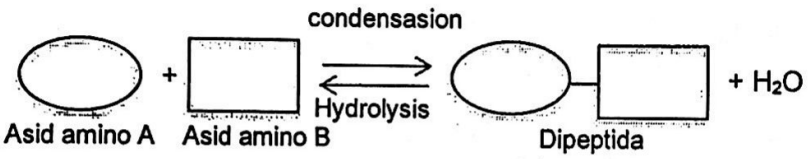
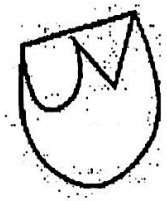
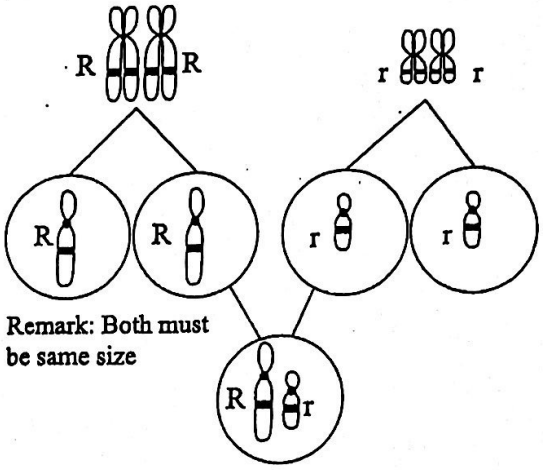
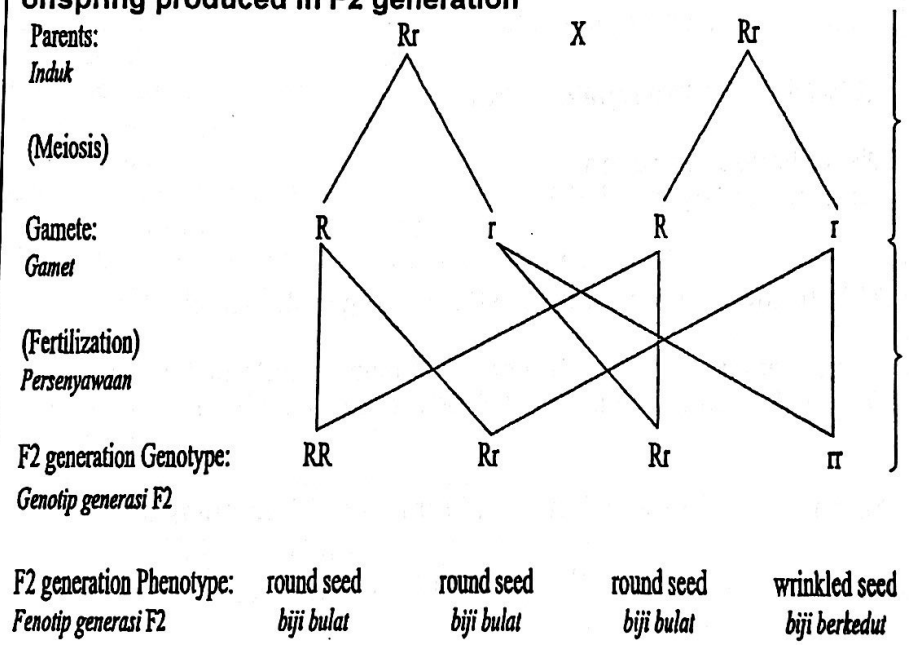
Question	Marking Scheme	Sub Mark	Total Mark
1.(a) (i)	**Able to name organelle M** Vacuole/ *vakuol*	1	1
(a)(ii)	**Able to explain the role of organelle M in herbaceous plant.** P1: The turgor pressure of the fluid in M(vacuole) pushes the cell contents and plasma membrane against the cell wall, *Tekanan segah bendalir di dalam M (vakuol) menolak kandungan sel dan membran plasma ke dinding sel* P2: Giving support to the plant so that the plant will not wilt easily. *Untuk memberikan sokongan kepada tumbuhan herba supaya tidak layu dengan mudah.* P3: Storage place in cell *Tempat simpanan dalam sel.* P4: Contain water, organic acid, sugar, amino acid, mineral salt, waste product/ any suitable answers *Mengandungi air, asid organik, gula, asid amino, garam mineral, bahan buangan / mana-mana jawapan yang sesuai.*	1 1 1 1	Max 1
1(a)(iii)	**Able to state the effect if the cell does not have organelle N.** P1: Less enzyme will be produced / *Sedikit enzim dihasilkan* P2: The synthesis of protein stop / *Sintesis protein terhenti*	1 1	Max 1
1(b)(i)	**Able to name zone M.** Division cell zone/ *Zon pembahagian sel*	1	1
	Able to explain the importance of zone M. P1: Cells in zone M divide rapidly / *Sel-sel di zon membahagi dengan pantas* P2: To produce new cells (identical cells) / *untuk menghasilkan sel-sel baharu (sel yang seiras)* P3: To make sure the cells are added into cell elongation zone / *memastikan sel-sel dapat ditambah ke dalam zon pemanjangan sel* P4: For growth / *Untuk pertumbuhan*	1 1 1	Max 3

