

# SPM BIOLOGY

EXCEL  
ESSAY  
MODULE



NAME : \_\_\_\_\_

FORM : \_\_\_\_\_

- 6 (a) Diagram 6.1 shows two types of mechanisms used by antibodies to destroy antigen.  
*Rajah 6.1 menunjukkan dua jenis mekanisme yang digunakan oleh antibodi untuk memusnahkan antigen.*

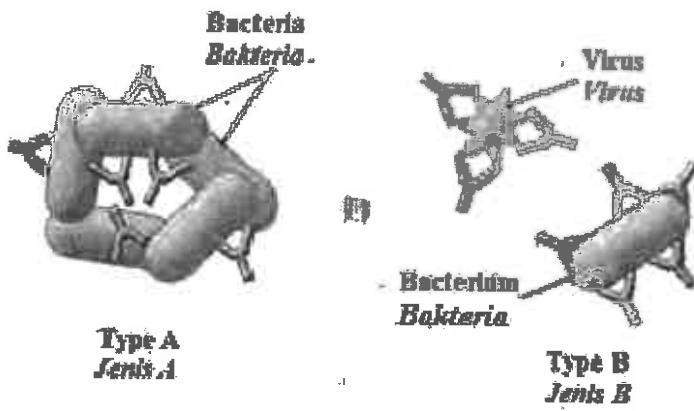


Diagram 6.1  
*Rajah 6.1*

Suggest how the mechanisms Type A and Type B are able to destroy antigens.  
*Cadangkan bagaimana mekanisme antibodi Jenis A dan Jenis B boleh memusnahkan antigen.*

[6 marks]  
[6 markah]

- (b) Diagram 6.2 shows the concentration of antibody in the blood of a person who acquired two different types of immunity.

*Rajah 6.2 menunjukkan kepekatan antibodi dalam darah seseorang yang memperoleh dua jenis keimunan.*

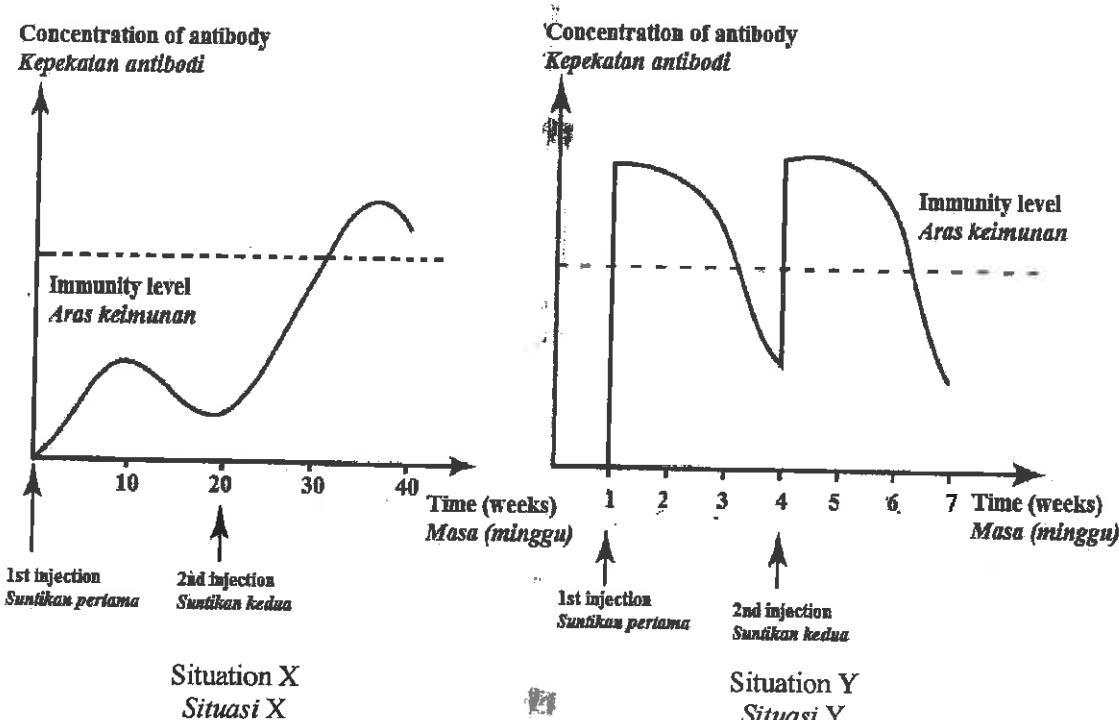


Diagram 6.2

*Rajah 6.2*

How the immunity achieved in situation X and situation Y are different?

*Bagaimakah keimunan yang diperolehi dalam situasi X dan situasi Y adalah berbeza?*

[8 marks]  
[8 markah]

- (c) Milk is the primary source of nutrition for newborn babies before they are able to eat and digest other food.

Suggest how to promote mothers to feed their newborns with mother's milk.  
What advice can be given to them?

*Susu merupakan sumber asas nutrisi bagi bayi baru lahir sebelum mereka dapat makan dan mencernakan makanan yang lain.*

*Cadangkan bagaimana untuk menggalakkan ibu menyusukan bayi baru lahir dengan susu ibu. Apakah nasihat yang boleh diberikan kepada mereka?*

[6 marks]  
[6 markah]

| No   | Criteria  | Marks  |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
|------|---|--|---|---|----|---------------------------------------|--|----|----------------------------|--|----|--|--|----|---------------------------|----------------------------------|----|---|---|----|---|--|----|--|--|----|--|--|---|
| 6(a) | <p>Able to explain the mechanisms used by antibody to destroy antigens.</p> <p>Sample answers:</p> <p>P1 Agglutination<br/>     P2 Antibody binds/join with the antigen<br/>     P3 (Antibody causes) the pathogens to clump together<br/>     P4 (the clumping) makes it easier for the pathogens to capture/destroy pathogens.</p> <p>P5 Neutralisation<br/>     P6 antibody neutralizes the toxins produced by bacteria<br/>     P7 by binding to a toxin molecules<br/>     P8 this prevent toxin molecule from attaching to a cell/causes damage</p> <p>(Any 6)</p>  | 6  |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
| (b)  | <p>Able to explain the differences between the immunity achieve in situation X and situation Y.</p> <p>Sample answers:</p> <table border="1"> <thead> <tr> <th></th><th>X</th><th>Y</th></tr> </thead> <tbody> <tr> <td>P1</td><td>(Artificial acquired) active immunity</td><td>(Artificial acquired) passive immunity</td></tr> <tr> <td>P2</td><td>Body produces own antibody</td><td>Body receive antibody from outside sources</td></tr> <tr> <td>P3</td><td>(Obtained through) an injection with a vaccine</td><td>(Obtained through) an injection with a serum</td></tr> <tr> <td>P4</td><td>Dead or weakened pathogen</td><td>Suspension of certain antibodies</td></tr> <tr> <td>P5</td><td>Does not result in immediate immunity against a disease</td><td>Result immediate immunity against a disease</td></tr> <tr> <td>P6</td><td>Antibodies need to be synthesized by the body</td><td>Antibodies do need to be synthesized by the body</td></tr> <tr> <td>P7</td><td>The induced immunity last longer//last long protection</td><td>The immunity lasts only for a short term//temporary protection</td></tr> <tr> <td>P8</td><td>The antibody is naturally produced by the body</td><td>The antibody is not produced by the body</td></tr> </tbody> </table> <p>P9 Vaccination is given before a person is infected with the disease</p> <p>An injection of antiserum is given when a person is infected with the disease//has a high risk of getting the disease.</p> <p>P10 Need time to synthesized antibody</p> <p>Antibody is obtained directly from the source</p> <p>P11 second injection ( booster) is necessary to increase the antibody production (to a level that protects the person against the disease)</p> <p>second injection is given when the person still infected (and his antibodies has dropped below immunity level)</p> <p>P12 Memory cell present</p> <p>No memory cells</p> <p>P13 Protection from diseases like chicken pox/ measles/ rubella/ polio/ hepatitis B/ diphtheria/ tuberculosis.</p> <p>Treatment of rabies/ botulism/ tetanus /snake bites.</p> |  | X | Y | P1 | (Artificial acquired) active immunity | (Artificial acquired) passive immunity | P2 | Body produces own antibody | Body receive antibody from outside sources | P3 | (Obtained through) an injection with a vaccine | (Obtained through) an injection with a serum | P4 | Dead or weakened pathogen | Suspension of certain antibodies | P5 | Does not result in immediate immunity against a disease | Result immediate immunity against a disease | P6 | Antibodies need to be synthesized by the body | Antibodies do need to be synthesized by the body | P7 | The induced immunity last longer//last long protection | The immunity lasts only for a short term//temporary protection | P8 | The antibody is naturally produced by the body | The antibody is not produced by the body | 8 |
|      | X   | Y  |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
| P1   | (Artificial acquired) active immunity   | (Artificial acquired) passive immunity                         |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
| P2   | Body produces own antibody  | Body receive antibody from outside sources                     |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
| P3   | (Obtained through) an injection with a vaccine  | (Obtained through) an injection with a serum                   |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
| P4   | Dead or weakened pathogen   | Suspension of certain antibodies                               |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
| P5   | Does not result in immediate immunity against a disease   | Result immediate immunity against a disease                    |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
| P6   | Antibodies need to be synthesized by the body   | Antibodies do need to be synthesized by the body               |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
| P7   | The induced immunity last longer//last long protection  | The immunity lasts only for a short term//temporary protection |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |
| P8   | The antibody is naturally produced by the body  | The antibody is not produced by the body                       |   |   |    |                                       |  |    |                            |  |    |  |  |    |                           |                                  |    |   |   |    |   |  |    |  |  |    |  |  |   |

