

a)Objective

1.	Α	2.	Α	3.	Α	4.	D	5.	Α
6.	В	7.	Α	8.	В	9.	В	10.	В
11.	В	12.	В	13.	D	14.	D	15.	В
16.	D	17.	С	18.	D	19.	D	20.	D
21.	С	22.	В	23.	D	24.	В	25.	С
26.	С								

1	P : Rough endoplasr	nic reticulum	1	2
a)(i)	Q: Golgi apparatus		1	
(ii)	P1: ribosome at P sy	nthesis protein	1	3
	P2: protein then bei	ng transported by P	1	
	to the Q			
	P3: modified protein	n into enzyme // Q	1	
	packaged the enzyn	ne/modified protein		
b)(i)				
	Nuklaus	1	2	
	Membran plasma	1		
(11)				
(ii)	Cheek cell	Epidermis cell		
	Do not have cell	Have cell wall		
	wall		1	1
	Do not have	Have vacuole	1	
	vacuole		_	
c)	P1: cell cannot divid		1	2
	/mitosis/differentia			
	P2: do not have gen		1	
d)	control mitosis/diffe			
u)		1	2	
	P2: generate energy respiration)	1		
	P3: (Meristematic)	1		
	energy	-		
	P4: for mitosis / cell	ular division	1	
	1	didi division	<u> </u>	

R: Jasad Golgi	1	1
Q: tapak respirasi sel / tapak	1	2
penjanaan tenaga		
S: mengangkut protein yang	1	
disintesis oleh ribosom ke jasal		
Golgi / R (oleh vesikel rembesan)		
Tisu meristem (pada hujung pucuk	1	1
dan hujung akar)/ tunas		
P1: berlaku proses respirasi sel	1	3
P2: menghasilkan tenaga/ATP	1	
P3: Untuk pembahagian sel /	1	
mitosis		
Aras 2: Tisu	1	2
Aras 3: Organ	1	
Proses pembezaan/proses	1	1
pengkhususan		
	Q: tapak respirasi sel / tapak penjanaan tenaga S: mengangkut protein yang disintesis oleh ribosom ke jasal Golgi / R (oleh vesikel rembesan) Tisu meristem (pada hujung pucuk dan hujung akar)/ tunas P1: berlaku proses respirasi sel P2: menghasilkan tenaga/ATP P3: Untuk pembahagian sel / mitosis Aras 2: Tisu Aras 3: Organ Proses pembezaan/proses	Q: tapak respirasi sel / tapak penjanaan tenaga S: mengangkut protein yang disintesis oleh ribosom ke jasal Golgi / R (oleh vesikel rembesan) Tisu meristem (pada hujung pucuk dan hujung akar)/ tunas P1: berlaku proses respirasi sel P2: menghasilkan tenaga/ATP P3: Untuk pembahagian sel / mitosis Aras 2: Tisu Aras 3: Organ Proses pembezaan/proses 1

(iii)	P1: Tisu floem	1	2
	P2: Mengangkut hasil	1	
	fotosintesis/sukrosa		
	P3: melalui proses translokasi		

3(a)	Cell P – Epithelial cell	1	2
	Tissue Q – Smooth muscle tissue	1	
(ii)	Tissue P	1	2
	P1- acts as a gastric glands		
	P2-to produce gastric juices which	1	
	contain pepsin and rennin		
	Tissue Q- (Contract and relax) to	1	
	allow peristaltic movement along		
	the digestive tract		
(c)	P1- made up (many) tissue P	1	2
	/epithelial tissues and tissue Q /		
	smooth muscle tissues		
	P2-perform / carry out (specific	1	
	function) digestion of food / protein		
(d)(i)	Digestive system	1	1
(ii)	Digest / breakdown complex food		1
	substances into simpler molecules		
(iii)	Mouth/small	2	2
	intestine/liver/pancreas		
(e)	P1-provide acidic medium	1	2
	P2-for the (optimal) reaction of	1	
	enzyme pepsin		
	P3-to stop the action of salivary	1	
	amylase enzyme		
	arriylase crizyrric		

IV. Daniela and and another settentions	4	2
k: Rough endoplasmic reticulum	1	2
L :Golgi apparatus	1	
	1	2
Phosphate group Phosphate group	1	
Pentose Nitrogenous group		
group		
P1 - Drawing		
P2 - Labelling		
Chromosome	1	1
P1: transport protein (synthesised by	1	3
the ribosome) to Q		
•	1	
	1	
	_	
	1	4
	_	"
, , ,		
	1	
P3-no/less trypsin produced		
P4-rate of digestion of polypeptide	1	
decreases // no/less polypeptide		
digested into peptide	1	
	Phosphate group Pl - Drawing P2 - Labelling Chromosome P1: transport protein (synthesised by the ribosome) to Q P2: Q modified by the protein P3: into lipase / pancreatic amylase /trypsin P1-alters the nucleotide sequence P2-no specific protein synthesized for modification of trypsin P3-no/less trypsin produced P4-rate of digestion of polypeptide decreases // no/less polypeptide	L:Golgi apparatus 1 Phosphate group Phosphate group Pl - Drawing P2 - Labelling Chromosome P1: transport protein (synthesised by the ribosome) to Q P2: Q modified by the protein P3: into lipase / pancreatic amylase /trypsin P1-alters the nucleotide sequence P2-no specific protein synthesized for modification of trypsin P3-no/less trypsin produced P4-rate of digestion of polypeptide decreases // no/less polypeptide

1(a)	P1-the process is binary fission	1	4
	P2-when Amoeba sp. has grown to	1	
	certain size		
	P3-the nucleus divide by mitosis	1	
	P4-then the cytoplasm divides//	1	
	cytokinesis occurs		
	P5- form 2 genetically Identical	1	
	amoeba sp.		
(b)	P1-the living process is	1	6
	osmoregulation		
	P2-osmoregulation in Amoeba sp.	1	
	involved contractile vacuole		
	P3-fresh water is hypotonic to	1	
	Amoeba sp.		
	P4: water diffuses into Amoeba sp.	1	
	by osmosis		
	P5-water fills the contractile	1	
	vacuole to its maximum size		
	P6-contractile vacuole contract	1	
	P7-expel the water out of amoeba	1	
	sp.		
	P8-thus amoeba sp. does not burst	1	
c)	P1-the organ is skin	1	10
	P2-skin consists of epithelial	1	
	tissues, nerve tissues, muscle		
	tissues and connective tissues (at		
	least two types of tissues)	1	
	P3-epithelial tissues specialised to	1	
	form sweat gland	1	
	P4-sweat gland secrete sweat during hot day	1	
	P5-epithelial tissues specialised to		
	form hair follicle/produce hair	1	
	P6-muscle tissues found in skin is	1	
	erector muscle	1	
	P7-during hot day erector muscle	1	
	relax, hair lies flat		
	P8-muscle tissues found at wall of	1	
	arteriole is smooth muscle		
	P9-smooth muscle relax during hot	1	
	day		
	P10-connective tissues found in	1	
	the skin is blood tissues		
	P11-when smooth muscle of	1	
	arteriole relax, more blood flow to		
	the skin		
	P12-more heat is lost	1	
	P13-nerve tissues is the receptor	1	
	P14-receptor detect the increase	1	
	of the temperature		
	P15-the function of the skin is to	1	
	lower the body temperature to		
	normal		

2(a)(i)	P1-mekanisma pembetulan untuk	1	3
	mengembalikan keadaasn		
	persekitaran dalam menjadi normal		
	P2-apabila aras glukosa dalam		

	darah meningkat, mekanisma	1	
	pembetulan akan menurunkan		
	semula aras glukosa kepada normal		
	P3-apabila aras glukosa dalam		
	darah menurun, mekanisme	1	
	pembetulan akan meningkatkan		
	semula aras glukosa kepada normal		
(ii)	P1-hormon X ialah insulin	1	5
	P2-hormon Y ialah glucagon	1	
	P3-apabila aras glukosa dalam		
	darah meningkat daripada aras	1	
	normal, (sel beta pada kelompok sel		
	Langerhans) di pancreas		
	merembeskan hormon X ke dalam		
	darah		
	P4-di hati , Hormon X menukarkan	1	
	glukosa berlebihan dalam sel darah		
	kepada glikogen untuk disimpan di		
	sel-sel hati dan sel-sel otot		
	P5-aras glukosa dalam darah	1	
	menurun daripada aras normal, (sel		
	alfa pada kelompok sel Langerhans		
	di) pancreas merembeskan		
	hormone Y ke dalam darah		
	P6-di hati hormone Y menukarkan	1	
	glikogen kepada glukosa		
	P7-aras glukosa dalam darah		
	meningkat semula dan kembali ke	1	
	aras normal		
		L	

CHAPTER 3

a)Objective

1.	D	2.	Α	3.	D	4.	С	5.	D
6.	D	7.	D	8.	В	9.	С	10.	Α
11.	Α	12.	Α	13.	С	14.	Α	15.	Α
16.	С	17.	D	18.	С				

1(a)	Label Function/Fungsi		
	A allow the movement of large molecules		
	B help cells recognize each other		
	C ensure stability, flexibility and rigidity		
(b)(i)	Hydrphilic (head) which attract water	1	1
(ii)	Easier for water molecule movement	1	1
	/osmosis		
c)(i)	F- mineral ions / ions Ca ^{2+,} ion K+/any	1	2
	examples		
	E-ion Ca ²⁺ in formation of bones// ion		
	K ⁺ in muscle contractions / impulse	1	
	transmission //any correct functions of		
	minerals in F		
(ii)	F1-mineral ions/any examples is	1	2
	transported via carrier protein		
	E1-by facilitated diffusion	1	
d)	P1-poison retard the respiration	1	2

	process		
	P2-this is due to no formation of	1	
	energy		
	P3-active transport does not occur	1	
e)	P1-protein molecules embedded /	1	2
	floating randomly in phospholipid		
	bilayer		
	P2-protein molecules always moving /	1	
	dynamic and fluid structure		

2 a(i)		} T	1	1
(ii)	F:T is phospholipid b	oilayer	1	3
	P1: allow the molec	ules that can	1	
	dissolve in lipid (lipid	d soluble		
	molecules) / non po	lar/uncharged		
	molecules/very sma	ll molecules		
	P2:such as fatty acid		1	
	oxygen and carbon (dioxide / water		
	molecules			
	P3:to cross the plass	ma membrane	1	
	freely			
	P4: by osmosis (wat	er)/ simple	1	
	diffusion			
(b)	F: sodium ion//any s		1	3
	P1: movement (of so	· ·	1	
	against the concent P2: it needs energy,			
	P3: ATP molecules b		1	
	carrier protein	illu to one site of	1	
	P4: at another site of	arrier protein hind	1	
	with sodium ions//a		1	
	example	, оштажно		
	· ·	hanges its shape (to	1	
	carry the sodium ior	_		
	P6: through active to		1	
(c)	Similarity:			3
	1.both of Q and R ar	e passive transport	1	
	2.energy is not requ	ired // No	1	
	ATP/energy used			
	3. down the concent	tration gradient	1	
	4.occurs until reach	dynamic		
	equilibrium state		1	
		Any 1		
	Differences:			
	Any 2			
	Q	R Cinnels differsion	1	
	Facilitated	Simple diffusion	1	
	diffusion	D		
	Need the help of	Do not need any	1	
	pore/carrier	protein	1	
	protein	Allow the		
	Allow the	Allow the	1	
<u> </u>	movement of	movement of		Ш

	molecules which	molecules which		
	are not soluble	are soluble in		
	in lipid (but	lipid		
	soluble in water)			
	Example	Example		
	molecules that	molecules that	1	
	transported	transported		
	such as	such as small		
	ions/nucleic	uncharged polar		
	acid/amino	molecules / such		
	acid/glucose	as oxygen/		
	, ,	carbon dioxide/		
		water		
		molecules//		
		lipid-soluble		
		molecules/ such		
		as fatty acid /		
		glycerol/ vitamin ADEK		
(d)	F1: plant wilt/die	ADLK	1	3
(u)		allula varanivatian in	1 -	3
	P1:cyanide inhibit co	ellular respiration in	1	
	(the root hair)cell			
	P2:no energy /ATP v	vill be generated /	1	
	produced		1	
	P3: active transport cannot occur to			
	transport mineral sa	ılt		
	P4:the root cell become	ome hypotonic than	1	
	the soil water			
	P5: no diffusion of w	vater molecules into	1	
	the root cell by osm	osis		
	P6:plasmolysis occu	rs// plant cell	1	
	flaccid	•		
		Any 3		
		, -	1	

_			
3(a)(i)	Osmosis	1	1
(ii)	P1-sucrose solution is hypertonic	1	2
	P2-water diffuse from distilled	1	
	water into the sucrose solution		
	P3-the level of sucrose solution in	1	
	the capillary tube stop rising at the		
	equilibrium stage/ the amount of		
	water diffuse into and out from the		
	visking tube is the same		
(b)	F- Sucrose molecule are too large	1	2
	E-the visking tubing is semi		
	permeable membrane/ which only		
	allows certain substances to pass	1	
	through		
(c)(i)	Y: crenation		2
	Z: haemolysis		
(ii)	P1- solution Z is hypotonic compare		3
	to red blood cell		
	P2-osmosis occur		
	P3-water leaves / diffuses into the		
	cell		
	P4-red blood cell expand/burst		
(iii)	F-no	1	2
	P1-Plant cell consist of cell wall		
	P2-cell wall is made up of cellulose /	1	
	able to withstand pressure	1	

4(a)(i)	Hypertonic solut	1	1	
(ii)	P1: 30% sucrose	solution	1	2
	/solution in beak			
	hypertonic comp			
	sap	1		
	P2:water molecu			
	from the vacuole		1	
	P3:by osmosis			
	P4: both vacuole		1	
	shrink // the plas		Any	
	pulls away from the cells becore	-	2	
	plasmolysis occu	•		
(iii)	P1: distilled water		1	Any
(,		tonic compare to	_	3
	the cell sap	, , , , , , , , , , , , , , , , , , ,		
	P2: water molecu	ules diffuse into	1	
	the vacuole/cell	sap by osmosis		
	P4:vacuole expar	nd and swell up		
	//plasma membr	ane pushes	1	
	against the rigid			
	P5: flaccid cell be	ecomes fully	1	
	turgid again			
	P6:the cells is sai		1	
/l=\	undergone depla	ismoiysis		2
(b)	Red Blood	Pod Plood		3
	Cell X	Red Blood Cell Y		
	Crenation	Haemolysis	1	
	The solution	The solution		
	is hypertonic	is hypotonic	1	
	compare to	compare to		
	the	the		
	cytoplasmic	cytoplasmic		
	of the red	of the red		
	blood cell	blood cell		
	Water	Water		
	diffuses out	diffuses into	1	
	from red	red blood cell		
	blood cell by	by osmosis		
1	osmosis Red blood	The red	1	
	cells shrivels	blood cell	-	
	expands and			
(c)	P1: Fruit / mangoes are		1	3
(0)	immersed in vine		-	
	low pH / acidic	San IIIe.		
	P2: vinegar diffuses into the			
	tissues of the mangoes/fruit			
	P3:the tissues of mangoes / fruit			
	become acidic			
	P4: the low ph prevent bacterial			
1	growth in the tissues/			
1	mangoes/fruits	daan, cf.H-		
1	P5:this prevents	decay of the	1	
	fruits / mangoes		Any 3	
				l

