



KEMENTERIAN PENDIDIKAN MALAYSIA  
JABATAN PENDIDIKAN NEGERI SARAWAK

# **PROGRAM SEMARAK KASIH SPM 2.0 JPN SARAWAK TAHUN 2021**

## **BIOLOGI**

### **KERTAS 2**

### **SET 2**

**PROGRAM  
SEMARAK KASIH SPM 2.0  
TAHUN 2021**

**JABATAN PENDIDIKAN NEGERI SARAWAK**

**BIOLOGI  
(4551/2)**

**PRAKTIS KERTAS 2  
SET 2**

## Pengenalan

Program Semarak Kasih yang dilaksanakan pada tahun 2020 telah mendapat sambutan yang menggalakkan daripada warga pendidik dan murid, khususnya calon SPM 2020. Sehubungan dengan itu, pada tahun 2021 ini, Sektor Pembelajaran, Jabatan Pendidikan Negeri Sarawak mengadakan **Program Semarak Kasih SPM 2.0** untuk membantu guru dan calon SPM menghadapi peperiksaan SPM 2021.

Modul yang dihasilkan disertakan dengan sampel Jadual Spesifikasi Ujian (JSU) dan sampel item/soalan mengikut format baharu peperiksaan SPM mulai 2021 untuk dijadikan bahan panduan dan rujukan guru-guru dan juga sebagai bahan latihan/ulangkaji kepada calon-calon SPM 2021 di semua sekolah menengah di negeri Sarawak.

### OBJEKTIF PROGRAM

1. Memastikan calon SPM menguasai format baharu Peperiksaan SPM 2021.
2. Memastikan calon SPM mempunyai bahan pembelajaran yang berfokus ke arah peperiksaan SPM.
3. Meningkatkan pencapaian akademik calon SPM 2021.
4. Melonjakkan keputusan SPM 2021 Negeri Sarawak

## Senarai Kandungan

Bil.	Perkara	Muka surat
1	Format Kertas Peperiksaan SPM Mulai Tahun 2021	2
2	Latihan - <b>Praktis Biologi 4551/2: Set 2</b>	3 – 21
3	Skema Jawapan/Pemarkahan	22-43
4	LAMPIRAN: Sampel Jadual Spesifikasi Ujian (JSU) untuk <b>Praktis Biologi 4551/2: Set 2</b>	44-46

## Senarai Ahli Panel Pembina Modul Semarak Kasih SPM 2.0

Bil.	Nama Guru	Sekolah	PPD
1.	Bibiana Toh Siew Siew	SMK Deshon	Sibu
2.	Wong Yew Tuang	SMK Tung Hua	Sibu
3.	Chan Chiew Wair	SMK Scared Heart	Sibu
4.	Lina Wong	SMK Asyakirin	Bintulu
5.	Choo Li Ming	SMK Lutong	Miri
6.	Tang Siew Jin	SMK Sibu Jaya	Sibu
7.	Sia Lee Ling	SMK Tiong Hin	Sibu
8.	Kuo Poh Ping	SMK Pending	Kuching
9.	Lim Yi Horng	Kolej Tun Datu Tuanku Haji Bujang	Miri
10.	Ngu Wee Ping	SMK St Elizabeth	Sibu
11.	Doreen Lau Siu Fong	SMK Lanang	Sibu

## Penyelaras

Bil.	Nama Pegawai	Stesen Bertugas
1	Evelin anak Medong	Unit Sains dan Matematik, JPN Sarawak
2	Abdul Rahman bin Bujang	Unit Sains dan Matematik, JPN Sarawak

**FORMAT INSTRUMEN PEPERIKSAAN SPM MULAI TAHUN 2021  
BAGI MATA PELAJARAN BIOLOGI (KOD: 4551)**

BIL	PERKARA	KERTAS 1 (4551/1)	KERTAS 2 (4551/2)	KERTAS 3 (4551/3)
1	Jenis Instrumen	Ujian Bertulis		Ujian Amali
2	Jenis Item	Objektif Aneka Pilihan	<ul style="list-style-type: none"> <li>• Subjektif Berstruktur</li> <li>• Subjektif Respons Terhad</li> <li>• Subjektif Respons Terbuka</li> </ul>	Subjektif Berstruktur
3	Bilangan Soalan	40 soalan (40 markah) (Jawab <b>semua</b> soalan)	<b>Bahagian A:</b> <ul style="list-style-type: none"> <li>• 8 soalan (60 Markah) (Jawab <b>semua</b> soalan)</li> <li>• <b>Bahagian B:</b> (20 Markah)</li> <li>• 2 soalan (Jawab 1 soalan)</li> </ul> <b>Bahagian C:</b> (20 Markah) <ul style="list-style-type: none"> <li>• 1 soalan</li> </ul>	3 item (Jawab mengikut subjek yang didaftar)
4	Jumlah Markah	<b>40 markah</b>	<b>100 markah</b>	<b>15 markah bagi setiap item</b>
5	Konstruk	<ul style="list-style-type: none"> <li>• Mengingat</li> <li>• Memahami</li> <li>• Mengaplikasi</li> <li>• Menganalisis</li> </ul>	<ul style="list-style-type: none"> <li>• Mengingat</li> <li>• Memahami</li> <li>• Mengaplikasi</li> <li>• Menganalisis</li> <li>• Menilai</li> <li>• Mencipta</li> </ul>	Kemahiran proses sains
6	Tempoh Ujian	1 jam 15 minit	2 jam 30 minit	40 minit + 5 minit setiap item (5 minit: sesi merancang) (40 minit: masa menjawab soalan)
7	Cakupan Konteks	Standard kandungan dan standard pembelajaran dalam Dokumen Standard Kurikulum dan Pentaksiran (DSKP) KSSM (Tingkatan 4 dan 5)		
8	Aras Kesukaran	Rendah : Sederhana : Tinggi 5 : 3 : 2		
9	Kaedah Penskoran	Dikotomus	Analitikal	
10	Alat Tambahan	Kalkulator saintifik		

## PRAKTIS BIOLOGI 4551/2 SET 2

### Bahagian A

#### Section A

[60 markah]

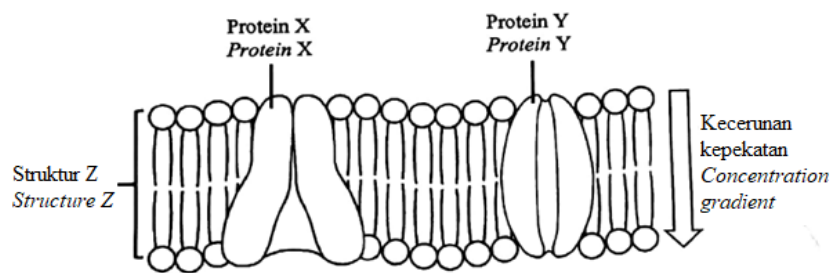
[60 marks]

Jawab **semua** soalan dalam bahagian ini

*Answer all questions in this section*

1. Rajah 1.1 menunjukkan struktur membran plasma yang dikenali sebagai “Model Bendalir Mozek”.

*Diagram 1.1 shows the structure of a plasma membrane, which known as “Fluid Mosaic Model”.*



Rajah 1.1 / Diagram 1.1

- a) Namakan Protein X dan Protein Y.

*Name Protein X and Protein Y.*

Protein X / *Protein X* : .....

Protein Y / *Protein Y*: .....

[2 markah / marks]

- b) Molekul vitamin E bergerak merentasi struktur Z. Pergerakan ini dikategorikan sebagai pengangkutan pasif. Terangkan mengapa.

*Vitamin E molecule move through structure Z. The movement is categorized as passive transport. Explain why.*

.....  
.....

[ 2 markah / marks]

- c) Rajah 1.2 menunjukkan sepaket garam rehidrasi oral.

*Diagram 1.2 shows a packet of oral rehydration salt.*



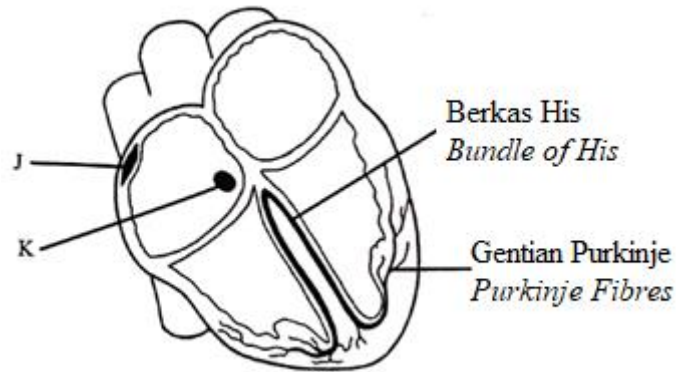
Rajah 1.2 / Diagram 1.2

Individu yang mengalami cirit-birit dinasihatkan untuk mengambil minuman rehidrasi seperti larutan garam rehidrasi oral ini. Terangkan mengapa.

*Individual who suffers from diarrhoea is advised to drink rehydration drinks such as oral rehydration salt solution. Explain why.*

.....  
 .....  
 [ 2 markah / marks]

2. Rajah 2 menunjukkan struktur J dan K di keratan rentas jantung manusia.  
*Diagram 2 shows structure J and K at the cross section of the human heart.*



Rajah 2 / Diagram 2

- a) Namakan perentak jantung utama.  
*Name the main heart pacemaker.*

.....  
 [1 markah / marks]

- b) Bagaimanakah struktur J dan K berfungsi untuk mewujudkan daya pengepaman jantung?  
*How do structures J and K work to create the heart pumping force?*

.....  
 .....  
 [ 2 markah / marks]

- c) Aterosklerosis ialah salah satu penyakit kardiovaskular yang membawa kesakitan dan kematian kepada lelaki dan perempuan. Terangkan bagaimana penyakit ini berkembang dalam badan seseorang individu.  
*Atherosclerosis is one of the cardiovascular diseases that brings illness and death for both men and women. Explain how this disease is developed in an individual body.*

.....  
 .....  
 .....  
 [ 3 markah / marks]



3. Rajah 3 menunjukkan radas yang digunakan untuk mengkaji keperluan nutrient tumbuhan X, Y, Z. Tumbuhan-tumbuhan ini dikekalkan dalam keadaan yang sama kecuali kandungan larutan kultur.

Tumbuhan X dibekalkan dengan semua mineral yang diperlukan.

Tumbuhan Y diberi semua mineral kecuali ion nitrat.

Tumbuhan Z diberi semua mineral kecuali ion fosfat.

Keadaan tumbuhan X, Y dan Z diperhatikan selepas 2 minggu.

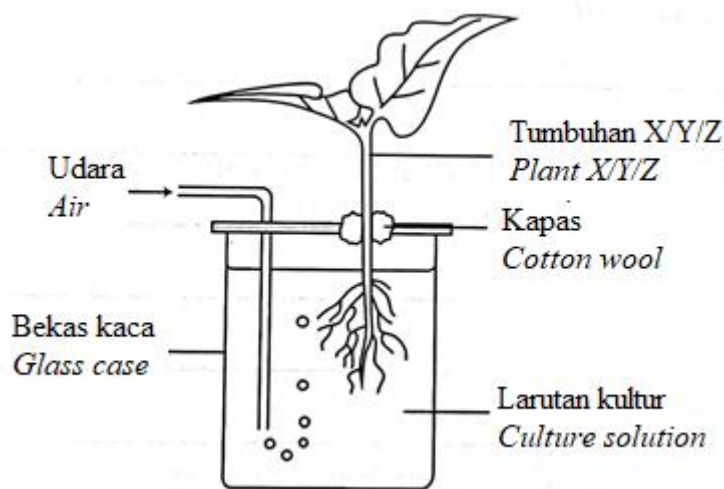
*Diagram 3 shows the apparatus used to investigate the nutritional requirement of plant X, Y, Z. These plants were kept on the same condition except the content of culture solution.*

*Plant X was provided with all essential minerals.*

*Plant Y was given all minerals except nitrate ions.*

*Plant Z was given all minerals except phosphate ions.*

*The condition of plant X, Y and Z is observed after two weeks.*



Rajah 3.1 / Diagram 3.1

- (a) Ramalkan keadaan tumbuhan Y dan Z selepas dua minggu.

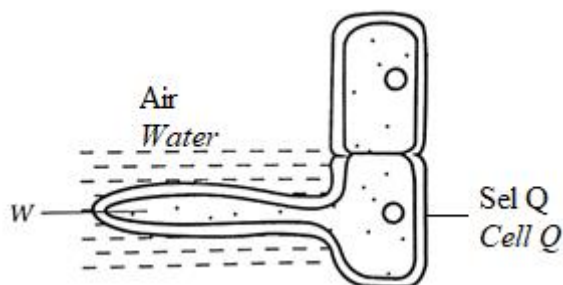
*Predict the appearance of plant Y and Z after two weeks.*

Y : .....

Z : .....

[2 markah / marks]

- (b) Rajah 3.2 menunjukkan sel Q pada akar tumbuhan Y. Sel Q diubahsuai daripada sel-sel epidermis akar. Diagram 3.2 shows cell Q of plant Y. Cell Q are adapted from root epidermal cells.