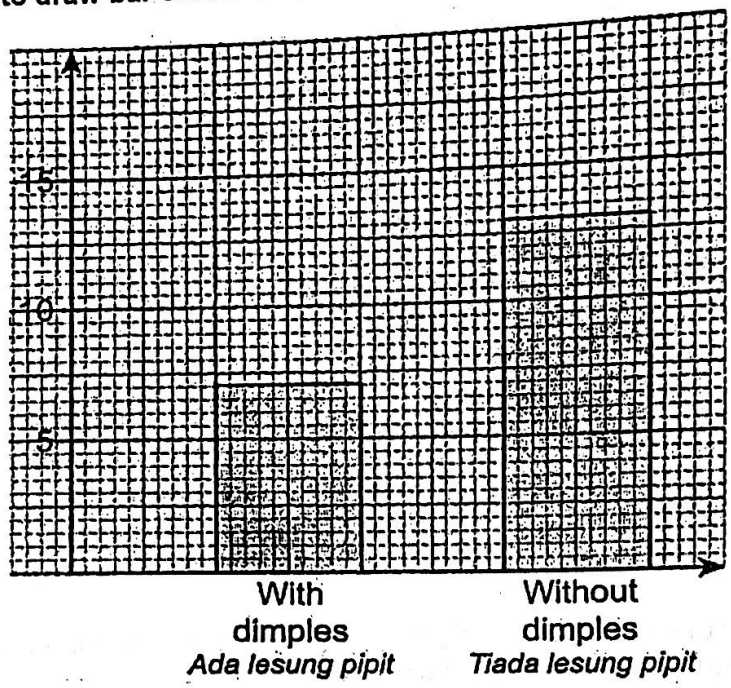
Question	Marking Scheme	Sub Mark	Total Mark
1(b)(ii)	**Able to state the organelle that can be found in high density at Zone M.**		
	mitochondria / *mitokondria.*	1	1
1(b)(iii)	**Able to explain the answer in 1(b)(ii)**		
	P1: Found abundantly to increase the rate of respiration / *Ditemui dengan banyak supaya dapat meningkatkan kadar respirasi*	1	Max 2
	P2: To produce maximum energy / *Bagi menghasilkan lebih banyak tenaga*	1	
	P3: Which is needed during cell respiration / *yang diperlukan semasa proses pembahagian sel.*	1	
1(b)(iv)	**Able to explain the stage of cell division in the root shown.**		
	P1: Stage: Cytokinesis / *Peringkat: Sitokinesis*	1	
	P2: Plate cell is formed in the middle of the cell / *Plat sel terbentuk di bahagian tengah sel*	1	3
	P3: Enables cell to divide into two new cells / *membolehkan sel membahagi kepada dua sel yang baharu.*	1	
			12

Question	Marking Scheme	Sub Mark	Total Mark
2(a)(i)	**Able to state the level of protein molecules P, Q, and R**		
	P : Tertiary / *tertier* Q : Quarternary / *kuartener* R : Secondary / *sekunder*	1 1 1	3
(a)(ii)	**Able to describe the structure of protein P**		
	Alpha-helix chain or beta-pleated sheets are folded into a three-dimensional shape of polypeptide. *Rantai alfa berpilin atau beta berlisu terlipat membentuk struktur tiga dimensi molekul polipeptida.*	1	1
(a)(iii)	**Able to name an example of molecule with structure P**		
	Enzymes, hormones, antibodies, plasma proteins *Enzim, hormone, antibodi, protein plasma.*	1	1
(b)(i)	**Able to draw the amino acid molecules to show the formation and breakdown of a dipeptide**  **Note** : 1m untuk struktur dipeptide 1m untuk mana-mana nama proses	1 1	2
(b)(ii)	**Able to state one difference between essential amino acids and non-essential amino acids**		
	Essential amino acids / Non-essential amino acids P1 : Cannot be synthesised by the body / *Tidak dapat disintesis dalam badan* / Can be synthesised by the body / *Dapat disintesis dalam badan* P2 : Need to obtain from food / *Perlu mendapatkan daripada makanan* / Derived from other amino acids / *Terhasil daripada asid amino yang lain* Any one pair / *mana-mana satu pasangan*	1	1