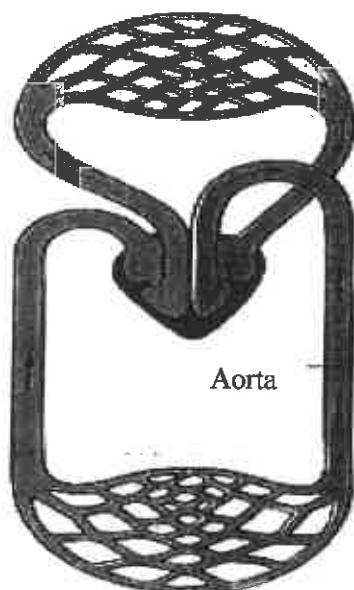
(Any 8)

|     |  |  |
|-----|--|--|
| (c) | Able to explain why mothers are advised to feed their babies with mother's milk.<br><br>Sample answers:<br>P1 mother's milk contain colostrum<br>P2 which contains (large number of ) antibodies<br>P3 which protect newborns against diseases<br>P4 naturally acquired immunity<br>P5 passive immunity<br>P6 higher in protein (than ordinary milk) and<br>P7 easy to digest<br>P8 lower in lipid (which is hard to digest)<br>P9 Colostrum contains high concentration of leucocytes<br>P10 protect the body from bacteria/ pathogens. | 6  |
|     | (Any 6)  | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 |
|     | <b>TOTAL</b>   | <b>20</b>                                      |

- 8 Diagrams 8.1 shows the blood circulatory system in organism P and organism Q.

*Rajah 8.1 menunjukkan sistem peredaran darah dalam organism P dan organism Q.*

Capillaries / Kapilari

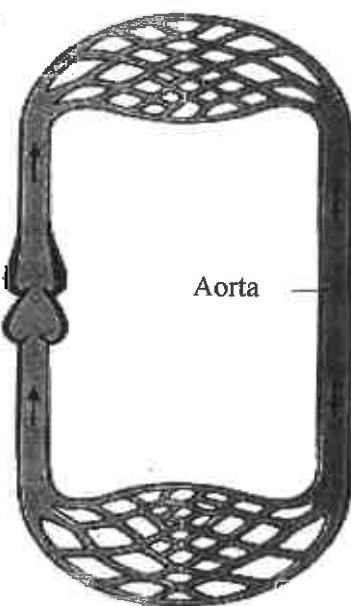


Capillaries / Kapilari

Organism P

Organisma P

Capillaries / Kapilari



Capillaries / Kapilari

Organism Q

Organisma Q

Diagram 8.1

*Rajah 8.1*

- a. Based on Diagram 8.1 :

*Berdasarkan Rajah 8.1 :*

- i. Give one example of organism P and organism Q.

*Beri satu contoh organisma P dan organisme Q.*

- ii. Describe the similarities and differences between the blood circulatory system in organism P and organism Q.

*Huraikan persamaan dan perbezaan antara sistem peredaran darah dalam organism P dan organism Q.*

[8 marks]

[8 markah]

- b. Diagram 8.2 shows a cardiovascular centre in the brain. Diagram 8.3 shows the heart with the location of aortic bodies and carotid bodies. *Rajah 8.2 menunjukkan pusat kardiovaskular di dalam otak. Rajah 8.3 menunjukkan jantung bersama lokasi jasad aortid dan jasad karotid.*

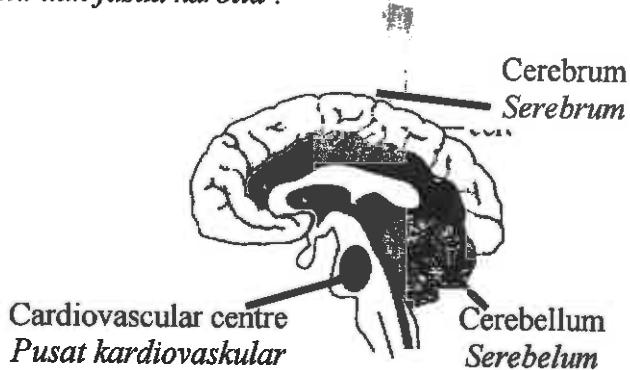


Diagram 8.2

*Rajah 8.2*

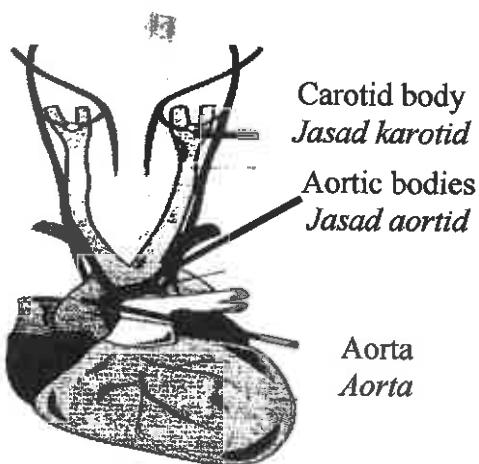


Diagram 8.3

*Rajah 8.3*

Based on Diagrams 8.2 and Diagram 8.3, explain the regulatory of blood pressure in the body.

*Berdasarkan Rajah 8.2 dan Diagram 8.3, terangkan mekanisme kawalatur tekanan darah di dalam badan.*

[6 marks]

[6 markah]

- c. Diagram 8.4 shows a person with his pacemaker that does not function. An electronic pacemaker is used to replace the original pacemaker.

