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	

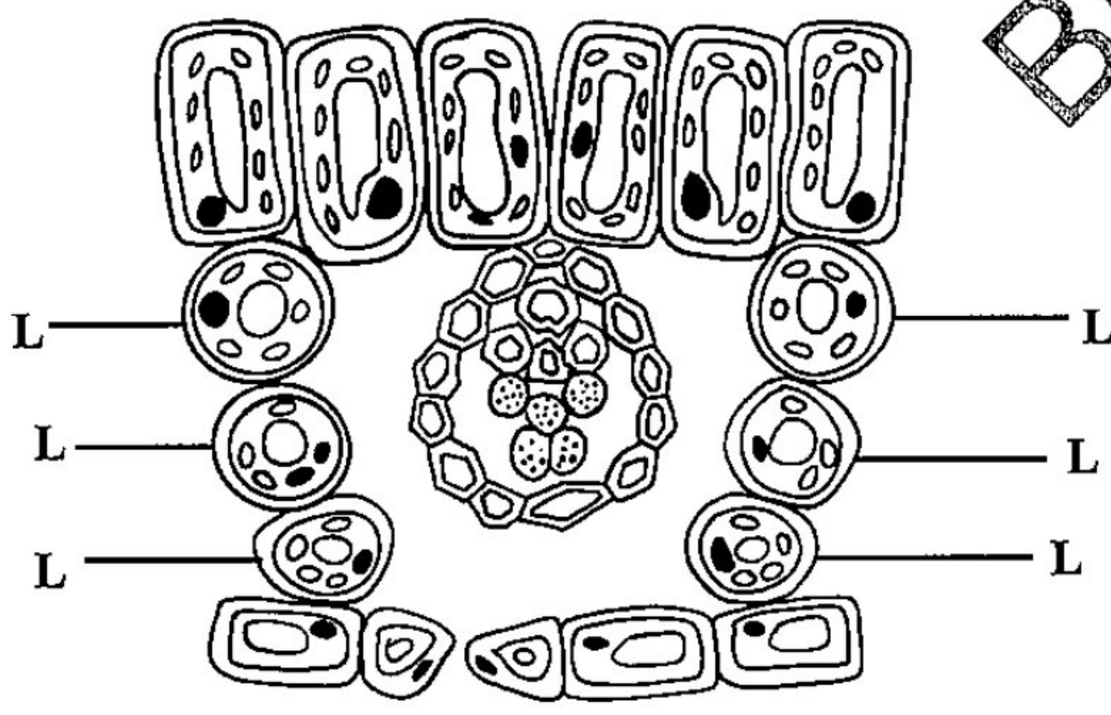
QUESTION 2

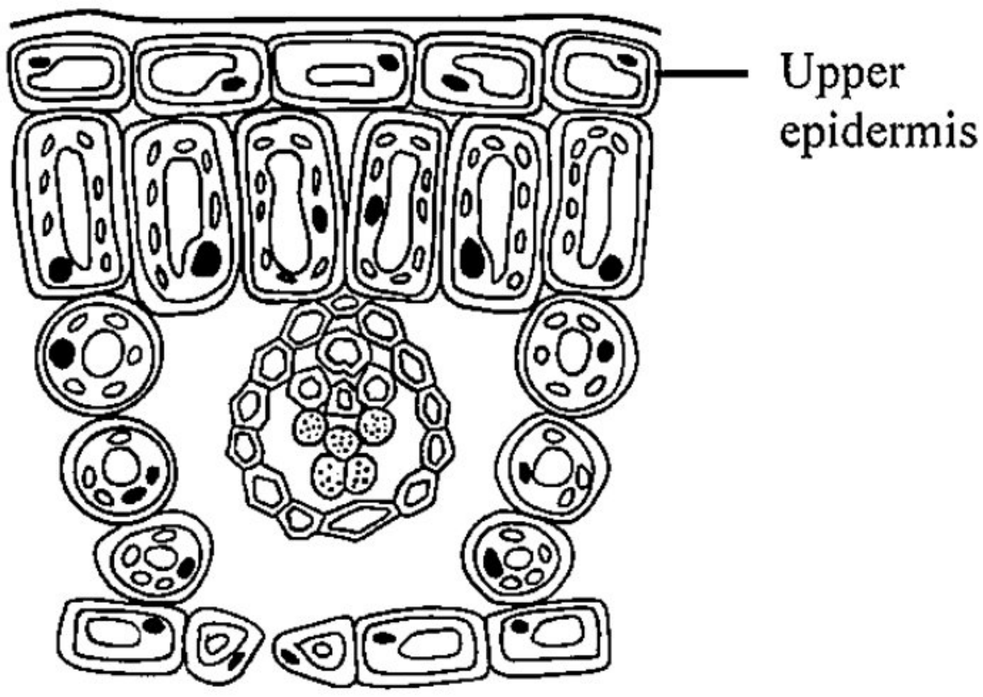
NO.	SUGGESTED ANSWER
(*a*)	Phosphate
(*b*)	Mitochondrion
(*c*)	• ATP molecules have weak (phosphate) links/ bonds • (Phosphate) links on ATP molecules are broken/ decomposed • Produce ADP and phosphate • Through glucose oxidation
(*d*)	• No increase in dough size// Bread dough does not rise • There is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

QUESTION 3

NO.	SUGGESTED ANSWER
3(*a*)(i)	P : Vascular cambium Q : Xylem *Reject : lateral cambium*
(*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 *Reject: food/ glucose/ nutrient/ starch*
(*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 continuosly 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 ***Reaction at* R**	**Aspek** ***Aspect***	**Tindak balas di stroma** ***Reaction at stroma***
Photolysis of water	Proses terlibat *Process involved*	Reduction of carbon dioxide
Water	Bahan tindak balas *Reaction substance*	Carbon dioxide
Oxygen (and water)	Hasil tindak balas *Reaction products*	glucose