Question	Marking Scheme	Sub Mark	Total Mark
(c)(i)	**Able to draw a correct diagram to complete the mechanism of the enzyme reaction** 	1	1
(c)(ii)	**Able to name the structure in c(ii)** Enzyme-substrate complex / *Kompleks enzim-substrat*	1	1
(c)(iii)	**Able to state two characteristics of enzyme S** P1 : enzymes are highly specific *Enzim adalah sangat khusus* P2 : enzymes are not destroy at the end of the reaction *Enzim tidak dimusnahkan pada akhir tindak balas*	1 1	2 12

Question	Marking Scheme	Sub Mark	Total Mark
3(a)(i)	**Able to name muscles G and H.**		
	G : Pectoralis minor / *Pektoralis minor*	1	
	H : Pectoralis major/ *Pektoralis major*	1	2
(a)(ii)	**Able to explain the meaning of antagonistic muscles**		
	P1 : Paired muscles / *Otot berpasangan*	1	
	P2 : which acts opposite // muscles shrink, muscle pairs relax / muscles relax, muscle pairs shrink *yang bertindak secara bertentangan // otot mengecut, pasangan otot mengendur / otot mengendur, pasangan otot mengecut*	1	2
(a)(iii)	**Able to explain the role of muscle G and H in locomotion of bird**		
	P1 : Muscle H / pectoralis major contracts, muscle G / pectoralis minor relax *Otot H / pektoralis major mengecut, otot G / pektoralis minor mengendur*	1	
	P2 : Pulling force is transfer from muscle H / pectoralis major to the wing bone *Daya tarikan dipindahkan dari otot H / pektoralis major kepada tulang sayap*	1	Max 3
	P3 : Produces upward thrust / *Menghasilkan daya tujah ke atas*	1	
	P4 : Muscle G / pectoralis minor contracts, muscle H / pectoralis major relax *Otot G / pektoralis minor mengecut, otot H / pektoralis major mengendur*	1	
	P5 : Pulling force is transfer from muscle G / pectoralis minor to the wing bone *Daya tarikan dipindahkan dari otot G / pektoralis minor kepada tulang sayap*	1	
	(Any 3P / Mana-mana 3P)		
(b)	**Able to explain the problem to bend arm**		
	Problem / *Masalah* : Arm cannot be bend / *Lengan tak boleh dibengkokkan*	1	2
	Explanation / *Penerangan* : Pulling force of biceps cannot be transferred to the radius bone / *Daya tarikan biseps tidak dapat dipindahkan ke tulang radius*	1	
(c)	**Able to explain how to overcome porous and brittle femur**		
	P1 : Consume food / drink / dairy products / *Mengambil makanan / minuman / produk tenusu*	1	
	P2 : Rich in calcium / phosphorus / *Kaya dengan kalsium / fosforus*	1	Max 3
	P3 : Reduce extreme activity / *Kurangkan aktiviti berat / lasak*	1	
	P4 : Do light exercise / *Lakukan senaman ringan* (Any 3P / Mana-mana 3P)	1	12

Question	Marking Scheme	Sub Mark	Total Mark
4(a)	**Able to complete the schematic diagram**  Remark: Both must be same size Remark: One big, one small	1 1 1	3
(b)	**Able to draw a schematic diagram to show the probability of the offspring produced in F2 generation**  	1 1 1 1	Max 3

Question	Marking Scheme	Sub Mark	Total Mark
(c)(i)	**Able to draw bar chart**  	2 1	2 1
(c)(ii)	**Able to name the type of variation** Discontinuous variation *Variai tak selanjar*	1	1
(c)(iii)	**Able to state one characteristic of the graph drawn** no intermediate value // The graph shows discrete distribution *Tidak ada nilai perantaraan // Graf menunjukkan taburan diskret*	1 1	2
(d)	**Able to explain the difference in mass of identical twins** P1 : Mass is an example of continuous variation *Jisim ialah variasi selanjar* P2 : which is influence by environmental factors / diet / exercise. *dipengaruhi oleh factor persekitaraan / gizi / senaman*		12