*Rajah 8.4 menunjukkan individu yang didapati mempunyai perentak yang tidak berfungsi. Perentak elektronik telah digunakan untuk menggantikan perentak jantung yang asal.*

Electronic pacemaker

*Perentak jantung elektronik*

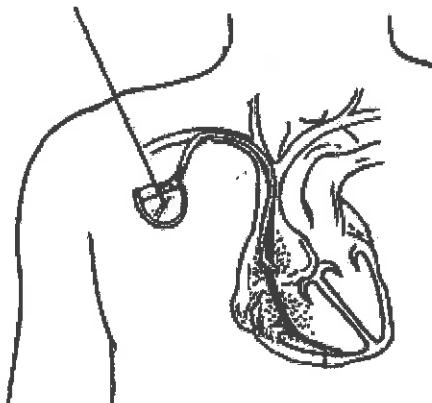


Diagram 8.4

*Rajah 8.4*

Explain how the electronic pacemaker functions.

*Terangkan bagaimana perentak elektronik itu berfungsi.*

[6 marks]

[6 markah]

|                 |   |  |
|-----------------|---|--|
| 8<br>(a)<br>(i) | <p><b>Boleh menyatakan satu contoh organisme P dan Q</b></p> <p><b><u>Contoh jawapan</u></b></p> <p>Organisma P : Manusia<br/>           Organisma Q : Ikan</p>   | 1<br>1   |
| (ii)            | <p><b>Boleh menghuraikan persamaan dan perbezaan di antara sistem peredaran darah dalam organisme P dan organisme Q.</b></p> <p><b><u>Contoh jawapan</u></b></p> <p>S: Persamaan , D: Perbezaan</p> <p>S1: Kedua-dua mempunyai sistem peredaran tertutup<br/>           S2: Darah mengalir dalam salur darah<br/>           S3: Kedua-dua mempunyai jantung<br/>           S4: yang mengepam darah ke sel badan<br/>           S5: Kedua-dua mempunyai injap dalam vena<br/>           S6: Pengaliran darah mengalir satu arah sahaja</p> | 1<br>1<br>1<br>1<br>1<br>1<br>1  |
|                 | [ Minimum 2 ]   |  |
|                 | Perbezaan   |  |
|                 | P   | Q  |
| D1              | Peredaran gandadua // Darah mengalir melalui jantung dua kali   | Peredaran tunggal // Darah mengalir melalui jantung satu kali              |
| D2              | Jantung mempunyai 2 atrium dan 2 ventrikel // Mempunyai 4 bahagian jantung  | Jantung mempunyai 1 atrium dan 1 ventrikel // Mempunyai 2 bahagian jantung |
| D3              | Darah terdeoksigen mengalir dari jantung ke peparu  | Darah terdeoksigen mengalir dari jantung ke insang                         |
| D4              | Darah beroksigen dipam daripada jantung ke sel badan  | Darah beroksigen dipam daripada insang ke sel badan                        |
| D5              | Darah beroksigen mempunyai tekanan yang lebih tinggi  | Darah beroksigen mempunyai tekanan yang lebih rendah                       |
| D6              | Pertukaran gas berlaku di peparu / alveolus   | Pertukaran gas berlaku di insang/ filamen / lamela                         |
|                 |   | [Maksimum 4]   |

|     |   |                                      |   |
|-----|---|--------------------------------------|---|
| (b) | <p><b>Boleh menerangkan mekanisme kawalatur tekanan darah di dalam badan.</b></p> <p><b><u>Contoh jawapan</u></b></p> <p>P1 : Tekanan darah yang tinggi dikesan oleh baroreseptor<br/> P2 : yang terletak di arteri koratid // aorta<br/> P3 : Baroreseptor menghantar impuls ke pusat kardiovaskular di medulla oblongata<br/> P4 : Pusat kardiovaskular menghantar impuls ke jantung<br/> P5 : menyebabkan pengecutan otot kardiak berkurangan<br/> P6 : Otot licin di arteri mengendur // vasodilasi/pemvasodilatan<br/> P7 : mengurangkan rintangan pengaliran darah<br/> P8 : Tekanan darah akan berkurang kembali kepada normal</p> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | 6 |
|     | [ mana-mana 6 P ]   |                                      |   |

|     |  |                                 |    |
|-----|--|---------------------------------|----|
| (c) | <p><b>Boleh menerangkan bagaimana perentak jantung berfungsi.</b></p> <p><b><u>Contoh jawapan</u></b></p> <p>P1 : Nodus sinoatrium / Nodus SA / SAN mencetuskan impuls saraf<br/> P2 : Impuls tersebar dengan cepat ke seluruh dinding kedua-dua atrium dan merangsang atrium mengecut<br/> P3 : menolak darah dari atrium ke dalam ventrikel<br/> P4 : Impuls sampai ke nodus atrioventrikel / nodus AV / AVN<br/> P5 : Impuls tersebar ke kedua-dua dinding ventrikel melalui gentian His dan gentian Purkinje<br/> P6 : Pengecutan ventrikel kanan akan mengepam darah ke peparu<br/> P7 : Pengecutan ventrikel kiri akan mengepam darah ke seluruh badan</p> | 1<br>1<br>1<br>1<br>1<br>1<br>1 | 6  |
|     | [ mana-mana 6 P ]  |                                 | 20 |

8. (a) Diagram 8 shows the formation of interstitial fluid.  
*Rajah 8 menunjukkan pembentukan cecair interstis.*

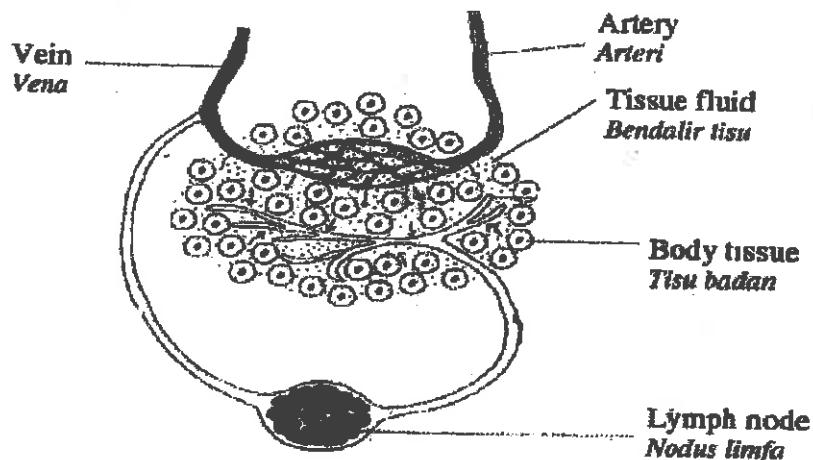


Diagram 8 / Rajah 8

- (i) Explain how interstitial fluid is formed.  
*Terangkan pembentukan cecair interstis* [5 marks] / [5 markah]
- (ii) What happens if the excess interstitial fluid does not flow into the lymph vessels?  
*Apakah akan terjadi jika cecair interstis yang berlebihan tidak mengalir ke dalam salur-salur limfa?* [2 marks] / [2 markah]
- (b) Explain the three functions of the lymphatic system.  
*Terangkan tiga fungsi sistem limfa.* [6 marks] / [6 markah]
- (c) The rate of Human Immunodeficiency (HIV) infection continues to increase rapidly all over the world.  
*Kadar jangkitan Virus kurang daya tahan (HIV) terus meningkat dengan cepat di seluruh dunia*
- (i) Explain how the HIV affects and cripples the body's immune system  
*Bincangkan bagaimana virus HIV mempengaruhi dan melumpuhkan sistem keimunan badan.*
- (ii) Suggest ways to prevent the spread of HIV.  
*Cadangkan cara-cara untuk mengelakkan jangkitan HIV.* [7 marks] / [7 markah]

