

SECTION A

QUESTION 1

NO.	SUGGESTED ANSWER
S1	(a) K: Contractile vacuole L: Cilium/ Cilia
	(b) (Rhythmic cilia) for movement// helps transfer food particle into oral groove.
	(c) <ul style="list-style-type: none"> • <i>Paramecium</i> sp. will die/ burst// osmoregulation cannot occur • K cannot expand (to maximum size) • Structure K/ contractile vacuole will not contract • Structure K/ contractile vacuole cannot expel excess water
	(d) Sexual reproduction // Conjugation

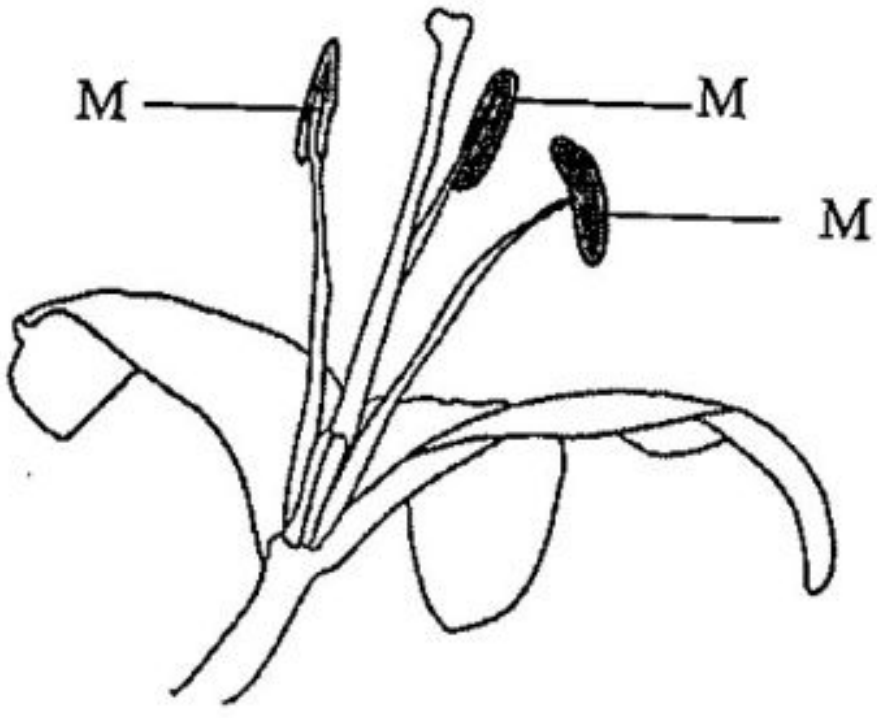
QUESTION 2

NO.	SUGGESTED ANSWER
S2	(a) Skin
	(b) <ul style="list-style-type: none"> • Thin To reduce the distance for gaseous exchange// rapid diffusion of gas// (highly) permeable to respiratory gases • Moist skin To allow respiratory gaseous to dissolve in the skin • (Beneath the skin) have network of blood capillaries For easy/ rapid transport of respiratory gases
	(c) <ul style="list-style-type: none"> • Structure X/ skin becomes dry// less moist • Gases less/ cannot dissolve • Gaseous exchange less/ cannot occurs • (More) gaseous exchange will occur in lungs

QUESTION 3

NO.	SUGGESTED ANSWER
S3	(a) P: Gg Q: gg
	(b) <ul style="list-style-type: none"> • A characteristics of an organism is controlled by a pair of alleles. • Only one of the allelic pair is inherited in a gamete.
	(c) <div> <div> Fenotip induk <i>Parental phenotype</i> </div> <div> Bulu pelepah putih <i>White feather</i> </div> <div>X</div> <div> Bulu pelepah hitam <i>Black feather</i> </div> </div> <div> <div> Genotip induk <i>Parental genotype</i> </div> <div> <div>$A^W A^W$</div> </div> <div>X</div> <div> <div>$A^B A^B$</div> </div> </div> <div> <div> Gamet Gamete </div> <div> <div>A^W</div> <div>A^B</div> </div> </div> <div> <div> Genotip F₁ <i>F₁ genotype</i> </div> <div> <div>$A^W A^B$</div> </div> </div>