E/-\/:\	D		1 4	
5(a)(i)	P : resapan ringkas		1	2
(**)	Q: resapan berban		1	
(ii)	R : sodium /ion po		1	2
	·	mino (semua jenis	1	
4	monosakarida)			
(iii)	Persamaan:			3
	P1-kedua-dua pros		1	
	struktur protein /	orotein pembawa		
	Perbezaan:			
	Q	R		
	Molekul/bahan	.,	1	
	-	lon/bahan	1	
	bergerak	bergerak		
	mengikut	melawan		
	kecerunan	kecerunan kepekatan		
	kepekatan			
	Tidak perlu			
	tenaga	1		
	Proses akan	1		
	terus berlaku	1		
	sehingga	1		
	keseimbangan			
	dinamik			
	tercapai			
(b)	F1-membran plasma bersifat separa		1	3
	telap			
	P1-yang membenarkan hanya			
	molekul tertentu/ kecil sahaja			
	melaluinya			
	P2-manakala yang lain tidak			
	dibenarkan			
(c)	P1-larutan garam pekat bersifat			2
	hipertonik terhadap sel ikan			
	P2-air meresap keluar daripada sel			
	P3-secara osmosis			
	P4-mikroorganism	a tidak dapat	1	
	membiak		1	

1(a)(i)	1.faccilitated diffu	sion	1	2
	2. active transport	t	1	
(ii)	1.absorption of nu	itrients into the	1	2
	villus			
	2.transport of ions into the plant			
	root			
(ii)	<u>Similarities</u>			
	P1-both need carr	ier protein	1	6
	P2-both occur in living cells			
	<u>Differences</u>			
	Facilitated	Active		
	diffusion	transport		
	D1-follow the	Oppose the	1	
	concentration	concentration		
	gradient	gradient		
	D2-molecule	Molecule	1	

		1	_	
	move from	move from		
	higher	lower		
	concentration	concentration		
	to lower	to higher		
	concentration	concentration	1	
	D3-molecule	Molecule		
	move from	move in one		
	both direction	direction only		
	when crossing	across the		
	plasma	plasma		
	membrane	membrane		
	D4-molecule	Molecule	1	
	can move	move through		
	through	transport		
	protein pore	protein only		
	without	which have		
	bonding	the receptor		
		site outside		
		the		
		membrane	1	
	D5- No ATP is	ATP is needed		
	needed			
		Any 4		
b)	P1-sodium potass	ium pump has	1	10
'	active site			
	P2-one molecule	ATP bind to the	1	
	active site			
	P3-sodium approa	ich the pump	1	
	P4-bindd to the ad	ctive site		
	P5-one of the pho	sphate bond at	1	
	ATP molecule is h	, ydrolysed	1	
	P6-release energy			
	P7: the pump cha		1	
	P8-release sodium		1	
	cell			
	P9-phosphate gro	up is released	1	
	from the pump			
	P10-potassium ior	n is release into	1	
	the cell			

(ii) P1-excessive fertiliser increases the solute concentration in soil (around the roots) compared to the cell sap (of the root) P2-the cell sap now has a higher concentration of water/hypotonic to the soil water P3-this results in water molecules diffusing from the cell sap into the	2	cell wall	1	4
(ii) P1-excessive fertiliser increases the solute concentration in soil (around the roots) compared to the cell sap (of the root) P2-the cell sap now has a higher concentration of water/hypotonic to the soil water P3-this results in water molecules	(a)(i)	0	1	
(ii) P1-excessive fertiliser increases the solute concentration in soil (around the roots) compared to the cell sap (of the root) P2-the cell sap now has a higher concentration of water/hypotonic to the soil water P3-this results in water molecules				
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(ii) P1-excessive fertiliser increases the solute concentration in soil (around the roots) compared to the cell sap (of the root) P2-the cell sap now has a higher concentration of water/hypotonic to the soil water P3-this results in water molecules		cytoplasm is a file from	1	
(ii) P1-excessive fertiliser increases the solute concentration in soil (around the roots) compared to the cell sap (of the root) P2-the cell sap now has a higher concentration of water/hypotonic to the soil water P3-this results in water molecules		too the suff	1	
(ii) P1-excessive fertiliser increases the solute concentration in soil (around the roots) compared to the cell sap (of the root) P2-the cell sap now has a higher concentration of water/hypotonic to the soil water P3-this results in water molecules		Condition B / Keadaan B		
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the roots) compared to the cell sap (of the root) P2-the cell sap now has a higher concentration of water/hypotonic to the soil water P3-this results in water molecules	(ii)	P1-excessive fertiliser increases the	1	5
(of the root) P2-the cell sap now has a higher concentration of water/hypotonic to the soil water P3-this results in water molecules		solute concentration in soil (around		
P2-the cell sap now has a higher concentration of water/hypotonic to the soil water P3-this results in water molecules		the roots) compared to the cell sap		
concentration of water/hypotonic to the soil water P3-this results in water molecules		(of the root)		
to the soil water P3-this results in water molecules		P2-the cell sap now has a higher		
P3-this results in water molecules		concentration of water/hypotonic	1	
To this results in trace mercanes		to the soil water		
diffusing from the cell san into the 1		P3-this results in water molecules		
aa		diffusing from the cell sap into the	1	
soil by osmosis		soil by osmosis		
P4-plasmolysis occurs 1		P4-plasmolysis occurs	1	

	P5-vacuole/cytoplasm shrink		
	P6-plasma membrane pulls away	1	
	from the cell wall	1	
	P7-plasmolysed cell lose turgidity	1	
	and support causing the whole	Any	
	plant to wilt	5	
(b)	P1-Pickling	1	5
(-)	P2-at high concentration of salt	_	
	/sugar solution is used	1	
	P3-concentrated salt/ sugar	1	
	solution is hypertonic compared to	-	
	the cell sap (of the mango)		
	• • • • • •	1	
	P4-water molecules within the food	1	
	cells diffuse out by osmosis		
	P5-water molecules also diffuses	1	
	out from the microorganism	_	
	P6-food becomes dehydrated	1	
	P7-without water, bacteria and	1	
	fungus cannot survive	Any	
		5	
c)	P1-plasma membrane is composed	1	6
	of phospholipid and protein		
	P2-various types of proteins are	1	
	dispersed throughout and inserted		
	into the phospholipid bilayer		
	P3-phospholipid bilayer are not	1	
	rigid / static but form a dynamic		
	/flexible structure		
	P4-phospholipid molecule has a	1	
	polar head (hydrophilic) and non-		
	polar tail (hydrophobic)		
	P5-contain cholesterol which links	1	
	the fatty acids together and	-	
	P6-helps to stabilise/strengthen the	1	
	plasma membrane and make it	1	
	•		
	more flexible	1	
	P7-has various type of proteins (e.g.	1	
	pore protein and carrier protein)		
	either partially attached or wholly		
	embedded in the membrane		
	P8-the protein molecules float		
	about in the phospholipid bilayer to	1	
	form a mosaic protein that is always	Any	
	changing / fluid/ dynamic	6	

3(a)	Process P		10
	F1-process P is simple diffusion	1	
	through phospholipid bilayer		
	P1-examples of substances	1	
	involved are small uncharged		
	molecules such as oxygen/carbon		
	dioxide/water	1	
	P2-lipid soluble molecules such as		
	glycerol/fatty acids/vitamin ADEK		
	Process Q		
	F2-Process Q is facilitated diffusion	1	
	through carrier protein		
	P1-examples of substances are	1	
	large water soluble molecules such		
	as glucose/amino acids		

	P2-the molecules bind to specific	1	
	carrier protein		
	P3-carrier protein changes it shape	1	
	and allow the molecules to pass		
	through it	1	
	P4-process Q does not need		
	energy	1	
	P5-process Q occur follow the		
	concentration gradient		
	Process R	1	
	F3-Process R is active transport	_	
	through carrier protein		
	P1-examples of substances	1	
	involved small water-soluble	1	
	molecules or ions such as K+ and	_	
	Na+	1	
	***	1	
	P2-the molecules or ions bind to	Λ	
	specific carrier proteins	Any	
	P3-that use energy from ATP (to	10	
	transport the molecules or ions)		
	P4-process Q occurs against the		
	concentration gradient		
(b)	In solution A		6
	P1-Solution A is hypotonic to the		
	red blood cell / osmotic	1	
	concentration of red blood cell		
	P2-water diffuses into the cell	1	
	P3-by osmosis		
	P4-causing the cell to burst	1	
	P5-the cell undergone haemolysis		
		1	
	In solution B		
	P6-Solution B is hypertonic to the		
	red blood cell	1	
	P7-water diffuses out the cell		
	P8-by osmosis	1	
	P9-causing the cells to shrink &	1	
	crenate		
	P10-the red blood cell undergone	1	
	crenation		
c)	P1-table salts gives the hypertonic	1	4
•	condition to the surrounding /		
	body fluid of leeches		
	P2-water diffuses out of leeches	1	
	P3-by osmosis	1	
	P4-leeches becomes dehydrated	1	
	P5-and make it released from	1	
	human skin and eventually die	_	

4(a)(i)	F-living organism need nutrients / oxygen/ glucose / mineral/ any suitable example to continue their life's processes	1	4
	E1-ions inside cells must be kept at different concentration to outside the cells	1	
	E2-to maintain a constant internal environment/ (homeostasis) E3-the substances across the	1	
	plasma membrane from the	1	

	external environment		
	E4-cells produce waste products	1	
	which exit through the plasma		
	membrane		
	E5-the movement /types/amount	1	
	of substances in and out of the		
	cells is regulated by plasma		
	membrane	1	
	E6-the cells need to maintain		
	suitable pH of the cells for enzyme		
	activity	1	
	E7-so that cells can secretes useful	Any	
	substances/hormones/enzymes	4	
(ii)	Type1		6
	F1-Faccilitated diffusion	1	
	E1-diffusion of small molecules		
	/ions	1	
	E2-move from higher	1	
	concentration to the lower of		
	solute	1	
	E3-through pore protein	1	
	E4-does not need energy	Any	
		3	
	Type 2		
	F-active transport	1	
	E1-the molecules such as sodium	1	
	ions / potassium ions/		
	glucose/amino acid		
	E2-move against concentration	1	
	gradient / from lower	1	
	concentration to the higher	1	
	concentration	1	
	E3-through carrier protein	Any	
	E4-have active site with bind with	3	
	particular molecule		
/I- \	E5-need energy/ATP	4	40
(b)	Isotonic to the cell sap:	1	10
	0.27moldm ⁻³ /0.27.moldm ⁻		
	³ /0.29moldm ⁻³		
	Doint D	1	
	Point P	1	
	F1-The mass of potato increase	1	
	E1-this occur because the solution concentration is hypotonic to the		
	cell sap of the potato	1	
	E2-the water molecule diffuse into	1	
	from lower concentration/		
	hypotonic region to higher	1	
	concentration/ hypertonic region	1	
	E3-by osmosis E4-cell becomes turgid (so the	Т	
	mass increased)		
	Point Q	1	
		1	
	F2-The potato does not lose or	1	
	gain mass E1-this occur because the	1	
	concentration of the solution is		
	isotonic to the cell sap	1	
	E2-diffusion of water molecules is	1	
	at equilibrium / equal rate	1	
	E3-no nett gain or loss of water	-	
L	LO HOTICIL BUILDI 1033 OF WATER		

molecule (so the mass is		
maintained)		
Point R	1	
F3-The mass of potato decease	1	
E1-because the solution is		
hypertonic to the cell sap	1	
E2-the water molecule diffuse out		
from cells / from higher		
concentration to the lower		
concentration / solution at the	1	
surrounding	1	
E3-by osmosis	1	
E4-cell becomes flaccid (so the		
mass decreased)		
Any 10		

(e)(i)	P1: Food sample A have reducing	1	2
	sugar while food sample C		
	not have reducing sugar.		
	P2: Food sample A contain maltose	1	
	but C contain sucrose		
	P3: Maltose reduce CuSO4 in the	1	
	Benedict solution into Cu2O		
	Any 2		
(ii)	P1 : (Food sample C) need to boil	1	3
	with dilute HCl / acid		
	P2 : Sucrose then is hydrolysed	1	
	P3: into glucose and fructose.		
	Or	1	
	P1: (Food sample C) added with		
	sucrase	1	
	P2: sucrose hydrolysed		
	P3: into glucose and fructose	1	

a)Objective

1.	В	2.	D	3.	D	4.	Α	5.	В
6.	В	7.	D	8.	В	9.	С	10.	Α
11.	С	12.	В	13.	С	14.	Α	15.	Α
16.		17.	С	18.	Α	19.	В	20.	В
21.	С	22.	Α	23.	В	24.	D		

_			
1(a)	DNA	1	1
(b)	Carbon, hydrogen, oxygen, nitrogen	1	1
	and phosphorus		
(c)	-carry genetic information	1	2
	-direct protein synthesis	1	M
(d)(i)	Nucleotide	1	1
(ii)	X-phosphate group	1	3
	Y-pentose sugar	1	
	Z-nitrogenous base	1	
(iii)	Z	1	1
e)	RNA	1	1
f)	P: Adenine / Q: Thymine or	1	2
	P: Cytosine / Q: Guanine or	1	
	P: Thymine / Q: Adenine or	1	
	P: Guanine / Q: Cytosine	1	

2(a)	Carbon / C, Hydrogen / H, Oxygen /	1	1
	0		
(b)	Glucose	1	1
(c)	P : Starch	2	2
	Q : Glycogen		
	R : Cellulose		
	Notes :all correct = 2 marks,		
	1&2 correct = 1 mark		
(d)	F : Saliva contain (salivary) amylase.	1	3
	P1 : Salivary amylase hydrolysed	1	
	starch/ P into maltose		
	P2 : By hydrolysis process	1	

X: Fatty acids Y: water					
(ii) Condensation 1 1 2 (b)(i) A: saturated fats B: unsaturated fats I 2 (iii) Saturated Fats Unsaturated fats I 2 (iii) Saturated Fats Unsaturated fats I 3 No double At least one double bond between atom carbon between atom carbon Not able to Able to react react with with additional hydrogen atom I 1 Solid at room Liquid at room temperature temperature High Low cholesterol Color E: Provide energy I 3 F: provide energy/insulator I G: carry genetic material I 1 (ii) P1: mutation occur P2: protein produced cannot I 1	3(a)(i)	X: Fatty acids		1	2
(b)(i) A: saturated fats B: unsaturated fats Cii) Saturated Fats Unsaturated fats No double At least one bond between double bond atom carbon Not able to react react with with additional additional hydrogen hydrogen atom Solid at room Liquid at room temperature temperature High Low cholesterol cholesterol (c)(i) E: Provide energy F: provide energy/insulator G: carry genetic material (ii) P1: mutation occur P2: protein produced cannot 1 2 2 3 4 5 1 1 1 1 2 1 2 1 2 1 2 1 1 1 1 1 1 1 1		Y: water		1	
B: unsaturated fats 1 (ii) Saturated Fats Unsaturated fats No double fats At least one double bond between atom carbon Not able to react react with with additional hydrogen atom Solid at room Liquid at room temperature temperature High cholesterol Ci)(i) E: Provide energy/insulator G: carry genetic material (ii) P1: mutation occur P2: protein produced cannot Saturated Fats Unsaturated 1 At least one double bond atom 1 At least one double bond atom 2 Liquid at room 1 Liquid at room 1 Liquid at room 1 Cholesterol 1 1 33	(ii)	Condensation		1	1
(ii) Saturated Fats Unsaturated fats No double At least one double bond between atom carbon Not able to react with with additional hydrogen atom Solid at room Liquid at room temperature temperature High Low cholesterol (c)(i) E: Provide energy F: provide energy/insulator G: carry genetic material (ii) P1: mutation occur P2: protein produced cannot 3 1 1 1 1 1 1 1 1 1 1 1 1	(b)(i)	A: saturated fats		1	2
Solid at room temperature High cholesterol Ci(i) E: Provide energy F: protein produced cannot 1 1 1 1 1 1 1 1 1		B: unsaturated fats		1	
No double bond between atom carbon Not able to react with with additional hydrogen atom Solid at room temperature High cholesterol (c)(i) E: Provide energy F: provide energy/insulator G: carry genetic material (ii) P1: mutation occur P2: protein produced cannot At least one double bond between atom atom 1 1 1 1 1 1 1 1 1 1 1 1 1	(ii)	Saturated Fats	Unsaturated		
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Not able to react with additional additional hydrogen atom Solid at room temperature High Low cholesterol (c)(i) E: Provide energy F: provide energy/insulator G: carry genetic material (ii) P1: mutation occur P2: protein produced cannot Able to react with additional hydrogen atom I temperature temperature 1 cholesterol 2 cholesterol 3 cholesterol 4 cholesterol 4 cholesterol 4 cholesterol 5 cholesterol 6 cholesterol 1 cholesterol 2 cholesterol 3 cholesterol 4 cholesterol 4 cholesterol 5 cholesterol 6 cholesterol 7 cholesterol 8 cholesterol 9 cholesterol 1 choles		atom carbon	between atom		
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Solid at room temperature High Low cholesterol (c)(i) E: Provide energy F: provide energy/insulator G: carry genetic material (ii) P1: mutation occur P2: protein produced cannot		hydrogen	atom		
temperature temperature High Low cholesterol (c)(i) E: Provide energy 1 3 F: provide energy/insulator 1 G: carry genetic material 1 (ii) P1: mutation occur 1 1 P2: protein produced cannot 1		atom			
High cholesterol Collecterol C		Solid at room	Liquid at room	1	
(c)(i) E: Provide energy 1 3 F: provide energy/insulator 1 G: carry genetic material 1 (ii) P1: mutation occur 1 1 P2: protein produced cannot 1		temperature	temperature		
(c)(i) E: Provide energy 1 3 F: provide energy/insulator 1 G: carry genetic material 1 (ii) P1: mutation occur 1 1 P2: protein produced cannot 1		High	Low	1	
F: provide energy/insulator 1		cholesterol	cholesterol		
G: carry genetic material 1 (ii) P1: mutation occur 1 1 P2: protein produced cannot 1	(c)(i)	E: Provide energy		1	3
(ii) P1: mutation occur 1 1 1 P2: protein produced cannot 1		F: provide energy/i	nsulator	1	
P2: protein produced cannot 1		G: carry genetic ma	aterial	1	
	(ii)	P1: mutation occur	•	1	1
function properly			ed cannot	1	
		function properly			