Rajah 3.2 / Diagram 3.2

Huraikan bagaimana ion nitrate memasuki struktur W.  
*Describe how do nitrate ions enter into structure W.*

.....

.....

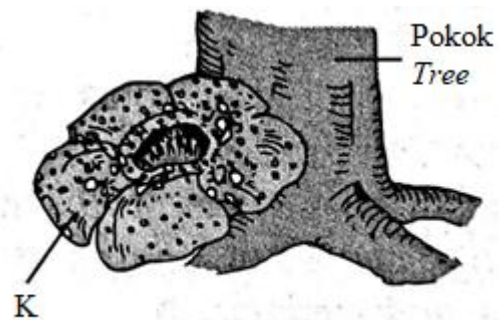
.....

[2 markah / marks]

- (c) Rajah 3.3(a) dan Rajah 3.3(b) menunjukkan dua jenis tumbuhan yang memperoleh nutrien dengan cara berlainan.  
*Diagram 3.3(a) and Diagram 3.3(b) shows 2 types of plants that obtain nutrients in different ways.*



Rajah 3.3(a) / Diagram 3.3(a)



Rajah 3.3(b) / Diagram 3.3(b)

- (i) Bezakan jenis nutrisi tumbuhan yang ditunjukkan oleh tumbuhan J dalam Rajah 3.3(a) dan tumbuhan K dalam Rajah 3.3(b).  
*Differentiate the type of plant nutrition shown by plant J in Diagram 3.3(a) and plant K in Diagram 3.3(b).*

.....

.....

[1 markah / mark]

- (ii) Ramalkan apa yang akan berlaku pada pertumbuhan tumbuhan J jika ia tertedah kepada cahaya matahari secara langsung.  
*Predict what would happen to the growth of the plant J if it is exposed to direct sunlight.*

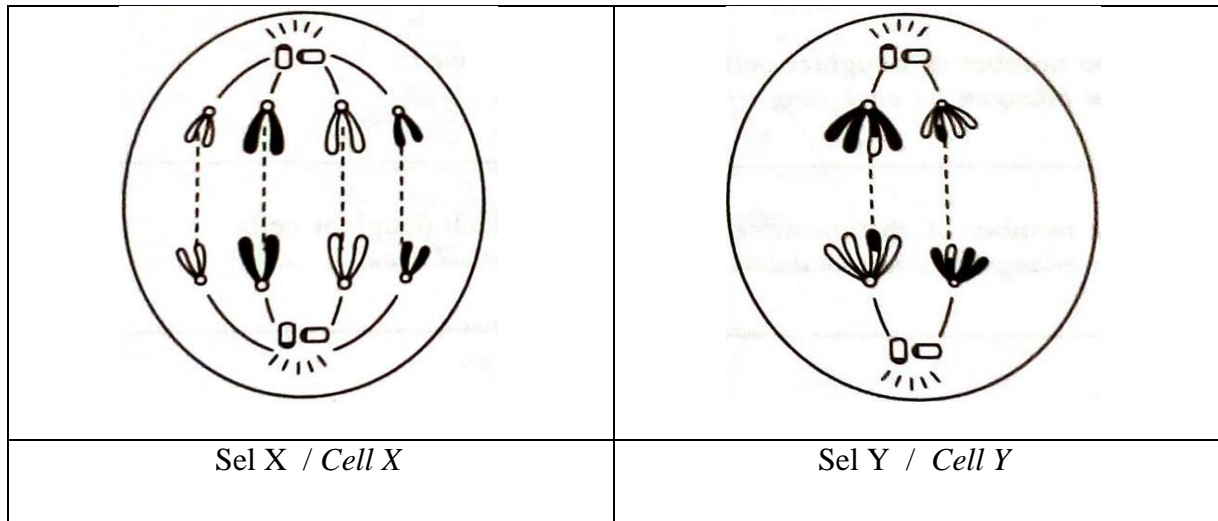
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[2 markah / marks]



4. Rajah 4 menunjukkan sel X dan sel Y mengalami dua jenis pembahagian sel yang berbeza.  
*Diagram 4 shows cell X and cell Y undergo two different types of cell division.*



Rajah 4 / Diagram 4

- (a) Berdasarkan Rajah 4, berikan satu contoh sel yang dihasilkan melalui pembahagian sel sepertimana yang dialami oleh Sel Y.  
*Based on Diagram 4, give an example of a cell produced through cell division as undergone by cell Y.*

.....  
 [1 markah / mark]

- (b) Lengkapkan Jadual 1 dengan mengisi aspek-aspek berikut bagi sel X dan sel Y berdasarkan Rajah 4.  
*Complete Table 1 by filling in the following aspects of cell X and Y based on Diagram 4.*

Aspek <i>Aspect</i>	<b>Sel X</b> <b>Cell X</b>	<b>Sel Y</b> <b>Cell Y</b>
Jenis pembahagian sel <i>Type of cell division</i>		
Peringkat pembahagian sel <i>Stage of cell division</i>		
Perlakuan kromosom <i>Chromosomal behaviour</i>		

[3 markah / marks]

- (c) Kitar sel adalah dikawal oleh sistem penguasaan yang khas untuk memastikan pembahagian sel berlaku dengan sempurna. Walau bagaimanapun, kadang-kadang pembahagian sel yang tidak terkawal berlaku semasa pembahagian sel X.

Seorang murid dikehendaki menyediakan sebuah risalah berkaitan ketidaknormalan pembahagian sel X. Terangkan satu contoh dan kesan ketidaknormalan yang boleh ditulis dalam risalah itu.

*The cell cycle is controlled by a special control system to ensure proper division of the cell. However, uncontrolled cell division sometimes occurs during division of cell X. A student is needed to produce a pamphlet about abnormal division on cell X.*

*Explain one example and effects of the abnormality that can be written in the pamphlet.*

.....

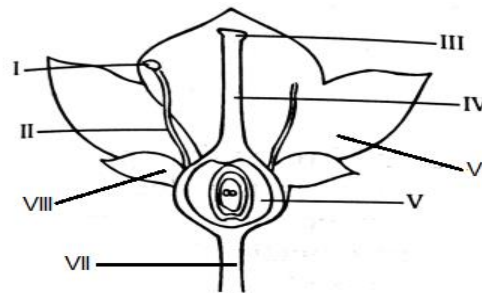
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[3 markah / marks]

5. Rajah 5.1 menunjukkan struktur pembiakan tumbuhan berbunga.

*Diagram 5.1 shows the reproductive structure of flowering plants.*



Rajah 5.1 Diagram 5.1

- (a) (i) Berdasarkan Rajah 5.1, senaraikan struktur-struktur yang terkandung dalam organ pembiakan jantan atau betina bagi tumbuhan berbunga dalam Jadual 2.  
*Based on Diagram 5.1, list the structures that are found in the male or female reproductive organ of the flowering plant in the Table 2.*

<b>Organ pembiakan tumbuhan berbunga</b> <i>Flowering plant reproductive organ</i>	Struktur <i>Structure</i>
<b>Jantan</b> <i>Male</i>	
<b>Betina</b> <i>Female</i>	

Jadual 2 / Table 2

[2 markah / marks]

- (ii) Terangkan secara ringkas apa yang berlaku sebaik sahaja butir debunga mendarat di struktur III dalam Rajah 5.1.

*Briefly explain what happen as soon as a pollen grain lands at the structure III in Diagram 5.1.*

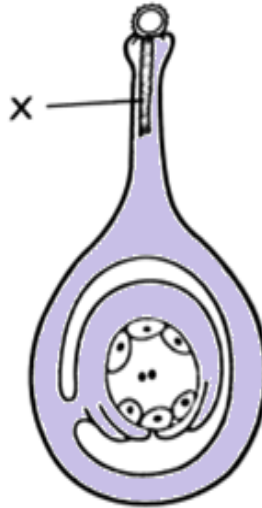
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[2 markah / marks]

- (b) Dalam Rajah 5.2, lukiskan pertumbuhan dan perkembangan struktur X sehingga ia sampai ke pundi embrio berlaku. Labelkan sel-sel dalam pundi embrio yang terlibat dalam persenyawaan.

*In Diagram 5.2, draw the growth and the development of structure X until it reaches embryo sac. Label the cells in the embryo sac that involve in fertilisation.*



Rajah 5.2 / Diagram 5.2

[2 markah / marks]

- (c) Sebilangan besar angiosperma menggunakan biji benih untuk menanam semula dan mengekalkan kelangsungan hidup spesies tumbuhan. Biji benih mempunyai ciri khas untuk meningkatkan peluang pembiakan  
*Most angiosperms use seeds to replant and to maintain the survival of plant species. Seeds have specific features to increase the chances of reproduction.*

Berdasarkan pernyataan di atas, bagaimanakah biji benih dapat meningkatkan peluang pembiakan dan memastikan bahawa spesies tumbuhan tidak pupus?

*With the above information, how can seeds increase reproductive opportunities and ensure that plant species do not become extinct?*

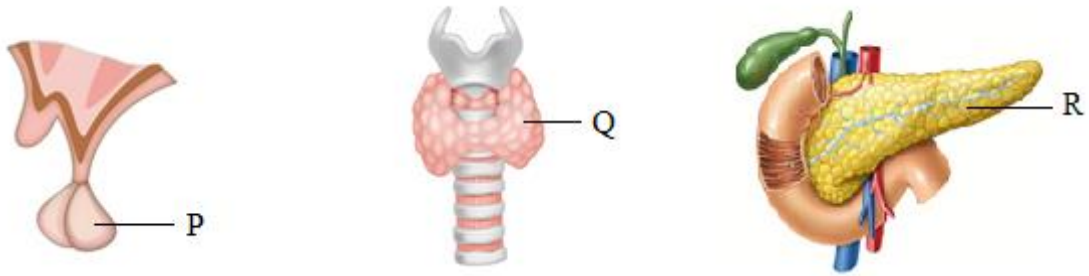
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.....

[2 markah / marks]

6. Rajah 6.1 menunjukkan kelenjar-kelenjar endokrin yang merupakan sebahagian daripada sistem endokrin di dalam badan manusia.  
*Diagram 6.1 shows the endocrine glands which are parts of the endocrine system in a human body.*



Rajah 6.1 / Diagram 6.1

- (a) (i) Namakan kelenjar endokrin berlabel P dan Q.  
*Name the endocrine glands labelled P and Q.*

P : ..... Q: .....  
 [2 markah / marks]

- (ii) Kelenjar P juga dikenali sebagai kelenjar utama. Terangkan kenapa kelenjar P dikenali sebagai kelenjar utama dengan memberikan satu contoh.  
*Gland P is also known as master gland. Briefly explain with an example why gland P is known as master gland.*

.....  
 .....  
 .....  
 [2 markah / marks]

- (b) (i) Kelenjar R bukan sahaja merembeskan enzim tetapi juga merembeskan hormon. Apakah fungsi hormon yang dirembeskan oleh kelenjar R? Sekiranya rembesan hormon tersebut berlebihan, nyatakan jenis penyakit yang akan dihadapi oleh seseorang.  
*Gland R not only secretes enzymes but secretes hormones too. What is the function of hormone secreted by gland R? If the hormone secretion is excessive, state the type of disease that a person will face.*

.....  
 .....  
 .....  
 .....  
 [2 markah / marks]

- (ii) Ketidakseimbangan hormon boleh menyebabkan kesan negatif dalam kesihatan. Rajah 6.2 menunjukkan seorang wanita mengalami pembengkakan kelenjar Q akibat ketidakseimbangan hormon.

*Hormonal imbalance may lead to negative effects in health. Diagram 6.2 shows a woman is having a swollen gland Q as a result of hormonal imbalance.*



Rajah 6.2 / Diagram 6.2

Terangkan kesan ketidakseimbangan hormon ini pada wanita tersebut.

*Explain the impacts of this hormonal imbalance on the woman.*

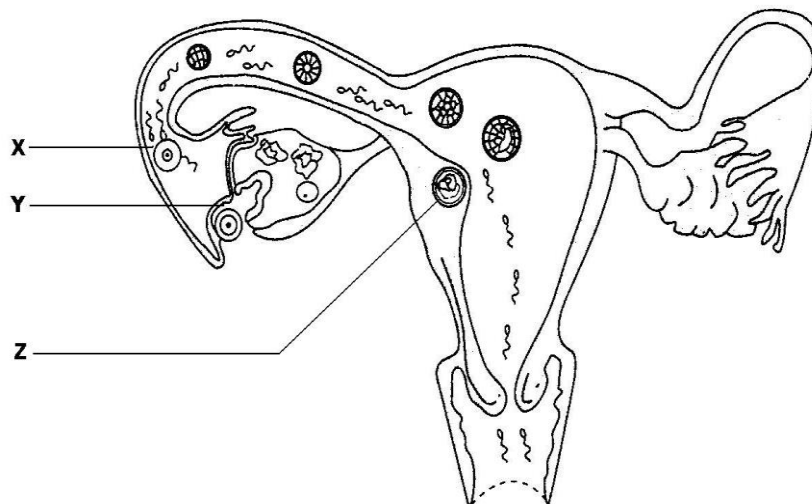
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.....