| Question | Marking Scheme   | Sub Mark              | Total Mark |
|----------|--|-----------------------|------------|
| 8(a)(i)  | <p>Able to explain how interstitial fluid is formed</p> <p>P1 : Blood flows from the arteries into the capillaries with a smaller diameter<br/> <i>Darah mengalir dari arteri ke kapilari yang mempunyai diameter yang lebih kecil</i></p> <p>P2 : results in a higher hydrostatic pressure at the arterial end of the capillaries.<br/> <i>ini menghasilkan tekanan hidrostatik yang lebih besar di hujung arteri kapilari itu.</i></p> <p>P3 : The higher pressure forces some blood plasma through the capillary wall into the spaces between the cells.<br/> <i>Tekanan yang lebih tinggi memaksa sebahagian daripada plasma darah melalui dinding kapilari dan menuras ke dalam ruang-ruang antara sel-sel.</i></p> <p>P4 : The fluid is known as interstitial fluid or tissue fluid.<br/> <i>Cecair ini ialah cecair interstis atau cecair tisu.</i></p> <p>P5 : Interstitial fluid does not contain plasma protein, erythrocytes and platelets<br/> <i>Cecair interstis tidak mengandungi protein plasma, eritrosit dan platlet</i></p> | 1<br>1<br>1<br>1<br>1 |            |
| (ii)     | <p>Able to explain what happens if the excess interstitial fluid does not flow into the lymph vessels</p> <p>P1 : The excess interstitial fluid will accumulate among the cells<br/> <i>Cecair interstis akan terkumpul di antara sel-sel</i></p> <p>P2 : Causes swelling of the affected body tissues<br/> <i>Menyebabkan pembengkakan tisu badan yang terlibat</i></p> <p>P3 : Oedema occurs.<br/> <i>Menyebabkan oedema.</i></p> <p style="text-align: right;">(any 2P) / (mana-mana 2P)</p>  | 2 X 1                 | 2          |
| (b)      | <p>Able to explain the 3 functions of the lymphatic system</p> <p>P1 : The lymphatic system returns the excess interstitial fluid back into the blood circulatory system.<br/> <i>Sistem limfa memulangkan cecair interstis yang berlebihan ke dalam sistem peredaran darah.</i></p> <p>E1 : Excessive accumulation of interstitial fluid in the space between cells result in oedema<br/> <i>Pengumpulan cecair interstis berlebihan antara ruang sel menyebabkan oedema</i></p> <p>P2 : The lacteals absorbs lipids(fats) and fat soluble vitamins A,D,E and K.<br/> <i>Lacteals menyerap lipid(lemak) dan vitamin yang boleh larut dalam lemak seperti Vitamin A,D,E dan K</i></p> <p>E2 : These are transported by lymphatic vessel to the blood circulatory system.<br/> <i>Bahan-bahan ini diangkut oleh salur limfa ke sistem peredaran darah.</i></p>  | 1<br>1<br>1           |            |

|        |   |                  |    |
|--------|---|------------------|----|
|        | P3 : The lymphatic system provides immunological defences against the diseases.<br><i>Sistem limfa menyediakan pertahanan pengimunan badan daripada serangan penyakit-penyakit.</i><br>E3 : Lymph nodes produce and store lymphocytes<br><i>Nodus limfa menghasil dan menyimpan limfosit</i>  | 1                | 6  |
| (c)(i) | Able to explain how HIV affects and cripples the body's immune system.<br><br>P1 : HIV infects helper T cells (T-lymphocytes)<br><i>HIV menjangkit sel-sel penolong T (T-limfosit)</i><br>P2 : Decrease in the number of helper T cells.<br><i>Bilangan sel-sel penolong T akan memurun.</i><br>P3 : The body becomes weak and defenceless against pathogens.<br><i>Badan menjadi lemah dan tidak boleh menahan peryerangan patogen-patogen.</i><br>P4 : The patient dies from other secondary infections e.g. pneumonia, Kaposi's sarcoma.<br><i>Pesakit mati dari jangkitan-jangkitan yang seterusnya (jangkitan sekunder) seperti Pneumonia dan Sarkoma Kaposi.</i>          | 1<br>1<br>1<br>1 | 4  |
|        | Able to suggest ways to prevent the spread of HIV<br><br>P5 : Refraining from promiscuous behaviour and use of condom<br><i>Mengelakkan seks diluar nikah dan menggunakan kondom.</i><br>P6 : strict screening of donated blood<br><i>Penyarigan darah yang diderma dengan lebih ketat.</i><br>P7 : use of sterile needles and syringes<br><i>mengguna jarum suntikan yang steril dan picagari yang steril</i><br>P8 : carry out awareness campaigns to make the public aware of the dangers of HIV and how it spreads<br><i>mengadakan kempen-kempen kesedaran supaya orang-orang awam tahu akan bahaya HIV dan bagaimana ia merebak.</i><br><i>(only 3P) / (mana-mana 3P)</i> | Max 3            | 3  |
|        |   |                  | 20 |

7

Diagram 7.1 shows a type of a plant tissue.  
*Rajah 7.1 menunjukkan sejenis tisu tumbuhan.*

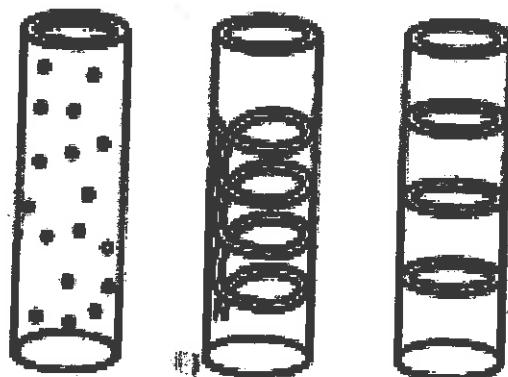


Diagram 7.1  
*Rajah 7.1*

- (a) Based on Diagram 7.1, explain how the tissue is adapted for its function.  
*Berdasarkan Rajah 7.1, terangkan bagaimana tisu tersebut diadaptasi untuk menjalankan fungsinya.*

[4 marks]  
[4 markah]

- (b) Diagram 7.2 shows the movement of water from the root hair to the xylem.  
*Rajah 7.2 menunjukkan pergerakan air dari akar rambut ke xilem.*

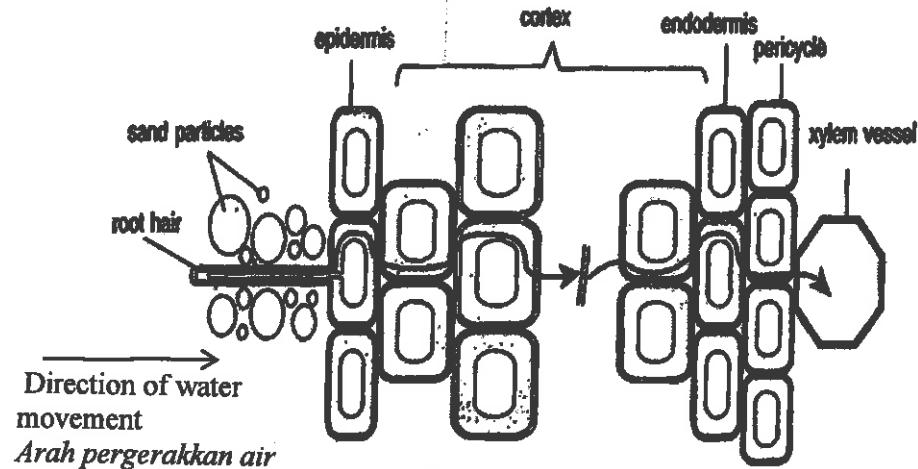


Diagram 7.2  
*Rajah 7.2*

Based on Diagram 7.2, explain the movement of water through the roots.  
*Berdasarkan Rajah 7.2 terangkan pergerakan air dalam akar.*