4(a)	Name of the hypothesis: Lock and key hypothesis	1	3
	Explanation:		
	P1: the process of breaking down	1	
	complex molecule		
	P2:removal of (one) water molecule	1	
	P3: to produce simple molecule	1	
	Any 2		
(b)	Hydrolysis	1	1
(c)	P1-process of break down complex	1	2
	molecule		
	P2-expel water molecule to produce	1	
	simple molecule		

(d)(i)	DNA/ deoxyribonucleic acid	1	1
(ii)	Phosphate group / Kumpulan Fosfat Nitrogenous base / Bes bernitrogen Pentose sugar / Gula pentosa	2	2
(iii)	P1-DNA in the nucleus determine the genetic information for the synthesis of amino acid	1	3
	P1-RNA messenger is synthesized by using the genetic information in the DNA	1	
	P3-Genetic information is translated to popypeptide chain to form amino acid	1	

5(a)(i)	X: amino acid	1	2
	Y: peptide bond	1	
(ii)	L: secondary structure	1	2
	M: Quaternary structure	1	
(b)(i)	Ribosome	1	1
(ii)	Hydrolysis	1	1
(iii)	Enzyme : K	1	2
	Haemoglobin : M	1	
C)	F: Temperature in refrigerator is	1	3
	low		
	P1: enzyme in bacteria is inactive	1	
	P2: food cannot be decomposed	1	
d)	F: 40°C is optimum temperature	1	2
	P1: enzyme activity is maximum	1	
	P2: the cleaning is more effective	1	

6(a)(i)	X:sucrose	3/	2
. , , ,	Y:Glucose	2/	1
	Z:Fructose	2/	0
(ii)			1
b(i)	P1-enzymes reaction is highly	1	2
	specific	1	
	P2-enzyme does not change at the	1	
	end of reaction		
	P3-reversible in action		
C(I)	F-increase of enzymes concentration will increase rate of enzymatic reaction (until it reach a maximum point)	1	3
	P1-due to more active site is available to bind with substrates	1	
	P2-more substrates will bind at the	1	
	active site of the enzymes to form enzymes-substrate complex P3-to produce more products	1	

(ii)	X Enzymes concentration (%)	1	1
d)	Zymase	1	1
	P1-Zymase enzymes found in yeast P2-it acts on starch and convert it	1	2
	into glucose	1	
	P3-it acts on glucose and convert it		
	into alcohol	1	
	P4-through fermentation process	1	

1(a)	P1: structure X is tertiary protein	1	4
	P2:such as		
	enzyme/hormones/antibodies/plasma proteins	1	
	P3:formed when secondary structure	1	
	folded into three dimensional shape		
	P4:structure Y is quaternary structure	1	
	P5:such as haemoglobin		
	P6: formed from 2 or more tertiary	1	
	structure that folded into a large and		
	complex molecule		
	Any 2 points each		
b(i)	F1-protease / papain	1	6
	P1-to tenderize meat	1	
	F2-lipase	1	
	P2-ripening of cheese	1	
	F3-amylase/amyloglucosidase	1	
	P3-convert glucose into sugar in syrup	1	
	making		
	54 T. WARRES	4	
	F4-zymase	1 1	
	P4-convert glucose to ethanol in	1	
	making alcoholic drinks		
	F5-trypsin	1	
	P5-remove hair in leather products	1	
		_	
	F6-cellulose	1	
	P6-extract agar from seaweed	1	

2(a)(i)	P1-enzymes are proteins which are	1	4
	synthesized by living organisms		
	P2-enzymes bind to their	1	
	substances and convert them to		
	product in the enzymatic reaction		
	P3-enzymes have specific sites	1	
	called active sites to bind to		
	specific substrates // enzymes are		
	highly specific in their reaction		
	P4-enzymes speed up the rates of	1	
	chemical reactions but remain		

unchanged (at the end of reaction) P5-enzymes are needed in small quantities because they are not used up (but released at the end of a reaction) P6-most enzymes-catalysed reactions are reversible P7-the activity of an enzyme can be slowed down or completely stopped by inhibitors (ii) Types of industry (T) I-Food processing industry a) Dairy products Lipase Lactase Lactase Hydrolyses lactose to glucose in the making of bread Protease Convert protein in the making of bread Protease Convert starch flour into sugar in the making of bread Convert starch in mylase Convert starch in mylase fermentation of yeast (in wine & beer products (in) Zymase Convert starch in mylase fermentation of yeast (in wine & beer production) Zymase Convert starch in mylase fermentation of yeast (in wine & beer production) Zymase Convert skin of fish elmeat products Protease Removes the elmeat products (Ferceal grain cellulase & removes seed coats from cereal grain glucose in the skin of fish elmeat products Protease Removes the skin of fish elmeat products Protease Removes the skin of fish elmeat products Cellulase Removes the skin of fish elmeat products Treats Incereate						
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(ii) Types of industry (T)		stopped by in	hibitors			
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4.biological Protease Dissolve		h)starch products 2.Leather products 3.medical/ pharmaceutical product	Amylase Glucose isomerase Trypsin /protease Pancreatic trypsin Microbial trypsin	grain Digests cell wall & extract agar from seaweed Change starch to sugar in the making of syrup Convert glucose into fructose // Production of high fructose syrup Removal of hair from animal hides Treats inflammation Dissolves blood clots	1 1 1 1	
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		h)starch products 2.Leather products 3.medical/ pharmaceutical product 4.biological washing	Amylase Glucose isomerase Trypsin /protease Pancreatic trypsin Microbial trypsin	grain Digests cell wall & extract agar from seaweed Change starch to sugar in the making of syrup Convert glucose into fructose // Production of high fructose syrup Removal of hair from animal hides Treats inflammation Dissolves blood clots Dissolve protein &	1 1 1 1 1 1	
detergent		h)starch products 2.Leather products 3.medical/ pharmaceutical product 4.biological washing powder /	Amylase Glucose isomerase Trypsin /protease Pancreatic trypsin Microbial trypsin Protease	grain Digests cell wall & extract agar from seaweed Change starch to sugar in the making of syrup Convert glucose into fructose // Production of high fructose syrup Removal of hair from animal hides Treats inflammation Dissolves blood clots Dissolve protein & starch stains	1 1 1 1 1 1	
detergent in clothes		h)starch products 2.Leather products 3.medical/ pharmaceutical product 4.biological washing	Amylase Glucose isomerase Trypsin /protease Pancreatic trypsin Microbial trypsin Protease	grain Digests cell wall & extract agar from seaweed Change starch to sugar in the making of syrup Convert glucose into fructose // Production of high fructose syrup Removal of hair from animal hides Treats inflammation Dissolves blood clots Dissolve protein &	1 1 1 1 1 1	

(h)	D1 Dinuclous store genetic	1	May
(b)	P1- P nucleus, store genetic	1	Max 10
	information / gene (for the		10
	synthesis of enzymes) in		
	chromosome /DNA/ is carried by		
	DNA		
	P2-the messenger RNA/mRNA is		
	synthesized according to the	1	
	instruction on the DNA		
	P3-Q, mitochondrion, produce	1	
	energy by cellular respiration (used		
	in the production of extracellular		
	enzyme)		
	P4- the messenger RNA/mRNA	1	
	then leaves the nucleus and moves		
	to the ribosome (which is the site		
	of protein synthesis)	1	
	P5-the messenger RNA / mRNA		
	attaches itself to the ribosome		
	P6-protein that are synthesised at		
	the ribosome are transported	1	
	through the spaces within the		
	rough endoplasmic reticulum		
	P7-proteins depart from the rough	1	
	endoplasmic reticulum wrapped in	_	
	vesicle that bud off from the sides		
	of RER		
	P8-these transport vesicles fuse	1	
	with the membrane of the R, Golgi	-	
	apparatus and empty their		
	contents into the membranous		
		1	
	space	_	
	P9-these proteins are modified		
	during their transport in the Golgi	1	
	apparatus, R	1	
	P10-For example, sugar to make		
	glycoprotein / carbohydrates are	_	
	added to protein	1	
	P11-S, secretory vesicles containing		
	these modified proteins bud off		
	from the Golgi membrane and		
	travel to plasma membrane	1	
	P12-these vesicle will then fuse		
	with the plasma membrane before		
	releasing the proteins outside the		
	cell as extracellular enzymes.		

3(a)	P1-Enzyme /P represent the lock	1	8
	P2-substrate / Q represent the	1	
	'key'	1	
	P3-enzyme / P is specific	1	
	P4- enzyme / P only can combined		
	with substrate / Q	1	
	P5-Enzyme / P has specific active		
	site which can fit into specific		
	substrate / Q	1	
	P6-the substrate /Q binds with the		
	active site / enzyme to form an		
	enzyme-substrate complex	1	
	P7-enzyme /P convert/ hydrolysed		
	/ breakdown substrate/ Q into		
	products/ R	1	

	T		
	P8-The products / R are released		
	from the enzymes	1	
	P9-the enzyme/ P remain		
	unchanged at the end of the		
	reaction	1	
	P10-enzyme P can be reused	1	
	P11- the enzyme/ P is now free to	Any	
	bind with another molecule of	8	
	substrate / Q		
b)	P1 –molecule X is polysaccharide /	1	4
,	cellulose which consist of many		
	monosaccharides /glucose		
	P2-the monosaccharides / glucose	1	
	are joined together by	_	
	condensation to form long chains		
	of polymers		
	P3-molecule Y is a polypeptide		
	(which consist of many amino	1	
	acids)	1	
	P4-molecule Y is broken down by	-	
	hydrolysis		
(c)	P1- X is pepsin; Y-salivary amylase;	1	10
(0)	Z-trypsin	1	10
	P2-each enzyme functions actively	1	
	at its optimum pH	1	
	P3-the enzyme salivary amylase	1	
	, , ,	1	
	functions optimally at ph 7/neutral	1	
	P4-the optimum pH for pepsin is	1	
	pH2/acidic	1	
	P5-trypsin is pH 8.5/Alkaline	1	
	P6-the changes in ph will cause	1	
	changes in the concentration of		
	hydrogen ion H+ and hydroxyl ion		
	(OH-)	1	
	P7-The excess hydrogen ion	1	
	/hydroxyl ions destabilizes		
	enzymes by changing the charges		
	of the active site		
	P8-charges on the substrate	1	ľ
	(surface area) are also changes		
	P9-hence the enzyme-substrate	_1	
	complex cannot be formed		
	P10-the effects of Ph changes on	1	
	enzyme activity are reversible		
	P11-an enzyme which is inactive in	1	
	high ph medium will become		
	active again when its optimum ph		

b) Structure

	ucture			
1(a)(i)	Metaphase		1	1
(ii)	P1: chromosomes		1	2
	plane/metaphase		_	
	P2: chromosomes	,	1	
	at equator plane /		1	
	P3: chromosome/c attached/ hold on		1	
	fibre	to the spindle		
(b)	ווטופ			2
(6)				
		(88))		
	(
	((0.	(
	(({{ ({{ (({ ((((((((((((((((((((((((()))))))))	((())		
	Notes:			
	Any one daughter	cell with the		
	correct combination		1	
	-D1			
	Correct drawing nu	ımber of		
	chromosome and s		1	
	one long) –D2			
c)(i)	centriole		1	1
(ii)	P1: spindle fibre ar	e not	1	2
	formed/cannot con	ntract		
	P2: Structure M/ch	romosome	1	
	cannot separate			
	P3:During anaphas		1	
d)(i)	Species X	Species y		2
	Nucleus of	Nucleus of		
	unfertilised egg	somatic cell	1	
	cell/ovum	/liver/example		
	Destroyed by	Removed or		
	ultraviolet rays	taken our	_	
		//place inside	1	
		the egg cell		
(**)		/ovum		
(ii)	Species Y		1	1
(iii)	E1:No variation		1	2
	E2: Has same resist	tance to certain	1	
	diseases			

CHAPTER 5

a)Objective

1.	С	2.	В	3.	С	4.	С	5.	Α
6.	С	7.	Α	8.	D	9.	D	10.	Α
11.	Α	12.	Α	13.	С	14.	D	15.	С
16.	Α	17.	D	18.	D	19.	D	20.	С
21.	R	22.	Δ						

2(a)	R,Q,S,P	1	1
(b)	Fasa Q:		4
	-Metafasa	1	
	-kromosom tersusun sebaris di	1	
	tengah-tengah sel / pada satah	1	
	khatulistiwa		
	Fasa S:	1	
	-Anafasa		
	-Sentromer membahagi kepada dua	1	
	dan kromatid kembar berpisah ke		
	kutub sel bertentangan (ditarik oleh		
	gentian gelendong)		
c)	P1: Mitosis menghasilkan sel anak	1	3

	yang mengandungi bilangan		
	kromosom yang sama dengan	1	
	induknya/2n/diploid		
	P2: kandungan genetik sama dengan		
	induknya	1	
	P3:tidak berlaku pindah silang (antara		
	kromatid bukan beradik)	1	
	P4:tiada variasi genetik yang berlaku		
(d)(i)	P1-pertumbuhan semua anak pokok	1	2
	terbantut/terencat/musnah		
	P2-kerana mempunyai rintangan /ciri	1	
	genetik yang sama		
(ii)	P1-tisu pada hujung pucuk mempunyai	1	2
	kromosom diploid		
	P2-aktif membahagi secara mitosis	1	
	P3-membentuk kalus/organisma	1	
	lengkap		