[2 markah / marks]

7. Rajah 7.1 menunjukkan peringkat-peringkat dalam perkembangan zigot manusia. Diagram 7.1 shows the stages in the development of a human zygote.



Rajah 7.1 / Diagram 7.1

- (a) (i) Namakan proses yang berlaku pada peringkat X dan Z.

*Name the process that occurs at stage X and Z.*

X: .....

Z: .....

[2 markah / marks]

- (ii) Terangkan kejadian yang berlaku pada proses Y.  
*Explain the event that happens in process Y*

.....

.....

.....

[2 markah / marks]

- (b) Terangkan bagaimana embrio dapat bergerak dari tuib falopio ke uterus.  
*Explain how can the embryo move from fallopian tube to the uterus.*

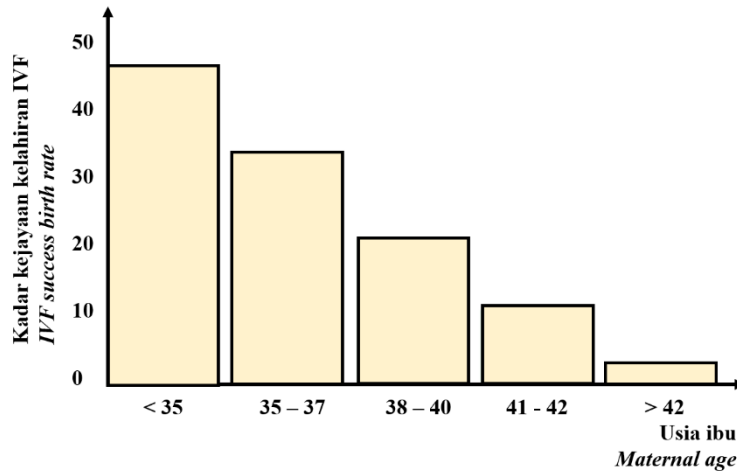
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[2 markah / marks]

- (c) Rajah 7.2 menunjukkan kesan usia pada kadar kejayaan kelahiran IVF.  
*Diagram 7.2 shows the impact of age on IVF success birth rate.*



Rajah 7.2 / Diagram 7.2

- (i) Berdasarkan rajah 7.2, nyatakan kesan usia pada kadar kejayaan kelahiran IVF.  
*Based on the diagram 7.2, state the impact of age on IVF success birth rate.*

.....

.....

[1 markah / mark]

- (ii) Terangkan faktor yang menyebabkan kesan ini.  
*Explain the factor that cause this impact.*

.....

.....

[2 markah / marks]



8. Rajah 8 menunjukkan sejenis pokok bakau yang ditemui di kawasan muara sungai  
*Diagram 8 shows a type of mangrove tree which can be found in estuaries.*



Rajah 8 / Diagram 8

- (a) Namakan pokok bakau dan jenis akar yang ditunjukkan dalam rajah 8.  
*Name the mangrove trees and the type of root shown in diagram 8.*

Pokok / Tree: .....

Akar / Root: .....

[2 markah / marks]

- (b) Terangkan mengapa akar pokok bakau terdapat di atas tanah.  
*Explain why the root of the mangrove tree is found above the ground.*

.....  
 .....  
 .....

[2 markah / marks]

- (c) Setelah 50 tahun, paya baharu terbentuk dan mengunjur ke laut.  
*After 50 years, the new swamp is form and extend further to the sea.*

Terangkan pernyataan ini.  
*Explain this statement.*

.....  
 .....  
 .....

[2 markah / marks]

- (d) Banyak kawasan hutan paya bakau telah ditebus guna untuk kawasan pertanian.  
Bincangkan kesan tindakan ini pada persekitaran.

*Many areas of mangrove swamp forest have been reclaimed for agriculture.  
Discuss the effect of this action on the environment.*

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.....

[3 markah / marks]

## Bahagian B

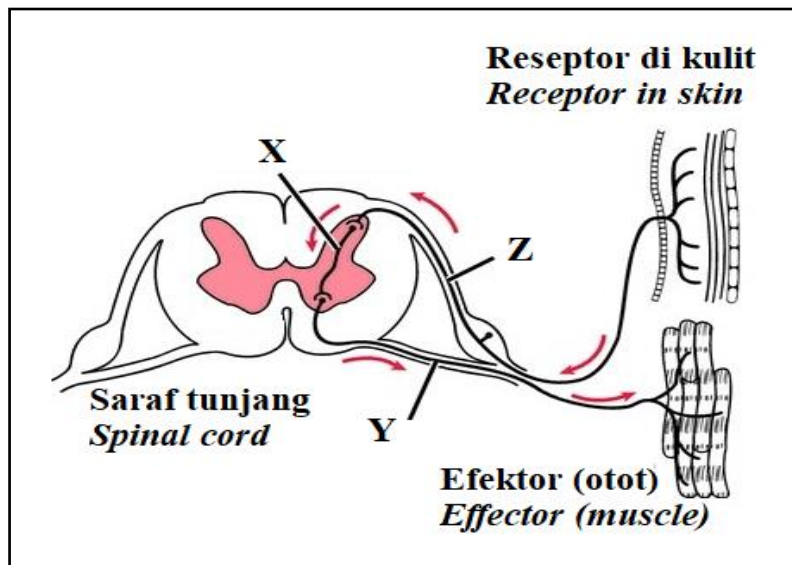
## Section B

[20 markah]

[20 marks]

Jawab mana-mana **satu** soalan dalam bahagian ini*Answer any **one** questions from this section*

- 9(a) Rajah 9.1 menunjukkan lintasan saraf yang terlibat ketika tersentuh objek panas.  
*Diagram 9.1 shows nerve pathway involved in touching hot object.*



Rajah 9.1 / Diagram 9.1

- (i) Berdasarkan Rajah 9.1, bandingkan dan bezakan di antara neuron Y dan neuron Z.  
*Based on Diagram 9.1, compare and contrast the neurone Y and neurone Z.*

[6 markah / marks]

(ii)

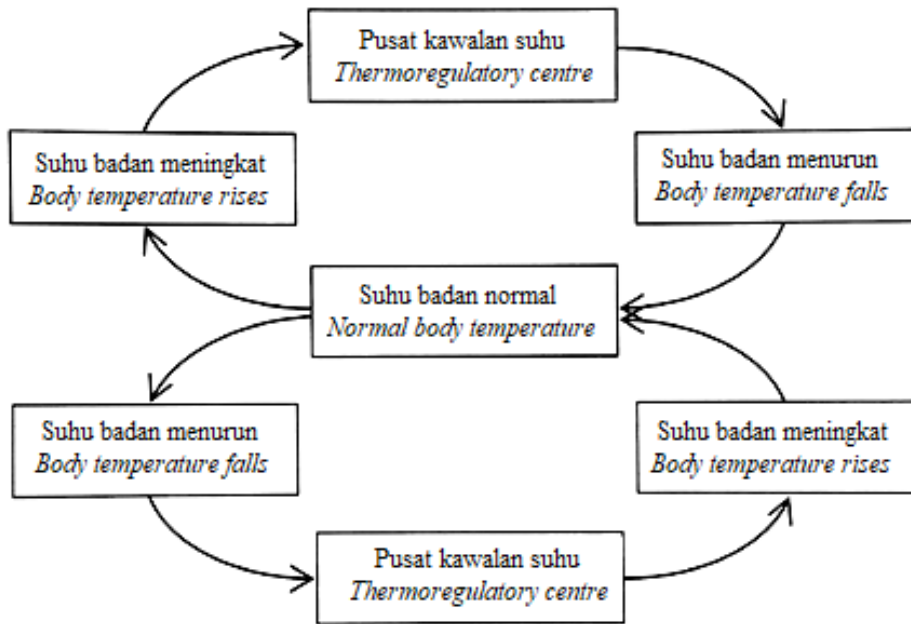
**Muhammad Ali merupakan seorang peninju yang terkenal di dunia. Pada akhir hayatnya, dia mengidap penyakit saraf iaitu penyakit Parkinson. Penyakit Parkinson adalah kemerosotan tisu saraf yang disebabkan oleh kegagalan neuron di dalam otak untuk menghasilkan dopamine yang cukup bagi mengawal pergerakan.**

*Muhammad Ali was a famous boxer in the world. At the end of his life, he suffered from nerves of Parkinson's disease. Parkinson disease is a degenerative neurological disorder resulted from neuron in the brain is not able to produce sufficient dopamine which control movement.*

Nyatakan symptom bagi penyakit Parkinson dan terangkan mengapa tindakan refleks seseorang yang mengalami Parkinson adalah tidak secepat berbanding seorang yang normal.  
*State the symptom of Parkinson's disease and explain why reflex action of a person suffering from Parkinson disease is less rapid compared to a normal person*

[4 markah / marks]

- (b) Rajah 9.2 menunjukkan mekanisma suap balik negative dalam pengawalan suhu badan.  
 Diagram 9.2 shows the negative feedback mechanisms in the regulation of body temperature.

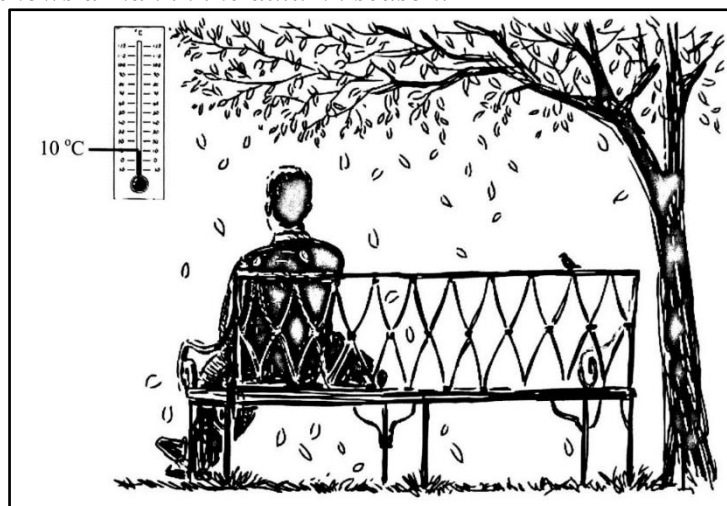


Rajah 9.2 / Diagram 9.2

- (i) Berdasarkan Rajah 3.2, terangkan maksud homeostasis.  
 Based on Diagram 3.2, explain the meaning of homeostasis.

[2 markah / marks]

- (ii) Rajah 9.3 menunjukkan seorang lelaki pada musim luruh.  
 Diagram 9.3 shows a man in the autumn season.

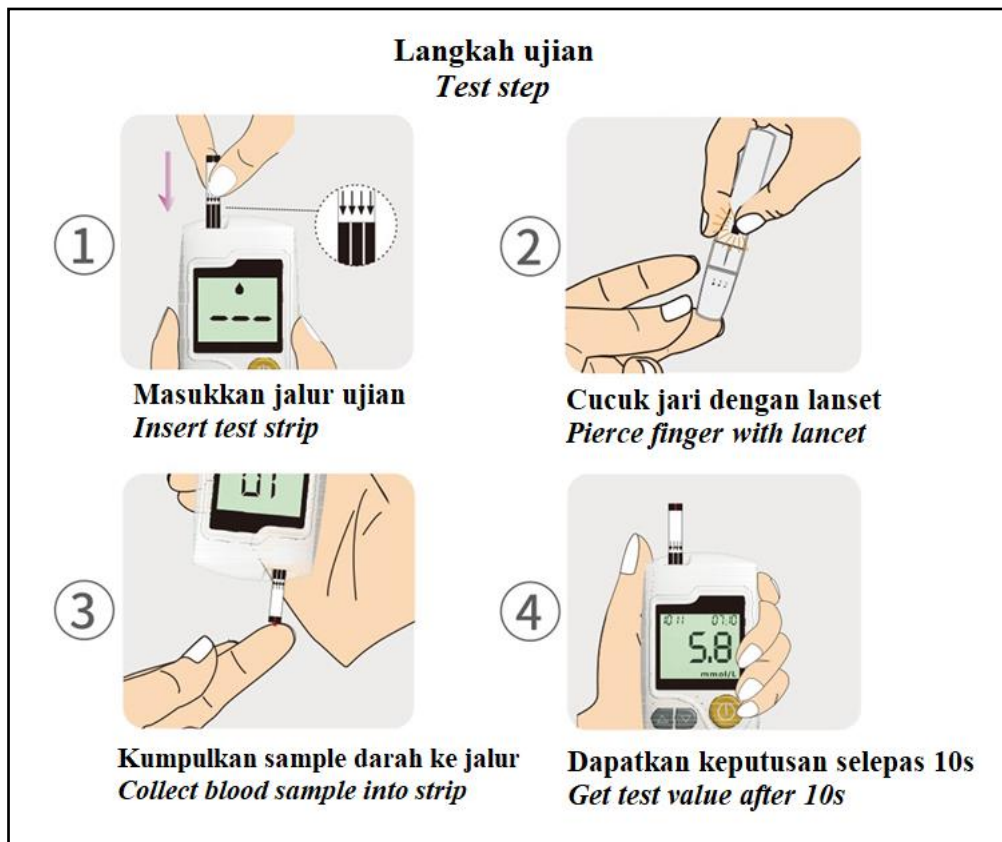


Rajah 9.3  
 Diagram 9.3

Terangkan gerak balas salur-salur darahnya semasa pengawalan suhu badannya.  
 Explain the response of his blood vessels during the regulation of the body temperature.

