</td><td>Number of chromosome is 47 / $2n + 1$ / extra chromosome X / $44 + XXY$</td></tr> <tr> <td>Cause by base substitution</td><td>Cause by nondisjunction in chromosomes</td></tr> <tr> <td>Changes in autosome</td><td>Change in number of sex chromosome</td></tr> <tr> <td>Involve/ gender of individual can be both male and female</td><td>Involve/ gender of individual is male only</td></tr> <tr> <td>(Mutation) during synthesis of amino acid</td><td>(Mutation) during gamete formation/ oogenesis / spermatogenesis</td></tr> </tbody> </table>	Disease R	Disease S	Gene mutation	Chromosomal mutation	Number of chromosomes is 46/ $2n$ /normal / not change / $44 + XY$ / $44 + XX$	Number of chromosome is 47 / $2n + 1$ / extra chromosome X / $44 + XXY$	Cause by base substitution	Cause by nondisjunction in chromosomes	Changes in autosome	Change in number of sex chromosome	Involve/ gender of individual can be both male and female	Involve/ gender of individual is male only	(Mutation) during synthesis of amino acid	(Mutation) during gamete formation/ oogenesis / spermatogenesis
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(c)	• Gene therapy • Prepare non-virulent virus • Normal CFTR gene is inserted into non-virulent virus • Normal CFTR gene is carried by non-virulent virus • (Non-virulent virus act) as a vector • Normal CFTR gene is inserted into patient cells • To replace the abnormal/ defect/ mutant CFTR gene • (in the patient cell) • Cell is able to produce CFTR protein														
(d)	• Continuous variation • Caused by environmental factors • Involved phenotypic differences • Same genetic makeup/ genetically identical at birth • Different type of diet/ food intake/ food proportion • Twin that has more fatty food/ carbohydrate will gain more weight// vice versa • Twin that is exposed to more light/ sun/ heat// undergo outdoor activities// different climates// vice versa • Will have darker skin color// vice versa														

	• More active/ sedentary • Small body size// vice versa
TOTAL: 20 marks	

SECTION C**QUESTION 11**

NO.	ANSWER SCHEME
E11	(a) • Availability of food// Sufficient supply of food • Access to food// Food can be obtained easily • Food utilisation// Get enough nutrients// Consuming food and drinking clean water// Good practices in food processing and preparation • Food stability// Has access to get enough nutritious food at all times
	(b) • Drought • Infertile/ Reduce nutrient in the soil • Plant wilt/ die • Quality/ crop yield/ food source decrease/ lack of nutrient received by human • Lack/ No clean water available// No source of water • Causing (aquatic) animal to die • Less supply of fish/ any animals • Hygiene and sanitation reduce// food/ drinking water contaminated • Outbreak of diseases to crops/ livestock • Food chain/ food web disrupted/ imbalance ecosystem / number of producer decrease so number of consumer decrease • Seed become dormant/ cannot germinate • Loss of habitat
	(c) • Provide healthy food program such as healthy breakfast program/ food with good quality • Provide a safety network program of food security such as Food Bank Program// Ensure food accommodate the needs of local society// Implementation of Menu Rahmah • Gives education to the households about choosing safer and healthier diets/ need to meet nutrients requirement • Good practices in halal food manufacturing// Follow the guideline of GMP and HAACP/

		monitor/ make sure safer techniques of producing/ processing/ storing / handling of food is implemented • (Gardening) Campaign// Policies implementation • Subsidy// agricultural/ horticultural/ livestock/ fishery subsidy/ incentive • Control the price of food products
	(d)	SDG: Clean water and sanitation • Affordable and safe source of drinking water • Provide access for sanitation and hygiene • Improve water quality/ sewage treatment/ safe water recycling • Increase efficiency of water usage// ensure sufficient source of raw water/ water supply • Create integrated management of water source • Protect and conserve water related ecosystem SDG: Affordable and clean energy • Use of renewable energy/ solar/ wind/ the resources can be replenished/ renewed for future generations • Efficient use of energy// Energy efficient building/ appliances • Use of (green environmental friendly) technology/ green transport system (electric train/ bus/ car) • subsidies on electrical vehicles • Universal access to modern energy • Promote access towards research, technology and investment on clean energy • (Expand) improve energy service for developed country
TOTAL: 20 marks		