3(a)	6 chromosomes	1	1
b)	1.mitosis	-	-
D)	Number of chromosomes are 6	1	
	Same pattern and same size of	1	2
	chromosome as parent cell	1	_
	cinomosome as parent cen		
	2. meiosis		
	Number of chromosomes are 3	1	
	Pattern and size of chromosomes is	1	2
	different compare to parent cell		
c)	In mitosis		
	-during anaphase	1	
	chromosome/sister chromatids		2
	separated and move to the		
	opposite poles (cause the number		
	of chromosome in daughter cell		
	remain the same)		
	In meiosis		
	-during anaphase I homologous	1	
	chromosomes separated and move		
	to the opposite poles (cause the		
	number of chromosome in		
	daughter cell become half from the		
	parent cell)		
d)	F1:mitosis produce no variation,	1	2
	while meiosis produce variation		
	P1:caused by crossing over during	1	
	Prophase I in meiosis		
e)	P1: albino buffaloes caused by gene	1	3
	mutation which control the		
	production of skin pigmentation		
	P2:in autosomes	1	
	P3: controlled by recessive alleles		
	P4: skin cells unable to synthesize	1	
	(melanin) pigment// no melanin	1	
	pigment		

4(a)(i)	X: sentromer Y: kromosom homolog	1	2
(ii)	Metafasa I	1	1

(1. \ () \	D4.1 1 1 1 "		_
(b)(i)	P1-kromosom homolog tersusun di	1	2
	satah khatulistiwa		
	P2-berlaku pertukaran segmen	1	
	DNA/ bahan genetik (di titik kiasma)		
	P3-berlaku pindah silang	1	
(ii)	P1-memastikan bilangan kromosom	1	1
	gamet separuh daripada		
	induk/haploid		
	P2-memastikan bilangan kromosom	1	
	sel anak adalah diploid /sama		
	dengan induk		
	P3-menghasilkan variasi dalam	1	
	organisma		
c)	P1-apabila nukleus sperma(haploid)	1	2
	bercantum dengan nukleus ovum		
	(haploid)	1	
	P2-melalui persenyawaan	1	
	P3-membentuk satu zigot yang		
	diploid		
d(i)	F : sel A adalah sama dengan sel B	1	2
.,	tetapi berbeza dengan sel C		
	P: Sel A dan sel B adalah hasil	1	
	daripada proses mitosis manakala		
	sel C adalah hasil daripada proses		
	meioisis		
(ii)	24 kromosom	1	1
(iii)	Sindrom Down/ Sindrom Klinefelter	1	1
()	Sind on Bown, Sind on Kincicici	_	

CJ L33	ay				
1(a)(i)	P1-Meiosis produc	ces		2	2
	gametes/sperms a	and ovum			
	P2-contain haploid	d number of			
	chromosomes (23				
	P3-when fertilisat	ion occur			
	P4-diploid zygote	is formed			
	P5-the offspring h	as similar number			
	of chromosomes a	as the parent			
(ii)	P1-Both involve n	uclear division		1	6
	P2-both involve th	ne formation of			
	spindle fibres			1	
	P3-the nuclear me			1	
	processes disinteg	rate during			
	prophase				
	P4-the nuclear me			1	
	processes reform				
		Any 2			
	Differences				
	Meiosis I	Meiosis II			
	(During	(During		1	
	Prophase 1),	prophase II),			
	homologous	homologous			
	chromosomes	chromosomes			
	pair	DO NOT pair			
	up/synapsis	up/synapsis			
	(During	(During		1	
	Prophase 1),	Prophase II),			
	crossing over /	crossing over /			
	exchange of	exchange of			
	genetic	genetic			

material occurs between homologous chromosomes / non sister chromatids During During Metaphase I, homologous chromosomes line up at the equator // metaphase plate During During Anaphase I, centromeres do not divide divide At the end of Telophase I), two four haploid daughter cells are formed are formed b(i) P1- The technique used is tissue culture P2- Meristematic tissues/active dividing cell from shoot/root/ small pieces of tissue/explants are taken from the parent plant p3- Cultured in sterile medium p4- Containing growth hormone, nutrient and suitable temperature p5- The explant divides mitotically p6- To produce undifferentiated
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p4- Containing growth hormone, nutrient and suitable temperature p5- The explant divides mitotically p6- To produce undifferentiated
nutrient and suitable temperature 1 p5- The explant divides mitotically 1 p6- To produce undifferentiated
p5- The explant divides mitotically 1 p6- To produce undifferentiated
p6- To produce undifferentiated
cells 1
p7- Callus develops to become 1
embryo
p8- Later into plantlets 1
(ii) Advantages 4
P1: Can be produced in a large 1
number in a short time
P2: Have the desirable
characteristics 1
P3: Can be carried out any time
P4: Increase the crop yield and 1
quality of the products
Any 2 1
Disadvantages:
P1: The resistance of the clones
towards diseases and pests is 1
the same 1
P2: No variation
P3: Clones cannot adapt to changes 1
in the environment
III LUE EUVILUIIIIEIII
P4: Clones have shorter lifespan Any 2

2(a					
)	Stages	Mitosis	Meiosis		
<i>'</i>	Metaphas	Homologous	Homologous	1	4
	е	chromosome	chromosom	1	4
		s are	e line up		
		arranged in	side by side		
		linear sequence /	at the metaphase		
		randomly at	plate		
		the			
		metaphase			
	Ananhasa	plate Separation of	Concretion	1	
	Anaphase	sister	Separation of the		
		chromatids	homologous		
		to the	chromosom		
		opposite	e to the		
		pole // the centromere	opposite pole //		
		of each	sister		
		chromosome	chromatids		
		divided into	still remain		
		two and allows sister	attached to each other		
		chromatid to	during		
		move to	movement		
		opposite	to the		
		pole	opposite	1	
	Telophase	Two	pole Four	1	
	Telophiase	daughter	daughter		
		nuclei are	nuclei are		
		formed	formed	1	
		Diploid(2n) number of	Diploid(2n) number of		
		chromosome	chromosom		
		is remained	e is reduced		
			to haploid	1	
		5 1:	(n)	An	
		Daughter cells are	Daughter are differ	y 4	
		genetically	from the		
		identical to	parent and		
		each other	from each		
		and to the parent cell	other // variation		
		parent cen	occurs		
			among		
			daughter		
(1-)	D4 the test		cells	1	_
(b)		nique used is	tissue	1	6
	culture tech	•	Lean		
		of explant is to	,	1.	
	-	ung part of th		1	
		shoot/root an	a cut it into		
	smaller pied				
		es are steriliz	•	1	
		ım hypochlori			
	•	the growth of			
		eces of sterilis			
		a growth me		1	
	containing I	nutrients (e.g.	glucose,		
	amino acid,	minerals etc.) and		
	hormone/a	uxin with opti	mum pH		
	level	•	-		
	P5-the appa	aratus & cultu	re medium	1	
		oe in sterile co			
	kept under				
	/ 30-35°C		, J. 2. 3. 3. 3		
	-	ues cells then	divide	1	
		by mitosis to		1-	
		differentiated			
		veral weeks, c		1	
	1 / arter 300	. C. G. WCCKS, C	unus	1 *	

	differentiated to produce shoots & roots / organogenesis P8-once the roots grow, the plantlets	1	
	are removed & transferred to the soil for growth into the adult plant P9-all the plantlets produced this way are genetically identical and known as	1	
	clones P10-therefore, all adults plant that develop from them share the same	1	
	traits, for example large fruits		
-1		4	_
c)	-certain substance/carcinogen such as benzo-A-pyrene etc	1	1 0
	-can cause the change in DNA	1	
	structure (that control the cell cycle)		
	-an abnormal cells is formed / cancer		
	cell/ mutant cell	1	
	-this change disrupts the coded DNA		
	genetic instruction for mitosis control	1	
	-this leads to uncontrolled mitosis		
	(which is non-stop division of the cell)	1	
	producing a mass of new daughter	-	
	cells called tumour		
		1	
	-tumour cells have no function, but	1	
	instead compete with surrounding		
	normal cells to obtain nutrients &		
	energy for their growth		
	-some tumours remain inactive and	1	
	are relatively harmless (not		
	cancerous) and called benign tumour		
	-benign tumour cells remain inactive	1	
	and are relatively harmless (not		
	cancerous) and called benign tumour		
	-benign tumour remains at its original	1	
		1	
	site and do not spread to other part		· '
	of the body. It can be removed by		
	surgery		
	-other tumour, called malignant	_	
	tumour are very active (cancerous),	1	
	spread locally & some cancer cells		
	migrates through bloodstream to		
	invade other organs		
	-when this happens, secondary	1	
	tumours develop in other body		
	tissue, than lead to the malfunction		
	of the tissue and ultimately death	1	
	-an individual with malignant tumour	1	
<u> </u>	is said to have cancer	<u> </u>	

(b)	P1-tissue culture technique	1	6
(0)	I -	1	0
	P2-used to produce (high quality	1	
	of seedling) oil palm seedlings in		
	vitro/ any suitable example		
	P3-the leaves/shoot/stem/root	1	
	tissues are cut out (explants)		
	P4-the pieces of meristematic		
	tissues (explants) are cultured in	1	
	sterile medium, in suitable pH and		
	with addition of plant growth		
	substances		
	P5-the flasks containing the tissue	1	
	are stored in an incubator at 37°C		
	for 2/3 weeks		
	P6-the cells divide by mitosis to	1	
	produce callus		
	P7-the callus is then cut into small	1	
		1	
	pieces		
	P8-the small pieces of callus	1	
	tissues are then cultured in sterile		
	nutrient medium		
	P9-when it has grown to suitable	1	
	size, the clone is transferred to	Any	
	the nursery	6	
c)	P1-the exposure damage the DNA	1	6
	of the cells		
	P2-a cell divides through mitosis	1	
	repeatedly		
	P3-produces cancerous cell	1	
	P4-due to severe disruption to the	1	
	mechanism that controls the cell	_	
	cycle P5-cancerous cells divide	1	
		1	
	freely/uncontrollably heeding the		
	cell cycle control		
	P6-(these cells) compete with	1	
	surrounding normal cells to		
	obtain nutrient/energy (for		
	growth)		
	P7-invade /destroy neighbouring	1	
	cells		
	P8-(they can spread to other	1	
	organ and) initiate cancers there	Any	
	1 0 1	,	ĺ
		6	

3(a) P1-cloning is an asexual 1 2 reproductive process of producing clones//does not involve gamete P2-a clone is a group of 1 cells/organism// a population of organism produced from single ancestral cell P3-a clone is genetically identical P4-the technique can be used to produce high quality of organism/orchids/oil palm/cocoa Any2 plants

CHAPTER 6

a)Objective

1.	В	2.	С	3.	D	4.	С	5.	Α
6.	В	7.	D	8.	В	9.	С	10.	С
11.	D	12.	В	13.	С	14.	Α	15.	D
16.	D	17.	С	18.	С	19.	С	20.	В
21.	В	22.	D	23.	Α	24.		25.	В
26.	D	27.	С	28.					

1	Villus	1	1
	Villus	1	1
a(i) (ii)	P1-the epithelial lining is only one	1	2
(11)	cell thick	1	_
	P2-epithelial cell have a lining of	1	
	microscopic projection called	1	
	microvillus		
	P3-each villus has a network of	1	
	blood capillaries		
	Any 2		
(b)	X:absorb fatty acid and	1	2
(-)	glycerol/vitamin A,D,E,K		
	Y: absorbed glucose/amino	1	
	acids/minerals/vitamin B,C		
(c)	P1: acts as checkpoint	1	2
	P2: which control the amount of		
	nutrients released into blood	1	
	circulatory system		
(d)	F-Nutrient P is glucose	1	2
	P1-which is converted into		
	glycogen & stored in the liver	1	
	P2-when there is lack of blood		
	glucose level, stored glycogen is	1	
	converted back to glucose	1	
	P3-glucose are transported to the	Any	
	cells to produce energy	2	
e)	F –lipids are not transported to the	1	3
	liver		
	P1-fatty acids and glycerol/lipids		
	are absorbed into lacteal not into	1	
	blood capillaries		
	P2-from lacteal lipids are	,	
	transported through lymphatic	1	
	system to blood circulatory system	1	
	P3: excess lipid stored in adipose	1	
	tissue	Any	
		3	

2	Absorption	1	1
a(i)			
(ii)	P1-thin wall	1	2
	P2-for rapid absorption of nutrients	1	
	P3-having microvilli on the	1	
	epithelial lining		
	P4-increase the surface area for	1	
	more absorption to occur		
(b)	Vessel P: hepatic portal vein	1	2
	Vessel R: lymphatic vessel	1	
(c)	F-The concentration of glucose in	1	2
	vessel P is higher than in vessel Q		
	P1-Glucose has been used by liver	1	
	cells (to carry out cellular		
	respiration)		
	P2-excess glucose has been	1	
	converted into glycogen (in the		
	liver)		
	(F + any 1P)		

(d)	P1-Protein is digested into amino	1	4
	acid		
	P2-excess protein will produce	1	
	excess amino acid		
	P3-(in the liver) excess amino acid	1	
	is broken down		
	P4: into urea		
	P5: the process is called	1	
	deamination	1	

Diet which contain all the nutrient	1	1
in correct proportion to meet the		
daily requirement of the individual		
Level 2 : Vitamin / mineral salt /	1	2
fibre		
Level 3 : Protein	1	
Can cause obesity / stroke /	1	1
thrombosis / arteriosclerosis / high		
blood pressure		
F Very active man need 15100kJ	1	2
energy , but moderate active man		
only need 12600 kJ energy		
E because very active man need	1	
more energy to carry out all the		
heavy / tough activity		
Deficieny disease : Ricket	1	2
Cause: Lack of vitamin D / calcium	1	
& phosphorus		
	in correct proportion to meet the daily requirement of the individual Level 2: Vitamin / mineral salt / fibre Level 3: Protein Can cause obesity / stroke / thrombosis / arteriosclerosis / high blood pressure F Very active man need 15100kJ energy , but moderate active man only need 12600 kJ energy E because very active man need more energy to carry out all the heavy / tough activity Deficieny disease: Ricket Cause: Lack of vitamin D / calcium	in correct proportion to meet the daily requirement of the individual Level 2: Vitamin / mineral salt / fibre Level 3: Protein Can cause obesity / stroke / 1 thrombosis / arteriosclerosis / high blood pressure F Very active man need 15100kJ energy , but moderate active man only need 12600 kJ energy E because very active man need more energy to carry out all the heavy / tough activity Deficieny disease: Ricket Cause: Lack of vitamin D / calcium

4(a)(i)	Ruminant		1	1
(ii)	A: omasum			2
	B:reticulum			
	C: Abomasum			
	D: Rumen			
B(i)	Cellulase		1	1
(ii)	To hydrolyse cel	llulose into	1	1
	glucose			
(iii)	P1-when food e	nter reticulum,	1	2
	cellulose is hydr	olyse		
	P2-the content of	of the	1	
	reticulum/cud is	the		
	regurgitated into			
	be thoroughly c	•	1	
	P3-this process	•		
	and break down	•		
	making it more			
	further microbia			
	action/reaction			_
C)	Human	Rodent		3
	Small	Large	1	
	caecum	caecum		
	Cannot	Can digest	1	
	digest	cellulose into simple	1	
	cellulose	1		
		sugar		
	Cellulose	Cellulose	1	
	producing	producing	1	
	bacteria is	bacteria is		

	absent	present	Max3	
	Food passes	Food passes		
	through the	the		
	alimentary	alimentary		
	canal once	canal twice		
d)	P1-in goat cellul	ose Is	1	Max
	hydrolysed in th	ie rumen		2
	whereas in rabb	it cellulose is		
	hydrolysed in th	e caecum	1	
	P2-therefore ral	obit need to		
	ingest the faece	s pellet to		
	recover the nuti	rients initially	1	
	list in their faece	es		
	P3-this allow the	e small intestine		
	to absorb the nu	utreints		

5(a)	Chloroplast / Organel M contain	1	Max
	chlorophyll to trap/ absorb/	1	2
	capture light energy		
(b)(i)	P1-Photolysis of water / Light	1	Max
	energy is used to split water		3
	molecule into hydrogen ion and		
	hydroxyl ion.		
	P2-Hydroxyll ion loses an electron	1	
	to form hydroxyl		
	group.	1	
	P3-Hydroxyll group combine to		
	form oxygen and water.		
(ii)	P1-Hydrogen atom and ATP from	1	2
	reaction P will be used		
	in the reaction Q.		
	P2-Hydrogen atom fix / reduce	1	
	carbon dioxide to form		
	glucose.		
c)	F1-Dust particle will cover/	1	Max
	accumulate on the surface of		3
	the leaf,		
	e1 -so less light energy will be trap	1	
	by the chlorophyll.		
	F2-Dust particle block the	1	
	stomata,		
	E2-so, les/ no supply of carbon		
	dioxide (to the cell)	1	
	E3-: rate of photosynthesis		
	decreases.	1	
	F1+ E1 + E3 or F2 + E2 + E3		
d)	F-In winter, temperature is very	1	Max
	low// light intensity is low		3
	and the rate of photosynthesis is		
	very low		
	P2-In the greenhouse, light	1	
	intensity/ concentration of carbon		
	dioxide/ temperature are		
	maintained at optimum level (for		
	photosynthesis) throughout the		
	year.		
	P3-So the rate of photosynthesis	1	
	is maintained at maximum level		
	throughout the year (regardless of		
	changes in light intensity or		

temperature). P4-The plants are able to increase	1	
yields/ increase the crops production throughout the years.		