[3 markah / marks]

- (c) Rajah 9.4 menunjukkan langkah ujian glukosa darah ke atas individu X dan Y dengan menggunakan glukometer dan Jadual 9.5 menunjukkan bacaan pada glukometer. *Diagram 9.4 shows a blood glucose test of individual X and Y by using glucometer and Table 9.5 shows the reading of the glucometer.*



Rajah 9.4  
*Diagram 9.4*

Individu <i>Individual</i>	Bacaan peranti meter glukosa (mg/dL) <i>The reading of glucose meter (mg/dL)</i>		Keadaan kesihatan <i>Health condition</i>
	Semasa berpuasa <i>During fasting</i>	Dua jam selepas makan <i>Two hours after eating</i>	
<b>X</b>	<b>75</b>	<b>80</b>	<b>Sihat</b> <i>Healthy</i>
<b>Y</b>	<b>125</b>	<b>210</b>	<b>Tidak sihat</b> <i>Unhealthy</i>

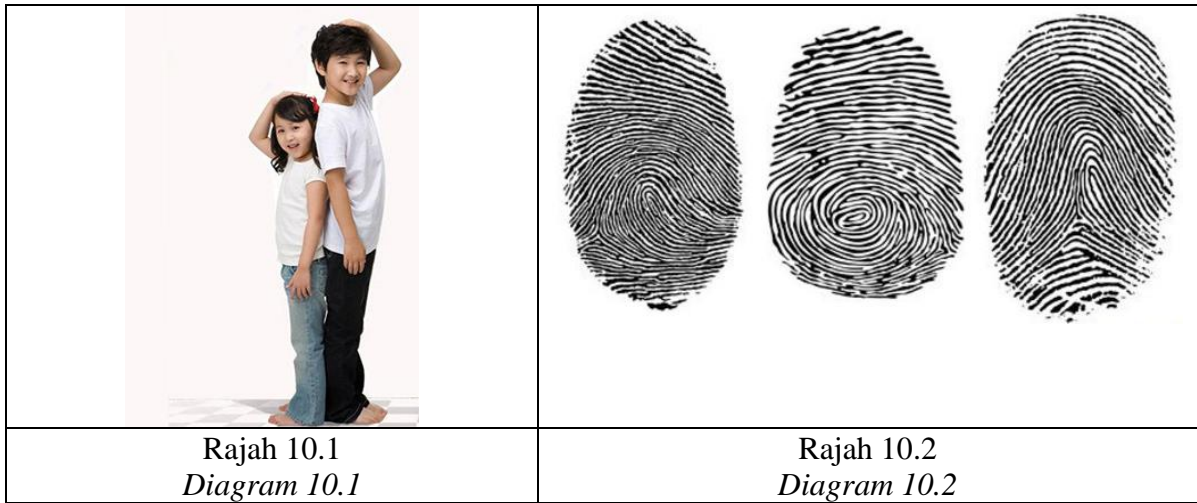
Jadual 9.5  
*Table 9.5*

Doktor telah mencadangkan individu Y untuk mengambil suntikan hormon M setiap hari. Namakan masalah kesihatan yang dihadapi oleh individu Y dan terangkan mengapa beliau perlu mengambil suntikan hormon M

*The doctor suggested individual Y to take an injection of hormone M every day. Name the health problem faced by individual Y and explain why he needs to take injection of hormone M.*

[5 markah / marks]

10. (a) Rajah 10.1 dan 10.2 menunjukkan dua jenis variasi.  
*Diagram 10.1 and 10.2 shows two types of variation.*



- (i) Kenal pasti jenis variasi dalam Rajah 10.1 dan 10.2 masing-masing.  
*Identify the types of variation in Diagram 10.1 and 10.2 respectively.*  
[ 2 markah / marks]
- (ii) Nyatakan perbezaan antara jenis variasi dalam Rajah 10.1 dan 10.2.  
*State the differences between the types of variation in Diagram 10.1 and 10.2.*  
[ 4 markah / marks]
- (b) Rajah 10.3 menunjukkan gambar sebuah keluarga.  
Anak-anak biasanya kelihatan seperti ayah mereka, dan sedikit seperti ibu mereka, tetapi mereka tidak serupa dengan ibu bapa mereka.  
*Diagram 10.3 shows a picture of a family.*  
*Children usually look a little like their father, and a little like their mother, but they are not be identical to either of their parents.*



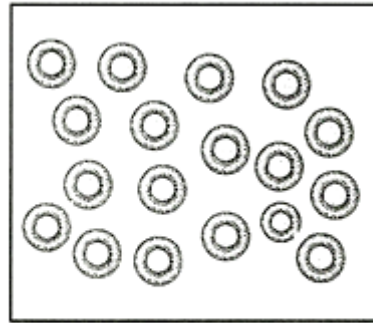
Rajah 10.3 / *Diagram 10.3*

Terangkan mengapa anak-anak kelihatan berbeza daripada ibu bapa mereka.  
*Explain why the offspring look different from their parents.*

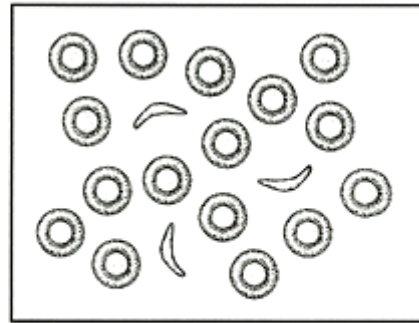
[10 markah / marks]



- (c) Rajah 10.4 menunjukkan keadaan sel darah merah dua individu, P dan Q, Individu Q menghidap suatu penyakit genetik.  
*Diagram 10.4 shows the conditions of red blood cells of two individuals, P and Q. Individual Q suffers from a genetic disease*



Sel-sel darah merah individu P  
*Red blood cells of individual P*



Sel-sel darah merah individu Q  
*Red blood cells of individual Q*

Rajah 10.4 / *Diagram 10.4*

Terangkan perbezaan kesihatan antara individu P dan Q.  
*Explain the difference in health between individuals P and Q.*

[4 markah / *marks*]

## Bahagian C

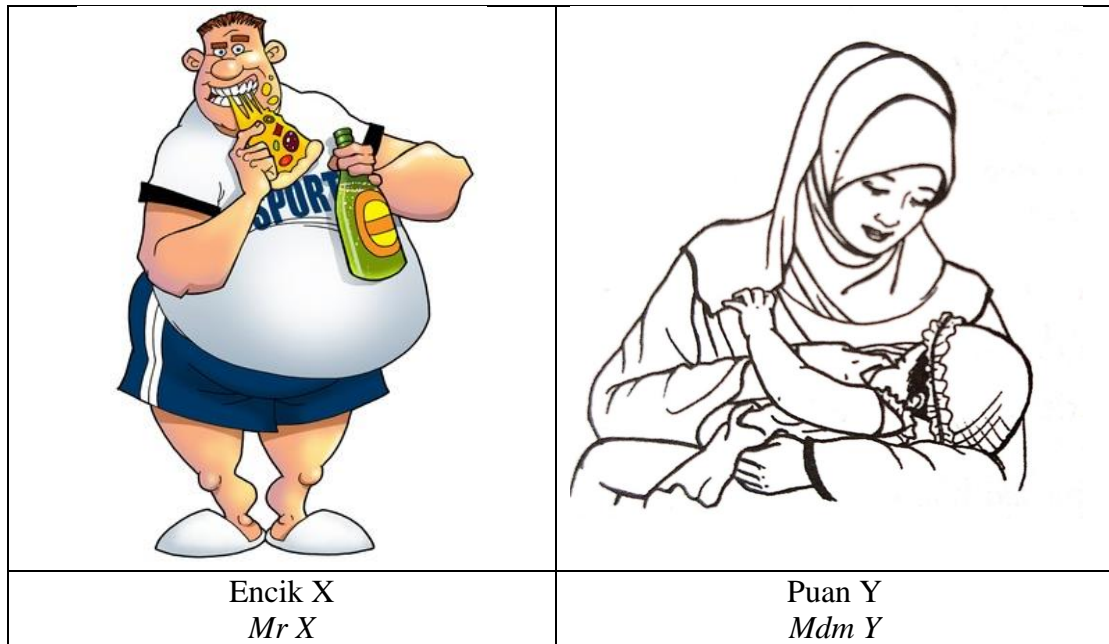
## Section C

[20 markah]

[20 marks]

Jawab **semua** soalan dalam bahagian ini*Answer all questions from this section*

11. (a) Rajah 11.1 menunjukkan keadaan dua individu, Encik X dan Puan Y  
*The diagram 11.1 shows the conditions of two individual, Mr X and Mdm Y.*

Rajah 11.1 / *Diagram 11.1*

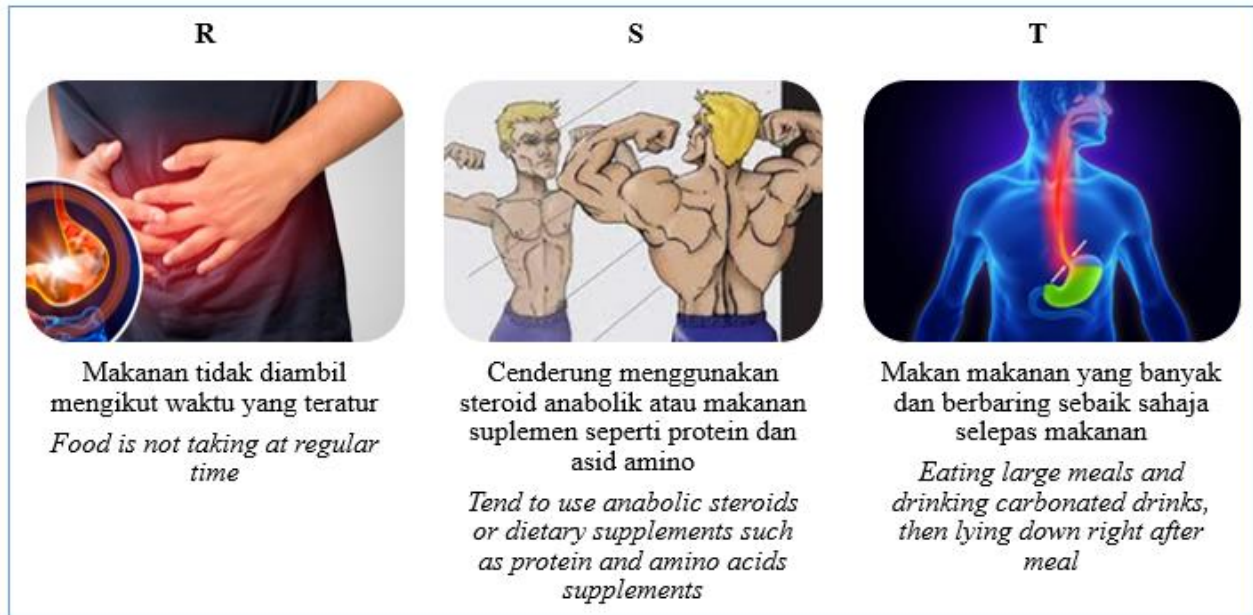
Seandainya anda seorang pakar pemakanan, apakah nasihat pemakanan yang perlu diberi kepada kedua-dua Encik X dan Puan Y? Terangkan jawapan anda.

*If you were a nutritionist, what are the dietary advices that should be given to both Mr X and Mdm Y? Explain your answer.*

[10 markah / *marks*]

(b) Rajah 11.2 menunjukkan masalah kesihatan, R, S dan T, yang timbul akibat daripada tabiat pemakanan tertentu.

*Diagram 11.2 shows health issues, R, S and T which arise as a result of certain eating habits.*



Rajah 11.2 / Diagram 11.2

Berdasarkan Rajah 11.2, terangkan bagaimana tabiat makan yang tidak baik boleh menyebabkan masalah kesihatan pada manusia.