Question	Marking Scheme	Sub Mark	Total Mark
5(a)	**Able to name activities P and Q.**		
	P : Open burning / factory smoke / vehicle smoke / *Pembakaran terbuka / asap kilang / asap kenderaan*	1	2
	Q : Excessive fertilization / Penggunaan baja berlebihan	1	
(b)(i)	**Able to give two examples of R.**		
	Soil erosion / flash floods / mud floods / any suitable examples *Hakisan tanah / banjir kilat / banjir lumpur / apa-apa contoh sesuai*	1 1	2
(b)(ii)	**Able to explain impact of R to the local community and the national economy.**		
	Local community: C1 : damaging nearby residential areas / *merosakkan kawasan perumahan berhampiran*. C2 : wildlife threatens the safety of locals / *haiwan liar menggangu keselamatan penduduk setempat* C3 : the cost of cleaning the area is high / *kos pembersihan kawasan penduduk tinggi* National economy: E4 : species of wild animals / plants are extinct *spesies haiwan / tumbuhan liar pupus* E5 : sources of research studies affected / *sumber kajian penyelidikan terjejas* (At least 1 C or 1 E)	1 1 1 1 1	Max 3
(c)	**Able to explain the differences between activity P and activity that can cause ozone depletion.**		
	Activity P: D1 : requires combustion / *memerlukan pembakaran* Activity causes ozone depletion: requires the use of electrical equipment / *memerlukan penggunaan peralatan elektrik*	1	2
	D2: release carbon dioxide / *membebaskan karbon dioksida* release CFC gas / *membebaskan gas CFC*	1	
	Any two pair / *mana-mana dua pasangan*		
(d)	**Able to justify should activity Q continue**		
	Yes / No *Ya / Tidak*	1	
	If yes, P1 : Helps plant growth / *Membantu tumbesaran tumbuhan* P2 : Speed up fruit / vegetable ripeness / *Mempercepat kematangan buah / sayur*	1 1	Max 3

Question	Marking Scheme	Sub Mark	Total Mark
	P3 : Benefit farmers / *Menguntungkan petani*	1	
	If no, Q1 : Killing aquatic life / *Membunuh hidupan akuatik* Q2 : Smell pollution / *Pencemaran bau* Q3 : Disrupting the surrounding population / *Menganggu penduduk sekitar*	1 1 1	12

Question	Marking Scheme	Sub Mark	Total Mark
6.(a)	**Able to state how antibodies destroy the antigen** P1:Lysis – Antibodies that bind with antigen and cause the antigen to disintegrate *Lisin – Antibodi melekat pada antigen dan menyebabkan antigen terurai* P2:Opsonisation – Antibodies that bind with antigen (to acts as marker) so that phagocytes can recognise antigen and destroy them *Opsonin – Antibodi yang mengikat antigen (bertindak sbagai penanda) sehingga fagosit dapat mengenali antigen dan memusnahkannya* P3:Aglutination – Antibodies clump antigen / pathogen together and the clumping cause the antigen not functioning *Aglutinin – Antibodi menggumpal antigen/ patogen dan gumpalan menyebabkan antigen tidak dapat berfungsi* P4:Antitoxin –Antibodi can neutralise the toxin produced by bacteria by binding the toxin *Antitoksin – Antibodi dapat meneutralkan toksin yang dihasilkan oleh bacteria dengan mengikat toksin*	1 1 1 1	4
6(b)	**Able to compare the immunities obtained** Similarities: Persamaan: S1:Both immunity need antibody *Kedua-dua keimunan memerlukan antibodi* S2: Antibodies (are needed to) fight diseases *Antibodi (diperlukan untuk) melawan penyakit*	1 1	