6(a)(i)	water	1	1
ii)	F: photolysis of water	1	3
	P1: light energy is used to split		
	the water molecules	1	
	P2: into hydrogen ion (H+) and		
	hydroxyl ion (OH-)	1	
b)	Gas Q: dark reaction	1	2
	Gas T : light reaction	1	
c)	F: no net gain or loss of the	1	Max
	sugar produced		3
	P1: at compensation point		
	P2: at low light intensity, the rate	1	
	of carbon dioxide production		
	during respiration is equal to the	1	
	rate of carbon dioxide		
	consumption during		
	photosynthesis // explanation on		
	oxygen	1	
	P3: a point is reached whereby	-	
	all the carbon dioxide is		
	produced		
	•	1	
	during respiration are used in	1	
	photosynthesis		
	P4: there is no net gain or loss in		
-	carbon dioxide by the plant		
d)	P1: remove carbon dioxide from	1	Max
	the atmosphere		3
	P2: provide food for plant and	1	
	animals in the form of		
	carbohydrates or sugar or		
	glucose	1	
	P3: uses oxygen as a waste		
	product which is released into		
	the	1	
	atmosphere		
	P4: changes the energy from the	1	
	sun into a usable form for living		
	organism		
	P5: provides the structural		
	components in the cell walls of		
	plants which is cellulose		

1(a)	(i) Teenagers		
	P1 need food which are rich in	1	Max
	carbohydrate		5
	P2 to provide energy for active	1	
	lifestyle		
	P3 need a lot of protein		
	P4 for rapid growth	1	
	P5 need a lot of calcium	1	
	P6 for bones n tissues formation	1	
	P7 need a lot of vitamin D	1	
	P8 to help in absorption of calcium		

	and phosphorous	1	
	P9 need a lot of vitamin E		
	P10 to prevent damaged of	1	
	phospholipid in cell membrane		
	P11 should consume food rich in	1	
	ferum	1	
	P12 to synthesis more		
	haemoglobin after	1	
	menstruation/prevent iron		
	deficiency/anemia		
	(ii) The Aged	1	
	P1 need a lot of protein	1	Max
	P2 for repairing damage tissue	_	5
	P3 need a lot of calcium	1	
	P4 to strengthen the	-	
	bones/prevent osteoporosis	1	
	P5 need a lot of vitamin D	1	
	P6 to prevent osteomalacia	1	
	P7 need a lot of folic acid	1	
	P8 helps synthesise red blood cells	1	
	P9 need a lot of vitamin C	1	
		1	
	P10 to help the strong immune		
	system/collagen synthesis for		
	bones		
(b)	and cartilage Diagram 1.1		Max
(6)	F1 obesity		5
	P1 condition where a person's		3
	body weight exceeds 20% the		
	normal		
	weight P2 excessive consumption of		
	carbohydrate and lipid P3 excess carbohydrates and lipids		
	in the diet are converted into		
	body fat/cholesterol		
	P4 causes them to face a higher		
	risk for cardiovascular		
	disease/hypertension/diabetes		
	mellitus		
	P5 can be overcome by practicing a		
	balanced diet		
	P6 eating not more than what is		
	required by the body		
	Diagram 1.2		
	F2 Anorexia nervosa		
	P1 condition where a person		
	experience an intense fear of		
	gaining		
	weight/recognized as a		
	physiological disorder		
	P2 the weight of individual with		
	anorexia nervosa is 15% or more		
	below the normal body weight		
	,		
	P3 deprive themselves from eating		
	which leads them to experience		
	severe lost of body weight		
	P4 tissue repair cannot take place due to lack of protein		
	·		
	P5 leads to hormone imbalance,		

I	
liver diseases and cardiovascular	
problems	
P6 will experience dehydration and	
can cause irregular periods	Max
P7 early treatment through	5
nutrition and gradual restoration	
of body	
mass	
P8 counseling is also needed to	
help the patient to overcome their	
emotional distress	

2(a)(i)	Mouth /oral cavity	1	3
	Duodenum	1	
	Ileum/small intestine	1	
(ii)	P1- food P in starch	1	7
	P2- (in oral cavity) saliva contains		
	enzyme salivary amylase	1	
	P3-to hydrolyse starch to maltose	1	
	Starch + water → maltose		
	P4-duodenum receive pancreatic		
	amylase from pancreas	1	
	P6-pancreatic amylase completes		
	the digestion of starch to maltose	1	
	Starch + water → maltose		
	P7-(in ileum) intestinal juice	1	
	contains maltase (erepsin, sucrase,		
	lactase)		
	P8-maltase hydrolyse maltose to	1	
	glucose		
	Maltose + water → glucose		
	P9-glucose diffuse into the	1	
	epithelial cells and absorbed into		
	the capillaries (villus)		
	P10-capillaries drain glucose into	1	
	hepatic portal vein, which leads to		
	the liver		
	P11-glucose is distributed	1	
	throughout the body by the		
	circulatory system		
	P12-when the glucose molecules		
	reach the cells, glucose are oxidised		
	to release energy during cellular		
	respiration		
b)	F-(at the end of digestive process)	1	5
'	Food F are hydrolysed / digested		
	into glucose (at ileum)		
	P1-excess glucose is converted into	1	
	glycogen		
	P2-stored in the liver	1	
	P3-when the blood sugar level falls,	1	
	the stored glycogen is converted		
	back to glucose		
	P4-when the glycogen stored in the	1	
	liver is full, excess glucose is		
	converted into lipid by liver		
c)	F-due to the stomach becomes to	1	5
	small the patient has less appetite		
	P1-reduce food intake	1	
	P2-reducing the absorption of	1	
	nutrients from digested food		
		•	

P3-causing the system in the body	1	
takes energy from fat (in the body		
as substitute food that is often		
taken)	1	
P4-leading to weight loss		

3(a)	i)Glukosa		10
	Asimilasi dalam hati P1-Glukosa yang berlebihan ditukarkan kepada glikogen oleh hormone insulin dan disimpan dalam hati	1	
	P2-apabila aras gula dalam darah menurun, glikogen ditukarkan semula kepada glukosa oleh	1	
	hormone glucagon P3-glikogen yang berlebihan akan ditukarkan kepada lipid	1	
	Asimilasi dalam sel badan P4-glukosa dioksidakan untuk membebaskan tenaga melalui respirasi sel	1	
	P5-tenaga diperlukan untuk proses kimia dalam sel (untuk pegecutan otot dan sintesis protein)	1	
	(ii)Asid Amino		
	Asimilasi dalam hati P6-asid amino disintesis menjadi protein plasma	1	
	P7-apabila kekurangan glukosa, hati menukarkan asid amino kepada glukosa	1	
	Asimilasi dalam sel badan P8-asid amino diguna untuk sintesis protoplasma baru/memperbaiki tisu yang rosak	1	
	P9-untuk sintesis enzim dan hormone	1	
	P10-asid amino berlebihan diuraikan oleh hati dan menghasilka urea	1	
	P11-melalui proses pendeaminaan P12-urea diangkat dari hati melalui aliran darah ke ginjal untuk dikumuhkan	1	
	(iii)Lipid		
	Asimilasi dalam sel badan P13-lipid seperti lemak merupakan sumber utama tenaga	1	
	P14-fosfolipid dan kolesterol merupakan komponen utama membrane plasma	1	
(b)	P1-klorofil menyerap tenaga cahaya menyebabkan klorofil teruja	1	6

	P2-dalam keadaan teruja electron		
	boleh meninggalkan molekul	1	
	klorofil		
	P3-tenaga cahaya juga digunakan	1	
	untuk memecahkan molekul air		
	kepada ion hidrogen dan ion		
	hidroksil melalui proses fotolisis air	1	
	P4-ion hidrogen bergabung dengan	1	
	electron yang dibebaskan oleh klorofil untuk membentuk atom		
	hidrogen		
	P5-manakala ion hidroksil	1	
	kehilangan electron dan	_	
	didermakan kepada klorofil untuk		
	membentuk kumpulan hidroksil		
	P6-kumpulan hidroksil akan	1	
	bergabung sesame sendiri untuk		
	membentuk air dan gas oksigen		
	P7-tindakbalas X dikenali sebagai	1	
	tindak balas cahaya		
	Mana-mana 4		
	P8-atom hidrogen (dari tindakbals	_	
	cahaya) digunakan untuk	1	
	menurunkan /mengikat karbon dioksida		
	P9-menyebabkan penurunan	1	
	karbon dioksida kepada glukosa	1	
	berlaku		
	P10-glukosa yang terhasil kemudian	1	
	dikondensasikan untuk membentuk		
	kanji		
	P11-tindak balas Y dikenali sebagai	1	
	tindak balas gelap		
	Mana-mana 2		
(c)	P1-pencemaran udara daripada	1	4
	kilang		
	P2-asap/debu/jelaga (yang tebal)	1	
	P3-menyebabkan keamatan cahaya	1	
	yang diterima oleh tumbuhan		
	kurang // keamatan cahaya yang		
	diserap oleh klorofil		
	P4-debu melekat pada permukaan	1	
	daun (menyebabkan keamatan	1	
	cahaya kurng diserap pleh klorofil/tumbuhan)		
	P5-debu juga menutup bukaan liang	1	
	stoma tumbuhan	-	
	P6-kurang gas karbon dioksida		
	diserap oleh daun	1	
	P7-menyebabkan kadar fotosintesis	1	
	rendah/kurang		
	Mana-mana 4		

4(a)	Reaction in P		6
	F1: Light reaction occur (in P)	1	
	E1: P is grana	1	
	Reaction in Q		
	F2: Dark reaction occur (in Q)	1	
	E2: Q is stroma	1	

			1	
	Differences			
	Reaction in P	Reaction in Q		
	F2: Requires	Does not	1	
	light energy	require light		
		energy		
	E2: To	Need atom H		
	breakdown	to reduce		
	/photolysis of	carbon dioxide	1	
	water			
	molecules			
	E3: To form ion	To form		
	H and ion OH	glucose	1	
	F3: Form ATP	Uses ATP	 	
(b)	F1: Epidermis is tra		1	8
	E1: to allow sunlight	nt to penetrate	1	
	into the leaf			
	E2: Cuticle laver :-	14/2V//14/2+02 2202+1	1	
	E2: To prevent loss	waxy(water proof)	1 1	
	protect the leaf	of water and to	*	
	protect the leaf			
	F3:Cell X/palisade	cells are closely	1	
	arranged and at rig			
	surface of the leaf	3		
	E3: They also conta	ain many	1	
	chloroplasts			
	E4: received/absor	b/trap maximum	1	
	sunlight			
	54. C-11.V/			
	F4: Cell Y/spongy r		1	
	loosely arranged a space	ilu ilas large ali		
	F5: (lower) epiderr	mis laver has	1	
	stomata	ins layer rias		
	E6: support photos	synthesis by		
	allowing exchange		1	M
	F6: veins contain x		1	
	E7: to transport wa		1	
	E8: to transport th		1	
	photosynthesis / (o	uissoivesjorganic		
(c)	product		+	6
(6)	P1: at low light into	ensity rate of	1	O
	photosynthesis lov		*	
	P2: increase light i		1	
	increase the rate of			
	P3: until reach a			
	maximum/saturat	ed point/level	1	
	P4: due to concent	tration of carbon	1	
	dioxide become lir	ū		
	P5: at extreme/vei		1	
	intensity, rate of p	hotosynthesis		
	decrease again	an in ablaration	1	
	P6: because enzym denatured	ie in chioropiast	1	
	achatureu			

-/ `			
5(a)	1-klorofil menyerap tenaga cahaya	1	10
	menyebabkan klorofil teruja	1	
	2- dalam keadaan teruja electron	1	
	boleh meninggalkan klorofil	1	
	3- tenaga cahaya juga digunakan	1	
	untuk memecahkan molekul air		
	kepada ion hidrogen dan ion		
	hidroksil melalui proses fotolisis air		
	4-ion hidrogen bergabung dengan	1	
	electron yang dibebaskan oleh		
	klorofil untuk membentuk atom		
	hidrogen		
	5-manakala ion hidroksil kehilangan	1	
	electron dan didermakan kepada		
	klorofil untuk membentuk		
	kumpulan hidroksil		
	6-kumpulan hidroksil akan	1	
	bergabung sesama sendiri untuk		
	membentuk air dan gas oksigen		
	7-tindak balas X dikenali sebagai	1	
	tindak balas cahaya	_	
	8-tindakbalas Y tidak memerlukan	1	
	cahaya		
	9-atom hidrogen daripada tindak	_	
	balas cahaya digunakan untuk	1	
	mengikat karbon dioksida		
	10-menyebabkan penurunan	1	
	karbon dioksida kepada glukosa		
	berlaku	1	
	11-glukosa yang terhasil kemudian		
	dikondensasikan untuk membentuk		
	kanji serta merta	1	
	12-tindakbalas Y dikenali sebagai	1	
(la)	tindak balas gelap	1	6
(b)	1-dinegara 4 musim, keamatan	1	О
	cahaya /suhu berubah sepanjang tahun		
	2-pada musim sejuk, suhu adalah	1	
	sangat rendah	1	
	I -	1	
	3-pada musim luruh, daun tumbuhan gugur//keamatan	1	
	cahaya/suhu adalah rendah		
	4-kadar fotosintesis adalah sangat	1	
	rendah	1	
	5-pada musim bunga dan musim	1	
	panas, keamatan cahaya/kepekatan	1	
	karbon dioksida/suhu kekal pada		
	tahap optimum untuk fotosintesis		
	6-jadi kadar fotosintesis	1	
	maksimum/paling tinggi pada masa	1	
	ini		
	7-dalam rumah kaca, keamatan	1	
	cahaya/kepekatan karbon	1	
	1 ' ' '		
	dioksida/suhu dikekalkan pada		
	tahap optimum sepanjang tahun 8-menyebabkan kadar fotosintesis	1	
	. Secretive name an Kanar TOTOSINTASIS	1	
	1		
	dikekalkan pada tahap maksimum		
	dikekalkan pada tahap maksimum sepanjang tahun	1	
	dikekalkan pada tahap maksimum sepanjang tahun 9-tumbuhan berupaya	1	
	dikekalkan pada tahap maksimum sepanjang tahun 9-tumbuhan berupaya meningkatkan hasil tanaman /	1	
c)	dikekalkan pada tahap maksimum sepanjang tahun 9-tumbuhan berupaya	1	4

kilang//atau kenderaan/pembakaran membebaskan asap /jerebu tebal 2-asap/jerebu yang tebal menyebabkan keamatan cahaya yang diterima oleh tumbuhan	1	
kurang 3-pencemaran udara daripada aktiviti kuari / pembakaran membebaskan debu yang banyak	1	
4-debu melekat pada permukaan daun menyebabkan keamatan cahaya kurang diserap oleh klorofil/tumbuhan	1	
5-debu juga menutup bukaan liang stoma tumbuhan	1	
6-menyebabkan kadar fotosintesis rendah/kurang	1	