*Based on Diagram 11.2, explain how the poor eating habits can cause health problems in human.*

[10 markah / marks]

KERTAS PEPERIKSAAN TAMAT  
END OF QUESTION PAPER

**SKEMA JAWAPAN / PEMARKAHAN**  
**PRAKTIS BIOLOGI 4551/2**  
**SET 2**

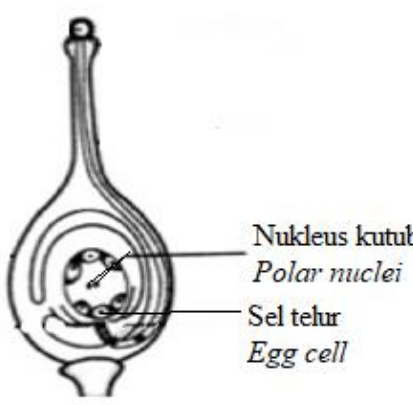
Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
1 (a)	<p><b>Able to name protein X and Y</b>  <u>Answer</u></p> <p>Protein X : Protein pembawa / <i>Carrier protein</i>            Protein Y : Protein liang / <i>Pore / Channel protein</i></p>	  1 1	2
1 (b)	<p><b>Able to explain why the movement of vitamin E molecule is catagorised as passive transport.</b>  <u>Sample answer</u></p> <p>P1: Bahan bergerak mengikut kecerunan kepekatan / dari kawasan berkepekatan tinggi ke kawasan berkepekatan rendah.  <i>Substances move following concentration gradient/ from high concentration region to low concentration region</i></p> <p>P2: Tidak memerlukan tenaga.  <i>Energy is not required.</i></p>	  1   1	2
1 (c)	<p><b>Able to explain why Individual who suffers from diarrhoea is advised to drink rehydration drinks</b>  <u>Sample answer</u></p> <p>P1: Pesakit cirit birit kehilangan banyak bendalir badan / air/ mengalami peningkatan tekanan osmosis darah  <i>Diarrhoea patient lost a lot of body fluid / water/ blood osmotic pressure increases</i></p> <p>P2: Minuman rehidrasi mengembalikan kehilangan air dan elektrolit  <i>Rehydration drinks recover the loss of water and electrolytes</i></p> <p>P3: Menggalakkan resapan air dari usus kecil ke kapilari darah melalui osmosis  <i>Promotes absorption of water from small intestines to blood capillary by osmosis</i></p> <p style="text-align: right;">(Mana-mana 2 / Any 2)</p>	  1  1  1	2
			6

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
2 (a)	<p><b>Able to name the main heart pacemaker</b> <u>Answer</u></p> <p>Nodus sinoatrium <i>Sinoatrial node</i></p>	1	1
2 (b)	<p><b>Able to explain how the structures J and K work to create the heart pumping force</b> <u>Sample answer</u></p> <p>P1: J/ Nodus sinoatrium menjana impuls elektrik menyebabkan kedua-dua atrium mengecut <i>J/ Sinoatrial node generates electrical impulses and causes both atria to contract</i></p> <p>P2: Impuls elektrik sampai ke K / nodus atrioventrikel <i>Electrical impulses reach the atrioventricular node</i></p> <p>P3: Impuls elektrik merebak melalui berkas His dan gentian Purkinje <i>Electrical impulses spread through the bundle of His and the Purkinje fibres</i></p> <p>P4: Kedua-dua ventrikel mengecut mengepam darah keluar <i>Both ventricles contract to pump blood out</i> (Mana-mana 2 / Any 2)</p>	1 1 1 1	2
2 (c)	<p><b>Able to explain how Atherosclerosis is developed in an individual body</b> <u>Sample answer</u></p> <p>P1: Pembentukan / pemendapan plak pada dinding dalam arteri <i>Formation / deposition of plaque on the lining of artery walls</i></p> <p>P2: Plak terbentuk daripada kolesterol / lipid / tisu otot yang mati / platlet yang tergumpal <i>The plaque is formed from cholesterol / lipid / dead muscle tissues / coagulated platelets</i></p> <p>P3: Plak menyumbat / menyembitkan lumen salur darah <i>The plaque clog / narrow the lumen in blood vessels</i></p> <p>P4: Arteri menjadi keras / hilang kekenyalannya <i>Artery becomes harden / loss its elasticity</i> (Mana-mana 3 / Any 3)</p>	1 1 1 1	3
			6

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
3 (a)	<p><b>Able to predict the appearance of plant Y and Z after two weeks</b> <u>Sample answer</u></p> <p>Y : Daun kelihatan kekuningan/Klorosis/daun dasar gugur <i>Leaves appear yellowish/chlorosis/underlying leaves fall off</i></p> <p>Z : Pertumbuhan akar yang tidak sihat/ pembentukan daun hijau tua dan warna yang pudar/ tompok merah atau ungu yang muncul pada daun tua <i>Unhealthy root growth/ formation of dark green and dull coloured leaves/ red or purple spots appear on older leaves.</i></p>	1  1	2
3(b)	<p><b>Able to describe how do nitrate ions enter into structure W</b> <u>Sample answer</u></p> <p>P1 : Ion nitrate dibawa ke dalam W secara pengangkutan secara aktif <i>Ion nitrate are taken into W by active transport</i></p> <p>P2 : melalui protein pembawa <i>through carrier protein</i></p> <p>P3 : melawan kecerunan kepekatan. <i>against the concentration gradient.</i></p> <p>P4 : Dengan kegunaan tenaga. <i>With the use of energy.</i></p> <p style="text-align: right;">(Mana-mana 2 / Any 2)</p>	1  1 1 1	2
3(c) (i)	<p><b>Able to differentiate the type of plant nutrition shown by plant J and plant K</b> <u>Sample answer</u></p> <p>Tumbuhan J ialah tumbuhan epifit manakala tumbuhan K ialah tumbuhan parasite. <i>Plant J is an epiphytic plant while Plant K is a parasitic plant.</i></p>	1	1
3(c) (ii)	<p><b>Able to Predict what would happen to the growth of the plant J if it is exposed to direct sunlight</b> <u>Sample answer</u></p> <p>P1 : Pertumbuhan tumbuhan J/ tanduk rusa akan terbantut <i>The growth of J/ bird-nest fern will be stunted</i></p> <p>P2 : kerana kekurangan air. <i>due to lack of water.</i></p>	1  1	2
			7



Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>								
4 (a)	<p><b>Able to give one example of cell that is produced through the cell division as undergone by Cell Y</b>  <u>Sample answer</u></p> <p>Sperma / sel telur/ ovum  <i>Sperm/ egg cell/ovum</i></p>	1	1								
4 (b)	<p><b>Able to fill the aspects of cell X and Y in terms of type of cell division, stage of cell division and chromosomal behaviour.</b>  <u>Sample answer</u></p> <table border="1" data-bbox="312 651 1157 1099"> <thead> <tr> <th data-bbox="312 651 740 725"><b>Sel X</b> <i>Cell X</i></th> <th data-bbox="740 651 1157 725"><b>Sel Y</b> <i>Cell Y</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="312 725 740 799">Mitosis <i>Mitosis</i></td> <td data-bbox="740 725 1157 799">Meiosis <i>Meiosis</i></td> </tr> <tr> <td data-bbox="312 799 740 873">Anafasa <i>Anaphase</i></td> <td data-bbox="740 799 1157 873">Anafasa I <i>Anaphase I</i></td> </tr> <tr> <td data-bbox="312 873 740 1099">Kromatid kembar berpisah dan tertarik / bergerak ke kutub sel yang bertentangan <i>Sister chromatids separate and be pulled / move to opposite poles of the cell</i></td> <td data-bbox="740 873 1157 1099">Kromosom homolog berpisah dan tertarik / bergerak ke kutub sel yang bertentangan <i>Homologous chromosomes separate and be pulled / move to opposite poles of the cell</i></td> </tr> </tbody> </table>	<b>Sel X</b> <i>Cell X</i>	<b>Sel Y</b> <i>Cell Y</i>	Mitosis <i>Mitosis</i>	Meiosis <i>Meiosis</i>	Anafasa <i>Anaphase</i>	Anafasa I <i>Anaphase I</i>	Kromatid kembar berpisah dan tertarik / bergerak ke kutub sel yang bertentangan <i>Sister chromatids separate and be pulled / move to opposite poles of the cell</i>	Kromosom homolog berpisah dan tertarik / bergerak ke kutub sel yang bertentangan <i>Homologous chromosomes separate and be pulled / move to opposite poles of the cell</i>	1 1 1	3
<b>Sel X</b> <i>Cell X</i>	<b>Sel Y</b> <i>Cell Y</i>										
Mitosis <i>Mitosis</i>	Meiosis <i>Meiosis</i>										
Anafasa <i>Anaphase</i>	Anafasa I <i>Anaphase I</i>										
Kromatid kembar berpisah dan tertarik / bergerak ke kutub sel yang bertentangan <i>Sister chromatids separate and be pulled / move to opposite poles of the cell</i>	Kromosom homolog berpisah dan tertarik / bergerak ke kutub sel yang bertentangan <i>Homologous chromosomes separate and be pulled / move to opposite poles of the cell</i>										
4(c)	<p><b>Able to explain the example of mutation with following aspect:</b>                      F : example                      C : cause of disease/type of mutation                      S : symptom</p> <p><u>Sample answer</u></p> <p>F1 : Kanser/ <i>Cancer</i>                      C1 : warisi daripada ibubapa/mutase gen/ merokok/ dedah kepada radiasi/ karsinogen / bahan kimia // Mitosis tidak terkawal  <i>inherit from parents/gene mutation/ smoking/exposure to radiation/carcinogen / chemicals // Uncontrollable mitosis</i>                      S1 : tumor/ perubahan berat/ letih/ mengalami masalah menelan/ simpton lain-lain yang sesuai  <i>tumour/weight changes/fatigue/difficulty in swallowing/any suitable symptoms</i></p>	1 1 1	3								
			7								

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>						
5(a) (i)	<p><b>Able to list the structures that are found in the male or female reproductive organ of the flowering plant</b>  <b>Answer</b></p> <table border="1" data-bbox="312 416 1145 622"> <thead> <tr> <th data-bbox="312 416 868 488"><b>Organ pembiakan tumbuhan berbunga</b> <i>Flowering plant reproductive organ</i></th> <th data-bbox="868 416 1145 488"><b>Struktur</b> <i>Structure</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="312 488 868 555"><b>Jantan</b> <i>Male</i></td> <td data-bbox="868 488 1145 555">I dan II <i>I and II</i></td> </tr> <tr> <td data-bbox="312 555 868 622"><b>Betina</b> <i>Female</i></td> <td data-bbox="868 555 1145 622">III, IV dan V <i>III, IV and V</i></td> </tr> </tbody> </table>	<b>Organ pembiakan tumbuhan berbunga</b> <i>Flowering plant reproductive organ</i>	<b>Struktur</b> <i>Structure</i>	<b>Jantan</b> <i>Male</i>	I dan II <i>I and II</i>	<b>Betina</b> <i>Female</i>	III, IV dan V <i>III, IV and V</i>	1  1	2
<b>Organ pembiakan tumbuhan berbunga</b> <i>Flowering plant reproductive organ</i>	<b>Struktur</b> <i>Structure</i>								
<b>Jantan</b> <i>Male</i>	I dan II <i>I and II</i>								
<b>Betina</b> <i>Female</i>	III, IV dan V <i>III, IV and V</i>								
5(a) (ii)	<p><b>Able to explain what happen as soon as a pollen grain lands at the structure III</b>  <b>Sample answer</b></p> <p>F: Butir debunga akan bercambah dan menghasilkan satu tiub debunga.  <i>Pollen grain will germinate and form a pollen tube.</i></p> <p>P1: Larutan bergula pada stigma merangsangkan percambahan butir debunga.  <i>Sugary solution on the stigma stimulates germination of the pollen grain.</i></p> <p>P2: Tiub debunga yang berkembang akan bertumbuh dengan menghalu ke bawah melalui stil.  <i>The developed pollen tube grows down through the style</i></p> <p>P3: Nukleus generatif akan membahagi secara mitosis untuk membentuk dua nucleus jantan.  <i>The generative nucleus divides by mitosis to form two male nuclei.</i></p> <p style="text-align: right;">( F dengan mana-mana 1P/ F with any 1P)</p>	1  1  1  1	2						
5(b)	<p><b>Able to draw the growth and the development of structure X until it reaches embryo sac and label the cells in the embryo sac that involve in fertilisation</b>  <b>Sample answer</b></p> <div style="text-align: center;">  </div> <p style="text-align: right;">Lukisan betul / <i>Correct drawing</i> : 1m  Label betul / <i>Correct labeling</i> : 1m</p>	1+1	2						

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
5(c)	<p><b>Able to explain how can seeds increase reproductive opportunities and ensure that plant species do not become extinct</b></p> <p><u>Sample answer</u></p> <p>P1: Biji benih mengandungi embrio yang bercambah untuk membentuk anak benih <i>Seeds contain embryo that germinate to form seedling.</i></p> <p>P2: Di dalam biji benih, tisu endosperma / kotiledon merupakan sumber nutrien untuk membekalkan tenaga apabila percambahan berlaku. <i>Inside the seeds, the endosperm tissue / cotyledon is the source of nutrient to supply energy when germination occurs.</i></p> <p>P3: Biji benih dilindungi oleh testa yang kuat dan tidak telap kepada air untuk menghalang kerosakan benih daripada berlaku. <i>Seeds are enclosed by the testa which is strong and water impermeable to prevent the seeds from spoiling</i></p> <p>P4: Biji benih boleh membentuk struktur dorman yang membolehkan ia disimpan lama <i>Seeds can form a dormant structure which enables the seeds to be stored for a long time.</i></p> <p>P5: Biji benih mempunyai ciri-ciri khusus / ringan / mempunyai tisu berspan / kuat / tidak mudah dirosakkan supaya mudah tersebar ke tempat lain untuk mengelakkan persaingan. <i>Seeds have special features /light / have spongy tissue /strong / do not spoil easily so that the seeds are easily dispersed to another place to avoid competition</i></p> <p style="text-align: right;">(Mana-mana 2 / Any 2)</p>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>	<p style="text-align: center;">2</p> <p style="text-align: center;">7</p>