QUESTION 4

NO.	SUGGESTED ANSWER	
S4	(a)(i)	
	(a)(ii)	Anther
	(a)(ii)	<ul style="list-style-type: none"> • Microspore mother cell undergo meiosis • To form four haploid microspores cells/ tetrad • Each cell in the tetrad/ microspore cells form/ develops into pollen grains • The nucleus in each pollen grain divides by mitosis to produce two nuclei/ generative nucleus and tube nucleus
	(b)	<ul style="list-style-type: none"> • No// seed cannot form • No pollination occur// pollen grain cannot be transfered to stigma • Pollen tube unable to form/ germinate • Generative nucleus unable to undergo mitosis/ divide • Male gametes cannot form • Male gamete cannot fertilise/ fuse with egg cell/ polar nuclei// double fertilisation cannot occur • Zygote/ embryo/ endosperm/ triploid nucleus cannot form// ovule cannot develop into seed

QUESTION 5

QUESTION 3

NO.		ANSWER SCHEME											
S5	(a)	Prop root											
	(b)	<ul style="list-style-type: none">Leaves have thick cuticle// Leaves have sunken stomataReduce/ prevent excessive loss of water// reduce rate of transpirationHave succulent leavesTo store more water											
	(c)(i)	<table><tr><th>Aspect</th><th>Zone Y</th><th>Zone Z</th></tr><tr><td>Name of zone</td><td>Middle zone</td><td>Inland zone</td></tr><tr><td>Dominant species</td><td><i>Rhizophora</i> sp./ Pokok Bakau Minyak</td><td><i>Bruguiera</i> sp./ Pokok Tumu Merah</td></tr></table>			Aspect	Zone Y	Zone Z	Name of zone	Middle zone	Inland zone	Dominant species	<i>Rhizophora</i> sp./ Pokok Bakau Minyak	<i>Bruguiera</i> sp./ Pokok Tumu Merah
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(c)(ii)	<ul style="list-style-type: none">Rate of respiration decreaseLess/ inhibit gaseous exchange (at lenticels)Oil will cover the pneumatophores/ breathing rootCover/ block lenticels												

QUESTION 6

NO.		ANSWER SCHEME
S6	(a)	Liver
	(a)(ii)	<ul style="list-style-type: none"> Bile cannot be stored Bile cannot be flow/ secreted into duodenum Less/ no lipid is emulsified into oil/ small droplets Slow down/ less lipid digestion
	(b)	<ul style="list-style-type: none"> Brown rice has lower glycaemic index/ GI than white rice Brown rice has more fiber than white rice Carbohydrate/ starch hydrolyzed slowly Less glucose is produce Blood sugar level can be controlled// avoid blood sugar level increases drastically/ quickly// glucose level increase gradually
	(c)	<ul style="list-style-type: none"> Dates contain glucose/ reducing sugar while sugarcane contain sucrose/ non-reducing sugar Dates reduce copper (II) sulphate (blue colour of Benedict's solution) into copper (I) oxide (brick-red precipitate) Sugarcane does not reduce copper (II) sulphate (blue colour of Benedict's solution) into copper (I) oxide (brick-red precipitate)

QUESTION 7

NO.	ANSWER SCHEME									
S7	(a)(i)	Bowman's capsule								
	(a)(ii)	Ultrafiltration								
	(b)	<table><tr><th>Kandungan dalam P <i>Content in P</i></th><th>Kandungan dalam glomerulus <i>Content in glomerulus</i></th></tr><tr><td>No/ Does not contain red blood cells</td><td>Contain/ Have red blood cells</td></tr><tr><td>No/ Does not contain platelets</td><td>Contain/ Have platelets</td></tr><tr><td>No/ Does not contain plasma proteins</td><td>Contain/ Have plasma proteins</td></tr></table>	Kandungan dalam P <i>Content in P</i>	Kandungan dalam glomerulus <i>Content in glomerulus</i>	No/ Does not contain red blood cells	Contain/ Have red blood cells	No/ Does not contain platelets	Contain/ Have platelets	No/ Does not contain plasma proteins	Contain/ Have plasma proteins
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(c)	<ul style="list-style-type: none">• Kidney/ glomerulus infection// kidney stone// kidney injury// cancer// glomerulus damage• Red blood cell will be filtered out into Bowman's capsule• Glomerular filtrate contains blood									
(d)	<ul style="list-style-type: none">• Jacket P• Thick clothes// hoodie (warmer)// fur• A thick layer of air is trapped in the clothes• Air acts as a heat insulator• More heat will be trapped/ less heat loss// jacket prevents loss of heat from skin (to the environment)• Body temperature maintain normal									