TOTAL: 7 marks

QUESTION 5

<table>
<tr><th>NO.</th><th>SUGGESTED ANSWER</th></tr>
<tr><td>(a)(i)</td><td>Cervical vertebrae</td></tr>
<tr><td>(ii)</td><td>12</td></tr>
<tr><td>(iii)</td><td>
<table>
<tr><th>Vertebra U
Vertebra U</th><th>Vertebra V
Vertebra V</th></tr>
<tr><td>Cuaran spina yang panjang
Long spinous process</td><td>Cuaran spina yang pendek
Short spinous process</td></tr>
<tr><td>Tidak mempunyai foramen melintang
No transverse foramen</td><td>Tidak mempunyai foramen melintang
No transverse foramen</td></tr>
</table>
</td></tr>
<tr><td>(b)(i)</td><td>Ball and socket (joint)</td></tr>
<tr><td>(c)</td><td>• 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</td></tr>
<tr><td colspan="2">TOTAL: 8 marks</td></tr>
</table>

QUESTION 6

<table>
<tr><th>NO</th><th>SUGGESTED ANSWER</th></tr>
<tr><td>(a)</td><td>Polypeptide</td></tr>
<tr><td>(b)(i)</td><td>Small intestine/ ileum</td></tr>
<tr><td>(ii)</td><td>Lipase</td></tr>
<tr><td>(c)</td><td>
<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>
</td></tr>
</table>

	Amino acids can be converted into glucose (when glucose supply is insufficient)	Amino acids less/ cannot be converted into glucose (when glucose supply is insufficient)
(*d*)	• Population of (large intestine's probiotic) bacteria decreases • Balance between beneficial and less beneficial bacteria distrupted • (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)	

Aspek *Aspect*	Sel X *Cell* X	Sel Y *Cell* Y
Jenis pembahagian sel *Type of cell division*	Mitosis	Meiosis
Bilangan kromosom dalam sel anak *Chromosome number in daughter cell*	6	3

(*b*)

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)

(*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

<table>
<tr><th>NO</th><th>SUGGESTED ANSWER</th></tr>
<tr><td>(a)</td><td>• Soft/ muddy soil/ silted
• Strong wind blows
• Strong/ high light intensity
• Waves/ water tides
• Soil with high salt content/ high salinity/ low dissolved oxygen</td></tr>
<tr><td>(b)</td><td><table><tr><th></th><th>Zone X</th><th>Zone Y</th></tr><tr><td>P</td><td>Pneumatophor</td><td>Prop root</td></tr><tr><td>D1</td><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></td></tr>
<tr><td>(c)</td><td>• 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
• Rhizophora sp succeeds/ replaces the Avicennia sp/ Sonneratia sp.</td></tr>
<tr><td>(d)</td><td>• 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 / die
• Disrupt the food chain/ food web
• Reduce source of income for fisherman
• Reduce charchoal timber
• Ecotourism distrupted/ eyesore view</td></tr>
<tr><td colspan="2">TOTAL: 9 marks</td></tr>
</table>

SECTION B

QUESTION 9

<table>
<tr><th>NO.</th><th></th><th>SUGGESTED ANSWER</th></tr>
<tr><td rowspan="3">E9</td><td>(a)(i)</td><td>Valve M : Tricuspid valve
Valve N : Bicuspid valve</td></tr>
<tr><td>(a)(ii)</td><td>C1:
<table>
<tr><th>Valve M</th><th>Valve N</th></tr>
<tr><td>Consists of three leaflets</td><td>Consists of two leaflets</td></tr>
<tr><td>Valve is between right atrium and right ventricle</td><td>Valve is between left atrium and left ventricle</td></tr>
<tr><td>Allows the flow of deoxygenated blood</td><td>Allows the flow of oxygenated blood</td></tr>
<tr><td>Prevent backflow of blood from right ventricle to right atrium// To ensure one direction of blood flow from right atrium to right ventricle</td><td>Prevent backflow of blood from left ventricle to left atrium// To ensure one direction of blood flow from left atrium to left ventricle</td></tr>
</table>
C2:
<table>
<tr><th>Vessel P</th><th>Vessel Q</th></tr>
<tr><td>Vena cava</td><td>Aorta</td></tr>
<tr><td>Thin wall</td><td>Thick wall</td></tr>
<tr><td>Less elastic/ muscular wall</td><td>More elastic/ muscular wall</td></tr>
<tr><td>Large lumen</td><td>Small lumen</td></tr>
<tr><td>Blood pressure is low</td><td>Blood pressure is high</td></tr>
<tr><td>Transport blood (from body cells) back to the heart</td><td>Transport blood out of the heart (to body cells)</td></tr>
<tr><td>Contains deoxygenated blood (except pulmonary vein)</td><td>Contains oxygenated blood (except pulmonary artery)</td></tr>
</table>
C3:
<table>
<tr><th>Wall R</th><th>Wall S</th></tr>
<tr><td>Right ventricle</td><td>Left ventricle</td></tr>
<tr><td>Thinner muscular wall</td><td>Thicker muscular wall</td></tr>
<tr><td>Lower pressure to pump blood to the lung</td><td>To generate greater/ higher pressure to pump blood out to the whole body</td></tr>
</table></td></tr>
</table>

	(*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/ arrythmia/ 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^GX^g X^GY

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:

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

(*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		