c/ \	1		
6(a)	P1-hydroponic	1	4
	P2-grow plants in culture solution		
	P3-the root of the plants are	1	
	immersed in solution		
	P4-which contains all the	1	
	macronutrients and micronutrient		
	in correct proportion	1	
	P5-culture solution is aerated	1	
	P6-to provide sufficient oxygen for	1	
	respiration		
(b)	Advantages		6
	P1- used to produce disease	1	
	resistant/pest resistant plants		
	P2-less pesticides are used	1	
	P3-less pollution to the	1	`
	environment	1	
	P4-increases yield of crops / profits		
	P5-help to solve problems of	1	
	insufficient food		
	P6-incrase resistance in plant to	1	
	herbicide e.g. soya bean plantation	1	
	P7-higher vitamin A / beta carotene	1	
	content in rice/ etc	1	
	P8- helps to solve problems of	1	
	malnutrition	1	
	P9-produce crops with longer shelf	1	
	life	Any	
	P10-prevent food wastage	4	
	P10-prevent food wastage	4	
	Disadvantages	1	
	Disadvantages	1	
	P11-pest resistant genes may be	1	
	transferred to weeds cause difficult	1	
	to control growth of weeds		
	P12-some genetic modified crops		
	may have animals genes	1	
	P13-genetic modified organisms	1	
	may affect the survival of other	Any	
	organisms in the ecosystem	2	
	P14-cause the imbalance of nature		
c)	Good effects:		10
	1-food can be preserved longer	1	
	2-to prevent food poisoning /	1	

wastage	
3-crops can be planted / poultry	1
can be reared in big scale	
4-to prevent food shortage	, 1
5-to increase commercial values	
easier to be transported	1
6-more varieties of food can be	1
produced	1
Bad effects:	
1-loss of nutrition value (under h	igh 1
temperature during processing)	
2-contin	
preservative/colouring/dye whic	h is 1
carcinogenic	
3- leas to mutation/ cancer/heal	th 1
problems	
4-contain excessive salt/sugar	1
5-leads to high blood	1
pressure/obesity	

a)Objective

1.	b.	2.	В	3.	Α	4.	С	5.	С
6.	D	7.	В	8.	Α	9.	D	10.	С
11.		12.	C	13.	Α	14.	В	15.	В
16.	Α	17.	Α	18.	D	19.	В	20.	В
21.	D	22.	D						

1	P1- the phospholipid molecules can	1	1
a(i)	move, making the plasma membrane		
	fluid		
	P2-the protein do not form a	1	
	continuous layer but are scattered in		
	the plasma membrane giving it a	Any	
	mosaic appearance	1	
(ii)	P1-faccilitated diffusion occurred	1	2
	P2-the glucose molecule binds to the		
	specific binding site of a carrier	1	
	protein		
	P3-the carrier protein alters its shape	1	
	and the glucose molecules is moved		
	by the carrier protein into the cell		
(b)(i)	Gills	1	1
(ii)	Gill filament	1	1
(iii)	Adaptation		
	F1-Filament have numerous thin	1	2
	walled lamellae // network of blood		
	capillaries		
	Explanation		
	E1-to increase surface area for		
	gaseous exchange // to transport	1	
	respiratory gases efficiently		
(iv)	P1-dissolved oxygen in the water	1	2

	diffuses into blood capillaries in the gill filaments While, P2-carbon dioxide diffuses out through the gill capillaries into the water	1	
c(i)	blood capillaries in the gills kapilari darah di dalam insang deoxygenated blood darah terdeoksigen blood capillaries in the body tissue kapilari darah di dalam tisu badan	1	1
(ii)	F1-Fish have closed circulatory system Or	1	2
	F2-fish have single circulatory system	1	
	E1-oxygentaed blood flows from the gills to the cells directly	1	

2.(a)(i)	X : oksigen	1	2
	Y: karbon dioksida	1	
(ii)	F1:alveolus mempunyai	1	2
	dinding yang nipis/ setebal		
	satu sel		
	E1: gas boleh meresap	1	
	masuk dan keluar melalui		
	dinding lebih cepat		
	F2:permukaan (dalaman)	1	
	alveolus lembap		
	E2:membenarkan oksigen	1	
	untuk larut sebelum		
	meresap keluar		
	F3:permukaan luar alveolus	1	
	diliputi oleh jalinan kapilari		
	darah		
	E3:meningkatkan luas	1	
	permukaan untuk		
	penyerapan gas yang lebih		
b)	cepat F1: kepekatan gas X dalam	1	2
D)	salur darah Q adalah	1	2
	rendah berbanding dengan		
	gas Y		
	E1: oksigen telah digunakan	1	
	oleh sel badan untuk	_	
	respirasi sel		
	E2:respirasi sel		
	membebaskan gas Y	1	
C)	F1: Asap rokok	1	3

	mengandungi karbon monoksida		
	E1: karbon monoksida		
	mempunyai keupayaan	1	
	yang tinggi untuk	_	
	bergabung dengan		
	haemoglobin berbanding		
	oksigen		
	E2: oleh itu, kurang oksigen	1	
	akan bergabung dengan	_	
	haemoglobin untuk		
	penghantaran dalam salur		
	darah P		
d)	E1: Kepekatan karbon	1	3
	dioksida yang tinggi		
	merendahkan nilai ph darah		
	E2: pH yang rendah dikesan	1	
	oleh kemoreseptor		
	pusat/kemoreseptor		
	peripheral		
	E3:impuls dihantar ke pusat	1	
	respirasi dank e otot		
	kardiak/otot		
	interkosta/diafragma		
	E4: meningkatkan kadar	1	
	denyutan jantung dan kadar		
	pernafasan		
	E5: untuk menyingkirkan	1	
	karbon dioksida berlebihan		
	(oleh itu, peratusan karbon dioksida kemmbali normal)		

3.(a)(i	Lungs	1	1
ii)	Gaseous	1	1
	exchange//respiration		
b)	Diagram 3.1	1	Ma
	F1-oxygen diffuse from		x 2
	alveolus into blood		
	capillaries	1	
	E1-Oxygen		
	concentration/partial		
	pressure in alveolus is		
	higher than in blood		
	capillaries	1	
	F2-carbon dioxide diffuses		
	from blood capillaries to the		
	alveolus		
	E2-carbon dioxide	1	
	concentration / partial		

	-	pressure in blood capillaries				
	is higher tha					
	Diagram 3.2 F1-oxygen d					
	mesophyll ce					
	E1-oxygen d	iffuses into the	1			
	•	een mesophyll				
	cells through					
		oxide diffuses	1			
	out from the	lls/mesophyll				
		leaves to the	1			
	atmosphere					
	E2-carbon di	ioxide		Ma		
	concentration	•		x 2		
	*	olood capillaries				
	is higher tha	n in alveolus	1			
c)	Human	Plant		2		
	Alveolus	Leaf	1			
	Carry out	Carry out				
	respiratio n	photosynthe sis	1			
	Absent of	Presence of	1			
	chloroph	chlorophyll				
	yll .	. ,				
d)	E1-carbon m	onoxide	1	Any		
		haemoglobin		4		
	to form	1	1			
	carboxyhaer		1			
	E3-less oxyg with haemog	1				
	E4-tobacco	1				
	deposited					
	E5-reduce di					
,	E6-heat from smoke					
		urface of alveoli	1			
	E8-oxygen ca	annot be	4			
	dissolved		1			

4.(Pore M / Liang M : Stoma /	2	2
a)	Stoma		
	Pore N / Liang N : Lenticel /		
	Lentisel		
(b)	Pore M	2	М
	P1- (During day time) stoma/M		ax
	(on the epidermis of the leaf)		2
	opens		
	P2-Oxygen from the		

	tmacah	oro diffus	es (through		
	tinospii toma)	ere umus	es (tillough		
	,	ir cnacac			
	P3-into air spaces P4- then into mesophyll cells				
			entration		
	radient	Tille conc	entration		
اع	iadiciic				
Р	ore N				
P	1-Oxyge	en from th	ie		
a	tmosph	ere diffus	es (through		
le	enticel)				
		ir spaces			
P	3-betwe	een cork c	ells which are		
	•	rranged			
			to the cells at		
		and (old)			
- 1			unk in water	2	2
1 -		lant carrie			
	anaerobic respiration				
	P3-Glucose is broken down in				
	the absence of oxygen				
	4-Less g	aseous ex	cnange		2
(ii)	Organ	Logues	Doots		2
	Organ Produc	Leaves Energy	Roots Energy/ATP,e		
	ts of	(ATP),ca	thanol and		
	respira	rbon	carbon		
	tion	dioxide	dioxide		
		and water			
d) T	o living	organisms	<u> </u>		1
P	P1-Cannot carry out respiration		1		
P	2-No ox	ygen rele	ased by the	1	
р	lant				

1	F1: Spiracles have valves which can open and close	1	4
(a)	E1: to allow air to go in and out of the	1	
	body F2: trachea are lined with ring of chitin E2: chitin is strong to which prevent	1	
	them collapse F3: air sac to assist the control of air	1	
	pressure in the body		
	E3: speed up movement of gases (to and from tissues during vigorous body	1	
	movement)	1	
		М	
		ax	
		4	
(b)	Organism Q/insect:		6
	P1: each muscle cell in the body of the	1	
	insect has one tracheole which can		

	P2:the trach	gen directly to the eole has a thin wal asy diffusion of res	l which	1	
	P3: the track layer so that dissolve in it		can	1	
	provides a la	mber of tracheoles arge surface area fo		1	
	exchange			A n	
	Organism R	/Fish		у	
	P1:Numerous of filament and lamellae which increase the total surface area (for efficiency of gaseous exchange in				
	fish)			1	
		ne of gills is thin w respiratory gases (i			
	(abundant) l	nent is supplied wit blood capillaries (fo	or	1	
	•	gaseous exchange gares	e and) to	1	
	•	nent is surrounded	by water	1	
		es the respiratory a	gases to	A	
	dissolve eas	iiy		n y	
				3	
(c)		urface area to volu		1	4
	exchange			1	
	F2: cells linir	ng the respiratory s	structure	1	
		s gas diffusion to ta	ke place	1	
	efficiently	ce of respiration st	ructures	1	
	are moist	ce of respiration st	ructures		
		the respiration gas	ses to	1	
	dissolve in				
	-	rect and E correct correct, E incorrect			
	Differences				
4	Characteris tics	P/ Human	Q/ Fish		
	Respiratory organ	Lungs	Gills	1	
	Respiratory structure	Alveoli	Filament/ Lamellae	1	6
	Respiratory	Nostrils	Mouth &	1	
	openings		operculu m	1	
	Network of blood	Alveoli are rich with blood capillary	Filament/l amellae	1	
	capillary		are rich with blood		
	Air passage	Nostrils>trachea>br onchi>bronchioles>	capillary Mouth>op erculum	1	
		alveoli	cavity>gill s and		
			lamellae>		
			operculu m		
	Other	Diaphragm, rib cage	Operculu		

structures which help in external respiration	and intercostal muscle	m & the muscular wall of floor buccal	1	
		cavity		

2(a)	P1-The frog lower the bottom level		4
	of the bucco-pharyngeal		
	(mouth) cavity		
	P2-Glottis closes		
	P3-The volume of bucco-pharyngeal		
	(mouth) cavity increases		
	P4-The pressure of bucco-		
	pharyngeal (mouth) cavity decreases		
	P5-Air is drawn into the bucco-		
	pharyngeal (mouth) cavity		
	P6-The nostril closes		
	P7-Glottis opens		
	P8-The floor of bucco-pharyngeal		
	(mouth) cavity is raised		
	P9-The pressure of bucco-		
	pharyngeal (mouth) cavity increases		
	P10-Air is drawn into the lung		
(b)(i)	F1-Both have thin wall	1	4
	P1-Allow rapid exchange of gases	1	
	F2-Both have moist surface	1	
	P2-For oxygen to dissolve	1	
	F3-Both are numerous in numbers	1	
	P3-Increase the surface area	1	
	P4-More exchange of gases	1	
	(F1 + P1 / F2 + P 2 / F3 + P3+ P4)		
(ii)	P1-The abdominal muscles relax	1	6
	P2-Spiracles are open	1	
	P3-Air pressure in the abdominal	1	
	cavity decreases		
	P4-Air / oxygen is drawn into the	1	
	trachea		
	P5-Air/oxygen enters tracheol	1	
	P6-Oxygen dissolve in the fluid(at		
	the end of the tracheol)	1	
	P7-(dissolved) oxygen diffuse into	1	
-\	the body cells	1	
c)	P1-Carbon dioxide diffuses into	1	6
	blood plasma	1	
	P2-Carbon dioxide diffuses into red	1	
	blood cells P3-Carbon dioxide reacts with water	1	
	(in the red blood cell)to form	1	
	carbonic acid		
	P4-Carbonic acid dissociates to form	1	
	hydrogen ions and	1	
	bicarbonate ions	1	
	P5-Bicarbonate ions diffuse from the	_	
	red blood cells into the		
	blood plasma	1	
	P6-(In the lungs), the bicarbonate	-	
	ions diffuse into the red blood		
	cells		
	P7-To form carbonic acid	1	
	P8-Carbonic acid breaks down into		
	carbon dioxide and waterP8-		

P9-Carbon dioxide diffuses out from	1	
the red blood cells		

	P1-semasa aktiviti respirasi / denyuta	_	1	6
	meningkat P2-otot berada dal		1	
	P3-respirasi anaero		1	
	P4-pengoksidaan s kepada asid laktik		1	
	P5-tenaga yang dik kurang/sedikit/2 A	TP/ 150 kJ	1	
	P6- masih banyak t terperangkap dian laktik		1	
(b)	iaktik			
	Respirasi	Respirasi		
	aerob	anaerob		
	Berlaku pada	Berlaku pada		4
	semua sel	sel tumbuhan	1	
	hidup	tertentu, yis,		
		bakteria, sel		
		otot		
	Memerlukan	Tidak	1	
	kehadiran	memerlukan		
	oksigen	kehadiran		
		oksigen		
	Pengoksidaan	Pengoksidaan	1	
	glukosa	glukosa tidak		
	lengkap	lengkap	1	
	Menghasilkan	Menghasilkan	1	
	karbon	asid laktik dan		
	dioksida, air	tenaga (dalam		
	dan tenaga	otot) atau		\mathbf{M}
		etanol, karbon		
		dioksida dan		
		tenaga (dalam yis)		
	Lebih banyak	Kurang tenaga	1	
	tenaga	dibebaskan /		
	dibebaskan /	2ATP/150Kj		
	38ATP/ 2898 kJ	2 11 11	1	
	Berlaku dalam	Berlaku dalam	1	
	mitokondria	sitoplasma		
	dan sitoplasma			
		Mana-mana 4		
(c)	P1-tekanan separa		1	3
	rendah	okolgen ar i	1	
l	P2-tekanan separa	oksigen di Q		
	tinggi	.	1	
	P3-tekanan separa	oksigen di R		
	tinggi		1	
	Pengangkutan oks	-		7
	P1-oksigen diangkı		1	
	/alveolus ke seluru	ıh bahagian badan		
			1	i
	/ sel			
	/ sel P2-oksigen bergab haemoglobin di eri		1	

P3-membentuk oksihaemoglobin	1	
P4-oksihaemoglobin dibawa ke		
sel/tisu badan	1	
P5-oksihaemoglobin terurai kepada		
haemoglobin dan oksigen	1	
P6-oksigen meresap ke sel badan	1	
(untuk respirasi sel)		
Mana-mana 4		
Pengangkutan karbon dioksida		
P1-karbon dioksida diangkut dari sel	1	
ke peparu /alveolus		
P2-dalam bentuk ion hidrogen	1	
karbonat dalam plasma		
P3-larut dalam plasma darah	1	
P4-bergabung dengan haemoglobin		
membentuk karbaminohaemoglobin	1	
P5-apabila darah tiba ke peparu,		
karbon dioksida dibebaskan dan	1	
meresap keluar daripada kapilari		
darah ke alveolus		
Mana-mana 3		