[6 marks]  
[6 markah]

- (c) Diagram 7.3 shows the relationship between transpiration rate with the opening and closing of stomata throughout the day

*Rajah 7.3 menunjukkan hubungan antara kadar transpirasi dengan pembukaan dan penutupan stoma sepanjang hari.*

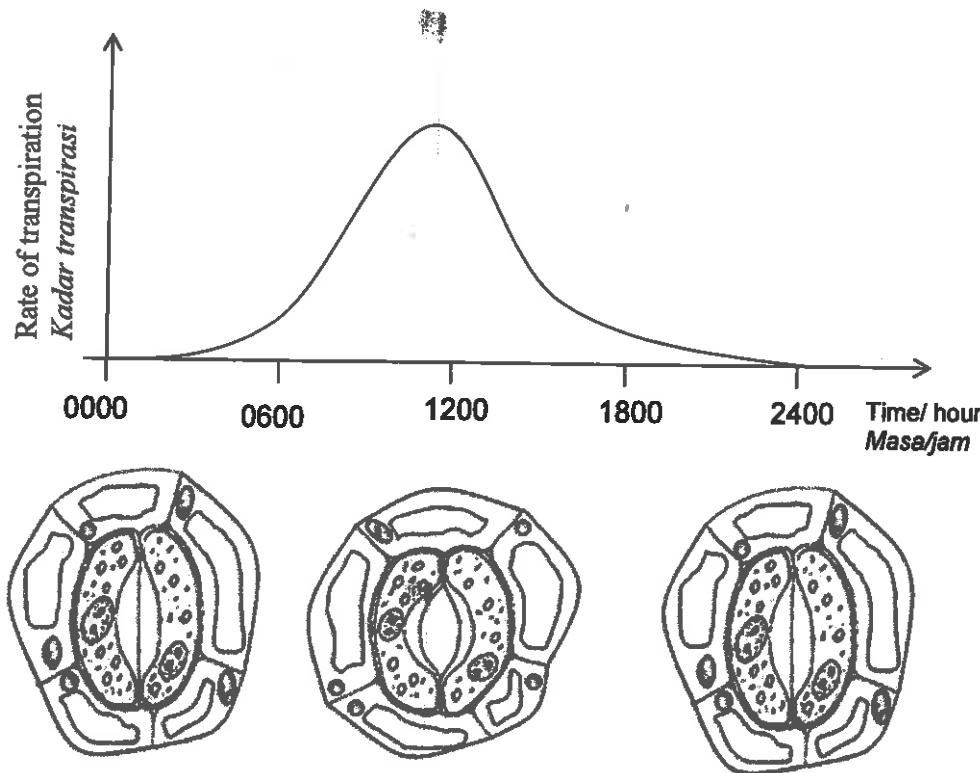


Diagram 7.3  
*Rajah 7.3*

Based on Diagram 7.3, explain the changes of the transpiration rate from 0000 hour to 2400 hour

*Berdasarkan Rajah 7.3 terangkan perubahan kadar transpirasi dari jam 0000 hingga jam 2400.*



[10 marks]

[10 markah]

## Question 7

| No   | Mark Scheme  | Sub total | Total |
|------|--|-----------|-------|
| 7(a) | <p><b>Able to explain the adaptation of xylem to its functions</b></p> <p><u>Sample answer :</u></p> <p><b>F1 : Xylem vessels are elongated cells arranged end to end</b><br/>P1 : to allows water to flow in continuous column.</p> <p><b>F2 : (end) walls (of the vessels) have (broken down in the) pits</b><br/>P2 : to allows water to pass/diffuse/move from cell to cell.</p> <p><b>F3 : The side walls of the xylem vessels are perforated by pits,</b><br/>P6 : to allows water to pass/move sideways/lateral movement</p> <p><b>F4 : The lignified walls</b><br/>P4 : prevent the xylem vessels from collapsing // for mechanical support</p> <p><b>F5 : The lumen of xylem vessels is narrow</b><br/>P5 : increases the capillarity forces / action</p> <p style="text-align: right;"><i>Any 2F with P</i></p>          | Max 4     |       |
| (b)  | <p><b>Able to explain the movement of water through the roots</b></p> <p><u>Sample answer :</u></p> <p>F : involve Root pressure</p> <p>P1 : The root hairs provide a large surface area ( for absorption of water.)</p> <p>P2 : The root hair <u>cells</u> are hypertonic to the surrounding soil water.</p> <p>P3 : water diffuse into the root hair cell</p> <p>P4 : by osmosis.</p> <p>P5 : The root hair cells become hypotonic to the cells in the cortex.</p> <p>P6 : (In the cortex) water diffuses (into the parenchyma cells)</p> <p>P7 : into endodermis.</p> <p>P8 : By osmosis</p> <p>P9 : Caspary strips ( lining the side of the cell wall of Endodermal) is impermeable to water.</p> <p>P10 : Water movement through the cell wall is blocked.</p> <p>P11 : Water diffuses through the cytoplasm / vacuole of</p> | Max 8     | 6     |

|     |  |        |           |
|-----|--|--------|-----------|
|     | endodermal cells (to the xylem vessels) // any explanation<br><i>Any six<br/>P4 and P8 give mark once</i>  |        |           |
| (c) | <p><b>Able to explain why the rate of transpiration differ from the time 0000 to time 2400.</b></p> <p><u>Sample answer :</u></p> <p><b>From 0000 to 0600 :</b></p> <p>F1 : Rate of transpiration is low. 1<br/>     P1 : Stomata close due to low light intensity. 1<br/>     P2 : Less water is lost 1</p> <p><b>From 0600 to 1800</b></p> <p>F2 : Rate of transpiration increases. 1<br/>     P3 : Light intensity is high, guard cells carry out photosynthesis, 1<br/>     P4: The sugar content in the guard cells increase causing its osmotic pressure to increase // guard cells is hypertonic to epidermal cells // Potassium ion diffuse into guard cell 1<br/>     P5 : Water diffuse into the guard cells 1<br/>     P6 : by osmosis 1<br/>     P7: and the guard cells become turgid 1<br/>     P8 : The guard cells curve due to the inner cell wall being thicker than the outer cell wall // any explanation 1<br/>     P9 : causing the stoma to open. 1<br/>     P10 : More water lost to surrounding. 1</p> <p><b>From 1800 to 2400</b></p> <p>F3 : Rate of transpiration decreases. 1<br/>     P11 : Light intensity is low, photosynthesis is low / does not occur. 1<br/>     P12 : Osmotic pressure in guard cells decrease // guard cells is hypotonic to epidermal cell 1<br/>     P13 : Water diffuse out of cells 1<br/>     P14 : by osmosis 1<br/>     P15 : The guard cell lose water / become flaccid causing the stoma to close. 1</p> <p><i>Any 10<br/>P6 and P14 : give mark once</i></p> | Max 10 |           |
|     | <b>TOTAL</b>   |        | <b>20</b> |

- 7 (a) Diagram 7.1 (a) shows the structure of a fish. Diagram 7.1 (b) is the cross section of the fish showing the myotomes.