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
6 (a)(i)	<p><b>Able to name the endocrine glands labelled P and Q</b></p> <p><u>Answer</u>            P: Kelenjar pituitari / <i>Pituitary gland</i>            Q: Kelenjar tiroid / <i>Thyroid gland</i></p>	1 1	2
6 (a)(ii)	<p><b>Able to explain with an example why gland P is known as master gland.</b></p> <p><u>Sample answer</u></p> <p>P1: Kelenjar pituitari merembeskan beberapa hormon yang dapat mengawal kelenjar endokrin yang lain.  <i>Pituitary gland secretes several hormones that control other endocrine glands</i></p> <p>P2: Contohnya, hormon perangsang tiroid yang dirembeskan oleh kelenjar pituitari berfungsi untuk merangsangkan kelenjar tiroid merembeskan hormon tiroksina //Mana-mana contoh yang sesuai  <i>For example, the thyroid stimulating hormone secreted by the pituitary gland works to stimulate the thyroid gland to secrete thyroxine hormone// Any suitable example</i></p>	1 1	2
6 (b) (i)	<p><b>Able to explain the function of hormone secreted by gland R, and state the type of disease that a person will face if the hormone secretion is excessive</b></p> <p><u>Sample answer</u></p> <p>Insulin / <i>Insulin</i></p> <p>P1: Insulin berfungsi untuk mengurangkan aras glukosa darah / menukarkan glukosa berlebihan kepada glikogen  <i>Insulin works to lower blood glucose level / convert excess glucose into glycogen</i></p> <p>P2: Rembesan insulin yang berlebihan akan menyebabkan hipoglisemia  <i>Over secretion of insulin can lead to hypoglycaemia</i></p> <p>Glukagon / <i>Glucagon</i></p> <p>P3: Glukagon berfungsi untuk meningkatkan aras glukosa darah / tukar glikogen kepada glukosa  <i>Glucagon works to increase blood glucose level / convert glycogen into glucose</i></p> <p>P4: Rembesan glukagon yang berlebihan akan menyebabkan diabetes jenis dua  <i>Over secretion of glucagon can lead to type 2 diabetes</i></p> <p style="text-align: right;">P1 &amp; P2 / P3 &amp; P4</p>	1 1 1 1	2

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
6 (b) (ii)	<p><b>Able to explain the impacts of hormonal imbalance that cause a swollen gland Q on the woman</b></p> <p><u>Sample answer</u></p> <p>P1: Pembengkakan kelenjar Q dikenali sebagai goiter <i>Swelling of the Q gland is known as goitre</i></p> <p>P2: Goitre berlaku disebabkan oleh rembesan hormon tiroksina yang berlebihan/ hipertiroidisme // kekurangan iodine <i>Goitre occurs due to the excessive secretion of thyroxine hormone / hyperthyroidism // lack of iodine</i></p> <p>P3: Rembesan hormon tiroksina yang berlebihan akan meningkatkan kadar metabolisme badan. <i>Over secretion of thyroxine hormone causes an increase in the metabolic rate of the body.</i></p> <p>P4: Simptom-simptom lain seperti perpeluhan secara berlebihan / tidak tahan panas / kerap buang air besar / takut / kadar denyutan jantung cepat / kehilangan berat badan. <i>Others symptoms include excessive sweating / heat intolerance / increased frequency of defaecation / fear / heart palpitations / weight loss.</i></p> <p style="text-align: right;">(Mana-mana 2 / Any 2)</p>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>	<p style="text-align: center;">2</p>
			8

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
7(a)(i)	<b>Able to name the process that occurs at stage X and Z</b> <u>Answer</u>  X: Persenyawaan / <i>Fertilization</i> Z: Penempelan / <i>Implantation</i>	1 1	2
7(a)(ii)	<b>Able to explain the event that happens in process Y</b> <u>Sample answer</u>  P1: Aras hormon peluteinan yang <u>tinggi</u> (LH) <i>The high level of Luteinising hormone (LH)</i> P2: Merangsang ovulasi <i>Stimulate ovulation</i> P3: Oosit sekunder dibebaskan dari folikel Graaf <i>Secondary oocyte is released from Graafian follicle</i>  Mana-mana 2 / <i>Any 2</i>	1 1 1	2
7(b)	<b>Able to explain how the embryo can reach the uterus</b> <u>Sample answer</u>  P1: Tindakan silium pada dinding dalam tiub falopio <i>The action of the cilia on the lining of fallopian tube</i> P2: Peristalsis otot tiub falopio membantu menggerakkan embrio ke uterus <i>Peristalsis of the Fallopian tube helps in delivering the embryo to the uterus</i>	1 1	2
7(c)(i)	<b>Able to state the impact of age on IVF success birth rate</b> <u>Sample answer</u>  Apabila usia ibu meningkat, kadar kejayaan kelahiran IVF menurun <i>When the maternal age increases, IVF success birth rate decreases</i>	1	1
7(c)(ii)	<b>Able to explain the factor that cause the impact of age on IVF success birth rate</b> <u>Sample answer</u> P1: Bilangan oosit berkurang (apabila wanita semakin tua) <i>The number of oocytes decreases (as women get older)</i> P2: Penurunan kualiti oosit sekunder // oosit sekunder mempunyai kromosom yang tidak normal <i>The decline in oocyte quality // secondary oocytes have abnormal chromosomes</i> P3: Risiko kecacatan sperma yang gagal mempersenyawakan oosit sekunder meningkat <i>Risk of sperm defects that fail to fertilise the secondary oocyte increase</i> P4: Uterus tidak normal / lemah <i>Abnormal uterus / weak uterus</i>  (Mana-mana 2 / <i>Any 2</i> )	1 1 1 1	2
			9

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
8(a)	<p><b>Able to name the mangrove trees and the type of root</b> <u>Answer</u></p> <p>Pokok / <i>Tree</i> : <i>Avicennia</i> sp / <i>Sonneratia</i> sp Akar / <i>Root</i> : Akar pneumatofor / <i>pneumatophore root</i></p>	1 1	2
8(b)	<p><b>Able to explain why the root of the mangrove tree is found above the ground</b> <u>Sample answer</u></p> <p>P1: Kepekatan oksigen di dalam tanah adalah sangat rendah <i>Oxygen concentration in soil is very low.</i></p> <p>P2: Akar pneumatofor mengunjur keluar dari permukaan tanah untuk pengudaraan <i>Pneumatophore root project out from the soil surface for aeration</i></p> <p>P3: Akar ini membolehkan pertukaran gas antara akar yang tenggelam dengan atmosfera melalui lentisel. <i>The root allows the gas exchange between the submerged root and atmosphere through lenticels.</i> (Mana-mana 2 / Any 2)</p>	1 1 1	2
8(c)	<p><b>Able to explain the statement about after 50 years, the new swamp is form and extend further to the sea.</b> <u>Sample answer</u></p> <p>P1: Sistem akar yang meluas memerangkap lumpur <i>Extensive root system trap mud</i></p> <p>P2: Pemerangkapan lumpur menyebabkan pemendapan <i>The trapped mud causes sedimentation</i></p> <p>P3: Tanah menjadi lebih tinggi/padat/kering <i>The soil becomes higher/denser/drier</i></p> <p>P4: Proses pemendapan membentuk paya baharu <i>Sedimentation process form a new swamp that extend further to the sea</i> (Mana-mana 2 / Any 2)</p>	1 1 1 1	2

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
8(d)	<p><b>Able to discuss the effect of reclaiming the mangrove swamp forest for agriculture on the environment</b></p> <p><u>Sample answer</u></p> <p>P1: Menyebabkan hakisan tanah / banjir di kawasan dataran rendah / kerosakan harta benda akibat rebut <i>Cause soil erosion/flooding in low lying area/damage to property from storms</i></p> <p>P2: Tiada sistem akar yang meluas / ranting / daun untuk mengurangkan kelajuan angin/ ombak/ memerangkap lumpur <i>No extensive root system/branches/leaves to reduce strong wind/wave /trap sediment</i></p> <p>P3: Kehilangan kepelbagaian biologi (seperti ikan / udang / ketam) <i>Loss of biodiversity (such as fish/ shrimps /crabs)</i></p> <p>P4: Tiada tempat perlindungan / pembiakan untuk ikan kecil/ udang / ketam (dari pemangsa) <i>No protection/breeding place for small fish/ shrimps /crabs (from predators)</i></p> <p>P5: Kurang pokok menjalankan fotosintesis // aras karbon dioksida di atmosfera meningkat // menyebabkan pemanasan global / kesan rumah hijau <i>Less trees carry out photosynthesis // level of carbon dioxide in the atmosphere increases // cause global warming / green house effect</i></p> <p>(Mana-mana 3 / Any 3)</p>	<p></p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>3</p>
<b>Jumlah / Total</b>			9



Soalan Question	Kriteria Criteria	Markah Sub marks	Jumlah markah Total marks																								
9 (a)(i)	<p><b>Able to compare and contrast the neurone Y and neurone Z</b>  <b>Sample answer</b>  <b><u>Persamaan/ Similarities</u></b>                      S1: Kedua-duanya adalah sel saraf  <i>Both are nerve cell</i>                      S2: Kedua-duanya menghantar isyarat impuls saraf / elektrik  <i>Both transmit nerve impulse / electrical signal</i>                      S3: Kedua-duanya terdiri daripada badan dendron / dendrit / akson / sel  <i>Both consist of dendron / dendrite/ axon/ cell body</i>                      S4: Kedua-duanya menghantar impuls dalam satu arah  <i>Both transmit impulse in one direction</i></p> <p><b><u>Perbezaan/ Differences</u></b></p> <table border="1" data-bbox="323 813 1158 2033"> <thead> <tr> <th></th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>D1</td> <td>Y ialah neuron motor <i>Y is motor neurone</i></td> <td>Z adalah neuron deria <i>Z is sensory neurone</i></td> </tr> <tr> <td>D2</td> <td>Membawa maklumat dari saraf tunjang ke efektor // disambungkan ke efektor <i>Carry information from spinal cord to the effectors // connected to effector</i></td> <td>Membawa maklumat dari reseptor ke saraf tunjang // disambungkan ke reseptor <i>Carry information from receptor into the spinal cord // connected to receptor</i></td> </tr> <tr> <td>D3</td> <td>Y/ Neuron motor keluar dari saraf tunjang melalui akar ventral <i>Y/ motor neuron exits spinal cord through ventral root</i></td> <td>Z/ Neuron deria memasuki saraf tunjang melalui akar dorsal <i>Z enters spinal cord through dorsal root</i></td> </tr> <tr> <td>D4</td> <td>Badan sel terletak di terminal neuron <i>Cell body is located at the terminal of the neurone</i></td> <td>Badan sel terletak di sisi / tengah neuron <i>Cell body is located at the side / middle of the neurone</i></td> </tr> <tr> <td>D5</td> <td>Badan sel terletak di bahan kelabu dari saraf tunjang <i>Cell body is located in the grey matter of spinal cord</i></td> <td>Badan sel terletak di ganglion saraf tunjang <i>Cell body is located in the (dorsal) ganglion of spinal cord</i></td> </tr> <tr> <td>D6</td> <td>Mempunyai akson panjang <i>Have a long axon</i></td> <td>Mempunyai akson pendek <i>Have a short axon</i></td> </tr> <tr> <td>D7</td> <td>Mempunyai dendron / dendrit pendek <i>Have a short dendron / dendrite</i></td> <td>Mempunyai dendron / dendrit yang panjang <i>Have a long dendron / dendrite</i></td> </tr> </tbody> </table> <p>(Sekurang-kurangnya 1S dan 1D / <i>At least 1S and 1D</i>)</p>		Y	Z	D1	Y ialah neuron motor <i>Y is motor neurone</i>	Z adalah neuron deria <i>Z is sensory neurone</i>	D2	Membawa maklumat dari saraf tunjang ke efektor // disambungkan ke efektor <i>Carry information from spinal cord to the effectors // connected to effector</i>	Membawa maklumat dari reseptor ke saraf tunjang // disambungkan ke reseptor <i>Carry information from receptor into the spinal cord // connected to receptor</i>	D3	Y/ Neuron motor keluar dari saraf tunjang melalui akar ventral <i>Y/ motor neuron exits spinal cord through ventral root</i>	Z/ Neuron deria memasuki saraf tunjang melalui akar dorsal <i>Z enters spinal cord through dorsal root</i>	D4	Badan sel terletak di terminal neuron <i>Cell body is located at the terminal of the neurone</i>	Badan sel terletak di sisi / tengah neuron <i>Cell body is located at the side / middle of the neurone</i>	D5	Badan sel terletak di bahan kelabu dari saraf tunjang <i>Cell body is located in the grey matter of spinal cord</i>	Badan sel terletak di ganglion saraf tunjang <i>Cell body is located in the (dorsal) ganglion of spinal cord</i>	D6	Mempunyai akson panjang <i>Have a long axon</i>	Mempunyai akson pendek <i>Have a short axon</i>	D7	Mempunyai dendron / dendrit pendek <i>Have a short dendron / dendrite</i>	Mempunyai dendron / dendrit yang panjang <i>Have a long dendron / dendrite</i>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6</p>
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Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
9(a)(ii)	<p><b>Able to state symptoms of Parkinson and explain why reflex action of a person suffering from Parkinson disease is less rapid compared to a normal person</b></p> <p><u>Sample answer</u></p> <p><u>Gejala Parkinson/ <i>Symptoms of Parkinson:</i></u></p> <p>S1: Otot lemah dan anggota badan yang menggigil (kaki dan lengan) <i>Weak muscles and shivering limbs (legs and arms)</i></p> <p>S2: Tidak dapat mengawal keseimbangan dan koordinasi badan <i>Unable to control body balance and coordination</i></p> <p>S3: Otak lemah dan tidak dapat berfungsi dengan cekap <i>Weak brain and unable to function efficiently</i> (Mana-mana 1/ <i>Any 1</i>)</p> <p><u>Sebab tindakan refleks yang lebih perlahan bagi orang Parkinson/ <i>Reason of slower reflex action of Parkinson person:</i></u></p> <p>P1: Tidak ada neuron baru yang terbentuk untuk menggantikan neuron mati / rosak <i>No new neurone are formed to replace dead / damaged neurons</i></p> <p>P2: (kurang neurotransmitter / dopamine dihasilkan) hubungan sinaptik menurun <i>(less neurotransmitter / dopamine produced) synaptic contact decreases</i></p> <p>P3: Penghantaran impuls perlahan <i>Slow impulse transmission</i></p> <p>P4: Kapasiti / keupayaan otak untuk menghantar dan menerima impuls menurun <i>Brain capacity / ability to send and receive impulses decreases</i></p> <p>P5: Keupayaan otak untuk memproses / mentafsir / mengintegrasikan maklumat rendah / lebih perlahan <i>The ability of the brain to process / interpret / integrate the information is low/ slower</i> (Mana-mana 3/ <i>Any 3</i>)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	4