QUESTION 8

NO.	ANSWER SCHEME
S8	(a)(i) Myotome (muscle)
	(a)(ii) <ul style="list-style-type: none"> • Tail cannot whip (to the right)// Whipping of tail is weaker (than before injury) • Myotome muscle less/ cannot contract (and relax)// Antagonistic muscle action cannot/ less happen • Less/ weak (forward) thrust • Fish difficult/ less/ cannot able to swim/ move forward
	(b)(i) Tendon
	(b)(ii) <ul style="list-style-type: none"> • Blood carries more amino acids/ minerals/ vitamins/ • Electrolytes/ glucose to muscle K • Blood carries more oxygen • Increase oxidation/ cellular respiration • Produce more energy • Produce more muscle tissue/ cell • By mitosis
	(c) <ul style="list-style-type: none"> • Increase/ more/ half plate intake of carbohydrate • To provide more/ a lot of energy • Increase/ more/ half intake plate of protein • To repair damaged cells/ tissues/ develop new muscles/ tissues • Decrease/ less/ quarter plate of vegetable • To provide vitamins/ minerals to help in blood clotting during training • To strengthen the muscles/ bones • To provide vitamins/ minerals to help in muscle contraction • To provide vitamins/ minerals to maintain good health throughout training

SECTION B

QUESTION 9

NO.	SUGGESTED ANSWER
E9	(a) <ul style="list-style-type: none"> • (Development and application of products) Production/ Introduction/ Using of electric vehicle • Which release less greenhouse gases/ carbon dioxide • Increase the air quality in towns// reduce air pollution// less pollutants/ accept any example of pollutant substances from motor vehicle
	(b)(i) <ul style="list-style-type: none"> • Put 300 g orange zest, 100 g brown sugar, 2 g yeast and 1 L warm water into a 2 L plastic bottle • Brown sugar provides glucose (for fermentation) • Yeast produces ethanol/ CO₂/ energy • Close the cap of the bottle tightly • Shake the bottle vigorously (for a few minutes till the brown sugar is dissolved) • Open the bottle cap to release the pressure (from inside of the bottle) • (For two weeks), let out the gas produced (at least three times a day) • Put the bottle in a place where the temperature is about 35°C (such as on a refrigerator) • (After two weeks), filter the solution (to remove the orange zests). • Keep the filtered solutions in an airtight container • The enzyme solution can be used to clean the floor
	(b)(ii) <ul style="list-style-type: none"> • Reduce kitchen food waste// contributes and encourages recycling of food waste into a multipurpose cleaner • Reduce the use of synthetic chemicals • Prevent causes of side effects of chemical substances to health// wasting money to buy chemical products/ save money/ cheaper • Promote a sustainable lifestyle// utilise waste into valuable products// create environmental awareness • Reduce landfills/ waste dumping site • It can be decomposed by microorganism in sewage// Biodegradable • Reduce water pollution
	(c)(i) <p><u>Diagram 9.3(a)</u></p> <ul style="list-style-type: none"> • Deforestation • Life loses their natural habitats. • Flora and fauna extinction// disrupt food chain/ food web • Loss of rainwater catchment areas • Soil erosion happens which brings landslides and flash floods • Reduce the amount of trees. • Trap more heat • Cause global warming// temperature of earth surface increase <p><u>Diagram 9.3(b)</u></p> <ul style="list-style-type: none"> • Greenhouse effects • Excessive heat trapped on Earth

	<ul style="list-style-type: none">• Causes global warming/ earth temperature increase• Changes in rainfall distribution and snow/ causes climate change• Increase in sea levels due to sea warming and ice melting at the poles• Drought and heat wave happen more frequent• Prevent infra-red rays to be reflected back to atmosphere																								
(c)(ii)	<table><tr><th>DIAGRAM 9(a)</th><th>DIAGRAM 9.4(b)</th></tr><tr><td>Eutrophication occurs</td><td>Eutrophication does not occur</td></tr><tr><td>High content of nitrate and phosphate</td><td>Low content of nitrate and phosphate</td></tr><tr><td>Algal bloom occur</td><td>Algal bloom does not occur</td></tr><tr><td>Prevents penetration of light</td><td>Allows penetration of light</td></tr><tr><td>Decreases rate of photosynthesis</td><td>Increases rate of photosynthesis</td></tr><tr><td>Decreases level of dissolved oxygen</td><td>Increases level of dissolved oxygen</td></tr><tr><td>Increases the BOD level</td><td>Decreases the BOD level</td></tr><tr><td>More decomposers/ decomposition</td><td>Less decomposers/ decomposition</td></tr><tr><td>Water is polluted</td><td>Water is not polluted</td></tr><tr><td>Destroys habitat of aquatic organisms</td><td>Maintains habitat of aquatic organisms</td></tr><tr><td>Destroys food chain/ web/ more fish die</td><td>Maintains food chain/ web/ no fish die</td></tr></table>	DIAGRAM 9(a)	DIAGRAM 9.4(b)	Eutrophication occurs	Eutrophication does not occur	High content of nitrate and phosphate	Low content of nitrate and phosphate	Algal bloom occur	Algal bloom does not occur	Prevents penetration of light	Allows penetration of light	Decreases rate of photosynthesis	Increases rate of photosynthesis	Decreases level of dissolved oxygen	Increases level of dissolved oxygen	Increases the BOD level	Decreases the BOD level	More decomposers/ decomposition	Less decomposers/ decomposition	Water is polluted	Water is not polluted	Destroys habitat of aquatic organisms	Maintains habitat of aquatic organisms	Destroys food chain/ web/ more fish die	Maintains food chain/ web/ no fish die
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QUESTION 10