*Rajah 7.1(a) menunjukkan struktur seekor ikan. Rajah 7.2 (b) adalah keratan rentas ikan tersebut yang menunjukkan miotom.*

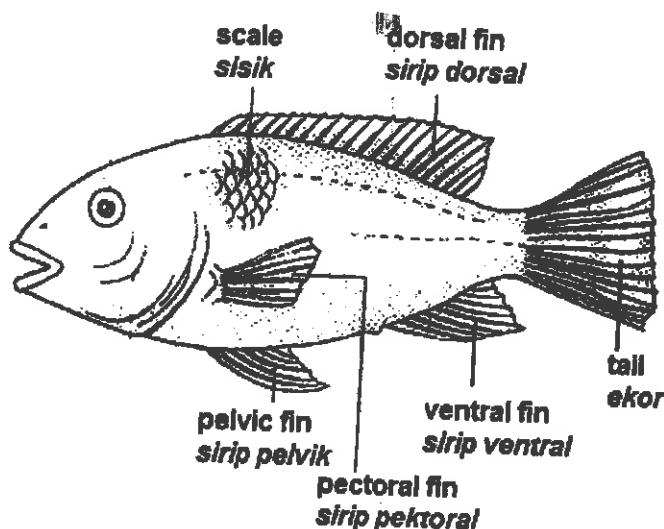


Diagram 7.1 (a)  
Rajah 7.1 (a)

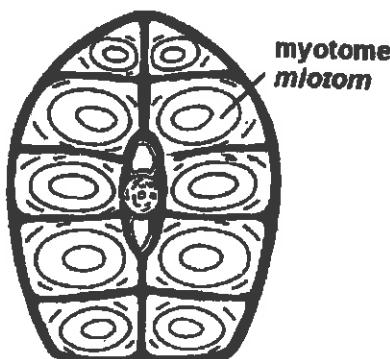


Diagram 7.1 (b)  
Rajah 7.1 (b)

Based on Diagram 7.1 (a) and 7.1(b), explain how these structures help the fish to move.

[6 marks]

*Berdasarkan Rajah 7.1 (a) dan 7.1 (b), terangkan bagaimana struktur-struktur ini dapat membantu ikan bergerak.*

[6 markah]

|     |  |  |   |
|-----|--|--|---|
| 7 a | P1 Has flexible endoskeleton<br>P2 Has W shaped muscle block ie myotomes<br>P3 Contract and relax antagonistically // one side contracts, another side relaxes<br>P4 Make the tail/ caudal fin to move side by side alternatively<br>P5 To push the fish forward // control the fish direction<br>P6 Has sleek and streamlined body shape<br>P7 Overlapping scale facing backward<br>P8 To reduce water resistance<br>P9 Yawning is prevented by having dorsal and ventral fin<br>P10 Pitching is prevented by having pelvic and pectoral fin<br>P11 Rolling is prevented by having dorsal and ventral fin | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | 8 |
|-----|--|--|---|

- 7 (a) Movement of the forelimb in human is brought about by a pair of antagonistic muscle. Explain the movement of the forelimb by using Diagram 7.1.  
*Pergerakan anggota hadapan manusia disebabkan oleh sepasang otot antagonistik. Terangkan pergerakan anggota hadapan dengan menggunakan Rajah 7.1.*

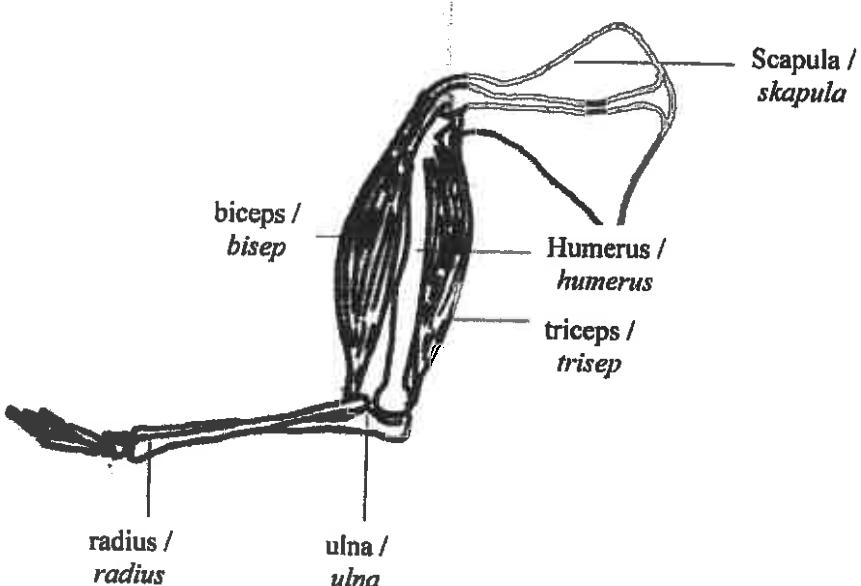
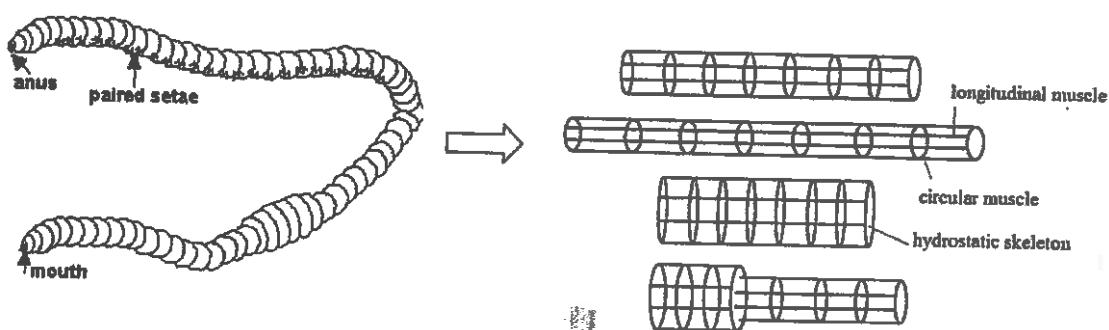


Diagram 7.1 // Rajah 7.1

[4 marks]

- (b) Explain how the structure in the earthworm involve in their movement as shown in Diagram 7.2.

*Terangkan bagaimana struktur dalam cacing tanah terlibat dalam pergerakannya seperti ditunjukkan dalam Rajah 7.2*



[6 marks]

- (c) (i) State the problems that could be faced by fish and the bird in support and locomotion

*Nyatakan masalah yang dihadapi oleh ikan dan burung dalam sokongan dan pergerakan*

[2 marks]

- (ii) Explain the similarities and differences between the fish and the bird's on the structural adaptation for support system and locomotion.

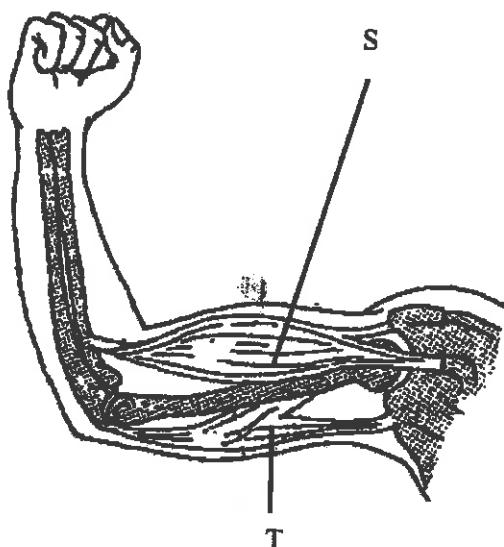
*Terangkan persamaan dan perbezaan di antara ikan dan burung tentang penyesuaian struktur untuk sistem sokongan dan pergerakan*