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
9(b)(i)	<p><b>Able to explain the meaning of homeostasis</b> <u>Sample answer</u></p> <p>P1: Proses mengatur / mengekalkan suhu badan / faktor fizikal <i>A process of regulating/ maintain the body temperature/ physical factor</i></p> <p>P2: Di persekitaran dalaman / cecair tisu / darah <i>In the internal environment/ tissue fluid/ blood</i></p> <p>P3: Oleh itu suhu badan dikekalkan pada suhu 37 °C normal // Sebarang kenaikan suhu akan berkurang // Sebaliknya / kembali normal <i>Thus the body temperature is maintained at normal 37 °C // Any increase of temperature will be decreased // Vice- versa/ back to normal</i></p> <p style="text-align: right;">(Mana-mana 2/ Any 2)</p>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>	2
9(b)(ii)	<p><b>Able to explain the response of blood vessels during the regulation of body temperature</b> <u>Sample answer</u></p> <p>P1: (Pada suhu rendah), vasokonstriksi berlaku // Otot (licin) pada (dinding) arteriol mengecut // Lumen arteriol menyempit / lebih kecil / berkurang <i>(At low temperature), vasoconstriction occurs // (smooth) muscles in the arterioles (wall) contract // Lumen of arterioles constrict/ smaller/ reduced</i> [Tolak: Kapilari darah mengecut <i>Reject: blood capillaries contract</i>]</p> <p>P2: Kapilari darah jauh dari permukaan kulit // Kurang darah yang mengalir berhampiran permukaan kulit <i>Blood capillaries away from the skin surface // Less blood flowing near the skin surface</i></p> <p>P3: Lebih sedikit haba hilang (oleh sinaran / pengaliran) <i>Less heat is lost (by radiation/ conduction)</i></p> <p>P4: Peningkatan suhu badan / kembali normal / tetap normal / dikekalkan pada suhu normal / 37°C <i>Body temperature increase/ back to normal/ remains normal/ maintained at normal/ 37°C</i></p> <p style="text-align: right;">(Mana-mana 3/ Any 3)</p>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>	3

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>
9(c)	<p><b>Able to name the health problem faced by individual Y and explain why he needs to take injection of hormone M</b></p> <p>F: Diabetes mellitus <i>Diabetes mellitus</i></p> <p>P1: Individu Y mempunyai glukosa darah yang tinggi <i>Individual Y has high blood glucose</i></p> <p>P2: Pankreas tidak dapat menghasilkan insulin // Penghasilan insulin yang tidak mencukupi <i>Pancreas unable to secrete insulin// Secrete insufficient insulin</i></p> <p>P3: Suntikan hormon M / insulin merangsang penukaran glukosa <u>berlebihan</u> (dalam darah) menjadi glikogen <i>Injection of hormone M/ insulin stimulates the conversion of excess glucose (in blood) to glycogen</i></p> <p>P4: (Glikogen) disimpan di sel hati / otot <i>(Glycogen) are stored in liver/ muscle cells</i></p> <p>P5: Tahap glukosa darah akan berkurang / menurun / diturunkan dan kembali normal <i>Blood glucose level will be reduced/ decreased/ lowered and back to normal</i></p> <p style="text-align: right;">(1F + Mana-mana 4P / 1F + Any 4P)</p>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>	<p style="text-align: center;">5</p>
	<b>Jumlah / Total</b>		20

Soalan <i>Question</i>	Kriteria <i>Criteria</i>	Markah <i>Sub marks</i>	Jumlah markah <i>Total marks</i>																		
10(a)(i)	<p><b>Able to identify the types of variation</b>  <u>Sample answer</u></p> <p>Rajah 10.1: Variasi selanjar  <i>Diagram 10.1: Continuous variation</i></p> <p>Rajah 10.2: Variasi tak selanjar  <i>Diagram 10.2: Discontinuous variation</i></p>	<p>1</p> <p>1</p>	2																		
10(a)(ii)	<p><b>Able to state the differences between the types of variation</b>  <u>Sample answer</u></p> <table border="1" data-bbox="312 667 1166 1854"> <thead> <tr> <th data-bbox="312 667 392 779"></th> <th data-bbox="392 667 778 779">Rajah / <i>Diagram</i> 10.1 // Variasi selanjar / <i>Continuous variation</i></th> <th data-bbox="778 667 1166 779">Rajah / <i>Diagram</i> 10.2 // Variasi tak selanjar / <i>Discontinuous variation</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="312 779 392 1037">P1</td> <td data-bbox="392 779 778 1037">Menunjukkan perubahan yang beransur/kecil// ada perantaraan (antara individu) <i>Shows gradual / slight changes // has intermediates (between the individuals)</i></td> <td data-bbox="778 779 1166 1037">Menunjukkan ekstrem / perbezaan ketara // tiada perantaraan <i>Shows extreme/ distinct differences// no intermediates</i></td> </tr> <tr> <td data-bbox="312 1037 392 1182">P2</td> <td data-bbox="392 1037 778 1182">Boleh diukur / kuantitatif <i>Can be measured / quantitative</i></td> <td data-bbox="778 1037 1166 1182">Tidak dapat diukur / kualitatif <i>Cannot be measured / qualitative</i></td> </tr> <tr> <td data-bbox="312 1182 392 1406">P3</td> <td data-bbox="392 1182 778 1406">Lengkung berbentuk loceng / Lengkung normal // Taburan normal <i>Bell-shaped curve/ normal curve// normal distribution</i></td> <td data-bbox="778 1182 1166 1406">Lengkung diskrit / graf diskrit // carta palang // Bukan taburan normal <i>Discrete curve/ graph// bar chart// not a normal distribution</i></td> </tr> <tr> <td data-bbox="312 1406 392 1630">P4</td> <td data-bbox="392 1406 778 1630">Dipengaruhi oleh faktor persekitaran (dan faktor genetik) <i>Influenced by environmental factor (and genetic factor)</i></td> <td data-bbox="778 1406 1166 1630">Dipengaruhi oleh faktor genetik <i>Influenced by genetic factor</i></td> </tr> <tr> <td data-bbox="312 1630 392 1854">P5</td> <td data-bbox="392 1630 778 1854">Dikawal oleh beberapa (pasang) gene / alel/ pelbagai gen / alel <i>Controlled by several (pairs of) genes/ alleles/ multiples genes/ alleles</i></td> <td data-bbox="778 1630 1166 1854">Dikawal oleh gen tunggal / sepasang alel <i>Controlled by a single gene/ a pair of alleles</i></td> </tr> </tbody> </table> <p style="text-align: right; margin-right: 50px;">Mana-mana 4 / Any 4</p>		Rajah / <i>Diagram</i> 10.1 // Variasi selanjar / <i>Continuous variation</i>	Rajah / <i>Diagram</i> 10.2 // Variasi tak selanjar / <i>Discontinuous variation</i>	P1	Menunjukkan perubahan yang beransur/kecil// ada perantaraan (antara individu) <i>Shows gradual / slight changes // has intermediates (between the individuals)</i>	Menunjukkan ekstrem / perbezaan ketara // tiada perantaraan <i>Shows extreme/ distinct differences// no intermediates</i>	P2	Boleh diukur / kuantitatif <i>Can be measured / quantitative</i>	Tidak dapat diukur / kualitatif <i>Cannot be measured / qualitative</i>	P3	Lengkung berbentuk loceng / Lengkung normal // Taburan normal <i>Bell-shaped curve/ normal curve// normal distribution</i>	Lengkung diskrit / graf diskrit // carta palang // Bukan taburan normal <i>Discrete curve/ graph// bar chart// not a normal distribution</i>	P4	Dipengaruhi oleh faktor persekitaran (dan faktor genetik) <i>Influenced by environmental factor (and genetic factor)</i>	Dipengaruhi oleh faktor genetik <i>Influenced by genetic factor</i>	P5	Dikawal oleh beberapa (pasang) gene / alel/ pelbagai gen / alel <i>Controlled by several (pairs of) genes/ alleles/ multiples genes/ alleles</i>	Dikawal oleh gen tunggal / sepasang alel <i>Controlled by a single gene/ a pair of alleles</i>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	4
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Soalan Question	Kriteria Criteria	Markah Sub marks	Jumlah markah Total marks																								
	<p>P18: Perubahan secara mendadak pada nombor / struktur kromosom / urutan bes DNA // apa-apa penerangan yang sesuai tentang mutasi</p> <p><i>Drastic changes in the number / structure of chromosome / sequence of base in DNA // any suitable explanation on mutation</i></p> <p style="text-align: right;">Mana-mana 10 /Any 10</p>	1																									
10(c)	<p><b>Able to explain the difference in health between individuals P and Q.</b></p> <p><u>Sample answer</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">P</th> <th style="text-align: center;">Q</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>Dapat menjalankan aktiviti cergas <i>Able to carry out vigorous activity</i></td> <td>Mudah letih / lesu / sukar bernafas <i>Easily feel tired / fatigue/ difficult in breathing/ breathless</i></td> </tr> <tr> <td>P2</td> <td>Sel darah merah / eritrosit berbentuk dwi cekung / normal <i>Normal / Biconcave shape of red blood cell / erythrocyte</i></td> <td>Sel darah merah / eritrosit berbentuk sabit <i>Sickle shape red blood cell / erythrocyte</i></td> </tr> <tr> <td>P3</td> <td>Luas permukaan yang besar <i>Larger surface area</i></td> <td>Luas permukaan yang kecil <i>Smaller surface area</i></td> </tr> <tr> <td>P4</td> <td>Menyimpan / mengandungi lebih banyak hemoglobin <i>Store / contain more haemoglobin</i></td> <td>Menyimpan / mengandungi kurang hemoglobin <i>Store / contain less haemoglobin</i></td> </tr> <tr> <td>P5</td> <td>Mengangkut lebih banyak oksigen <i>Transport more oxygen</i></td> <td>Mengangkut kurang oksigen <i>Transport less oxygen</i></td> </tr> <tr> <td>P6</td> <td>Respirasi sel yang cekap <i>Efficient cellular respiration</i></td> <td>Respirasi sel kurang cekap <i>Less efficient in cellular respiration</i></td> </tr> <tr> <td>P7</td> <td>Individu yang normal / sihat <i>Normal / healthy individual</i></td> <td>Menghidap anemia sel sabit <i>Suffering from sickle cell anemia</i></td> </tr> </tbody> </table> <p style="text-align: right;">Mana-mana 4 /Any 4</p>		P	Q	P1	Dapat menjalankan aktiviti cergas <i>Able to carry out vigorous activity</i>	Mudah letih / lesu / sukar bernafas <i>Easily feel tired / fatigue/ difficult in breathing/ breathless</i>	P2	Sel darah merah / eritrosit berbentuk dwi cekung / normal <i>Normal / Biconcave shape of red blood cell / erythrocyte</i>	Sel darah merah / eritrosit berbentuk sabit <i>Sickle shape red blood cell / erythrocyte</i>	P3	Luas permukaan yang besar <i>Larger surface area</i>	Luas permukaan yang kecil <i>Smaller surface area</i>	P4	Menyimpan / mengandungi lebih banyak hemoglobin <i>Store / contain more haemoglobin</i>	Menyimpan / mengandungi kurang hemoglobin <i>Store / contain less haemoglobin</i>	P5	Mengangkut lebih banyak oksigen <i>Transport more oxygen</i>	Mengangkut kurang oksigen <i>Transport less oxygen</i>	P6	Respirasi sel yang cekap <i>Efficient cellular respiration</i>	Respirasi sel kurang cekap <i>Less efficient in cellular respiration</i>	P7	Individu yang normal / sihat <i>Normal / healthy individual</i>	Menghidap anemia sel sabit <i>Suffering from sickle cell anemia</i>	1  1  1  1  1  1	4
	P	Q																									
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	<b>Jumlah / Total</b>		20																								