Question	Marking Scheme	Sub Mark	Total Mark

Differences:
Perbezaan

	Situation 1 Situasi 1	Situation 2 Situasi 2	Sub Mark
D1	Injection contained vaccine *Suntikan mengandungi vaksin*	Injection contained antiserum *Suntikan mengandungi antiserum*	1
D2	Vaccine contained weakened / killed pathogen *Vaksin mengandungi pathogen yang telah dilemahkan /dimatikan*	Antiserum contained antibodies to fight pathogen *Antiserum mengandungi antibodi yang melawan patogen*	1
D3	Pathogen stimulate lymphocyte / body to produce antibody *Patogen merangsang limfosit / badan untuk menghasilkan antibodi*	Antibody is ready to kill pathogen *Antibodi sedia digunakan untuk membunuh patogen*	1
D4	Immunity last for a longer period *Keimunan bertahan untuk tempoh yang panjang*	Immunity last for a short period *Keimunan bertahan untuk tempoh yang singkat*	1
D5	Take time to obtained immunity *Mengambil masa untuk mendapat keimunan*	Instant immunity *Mendapat keimunan segera*	1
D6	Injection is received before contracting the disease *Suntikan diterima sebelum dijangkiti penyakit*	Injection is received after contracting the disease *Suntikan diterima selepas dijangkiti penyakit*	1
D7	Active artificial immunity *Keimunan aktif buatan*	Passive artificial immunity *Keimunan pasif buatan*	1

Max 6

At least 1 S + 5 D

Question	Marking Scheme	Sub Mark	Total Mark
6(c)	Able to explain the effect and precaution to avoid AIDS Effect: Kesan : E1: Presence of HIV *Kehadiran HIV* E2:Transmitted by direct a direct contact such as blood transfusion / sharing needle / sexual transmission *Tersebar melalui hubungan langsung seperti pemindahan darah / perkongsian jarum suntikan / persetubuhan* E3:HIV is not transmitted by saliva/ tears/ sweat / shaking hands *HIV tidak tersebar melalui air liur / air mata / peluh / bersalaman* E4: Attack lymphocyte / body defence system *Menyerang limfosit / sistem pertahanan badan* E5: Body immune collapse / decline *Keimunan badan merosot* E6:Easily affected by other pathogen *Mudah diserang oleh pathogen lain* E7: Leads to complication of other disease *Membawa kepada komplikasi penyakit lain* Precaution: Pencegahan: P1: Stay away from sex with patient *Menjauhi hubungan seks dengan pesakit* P2:Using a condom/ avoid unprotected copulation *Menggunakan kondom / tidak melakukan hubungan seks rambang* P3:Do not share contaminated needles *Tidak berkongsi jarum suntikan* P4:Do not engage in drug abuse *Tidak melibatkan diri dengan penyalahgunaan dadah* P5: Avoid breastfeeding a sick mother *Mengelakkan penyusuan ibu yang berpenyakit AIDS* P6: Sick mother take antivirus during pregnancy and childbirth *Ibu yang berpenyakit mengambil antivirus semasa mengandung dan bersalin* P7: Ensure that health officials dealing with patients always comply with the rules to avoid direct contact with the patient's blood *Memastikan pegawai kesihatan yang berurusan dengan pesakit sentiasa mematuhi peraturan bagi mengelak tersentuh secara langsung dengan darah pesakit.* Any 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1	Max 10 20

Question	Marking Scheme	Sub Mark	Total Mark
7 (a)(i)	**Able to explain how structure S and heart enable the return of blood pressure back to normal.** ***Dapat menerangkan bagaimana struktur S dan jantung membolehkan tekanan darah kembali ke normal*** Sample answers: E1 (When the blood pressure decreases), it will be detected by baroreceptors *(Apabila tekanan darah meningkat). Ia akan dikesan oleh baroreseptor* E2 at the wall of aorta. *Pada dinding aorta* E3 Baroreceptors produce an impulse. *Baroreseptor menghasilkan impuls* E4 which is transmitted to medulla oblongata / S. *yang akan dihantar ke medulla oblongata/S* E5 Medulla Oblongata sent impulse via sympathetic nerve. *Medulla oblongata menghantar impus melalui saraf simpatetik* E6 to the heart / Sinoatrial node. *Kepada jantung/ nodus sinoatrium* E7 more impulse is initiated. *Lebih banyak impuls dihasilkan* E8 rate of heartbeat increases // blood vessel constrict. *Kadar denyutan jantung ditingkatkan// salur darah mengecil* E9 resulting in an increase of blood pressure back to normal. *Menyebabkan tekanan darah meningkat dan balik ke normal*	1 1 1 1 1 1 1 1 1	Max 6
(ii)	**Able to explain how endocrine gland causes the physiological changes in her body during the situation.** *Dapat menerangkan bagaimana kelenjar endokrin menyebabkan perubahan fizikal di dalam badan dalam situasi* Sample answers: E1: (In panic situation) medulla oblongata detects the strenuous moments. *(dalam situasi cemas) medulla oblongata mengesan situasi yang mencemaskan* E2: stimulates the adrenal glands *Merangsang kelenjar adrenal* E3: to secrete adrenaline hormone. *Untuk merembeskan hormone adrenalin* E4: transports by the bloodstream. *Diangkut melalui salur darah* E5: Adrenaline hormone stimulates heart to increase heartbeat. *Hormon adrenalin merangsang jantung untuk meningkatkan kadar denyutan jantung* E6: to transport more oxygen / glucose to muscle tissue // increase blood flow to the muscles.	1 1 1 1 1 1	Max 8