[8 marks]

| No   | Mark Scheme  | Sub Mark  | Total Mark |
|------|--|---|------------|
| 7(a) | <p><i>Able to explain the movement of the forelimb in human</i></p> <p><i>Suggested answer</i></p> <p>F1: forelimb/arm being bent<br/>E1: when the biceps muscle contract, the triceps muscle relaxes<br/>F2: Forelimb/arm being straight<br/>E2: when the triceps muscle contract, the biceps muscle relaxes</p>  | 1<br>1<br>1<br>1  | 4          |
| 7(b) | <p><i>Able to explain how the structure in the earthworm involve in their movement as shown in the diagram.</i></p> <p><i>Suggested answer</i></p> <p>F1: hydrostatic skeleton<br/>E1: fluid in the body cavity helps the earthworm to move<br/>F2: muscle at the body wall are longitudinal and circular muscle / antagonistic muscle<br/>E2: contraction of circular muscles cause segment to extend while the longitudinal muscles relax<br/>E3: contraction of longitudinal muscles cause segment to shorten while the circular muscles relax<br/>F3: chaetae<br/>E3: secure the shorted segments in the posterior to the ground while the anterior segments extended owing to contractions of the circular muscles</p>  | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1  | 6          |
| 7(c) | <p><i>Able to state the problems that could be faced by fish and the bird in support and locomotion</i></p> <p><i>Answer:</i> Fish – Water resistance<br/>Bird – Air resistance</p> <p><i>Able to explain the similarities and differences between the fish and the bird's on the structural adaptation for support system and locomotion.</i></p> <p><i>Suggested answer</i></p> <p>S1: both fish and bird has antagonistic muscle<br/>E1: able the organism move in the habitat<br/>S2: both fish and bird has endoskeleton<br/>E2: able to give support to organism<br/>D1: fish has streamlined shapes/ skin covered with skin but the shape of bird / body covered with furs<br/>E3: to overcomes the problem of water resistant in fish and air resistant in bird<br/>D2: fish has myotome arranged in segments on both side of left and right side of the body but the bird has pectoralis major and minor at their limb<br/>E4: for fish to swim and bird to fly (in their habitat)<br/>D3: fish has unstable problem in water while swimming / Yawing / Pitching / Rolling but bird has unstable problem while flying/ lifting force<br/>E5: instability of fish is overcome by fin but instability of bird is overcome by the shape of an aerofoil wings</p> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>maximum | 2<br>10    |

7 (a) Rajah 7.1 menunjukkan struktur bahagian tangan manusia.

*Diagram 7.1 shows the structure of a human arm*



Rajah 7.1  
*Diagram 7.1*

Berdasarkan rajah 7.1, terangkan peranan S dan T dalam pergerakan lengan.

*Based on diagram 7.1, explain the role of S and T in movement of the arm.*

[6 markah]  
[6 marks]

SULIT

- (b) Rajah 7.2 menunjukkan dua jenis vertebra dalam tulang belakang manusia.

*Diagram 7.2 shows two types of vertebrae in human backbone.*

Vertebra P

*Vertebrae P*

Vertebra Q

*Vertebrae Q*

Rajah 7.2 / Diagram 7.2

Nyatakan perbezaan struktur bagi vertebra P dan vertebra Q.

*State differences in structure between the vertebra P and vertebra Q.*

[4 markah]

[4 marks]

(c)

Seorang lelaki mengalami bengkak buku lali dan berasa sakit ketika bergerak setelah mengamalkan pengambilan diet yang tinggi kandungan protein dan tidak mengamalkan gaya hidup sihat.

*A man has swollen ankle and is painful during movement after having a habit of taking high protein diet and practicing unhealthy lifestyle.*

Dengan menggunakan pengetahuan biologi anda, bincangkan pernyataan di atas.

*Based on your biological knowledges, discuss the statement above.*

[10 markah]

[10 marks]

| NO                            | KRITERIA PEMARKAHAN  | MARKAH                     | JUMLAH      |               |                         |                             |                                   |                         |                          |                   |                   |                               |                               |                       |      |
|-------------------------------|--|----------------------------|-------------|---------------|-------------------------|-----------------------------|-----------------------------------|-------------------------|--------------------------|-------------------|-------------------|-------------------------------|-------------------------------|-----------------------|------|
| 7 (a)                         | <p><b>Terangkan peranan S dan T untuk membengkokkan tangan.</b></p> <p><b>Contoh jawapan</b></p> <ul style="list-style-type: none"> <li>• S ialah otot biseps</li> <li>• T ialah otot triseps</li> <li>• S akan mengecut, T akan mengendur</li> <li>• Daya tarikan yang terhasil dipindahkan kepada tulang melalui tendon</li> <li>• Tulang ulna ditarik ke arah atas</li> <li>• Lengan dibengkokkan</li> </ul>  | 1<br>1<br>1<br>1<br>1<br>1 | 6           |               |                         |                             |                                   |                         |                          |                   |                   |                               |                               |                       |      |
| (b)                           | <p><b>Nyatakan perbezaan struktur bagi vertebra P dan vertebra Q.</b></p> <p><b>Contoh jawapan</b></p> <table border="1"> <thead> <tr> <th>Vertebra P</th> <th>Vertebra Q.</th> </tr> </thead> <tbody> <tr> <td>Sentrum pipih</td> <td>Sentrum besar dan tebal</td> </tr> <tr> <td>Mempunyai salur vertebareri</td> <td>Tidak mempunyai salur vertebareri</td> </tr> <tr> <td>Cuaran melintang pendek</td> <td>Cuaran melintang panjang</td> </tr> <tr> <td>Salur saraf besar</td> <td>Salur saraf kecil</td> </tr> <tr> <td>Cuaran spina pendek dan lebar</td> <td>Cuaran spina pendek dan pipih</td> </tr> </tbody> </table> | Vertebra P                 | Vertebra Q. | Sentrum pipih | Sentrum besar dan tebal | Mempunyai salur vertebareri | Tidak mempunyai salur vertebareri | Cuaran melintang pendek | Cuaran melintang panjang | Salur saraf besar | Salur saraf kecil | Cuaran spina pendek dan lebar | Cuaran spina pendek dan pipih | 1<br>1<br>1<br>1<br>1 | 4MAX |
| Vertebra P                    | Vertebra Q.  |                            |             |               |                         |                             |                                   |                         |                          |                   |                   |                               |                               |                       |      |
| Sentrum pipih                 | Sentrum besar dan tebal  |                            |             |               |                         |                             |                                   |                         |                          |                   |                   |                               |                               |                       |      |
| Mempunyai salur vertebareri   | Tidak mempunyai salur vertebareri  |                            |             |               |                         |                             |                                   |                         |                          |                   |                   |                               |                               |                       |      |
| Cuaran melintang pendek       | Cuaran melintang panjang   |                            |             |               |                         |                             |                                   |                         |                          |                   |                   |                               |                               |                       |      |
| Salur saraf besar             | Salur saraf kecil  |                            |             |               |                         |                             |                                   |                         |                          |                   |                   |                               |                               |                       |      |
| Cuaran spina pendek dan lebar | Cuaran spina pendek dan pipih  |                            |             |               |                         |                             |                                   |                         |                          |                   |                   |                               |                               |                       |      |
| (c)                           | <p><b>Bincangkan hubungkait antara diet dan penyakit yang dialaminya.</b></p> <p><b>Contoh jawapan</b></p> <ul style="list-style-type: none"> <li>▪ Menyebabkan penyakit atritis</li> <li>▪ Pengambilan protein yang berlebihan menyebabkan pengumpulan asid urik pada sendi</li> <li>▪ Menyebabkan keradangan pada sendi // sendi menjadi sakit dan kaku</li> </ul>   | 1<br>1<br>1                |             |               |                         |                             |                                   |                         |                          |                   |                   |                               |                               |                       |      |

| NO | KRITERIA PEMARKAHAN   | MARKAH      | JUMLAH    |
|----|---|-------------|-----------|
|    | <ul style="list-style-type: none"> <li>▪ Kurang mengambil vitamin D</li> <li>▪ Kurang penyerapan kalsium</li> <li>▪ Tulang kurang kuat</li> </ul> | 1<br>1<br>1 |           |
|    | <ul style="list-style-type: none"> <li>▪ Kurang bersenam</li> <li>▪ Menyebabkan jisim tulang kurang</li> </ul>                                    | 1<br>1      |           |
|    | <ul style="list-style-type: none"> <li>▪ Mengamalkan postur badan yang salah</li> <li>▪ Memberi tekanan pada sistem rangka</li> </ul>             | 1<br>1      | 10        |
|    | <b>JUMLAH</b>   |             | <b>20</b> |