P13: Kandungan serat yang <u>bertambah / mencukupi</u> <i>Increase / Sufficient intake of fibre</i>	1	
P14: Untuk mencegah sembelit // memudahkan penyahtinjaan // melancarkan pergerakan peristalsis dalam kolon / usus besar <i>To avoid constipation// for easier defecation// increase peristalsis movement in colon/ large intestine</i>	1	
P15: Kandungan garam mineral / contoh mineral yang <u>mencukupi</u> <i>Sufficient content of mineral salts / example of minerals</i>	1	
P16: Untuk pertumbuhan normal / memelihara kesihatan // untuk mencegah penyakit yang disebabkan oleh kekurangan garam mineral // mana-mana contoh yang sesuai <i>for normal growth/ health // to avoid diseases caused by deficiency of mineral salts / any suitable example</i>	1	
P17: Kandungan vitamin / contoh vitamin yang <u>mencukupi</u> <i>Sufficient content of vitamin / example of specific vitamin</i>	1	
P18: Untuk pertumbuhan normal / memelihara kesihatan // untuk mencegah penyakit yang disebabkan oleh kekurangan vitamin // mana-mana contoh yang sesuai <i>For normal growth/ health / to avoid diseases caused by deficiency of vitamins / any suitable example</i>	1	
P19: Kandungan lemak yang <u>mencukupi</u> <i>Sufficient content of fats</i>	1	
P20: Membekalkan tenaga untuk aktiviti sel // pembentukan membran plasma // membantu dalam penyerapan vitamin larut lemak <i>Provide energy for cell activity// formation of plasma membrane// assist in the absorption of fat-soluble vitamin</i>	1	
P21: Kandungan air yang <u>mencukupi</u> <i>Sufficient content of water</i>	1	
P22: Sebagai medium untuk tindak balas biokimia // apa-apa fungsi air yang sesuai <i>As a medium for biochemical reaction// any suitable function of water</i>	1	
(Mana-mana 5 / Any 5)		



	<p>S7: Pengambilan protein yang berlebihan berisiko menyebabkan gout / kerosakan hati / ginjal. <i>Excessive protein intake is at risk of causing gout / liver / kidney damage.</i></p> <p><u>Isu kesihatan T / Health issue T</u></p> <p>T1: Refluks asid <i>Acid reflux</i></p> <p>T2: Sfinkter kardia / Sfinkter bawah esofagus gagal berfungsi / menjadi lemah / gagal menutup dengan ketat <i>Cardiac sphincter / lower esophageal sphincter falls to function / weaken / fails to close tightly</i></p> <p>T3: menyebabkan asid dari perut mengalir ke esofagus dan mulut <i>lead to acid from the stomach flow up the oesophagus and mouth</i></p> <p>T4: Asid akan menyebabkan kecederaan / keradangan pada saluran pencernaan / esofagus / kerongkong <i>the acid will cause injury / inflammation to the digestive tract / throat</i></p> <p>T5: menyebabkan pedih jantung / sakit terbakar di bahagian bawah dada / kesukaran menelan / gejala lain yang sesuai <i>cause heartburn/ burning pain in the lower chest / difficult swallowing / any suitable symptom</i></p> <p>(Sekurang-kurangnya 1R,1S dan 1T / <i>At least 1R, 1S and 1T</i>)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	
	<b>Jumlah / Total</b>		20

### PERATURAN PERMARKAHAN TAMAT

# LAMPIRAN

(Untuk rujukan guru)

## SAMPEL JADUAL SPESIFIKASI UJIAN (JSU)

### • PRAKTIS BIOLOGI 4551/2: SET 2

Chapter	Sub-chapter	Remembering (PB01)			Understanding (KB01)			Applying (KB02)			Analyzing (KB03)			Evaluating (KB03)			Creating (KB04)			HOTS	Total
		E	M	H	E	M	H	E	M	H	E	M	H	E	M	H	E	M	H		
<b>FORM 4</b>																					
<b>1.0 Introduction to Biology and Laboratory Rules</b>	1.1 Fields and Careers in Biology																				0
	1.2 Safety and Rules in Biology Laboratory																				0
	1.3 Communicating in Biology																				0
	1.4 Scientific Investigation in Biology																				0
<b>2.0 Biology and Cell Organisation</b>	2.1 Cell Structure and Function																				0
	2.2 Living Processes in Unicellular Organisms																				0
	2.3 Living Processes in Multicellular Organisms																				0
	2.4 Levels of Organisation in Multicellular Organisms																				0
<b>3.0 Movement of Substances Across a Plasma Membrane</b>	3.1 Structure of Plasma Membrane	2																			2
	3.2 Concept of Movement of Substances Across a Plasma Membrane				2																2
	3.3 Movement of Substances Across a Plasma Membrane in Living Organisms																				0
	3.4 Movement of Substances Across a Plasma Membrane and its Application in Daily Life.							2												2	2
<b>4.0 Chemical Composition in a Cell</b>	4.1 Water																				0
	4.2 Carbohydrates																				0
	4.3 Proteins																				0
	4.4 Lipids																				0
	4.5 Nucleic Acids																				0
<b>5.0 Metabolism and Enzymes</b>	5.1 Metabolism																				0
	5.2 Enzymes																				0
	5.3 Application of Enzymes in Daily Life																				0
<b>6.0 Cell Division</b>	6.1 Cell Division				1																1
	6.2 Cell Cycle and Mitosis									3											3
	6.3 Meiosis																				0
	6.4 Issues of Cell Division on Human Health															3				3	3
<b>7.0 Cellular Respiration</b>	7.1 Energy Production through Cellular Respiration																				0
	7.2 Aerobic Respiration																				0
	7.3 Fermentation																				0
<b>8.0 Respiratory System in Humans and Animals</b>	8.1 Types of Respiratory System																				0
	8.2 Mechanisms of Breathing																				0
	8.3 Gaseous Exchange in Humans																				0
	8.4 Health Issues Related to the Human Respiratory System																				0

Chapter	Sub-chapter	Remembering (PB01)			Understanding (KB01)			Applying (KB02)			Analyzing (KB03)			Evaluating (KB03)			Creating (KB04)			HOTS	Total	
		E	M	H	E	M	H	E	M	H	E	M	H	E	M	H	E	M	H			
<b>FORM 4</b>																						
9.0 Nutrition and Human Digestive System	9.1 Digestive System																				0	
	9.2 Digestion																				0	
	9.3 Absorption																				0	
	9.4 Assimilation																				0	
	9.5 Defaecation																				0	
	9.6 Balanced Diet																		10	10	10	10
	9.7 Health Issues Related to the Digestive System and Eating Habits											10									10	10
10.0 Transport in Humans	10.1 Types of Circulatory System																				0	
	10.2 Circulatory System of Humans																				0	
	10.3 Mechanism of Heart Beat				1						2										2	3
	10.4 Mechanism of Blood Clotting																				0	0
	10.5 Blood Grouping in Humans																				0	0
	10.6 Health Issues Related to the Human Circulatory System								3												3	3
	10.7 Lymphatic System of Humans																				0	0
	10.8 Health Issues Related to the Human Lymphatic System																				0	0
11.0 Immunity in Human	11.1 Body Defence																				0	0
	11.2 Actions of Antibodies																				0	0
	11.3 Types of Immunity																				0	0
	11.4 Health Issues Related to Immunity																				0	0
12.0 Coordination and Response in Humans	12.1 Coordination and Response																				0	0
	12.2 Nervous System																				0	0
	12.3 Neurones and Synapse							6													6	6
	12.4 Voluntary and Involuntary Actions																				0	0
	12.5 Health Issues Related to the Nervous System										4										4	4
	12.6 The Endocrine System	2						2													4	4
12.7 Health Issues Related to Endocrine System										2				2						4	4	
13.0 Homeostasis and Human urinary System	13.1 Homeostasis				2					3				5							5	10
	13.2 Urinary System																				0	0
	13.3 Health Issues Related to Urinary System																				0	0
14.0 Support and Movements in Humans and Animals	14.1 Types of Skeleton																				0	0
	14.2 Musculoskeletal System of Humans																				0	0
	14.3 Movement and Locomotion																				0	0
	14.4 Health Issues Related to the Human Musculoskeletal System																				0	0
15.0 Sexual Reproduction, Development and Growth in Humans and Animals	15.1 Reproductive System of Humans																				0	0
	15.2 Gametogenesis in Humans																				0	0
	15.3 Menstrual Cycle																				0	0
	15.4 Development of Human Foetus	2						2			2										4	6
	15.5 Formation of Twins																				0	0
	15.6 Health Issues Related to the Human Reproductive System										1			2							3	3
	15.7 Growth in Humans and Animals																				0	0

Chapter	Sub-chapter	Remembering (PB01)			Understanding (KB01)			Applying (KB02)			Analyzing (KB03)			Evaluating (KB03)			Creating (KB04)			HOTS	Total
		E	M	H	E	M	H	E	M	H	E	M	H	E	M	H	E	M	H		
<b>ORM 5</b>																					
<b>1.0 Structure of Plants and Growth</b>	1.1 Organisation of Plant Tissues																				0
	1.2 Meristematic Tissues and Growth																				0
	1.3 Growth Curves																				0
<b>2.0 Structure of Leaves and Function</b>	2.1 Structure of a Leaf																				0
	2.2 Main Organ for Gaseous Exchange																				0
	2.3 Main Organ for Transpiration																				0
	2.4 Main Organ for Photosynthesis																				0
	2.5 Compensation Point																				0
<b>3.0 Nutrition of Minerals in Plants</b>	3.1 Main Inorganic Nutrients				2																2
	3.2 Organ for Water and Mineral Salts Uptake									2											2
	3.3 Diversity in Plant Nutrition							1					2							2	3
<b>4.0 Transport in Plants</b>	4.1 Vascular Tissues																				0
	4.2 Transport of Water and Mineral Salts																				0
	4.3 Translocation																				0
	4.4 Phytoremediation																				0
<b>5.0 Response in Plants</b>	5.1 Types of Responses																				0
	5.2 Phytohormone																				0
	5.3 Application of Phytohormones in Agriculture																				0
<b>6.0 Sexual Reproduction in Flowering Plant</b>	6.1 Structure of a Flower	2																			2
	6.2 Development of Pollen Grains and Embryo Sac																				0
	6.3 Pollination and Fertilisation				2					2										2	4
	6.4 Development of Seeds and Fruits																				0
	6.5 Importance of Seeds for Survival													2						2	2
<b>7.0 Adaption of Plants in Different Habitats</b>	7.1 Adaptations of Plants																				0
<b>8.0 Biodiversity</b>	8.1 Classification System and Naming of Organisms																				0
	8.2 Biodiversity																				0
	8.3 Microorganisms and Viruses																				0
<b>9.0 Ecosystem</b>	9.1 Community and Ecosystem				2			2		2				3						3	9
	9.2 Population Ecology																				0
<b>10.0 Environmental Sustainability</b>	10.1 Threats to the Environment																				0
	10.2 Preservation, Conservation and Restoration of Ecosystems																				0
	10.3 Practices in Environmental Sustainability																				0
	10.4 Green Technology																				0
<b>11.0 Inheritance</b>	11.1 Monohybrid Inheritance																				0
	11.2 Dihybrid Inheritance																				0
	11.3 Genes and Alleles																				0
	11.4 Inheritance in Humans																				0
<b>12.0 Variation</b>	12.1 Types and Factors of Variation				2			10		4										10	16
	12.2 Variation in Humans																				0
	12.3 Mutation					4														4	4
<b>13.0 Genetic engineering</b>	13.1 Genetic Engineering																				0
	13.2 Biotechnology																				0
<b>ANALYSIS</b>	TOTAL (LEVEL OF DIFFICULTY)	8	0	0	14	0	4	13	15	3	18	16	0	4	5	7	3	0	10	62	120
	TOTAL (ELEMENT)	8			18			31			34			16			13				
	PERCENTAGE (ELEMENT)	6.67			15.00			25.83			28.33			13.33			10.83			62.00	

Ratio of E:M:H 5:3:2 (SPM FORMAT)

Level of Difficulty E : Easy M : Medium H : Hard

EASY	60
MEDIUM	36
HARD	24
GCD	12
RATIO OF E:M:H	5:3:2