Question	Marking Scheme	Sub Mark	Total Mark
	Untuk mengangkut lebih banyak oksigen/ glukosa ke tisu otot//meningkatkan aliran darah ke otot E7: Breathing rate increases // breath faster/ deeper\ *Kadar pernafasan meningkat// pernafasan bertambah/ lebih dalam* E8: to get more oxygen *Untuk mendapat lebih banyak oksigen* E9: glycogen is converted to glucose *Glikogen ditukarkan ke glukosa* E10: level of glucose increases *Aras glukosa meningkat* E11: rate of respiration in the muscles increases. *Kadar respirasi di otot meningkat* E12: more energy is generated/ produced *Lebih banyak tenaga dihasilkan*	1 1 1 1 1 1	
(b)	**Able to explain the similarities and differences between neurone V and neurone W.** *Dapat menerangkan persamaan dan perbezaan antara neuron V dan neuron W.* Sample of answers: **Similarities/ *Persamaan*** S1: Both neurons involve in impulse transmission *Kedua-dianya terlibat dalam penghantaran impuls* S2: Axons of both neurons are covered by myelin sheath. *Akson untuk kedua-dua neuron dilitupi oleh salut mielin* S3: Both have cell body/ axon/ dendron/ dendrite *Kedua-dua mempunyai badan sel /akson/ Dendron/dendrit*	1 1 1	

Question	Marking Scheme	Sub Mark	Total Mark

Differences/ *Perbezaan*

	Neuron V	Neuron W	Sub Mark
D1	Afferent neuron *Neuron aferen*	Efferent neuron *Neuron eferen*	1
D2	Cell body is at the middle of the neuron *Badan sel berada di tengah neuron*	Cell body is located at the terminal of the neuron *Badan sel terletak di terminal neuron*	1
D3	Cell body is located in the ganglion of dorsal root. *Badan sel terletak di ganglion akar dorsal*	Cell body is located in grey matter of the spinal cord *Badan sel terletak di jirim kelabu pada saraf tunjang*	1
D4	Transmit impulse from receptor to spinal cord / interneuron. *Membawa impus dari resptor ke saraf tunjang/neuron perantaraan*	Transmit impulse from spinal cord / interneuron to the effector *Membawa impuls dari saraf tunjamg / neuron perantaraan ke efektor*	1
D5	Has long Dendron *Mempunyai Dendron yang panjang*	Has short Dendron *Mempunyai Dendron yang pendek*	1
D6	Has short axon. *Mempunyai akson yang pendek*	Has long axon *Mempunyai akson yang panjang*	1

Max 6

20

Question	Marking Scheme	Sub Mark	Total Mark
8 (a)	**Able to explain how pollination leads to the formation of fruits and seeds in a flowering plant.** *Dapat menerangakan bagaimana pendebungaan menyebabkan pembentukan buah dan biji pada tumbuhan berbunga* Sample answers: *Sampel jawapan :* C1: Pollination *Pendebungaan* P1 - The arrival of pollen grains on the stigma of flower *Debunga berpindah ke stigma* P2 - triggers secretion of sugar / sucrose solution that provides energy *Mencetus rembesan bergula/larutan sukrosa yang menghasilkan tenaga* P3 - Pollen grains germinate and form pollen tubes *Debunga bercambah dan menghasilkan tiub debunga* P4 - Pollen tubes grow along style towards the ovule *Tiub debunga bercambah sepanjang stil ke arah ovul* P5 - under the control tube nucleus *Di bawah kawalan nucleus tiub* P6 - (During pollen tube growth) generative nucleus divides by mitosis to form two male nuclei / hapliod (n) nuclei *(semasa tiub debunga bercambah) nucleus penjana membahagi secara mitosis membentuk dua nucleus jantan / nukleus haploid(n)* P7 - The male nucleus follow down pollen tube towards embryo sac *Nukelus jantan mengikuti tiub debuga ke pundi embrio* P8 - When the pollen tubes reached the ovary, the pollen tube penetrates the ovule through the micropyle. *Apabila tiub debunga tiba di ovary tiub debunga menembusi ovul melalui mikropil* P9 - Tube nucleus degenerates leaving the way for the male nuclei to enter the embryo *Nukleus tiub merosot memberi laluan nukleus jantan masuk ke dalam pundi embrio* C2: Double fertilization *Persenyawan ganda dua* P10 - A male nucleus fertilises the ovum to form a diploid zygote (2n) *Nukleus jantan bercantum dengan sel telur untuk menghasilkan zigot diploid (2n)*	1 1 1 1 1 1 1 1 1 1 1	