4(a)	Individual X		6
	F1-Anaerobic respiration / no oxygen	1	
	required		
	P1-occur in cytoplasm	1	
	P2-the glucose is partially oxidised	1	
	P3-release less energy / 150kj of	1	
	energy (per mole of glucose)		
	P4- produce lactic acid	1	
	•		
	Individual Y		
	F2-aerobic respiration / requires	1	
	oxygen		
	P5-occurs in mitochondria (and	1	
	cytoplasm)		
	P6-glucose is completely oxidised	1	
	P7-release higher energy /2898kj of		
	energy (per mole of glucose)	1	
	P8-produce carbon dioxide and	1	
	water		
(ii)	Wears track suit		
, ,	F-to prevent loss of heat	1	6
	P1-heat that traps by the track suit is	1	
	used to maintain the body		
	temperature		
	P2-less oxygen is used to produce	1	
	heat and the oxygen can be used to		
	oxidise lactic acid		
	Takes a few long deep breaths		
	F – obtain more oxygen	1	
	P3- to pay oxygen debt	1	
	P4 – oxygen is used to breakdown	1	
	lactic acid	-	
	Walks freely as a "cooling down"	1	
	activity	_	
	F-to maintain the blood circulation	1	
	rate (to transport the lactic acid to	_	
<u> </u>			

	the liver)		
	P5-to ensure that oxygen is supplied	1	
	continuously to the muscle cells		
b)	P1-the mountain climber is carrying	1	6
	/wearing the oxygen supply		
	equipment / respirator		
	P2-as the altitude increase, the	1	
	atmospheric pressure decrease		
	P3-the partial pressure / amount of	1	
	oxygen decrease as well		
	P4-low atmospheric pressure cause	1	
	less air is drawn into the lungs		
	P5-the mountain climber facing lack	1	
	of oxygen (in the body)		
	P6-oxygen supply equipment /		
	respirator supply enough oxygen for	1	
	the body		
	P7-(it also) assists in maintaining the	1	
	pressure of the lungs		
	P8-the mountain climber also	1	
	wearing thick clothes		
	P9-as altitude increase, the	1	
	temperature decreases	1	
	P10-thick clothes help the climber to	Any	
	maintain the body temperature	6	

OTT A			
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a)Objective

1.	D	2.	D	3.	U	4.	Α	5.	В
6.	C	7.	Α	8.	В	9.	U	10.	D
11.	Α	12.	С	13.	В	14.	С	15.	С
16.	С	17.	С	18.	С	19.	D	20.	В
21.	Α	22.	Α						

1(a)	i. 50kj	1	2
	ii. 5kj	1	
(ii)	Tenaga hilang kepersekitaran melalui		2
	P1 - proses respirasi		
	P2 - pembuangan bahan kumuh melalui	1	
	air kencing		
	P3 – pembuangan bahan kumuh	1	
	melalui penyahtinjaan		
	Mana-mana 2	1	
B(I)	Komponen Biotik :Tumbuhan, ikan,	1	2
	penyu, katak, alga –		
	Komponen abiotic :Udara, Air,	1	
	cahayamatahari, pH tanah-		
(11)			3
	Pepatung Katak		
	Burung		
	Rumput Ikan kecil Ikan besar		
	Cacing		
c)	P1 – Pertumbuhan alga menghalang	1	3

kemasukan cahaya		
matahari ke dalam sungai	1	
P2- Menghalang proses fotosintesis		
P3-Oksigen akan berkurang	1	
P4-Organisma akan mati	1	
Mana-mana 3		

2(a)	1.Light intensity	1	2
	2.temperature	1	
(b)	total number of individuals of species in all quadrat Quadrat area x num of quadrats		2
	$=\frac{28}{4\times5}$	1	
	=1.4 per meter square	1	
(c)	F: light intensity	1	3
	E1:more light energy absorb by chloroplast in <i>Colocasia</i> leaf	1	
	E2: rate of photosynthesis high	1	
	E3: cause growth rate high	1	
(d)	F1: pond water become toxic	1	3
	E1: damage the roots of plants in the pond	1	
	E2:decrease the growth rate of plant Or F2:insecticide contain carcinogenic	1	
	compound E1: lead to mutation in plant	1	
	E2: due to gene alteration / change in DNA	1	
		1	
e)	F1: Used biological method /prey and predator	1	2
	E1: using bird as predator to eat prey / grasshopper	1	_
	F2:using lime powder/ calcium carbonate /dolomite	1	
	E2: neutralise acidic condition in pond	1	

3(a)(i)	An ecosystem is a community of organisms / biotic components whichinteract with their non-living environment/abiosis components.	1	1
(ii)	Squirrel eat fruits from the tree // big bird eat mouse in the garden.	1	1
b(i)	grass owl owl		2

(ii)	owl bird snail Tree		2
C(i)	C1: 10% x 1500 kJ	1	2
	C2 : = 150	1	
(ii)	P1 lost to atmosphere as heat energy P2 used to decompose dead matter (by	1	2
	decomposer) P3 used to carry out metabolism	1	
	reaction in cells P4 respiration	1	
		1	

4a)	L: Sonneratia sp	1	2
	M : Rhizophora sp	1	
	Zon K//Zon L	1	1
	Zon K : Avicennia sp // Zon L :	1	1
	Sonneratia sp		
	F1 : Spesies perintis memerangkap	1	2
	sampah sarap / lumpur		
	P1 :Kerana mempunyai akar	1	
	pneumatofor / akar jangkang		
	P2 :Tebing menjadi tinggi / keras /	1	
	padat/ kurang subur		
	P3 :yang tidak sesuai lagi untuk	1	
	spesies perintis tetapi sesuai untuk		
	spesies penyesar		
C(i)		1	3
	Zon 1		\
	Zon 2	1	
	Zon 3	1	
	Zon 3		
/::\	And and contact timely their department	1	3
(ii)	-Apa-apa contoh tumbuhan daratan /	1	3
	Hutan hujan tropika		
	-kerana selepas 100 tahun kawasan	1	
	tersebut telah pun mencapai klimaks komuniti	1	
		1	
	-di mana spesies penyesar telah	1	
	berjaya mendominasi kawasan tersebut		
	tersebut		

5(a)	The capture and recapture	1	1
	technique.		
B(i)	Mark the specimens using a non-	1	1
	toxic permanent ink marker.		
(ii)	-The mark must not be lost and must	1	2
	not inhibit normal body activities.		
	-The mark does not prevent the rat	1	
	from randomly mixing with the other		
	unmarked rats.		
c)	Population = (100 x 140) / 40	1	2
	= 350 rats	1	

time for the	1	1
I and mixing among		
pulation.		
ze of population		2
hs can be caused		
ber of the rats due	1	
th rate.		
nber of the rats due	1	
ats, diseases or		
ors.	1	
igration or		
ie rats.		
ilizer in the river	1	4
d by the algal cells.		
occur	1	
and reproduce		
completely cover	1	
the light for plants	1	
them, which causes		
acteria acting on the	1	
algae compete for		
e water.		
and other organisms	1	
ue to the lack of		
	al and mixing among opulation. Ize of population which can be caused where of the rats due the rate. It is in the rate of the	all and mixing among opulation. ize of population this can be caused there of the rats due the rate. inber of the rats due ats, diseases or ors. igration or the rats. illizer in the river do by the algal cells. occur and reproduce completely cover the light for plants them, which causes the algae compete for e water. and other organisms 1

1(a)(i	P1: The Quadrat Sampling Technique	1	6
)	P2: Percentage coverage is an indication	1	
	of how much area of the quadrat is		
	occupied by a species.//Percentage		
	coverage is useful when it is not		
	possible to identify separate individuals.		
	P3: A clear trunk, without any boughs	1	
	and has a lot of Pleurococcus sp		
	colonies on the bark is selected.		
	P4: The rope is tied around the trunk at	1	
	the level with a lot of colony of		
	Pleurococcus sp .		
	P5: The distance of the rope from the	1	
	ground is measured (x m)		
	P6: A translucent Quadrat frame of 10	1	
	cm x 10cm in size is used for sampling.		
	P7: The quadrat is placed on the bark at		
	different aspects A,B,C,D and E	1	
	(to determine the percentage coverage)		
	P8: Each small quadrat is 1% or 1cm2.	1	
	Only squares that are covered by half or		
	more than half of the		
	species are counted	1	
	P9: The squares that are covered by less		
	than half are omitted.	1	
	P10: Percentage coverage for all		
	quadrats is estimated by using :	1	
	= <u>aerial coverage of all quadrats (m2)</u> x 100% number of quadrats x quadrat area		

(ii)	p1: At B population size/percentage coverage of Pleurococcus sp is high //at A and E Percentage coverage of Pleurococcus sp is lower.	1	6
	P2: At B Light intensity is optimum for Pleurococcus sp to carry out photosynthesis at maximum rate.	1	
	P3: At B the growth rate of Pleurocccus sp is higher	1	
	P4: At A, Light intensity is very high , dehydrate the cells of the Pleurococcus sp /less moist	1	
	P5: At A, not suitable for the growth of Pleurococcus sp/the growth rate	1	
	of Pleurocccus sp is low P6: At E, light intensity is low, the rate of photosynthesis is low	1	
	P7: At E, the growth rate of Pleurocccus sp is low		
B(i)	P1: Vector that transmit pathogen disease is Aedes (aegypti betina)	1	6
	/Aedes sp mosquito P2: Pathogen that cause dengue fever is virus,	1	
	P3: Dengue viruses are transmitted to humans (host) through the bites of the (female striped) Aedes (aegypti) mosquito (vector).	1	
	P4: These mosquito breeds easily during	1	
	the rainy seasons / fresh water / any suitable example / e.g. water that is stored in plastic bags / cans /		
	flowerpots / old tires. P5: causes / able to state any symptom: - High fever (104 F, 40°C) with severe	1	
	body pain and rashes over parts of the body// deep muscle and		
	joint pains (during first hours of illness) and Chills	1	
	- Severe headache and vomiting/nausea- Red eyes, pain in the eyes		
	- Enlarged lymph nodes Loss of appetite - Low blood pressure and heartbeat		
	rate - Extreme fatigue		
(ii)	[Any 3 symptoms] F1: keep environment clean		5
	P1: by carrying out "gotong-royong" (in local community)		
	P2: bury cans / bottles / old tyres / any example in the ground to avoid		
	water retention F2: control the population of Aedes		
	mosquitoes larvae P3: put medication to kill the larvae /		
	abate / spray insecticides (reject: mention the brand / Ridsect)		
	F3: Awareness campaign P4: carry out poster / colouring		
	competition / talks / educate people	<u> </u>	

about	
the importance of health / any suitable	
example	
F4: Restrict laws / Laws enforcement	
P5: compound / jail / any reasonable	
punishment	

2/2\/:\	F komonsolismo		4
2(a)(i)	F-komensalisme	1	4
	P1- orkid ialah komensal / epifit	1	
	manakala pokok adalah perumah	4	
	P2-komensal /epifit mendapat	1	
	keuntungan makanala perumah		
	tidk mendapat keuntungan atau		
	kerugian	1	
	P3-orkid mendapat keuntungan //		
	tidak mengancam perumah		
	P4-dengan menumpang pokok	1	
	lebih tinggi, orkid mendapat lebih		
	banyak cahaya untuk fotosintesis		
	[F + mana-mana 3P]		
(ii)	P1-Burung hantu adalah pemangsa	1	6
, ,	dan tikus adalah mangsa		
	P2-peningkatan mangsa		
	menyebabkan peningkatan	1	
	pemangsa	_	
	P3-ada makanan (mangsa)//lebih		
	banyak makanan (mangsa) dalam	1	
	habitat	1	
	P4-apabila pemangsa memburu	1	
		1	
	mangsa sebagai makanan, bilangan		
	mangsa akan berkurang.		
	P5-apabila populasi mangsa	_	
	berkurang, populasi pemangsa	1	
	juga akan berkurangan		
	P6-makanan berkurangan	1	
	P7-pengurangan pemangsa	1	
	menyebabkan mangsa dapat terus		
	hidup dan membiak.Oleh itu		
	populasi mangsa akan meningkat		
	kembali	1	
	P8-kitaran populasi akan berulang		
	dan dikatan sebagai keseimbangan		
	dinamik		L
c)	E1-R/Nitrogen fixing	1	10
	bacteria/Azotobacteria sp./Nostoc		
	sp./Clostridium sp./Rhizobium sp		
	E2-convert nitrogen into		
	ammonium compound	1	
	E3-S/nitrifying	1	
	bacteria/nitrosomonas sp convert	-	
	ammonium compounds into		
	nitrites	1	
		1	
	E4-T/nitrifying bacteria /		
	nitrobacter sp. convert nitrites into	4	
	nitrates	1	
	E5-(Nitrate) are absorbed by plants		
	to make protein	1	
	E6-when animals eats the plants,		
	the protein is transferred to the		
	animals	1	

E7-waste materials / faeces/ urea/		
excretory nitrogenous plants	1	
E8-when animals/plants die	1	
E9-are decomposed by U/		
decaying bacteria/saprophytic	1	
bacteria/fungi		
E10-break them down to	1	
ammonium compound in the soil		
E11-V /denitrifying bacteria		
converts nitrates into nitrogen		

	, ·	
3(a)	P1 : The mangrove zone become	Any
	broader towards the sea from	10
	their original	
	position (from 1995 to 2015)	
	P2 : Colonisation and Succession	
	has occurred	
	Pioneer species:	
	P3 : Avicennia sp /Zone A colonies	
	of open area, exposed to the sea	
	waveand wind.	
	P4 : Sonneratia sp/Zone A colonies	
	at shady area , not exposed to the	
	seawater.	
	P5 : Avicennia sp / Zone Ahas	
	cable root system to withstand in	
	the soft and muddy soil and wave	
	action. P6:The roots of the pioneer	
	species trap the mud, causing the	
	, , ,	
	soil to become more compact / soil level increases	
	P7: (as the soil increases)	
	exposure to the tides and this	
	makes the soil unsuitable for the	
	pioneer species.	
	pioneer species.	
	Primary successor	
	P8: Rhizophora sp / Zone B	
	replace Avicennia sp / Zone A	
	P9: Rhizophora sp / Zone B has	
	prop root	
	P10: The roots of the primary	
	successor species trap the mud,	
	causing the soil to become more	
	compact / soil level increases	
	P11: (as the soil increases)	
	exposure to the tides and this	
	makes the soil unsuitable for the	
	primary successor species.	
	, , , , , , , , , , , , , , , , , , , ,	
	Secondary successor	
	P12: Bruguiera sp / Zone C replace	
	Rhizophora sp / Zone B	
	P13 : when the land become	
	higher/ firm	
	P14: Bruguiera sp / Zone C is a	
	larger species.	
	Climax community:	
	P15: (As the time passed),	

	•	
	terrestrial plants such as Nypa sp/	
	pandanus sp began to replace	
	Bruguiera sp. /Zone C	
	P16: Tropical rain forest develops	
	(Any 10)	
b)	P1 : natural biodegradation	10
	process	
	P2 : add a chemical/ oil spill	
	dispersants to the oil spill	
	P3 : increase the surface area of	
	oil molecule	
	P4 : stimulate the growth of	
	bacteria	
	P5 : bacteria digest the oil spill	
	P6 : by using enzyme lipase	
	P7 : the oil will be broken down	
	into small molecule	
	P8 : by using natural fibre from	
	plant /e.g wild lemon grass	
	P9 : as an absorbent	
	P10: absorb and coagulate the oil	
	P11: the combination of fibre and	
	oil will not harm other organism in	
`	mangrove ecosystem.	
	P12 : physically removing the oil	
	like using scoops	
	P13 :Law enforcement to the oil	
	company to fully responsible for	
	the	
	cleaning of affected mangrove	
	swamp.	
	(Any 10)	