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E10	(a)	<ul style="list-style-type: none"> • Lignified wall// lignin thickening • Give (mechanical) strength • To prevent from collapsing • Have pits • Allow water movement to adjacent cells • Hollow tube • Allow water flow continuously
	(b)(i)	<ul style="list-style-type: none"> • Plants produce radioactive glucose in the leaves through the process of photosynthesis • (Radioactive) glucose monomers condensate to form starch molecule stored in the leaves/ chloroplast • (Radioactive) sucrose is <u>actively</u> transported into the sieve tube • Through the companion cell from the leaf cell • Reduce the water potential in the sieve tube • Causes water to diffuse from the xylem into the sieve tube via osmosis • Increase the hydrostatic pressure in the sieve tube • (Increase in the hydrostatic pressure) cause the phloem sap/ (radioactive) sucrose to be pushed along the sieve tube to the other organs of the plant • Phloem sap/ (radioactive) sucrose is transported from the sieve tube to the fruit/ chilli K
	(b)(ii)	<ul style="list-style-type: none"> • Phloem is removed • (Radioactive sucrose) accumulate at the upper part of the ring • (Radioactive sucrose) cannot be transported to the lower part of the ring/ chilli L. • The upper part of bark ring swollen

	<p><u>X</u></p> <ul style="list-style-type: none">• Root pressure happen in X• Water potential in the root hair cells is lower compared to in the cell• Mineral ions are actively pump by the root hair cells into the vocuole• Causing the cell sap of the root hair to have low water potential compared to the soil• Water from the soil diffuses into the root hair cells/ epidermal cells via osmosis• Become high water potential in the root hair cells• Causes the water to diffuse from the root hair cells into the cortex via osmosis• Osmosis continuously occur into the cortex/ endodermis/ pericycle layers• Root pressure push water from xylem vessels of the root into the xylem vessels of the stem <p>(c)(i)</p> <p><u>Y</u></p> <ul style="list-style-type: none">• Capillary action happens in Y• Adhesion/ adhesive force// force between water molecule and xylem wall• Cohesion/ cohesive force// force between water molecules• Water molecule move water upwards/ against gravity <p><u>Z</u></p> <ul style="list-style-type: none">• Water diffuse out as water vapour through opened stoma• Spongy mesophyll cells loose water• Low water potential towards adjacent cells• Water molecule diffuse from neighbouring cells• Via spongy mesophyll cells by osmosis• Produce a force called transpirational pull• Pulls water molecules in the xylem vessel to the outside of the leaf																
	<table><tr><th colspan="2">DIFFERENCES</th></tr><tr><th>DIAGRAM 10.4/ GUTTATION</th><th>TRANSPIRATION</th></tr><tr><td>Happens at night/ early morning</td><td>Happens on hot/ windy days</td></tr><tr><td>Only happens in herbaceous plants</td><td>Happens in all plant</td></tr><tr><td>Water is releases in the form of water droplets</td><td>Water is released as water vapour</td></tr><tr><td>Water is released through a special structure at the end of the leaf veins</td><td>Water is released through stomata</td></tr><tr><td>Happens when root pressure is high</td><td>Controlled by the stomata opening and closing</td></tr><tr><td>Releases water that is rich in minerals</td><td>Releases pure water</td></tr></table> <p>(c)(ii)</p>	DIFFERENCES		DIAGRAM 10.4/ GUTTATION	TRANSPIRATION	Happens at night/ early morning	Happens on hot/ windy days	Only happens in herbaceous plants	Happens in all plant	Water is releases in the form of water droplets	Water is released as water vapour	Water is released through a special structure at the end of the leaf veins	Water is released through stomata	Happens when root pressure is high	Controlled by the stomata opening and closing	Releases water that is rich in minerals	Releases pure water
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SECTION C