Question	Marking Scheme	Sub Mark	Total Mark
	P11 - Another male nucleus fused with two polar nuclei, forming the endosperm nucleus which triploid (3n). *Nukleus jantan yang satu lagi akan bercantum dengan 2 nukleus kutub membentuk nukleus endosperma yang triploid(3n)*	1	
	P12 - The triploid nucleus divides to form endosperm tissue which provides nutrient to the embryo *Nukleus triplod membahagi membentuk tisu endosperma yang membekalkan makanan kepada embrio*	1	
	P13 - Synergid cells and antipodal cells degenerate	1	
	C3: The development of seed and fruit	1	
	P14 - The ovary develops into fruit (tissue)	1	Max 10
	P15 - The ovule will become seed.	1	
	P16 - (Diploid) zygote germinates into embryo / with plumule / shoot and radicle / root / into plantlet	1	
	P17 - Endosperm tissue absorbed into the cotyledons	1	
	P18 - The integument of the embryo will form seedcoat / testa	1	
	P19 - that will protect the seeds from microorganisms, fungi and dehydration.	1	
	[Any 3 Ps from C1 + Any 1 P from C2 + Any 2 Ps from C3 + Any 4 of other Ps]		
8(b)	**Able to state what methods L, M and N are, and discuss the need to use the methods in human reproduction.**		
	Sample answers:		
	P1 - Methods L and N are birth controls / to prevent pregnancies	1	
	P2 - Method M is to overcome infertility	1	
	C1: Method L		
	P3 - The intrauterine device / IUD method	1	
	P4 - Made of (flexible) plastic / metal // shape like 'T'	1	
	P5 - Inserted into the uterus using a special applicator / by a doctor	1	
	P6 - It makes the endometrium less suitable for implantation of embryo	1	

Question	Marking Scheme	Sub Mark	Total Mark
	P7 - Can contain progesterone	1	
	P8 - Can increase prostaglandin secretion / increase contraction of uterus / can cause expulsion / discharged of the fertilised ovum / zygote	1	
	C1: Method M		
	P9 - In vitro fertilisation (is a technique of fertilisation).	1	
	P10 - The doctor retrieved many eggs / secondary oocytes from ovaries	1	
	P11 - by using a laproscope	1	Max
	P12 - Sperms are also collected	1	10
	P13 - Eggs are then fertilized with sperm in a glass dish	1	
	P14 - Fertilised eggs are then allowed to develop to become embryos	1	
	P15 - by mitosis until 8 cells	1	
	P16 - Then selected embryos are injected in the woman's uterus to allow implantation to occur	1	
	C1: Method N		
	P17 - Fallopian tubes are cut and ligated in an operation	1	
	P18 - Sperms cannot reach the part where an ovum is released in the fallopian tube	1	
	P19 - Hence the sperms are unable to fertilise the ovum // No fertilisation of sperm and ovum occur	1	
	[Any 2 Ps from C1 + Any 2 P from C2 + Any 1 Ps from C3 + Any 5 of other Ps]		
			20