4(a)(i)	F1: colonization is a process by	1	2
	which living organisms conquer or		
	occupy a new area that has never		
	been occupied by other organisms		
	F2: succession is the process of	1	
	replacing a species by other species		
	gradually and sequentially		
(ii)	P1: the pioneer species in the pond	1	8
	is aquatic plants / phytoplankton/		
	algae/submerged plants /Hydrilla		
	sp/, cabomba sp./elodea sp		
	P2: these plants have fibrous roots	1	
	to penetrate deep into the soil to		
	absorb nutrients and bind sand		
	particles together		
	P3: when the pioneer species die	1	
	and decompose, more organic		
	nutrients/ humus are released into		
	the pond		
	P4: the humus / and soil which	1	
	erode from the pond apron are		
	deposited at the base of the pond		
	and this causes the pond to become		
	shallow		
	P5: the condition becomes	1	
	unfavourable for submerged plants		
	but more suitable for floating plants		
	/ duckweeds (Lemna sp.)/ water		

	hyacinths (Eichornia sp.)/ Lotus		
	plants (<i>Nelumbium</i> sp.)		
	P6: the floating plants spread to		
	cover a large area of the water	1	
	surface and prevent sunlight from		
	reaching the submerged plants		
	P7: as a result, the plants die	1	
	because they cannot		
	photosynthesise		
	P8: the decomposed remains of	1	
	submerged plants add more organic		
	matter to the base of the pond		
	P9: as a result, the pond becomes		
	more and more shallow which	1	
	makes it unsuitable for the floating	_	
	plants		
	P10: the floating plants are	1	
		1	
	subsequently replaced by emergent plant / sedges/ cattails		
	. , , , , , , , , , , , , , , , , , , ,		
	P11: the emergent plants grow		
	from the edge of the ponds	1	
	towards the middle of the pond as		
	the pond becomes more shallow		
	P12: the condition of the pond now	1	
	becomes more favourable for land		
	plants / small herbaceous weeds		
	/Ageratum conyzoides, / euphorbia		
	hirta / oldentandia dichotoma.		
	P13: as time passes, the land		
	becomes very much drier	1	
	P14: land plants such as shrubs,		
	bushes and woody plants become	1	
	more numerous		
	P15: a jungle emerges and		
	. =		
	eventually turns into a tropical	1	
	, ,	1	
	eventually turns into a tropical	1	
(b)	eventually turns into a tropical rainforest which also known as	1	8
(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very		8
(b)	eventually turns into a tropical rainforest which also known as climax community		8
(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very high content of nitrates /		8
(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very high content of nitrates / phosphates dissolved in rain water / flow into the pond		8
(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very high content of nitrates / phosphates dissolved in rain water / flow into the pond P2: enhances the growth of algae /	1	8
(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very high content of nitrates / phosphates dissolved in rain water / flow into the pond P2: enhances the growth of algae / causes alga to grow rapidly	1	8
(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very high content of nitrates / phosphates dissolved in rain water / flow into the pond P2: enhances the growth of algae / causes alga to grow rapidly P3: which leads to eutrophication //	1	8
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(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very high content of nitrates / phosphates dissolved in rain water / flow into the pond P2: enhances the growth of algae / causes alga to grow rapidly P3: which leads to eutrophication // algal bloom P4: the alga covers the surface of the pond and blocking sunlight to	1	8
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(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very high content of nitrates / phosphates dissolved in rain water / flow into the pond P2: enhances the growth of algae / causes alga to grow rapidly P3: which leads to eutrophication // algal bloom P4: the alga covers the surface of the pond and blocking sunlight to penetrate into the water P5:causes aquatic plants rate of photosynthesis lower P6: less oxygen released P7: aquatic organism's rate of photosynthesis lower P8:(aquatic organism competing with the algae for oxygen P9: leads to death of aquatic organism P10: rate of decomposition by bacteria higher	1 1 1 1 1 1 1	8
(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very high content of nitrates / phosphates dissolved in rain water / flow into the pond P2: enhances the growth of algae / causes alga to grow rapidly P3: which leads to eutrophication // algal bloom P4: the alga covers the surface of the pond and blocking sunlight to penetrate into the water P5:causes aquatic plants rate of photosynthesis lower P6: less oxygen released P7: aquatic organism's rate of photosynthesis lower P8:(aquatic organism competing with the algae for oxygen P9: leads to death of aquatic organism P10: rate of decomposition by bacteria higher P11:less oxygen dissolved in water	1 1 1 1 1 1 1 1	8
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(b)	eventually turns into a tropical rainforest which also known as climax community P1: excess fertilisers which has very high content of nitrates / phosphates dissolved in rain water / flow into the pond P2: enhances the growth of algae / causes alga to grow rapidly P3: which leads to eutrophication // algal bloom P4: the alga covers the surface of the pond and blocking sunlight to penetrate into the water P5:causes aquatic plants rate of photosynthesis lower P6: less oxygen released P7: aquatic organism's rate of photosynthesis lower P8:(aquatic organism competing with the algae for oxygen P9: leads to death of aquatic organism P10: rate of decomposition by bacteria higher P11:less oxygen dissolved in water	1 1 1 1 1 1 1 1	8

a)Objective

1.	D	2.	D	3.	Α	4.	C	5.	В
6.	D	7.	D	8.	D	9.	В	10.	Α
11.	С	12.	С	13.	Α	14.	Α	15.	В
16.	В	17.	В	18.	В	19.	Α	20.	С
21.	В	22.	Α						

1(a)(i)	15 km	1	1
(ii)	P1-Water pollution P2-Pesticide/ herbicide / fungicide/ insecticide	1	2
	OR P1-Eutrophication P2-Faeces / fertilizer's	1	
b)	Population R S T T flish population (un Analysis) o Logistina with any unit) Daysen Backeria Backeria Backeria Backeria Backeria Backeria Backeria Backeria Backeria Backeria Backeria	1	2
	Oxygen level in the water drops, they die / their population decrease.	1	
c)	Agriculture activities releases fertilizer / nitrates / phosphates o Decomposition of the waste product/ sewage release mineral / ions	1	4
	o Leaching / Washing down the fertilizers and ions/minerals into the river, accelerate / promotes alga and aquatic plant growth/algal blooming	1	
	o Prevent penetration of sunlight into the river and inhibit photosynthesis process o Oxygen content decrease, aquatic	1	
d)	organisms die. High agriculture sewage provides food / organic substances for		3
	microorganisms o Encourages the population of bacterial in the river.	1	
	o There is increase in oxygen consumption by the bacteria / High BOD	1	
	o Therefore the oxygen content in the river decrease	1	

2(a)	Greenhouse effect	1	1
(b)	P1-deforestation reduces the	1	4
	number of trees		

			_
	P2-less photosynthesis	1	
	P3-less carbon dioxide absorbed by	1	
	trees		
	P4-accumulation of carbon dioxide	1	
	in the atmosphere		
	P5-trap the heat		
	P6-increase the earth temperature		
	P7-global warming		
c)	P1-limit deforestation	1	3
	P2-limit open burning	1	
	P3-replanting	1	
	P4-use alternative source of energy		
	(solar energy)/hybrid car	1	
	P5:car pool	1	
	P6:use public transport	1	
d(i)	Drought	1	1
(ii)	F1:crop yields decreases	1	3
	P1:water content in the soil	1	
	decreases		
	P2:depletion of minerals (in the	1	
	soil)		
	P3: the soil becomes infertile	1	
	(F + Any 2ps)		

1.(a)	Good Effect	10
	G1: Build / Develop residence to	
	accommodate the increase in	
	population.	
	G2: Industrial / factory to increase	
	job opportunities / increase the	
	income/ economic.	
	G3: Develop road system to	
	shorten travelling time / reduce	
	traffic jam.	
	G4: Restructuring of infrastructure	
	facilities / upgrade the	
	Infrastructure / example	
	ANY 2	
	Bad Effect	
	F1: causes soil erosion / landslides	
	/ flash flood	
	P1: forest floor stripped of it	
	vegetation / absence of plant root	
	system	
	make the soil structure unstable	
	P2: when it rains heavily, top layer	
	of the soil removal and thinning /	
	crumble and lead to soil erosion /	
	landslides	
	P3: eroided soil then carried and	
	deposited at the bottom of river /	
	flash flood	
	P4: depletion of water catchment	
	areas	
	F2: results in loss of biodiversity	
	P5: the loss of habitats of flora and	
	fauna	

P7: the removal of the base of numerous food chain / web / other source F3: caused climatic changes P8: disrupts the normal weather patterns / creating hotter / drier weather P9: removal of trees will reduces transpiration / rain fall / absorption of carbon dioxide P10: high level of carbon dioxide lead to greenhouse effect / global warming F4: disrupts the nutrient / carbon / nitrogen cycle P11: atmospheric carbon dioxide concentration may rise / less carbon dioxide removed for photosynthesis P12: atmospheric oxygen is less produced by photosynthesis P13: Reduction in soil fertility F5: Industries/ factories/ vehicles contribute to air pollution P14: Industries emit pollutants such as sulphur dioxide/ oxides of nitrogen/ smoke/fine solid particles which can cause respiratory problems/asthma/bronchitis P16: Acid rain makes the soil acidic / unsuitable for the cultivation of crops P17: smoke / haze reduce light intensity cause the rate of photosynthetic decrease. P18: Which subsequently reduces crop yield P19: Hot water is discharged into nearby lakes and river lead thermal pollution P20: cause instant death of aquatic species/ Any 8

P6: caused extinction of species and varieties of plant and animal

2(a)(i)	-Graf menunjukkan hubungan	8
	antara kenaikan paras karbon	
	dioksida dan kenaikan suhu global	
	purata dari tahun 1890 hingga	
	tahun 2000	
	-Daripada graf didapati peningkatan	
	suhu global sejajar dengan	
	peningkatan paras kepekatan	
	karbon dioksida	
	-Keadaan ini dikaitkan dengan	
	fenomena kesan rumah hijau	
	-Apabila sinaran matahari	
	memancar ke bumi, sebahagian	
	sinar dipantul balik ke angkasa	

	-Manakala sebahagian lagi sampai ke bumi dan dipantul balik ke angkasa -Kehadiran gas karbon dioksida	
	angkasa -Kehadiran gas karbon dioksida	
	-Kehadiran gas karbon dioksida	
	_	l
	yang banyak membentuk satu	
	lapisan gas rumah hijau ruang	
	angkasa	
	-Menyebabkan sebahagian haba	
	yang dipantulkan dari permukaan	
	bumi diperangkap dan dipantul	
	balik ke permukaan bumi	
	-Pemerangkapan haba ini	
	menyebabkan peningkatan suhu	
	bumi	
	-Maka apabila kepekatan karbon	
	diosida meningkat, suhu bumi juga	
	meningkat	
(ii)	-Jika kepekatan karbon dioksida	6
	terus meningkat,	
	kesan rumah hijau terus meningkat.	
	-Ini menyebabkan air batu di kutub	
	mencair	
	-Dan paras laut akan meningkat	
	-Banjir akan berlaku di sana sini	
	-Perubahan arah tiupan angina	
	-Menyebabkan musim akan	
	berubah/ kemarau	
	-Keadaan ini menggangu /	
	merosotkan hasil pertanian	
b)	-Pembakaran hutan menyebabkan	6
	Pemusnahan habitat flora dan	
	fauna liar akan pupus	
	-Tiada kawasan tadahan hujan	
	menyebabkan hakisan tanah/ tanah	
	runtuh/ banjir kilat	
	-tanah kurang subur dan hasil	
i	pertanian merosot	
	-Menyebabkan kehilangan	
	biodiversiti kerana tumbuhan dan	
	haiwan pupus	
	-Kitar karbon dan kitar oksigen akan	
	terganggu apabila tiada tumbuh-	
	tumbuhan	
	-Pembakaran menghasilkan debu	
	yang menyebabkan pencemaran	
	udara	
	-Menjejaskan proses fotosintesis	
	(debu menutup permukaan daun)	
	-Manusia terdedah kepada penyakit	
	berkaitan dengan system respirasi	

3.(a)(i)	P1 – only mature trees are	4
	removed.	
	P2 – Reforestation // large scale	
	replanting of trees.	
	P3 – establishing forest reserve	
	P4 – to maintain the equilibrium of	
	the ecosystem	
	P5 – law of forest enforcement	
	continuously	
	P6 – maximise recycle campaign.	

	D7 whent avrial analysis and door	
	P7 – plant quick growing and deep-	
	rooted trees to prevent soil	
(**)	erosion.	_
(ii)	P1 – to obtain timber for	6
	construction	
	P2 - to obtain wood for producing	
	paper and other wood products.	
	P3 – wood for cooking and heating	
	purposes	
	P4 – to clear land for agricultural,	
	such as planting crops and grazing	
	livestock.	
	P5 – for mining of mineral such as	
	tin and iron.	
	P6 – for urbanisation // building of	
	roads and buildings.	
	P7 – to build dam for water	
	reservoir.	
	P8 – to build hydroelectric power	
	station.	
	P9 – to build recreation park	
(b)	F1 – CFC Free is used to reduce	10
	ozone depletion.	
	P1 – the destruction of the ozone	
	layer is mainly due to increasing	
	levels of CFC (
	Chlorofluorocarbons) in the	
	atmosphere.	
	P2 – ozone layer absorb ultraviolet	
	(UV) radiation	
	P4 – and shield organisms from its	
	damaging effects // mutation //	
	skin	
	cancer // reduce immune system	
	of animals and humans.	
	P5 – CFCs are used as coolants in	
	air conditioners and refrigerator //	
	propellants in aerosol cans //	
	foaming agents in the making of	
	Styrofoam packaging.	
	P6 – CFCs are currently being	
	replaced by HFC.	
	P7 – HFC do not break down ozone	
	molecule	
	P8 – or replaced by HCFCs which	
	has a low ozone breakdown.	
	F2 – hybrid car using both	
	conventional petrol engine and	
	electric	
	generators.	
	P9 – it reduce emission of	
	greenhouse gases / CO2.	
	P10 – example: carbon dioxide	
	(CO2)// nitrous oxide (N2O).	
	P11 – an increase of carbon dioxide	
	concentration in the atmosphere	
	leads to greenhouse effect.	
	P12 – also cause global warming //	
	the Earth's average temperature	
	rises // melting of polar ice caps //	
	causing sea levels to rise //	
	flooded in low land area // drought	

// risk to human health such	
as heat related illness.	
P13 – use unleaded petrol is to	
reduce emission of lead from	
motor	
vehicles	
P14 – lead is an air pollutant which	
may leads to brain damage	
//kidney and digestive problems.	
[Any 10]	

4.	P1-the activity cause noise pollution	1	5
	P2-if the noise above 80dB can		
	cause deafness	1	
	P3-can leads to stress related	1	
	problems such as high blood		
	pressure/headaches/ulcers		
	P4-also stimulate adrenaline	1	
	secretions		
	P5-which also cause high blood	1	
	pressure / increase in heart		
	rate/respiration rate		
	P6-also can cause muscle becomes	1	
	tense		
(b)	Impact		5
	P1-hot water release from the plant	1	
	cause thermal pollution		
	P2-increases the temperature of	1	
	water in the river		
	P3-can cause instant death to	1	
	certain aquatic organisms		
	P4-hot water also cause oxygen	1	
	becomes less soluble in water		
	P5-increase growth rate of algae	1	
	P6-leads to higher BOD		
	Precautions		
	P1-Treat/cool the water before	1	
	released into the river		
	P2-use cooling towers	1	
	P3-us alternative energy/renewable	1	
	energy/solar energy to generate		
	power		
	P4-have campaign to educate the		
	public on effects of pollution		