QUESTION 11

NO.	SUGGESTED ANSWER															
E11	<p>(a)</p> <ul style="list-style-type: none"> • Temperature is an environmental factor (that cause variation)// environmental variation • Siamese cat X inherited the gene produces dark pigment enzyme for fur colour • Enzyme only functions at temperature less than the body temperature • Parts with darker in colour is ears/ face/ tail/ paws// certain parts dark in colour 															
	<p>(b)</p> <ul style="list-style-type: none"> • The patient suffered from sickle cell anaemia • The red blood cells are sickle-shaped// shape of a crescent • Due to gene mutation// base substitution • Causing different amino acids are synthesized to produce haemoglobin • Less haemoglobin can be transported in the red blood cell • Less oxygen can be transport to all part of body/ vital organs • Less energy is produced in the body cells/ less cellular respiration • Patient easily tired/ easily exhausted/ fatigue/ unable to carry out vigorous activity 															
	<p>(c)</p> <table border="1"> <thead> <tr> <th data-bbox="562 1255 1213 1320">DIAGRAM 11.3(a)</th><th data-bbox="1213 1255 1791 1320">DIAGRAM 11.3(b)</th></tr> </thead> <tbody> <tr> <td data-bbox="562 1320 1213 1427">Type of variation is continuous variation</td><td data-bbox="1213 1320 1791 1427">Type of variation is discontinuous variation</td></tr> <tr> <td data-bbox="562 1427 1213 1486">Presence of intermediate characteristics</td><td data-bbox="1213 1427 1791 1486">No intermediate characteristics</td></tr> <tr> <td data-bbox="562 1486 1213 1576">No obvious differences in characteristics</td><td data-bbox="1213 1486 1791 1576">Obvious and distinct differences in characteristics</td></tr> <tr> <td data-bbox="562 1576 1213 1635">Graph with normal distribution</td><td data-bbox="1213 1576 1791 1635">Graph with discrete bars</td></tr> <tr> <td data-bbox="562 1635 1213 1745">Characteristic is controlled by many genes</td><td data-bbox="1213 1635 1791 1745">Characteristic is controlled by one single gene</td></tr> <tr> <td data-bbox="562 1745 1213 1855">Influenced by environmental factors.</td><td data-bbox="1213 1745 1791 1855">Not influenced by environmental factors</td></tr> <tr> <td data-bbox="562 1855 1213 1952">The difference in characteristics can be measured (quantitative)</td><td data-bbox="1213 1855 1791 1952">The difference in characteristics cannot be measured (qualitative)</td></tr> </tbody> </table>	DIAGRAM 11.3(a)	DIAGRAM 11.3(b)	Type of variation is continuous variation	Type of variation is discontinuous variation	Presence of intermediate characteristics	No intermediate characteristics	No obvious differences in characteristics	Obvious and distinct differences in characteristics	Graph with normal distribution	Graph with discrete bars	Characteristic is controlled by many genes	Characteristic is controlled by one single gene	Influenced by environmental factors.	Not influenced by environmental factors	The difference in characteristics can be measured (quantitative)
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	<p>(d) <u>Advantages of GMF</u></p> <ul style="list-style-type: none"> • To overcome food/ tomato supply problems// Has adequate food/ tomato supply • The cost of food/ tomato production becomes lower • Increases the nutrient content in (food/ tomato) • Reducing the problem of pests in plant cultivation (farmers)// Reduce the use of pesticides/ insecticides • Increase in quality/ size/ sweetness • Increase in quantity of food/ tomato • Reduce the price of food/ tomato • Enhancing the development of the biotechnology industry// Reducing poverty/ Improving the economy <p><u>Disadvantages of GMF</u></p> <ul style="list-style-type: none"> • Natural species will be threatened • Possibility of GMF gene transfer to humans// Human genetic content may be affected • Human health may be affected// There are side effects to humans// Triggers an allergic reaction • Causes human resistance to antibiotics • GMF Ethical issues in producing GMF plants
	<p>(e)</p> <ul style="list-style-type: none"> • Using DNA recombinant technology • Involve the transfer of DNA segment from human (one organism) to a cow (to another organism)// human gene is inserted into the cows' genetic information/ DNA • To form recombinant DNA • Production of new gene combination • Cow produces milk which does not contain β-lactoglobulin • (β-lactoglobulin) a type of protein that causes allergy to infant/ children • The cow is known as a transgenic organism