Question	Marking Scheme	Sub Mark	Total Mark
9(a)(i)	**Able to name and describe the interaction shown**		
	P1 : commensalism *komensalisme*	1	
	P2 : barnacles are commensal *teritip adalah komensal*	1	
	P3 : crabs are host *ketam adalah perumah*	1	
	P4 : barnacles attach to the shell of crab to get free transport / barnacles benefited *teritip melekat pada cengkerang ketam untuk mendapatkan pengangkutan percuma / teritip mendapat keuntungan*	1	
	P5 : crabs are not affected by the presence of the barnacles / not harm or benefited *ketam tidak dipengaruhi oleh kehadiran teritip / ketam tidak mengalami keuntungan atau kerugian* (any 4P / *mana-mana 4P*)	1	Max 4
(b)	**Able to explain how the relationship can be used by a farmer to increase the yield in his oil palm plantation and state its benefits.**		
	P1 : prey-predator interaction / the owl is the predator / the rat is the Prey *Interaksi mangsa-pemangsa / burung hantu adalah pemangsa / tikus adalah mangsa*	1	
	P2 : an increase in the population of rats cause an increase in the population of owls *peningkatan populasi tikus akan menyebabkan peningkatan dalam populasi burung hantu*	1	
	P3 : more owls to hunt and eat the rats *Lebih banyak burung hantu memburu dan memakan tikus*	1	
	P4 : when the population of rats decreases, the yield of oil palm Increases *Apabila populasi tikus berkurangan, hasil kelapa sawit akan bertambah*	1	
	P5 : owls are used to control the population of rats / biological control Method *Burung hantu digunakan untuk mengawal populasi tikus / kaedah kawalan biologi*	1	
	P6 : biological control method is cheap *Kaedah kawalan biologi lebih murah*	1	
	P7 : environmental friendly / does not pollute the environment // any suitable benefits of biological control method *Mesra alam / tidak mencemarkan alam sekitar // lain-lain kebaikan kaedah kawalan biologi yang sesuai* (any 6Ps / mana-mana 6 P)	1	Max 6
(c)(i)	**Able to state the problems faced by the mangrove plant and explain the adaptive characteristics to overcome the problems**		
	P1 : soft muddy soil *Tanah berlumpur yang lembut*	1	

Question	Marking Scheme	Sub Mark	Total Mark
	E1 : highly branched underground cable roots / prop roots *Akar sokong / akar jangkang bawah tanah yang bercabang*	1	
	P2 : waterlogged condition / lack of oxygen *Keadaan yang ditenggelami air / kekurangan oksigen*	1	
	E2 : have breathing roots / pneumatophores / lenticels on the bark of the tree *mempunyai akar pernafasan / pneumatofor / lentisel pada batang pokok*	1	
	P3 : direct sunlight / high rate of transpiration *Cahaya matahari yang terus / kadar transpirasi yang tinggi*	1	
	E3 : leaves covered with thick layer of cuticle / sunken stomata succulent *Daun dilitupi dengan lapisan kutikel tebal / stoma terbenam / sukulen*	1	
	P4 : germination of seeds on waterlogged condition *Percambahan biji benih pada tanah yang bertakung air*	1	
	E4 : vivipary / seed germinates while still attached to mother plant *Vivipari / biji benih bercambah semasa masih melekat pada pokok induk*	1	
	P5 : high salinity of water *kandungan garam yang tinggi dalam air*	1	
	E5 : cell sap of mangrove plant has higher osmotic pressure than the water surrounding them *sap sel tumbuhan paya bakau mempunyai tekanan osmotik yang tinggi berbanding air sekitarnya* (any 3 pairs of P and E / *mana-mana 3 pasang P dan E*)	1	Max 6
(c)(ii)	**Able to explain why the mangrove ecosystem need to be preserved**		
	P1 : act as (shore) protection // barrier against strong coastal wind / waves // wave breaker *bertindak sebagai pelindung (pantai) // banteng terhadap tiupan angin kencang / ombak // pemecah ombak*	1	
	P2 : maintaining biodiversity / variety of organisms *Mengekalkan biodiversiti / kepelbagaian organisma*	1	
	P3 : habitat for flora and fauna *Habitat kepada flora dan fauna*	1	
	P4 : breeding / nursery area for organisms *Tempat pembiakan / nursery kepada organisma*	1	
	P5 : source of raw material *Sumber bahan mentah*	1	
	P6 : as an eco-tourism attraction // any explanation *Sebagai tarikan eko pelancongan*	1	
	P7 : maintain CO_2 / O_2 content in the atmosphere *Mengekalkan kandungan CO_2 / O_2 dalam atmosfera*	1	Max 4
	Note : any other suitable explanation on the importance of preserving mangrove ecosystem (any 4 P / *mana-mana 4 P*)		Total 20