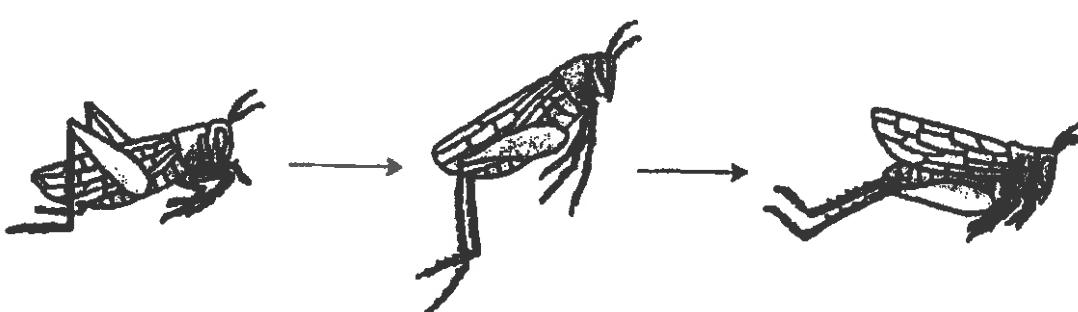
8. Diagram 8.1 shows locomotion in an earthworm and grasshopper.

Rajah 8.1 menunjukkan pergerakan pada cacing tanah dan belalang.



Diagram 8.1 Locomotion in earthworm

Rajah 8.1 Pergerakan pada cacing tanah



(a)

(b)

(c)

Diagram 8.2 Locomotion in grasshopper

Rajah 8.2 Pergerakan pada belalang

- (a) (i) Based on Diagram 8.1 state the type of skeleton in the earthworm and explain the action of antagonistic muscles which brings about the movement in this animal.

[ 5 marks]

Berdasarkan Rajah 8.1, nyatakan jenis rangka pada cacing tanah dan terangkan tindakan otot-otot antagonistik yang menghasilkan pergerakan pada haiwan ini.

[ 5 markah]

- (ii) Based on Diagram 8.2 (a), 8.2 (b) and 8.2 (c), explain the action of antagonistic muscles and adaptation of the rear legs to enable the grasshopper to jump.

[ 5 marks]

Berdasarkan Rajah 8.2 (a), 8.2 (b) dan 8.2 (c), terangkan tindakan otot-otot antagonistik dan adaptasi pada kaki belakang belalang bagi membolehkannya melompat.

[ 5 markah]

- (b) Diagram 8.3 shows the arrangement of muscles, tendons and ligaments in human forelimb.

*Rajah 8.3 menunjukkan susunan otot, tendon dan ligamen dalam anggota manusia.*

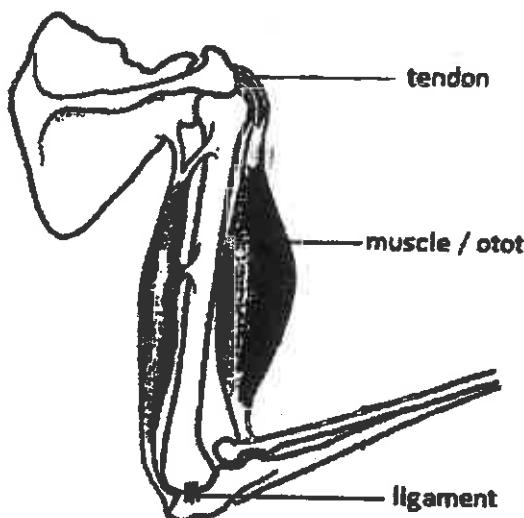


Diagram 8.3

Rajah 8.3

- (i) Based on Diagram 8.3, describe the function of muscles, tendons and ligaments in enabling the bending and straightening of human forelimb.

[8 marks]

*Berdasarkan Rajah 8.3, terangkan fungsi otot, tendon dan ligament dalam membolehkan lengannya dibengkokkan dan diluruskan.*

[8 markah]

- (ii) A housewife aged 55 years old often experiences aches and pains in her bones. Her doctor told her that she is suffering from osteoporosis.

State the symptoms of osteoporosis and suggest the ways to overcome this problem.

[2 marks]

*Seorang suri rumah berumur 55 tahun mengalami sakit tulang. Doktor memberitahu dia menderita penyakit osteoporosis.*

*Nyatakan simptom osteoporosis dan cadangkan cara-cara untuk mengatasi masalah ini.*

[2 markah]

| QUESTION NO |     | MARKING CRITERIA   | SUB MARKS | TOTAL MARKS |
|-------------|-----|--|-----------|-------------|
| 8(a)        | P1: | Earthworm have a hydrostatic skeleton  | 1m        |             |
| (i)         | P2: | The body wall has both longitudinal and circular muscle which act antagonistically   | 1m        |             |
|             | P3: | The contraction of the circular muscle and relaxation of the longitudinal muscles cause the segment to extend.                         | 1m        |             |
|             | P4: | chaetae are extended to grip the soil / ground   | 1m        |             |
|             | P5: | The contraction of the longitudinal muscle and relaxation of the circular muscle cause the segment to shorten.                         | 1m        |             |
|             | P6: | Contraction and relaxation of these muscles causes the transfer of hydrostatic pressure from the anterior to the posterior.            | 1m        |             |
|             | P7: | It causes the body to move to the front.   | 1m        |             |
|             | P8: | The chaetae are retracted to allow movement  | 1m        |             |
|             |     | Any 5 P  |           | 5 m         |
|             |     |  |           |             |
| (ii)        | P1: | A grasshopper has antagonistic muscles called the flexor and extensor muscles which ( are attached to the interior of the exoskeleton) | 1m        |             |
|             | P2: | The rear legs are bigger and longer and (are adapted for jumping).   | 1m        |             |
|             | P3: | In Diagram 8.2 (a) Flexor muscle contract to flex the leg / prepare for jumping.   | 1m        |             |
|             | P4: | In Diagram 8.2 (b) Flexor muscle relaxed, extensor muscle contracts.   | 1m        |             |
|             | P5: | Causes the rear legs to extend.  | 1m        |             |
|             | P6: | and pushes against the ground  | 1m        |             |
|             | P7: | In Diagram 8.3(c), the thrust created propels the grasshopper forwards and upwards.  | 1m        |             |
|             |     | Any 5 P  |           | 5m          |
|             |     | Total marks  |           | 10 m        |

| QUESTION NO |      | MARKING CRITERIA   | SUB MARKS          | TOTAL MARKS |
|-------------|------|--|--------------------|-------------|
| 8(b)        | P1:  | In Diagram 8.3 (a), Biceps muscle is attached to the radius by tendons     | 1m                 |             |
| (i)         | P2:  | When biceps muscle contracts, a pulling force is produced                  | 1m                 |             |
|             | P3:  | And is transferred to the tendon   | 1m                 |             |
|             | P4:  | Tendon pulls the radius upwards  | 1m                 |             |
|             | P5:  | Ligaments hold the humerus to the radius – ulna at the elbow joint.        | 1m                 |             |
|             | P6:  | Give support and strength to the bones when they are being pulled upwards. | 1m                 |             |
|             | P7:  | At the same time the triceps muscle relaxes.                               | 1m                 |             |
|             | P8:  | Triceps muscle is connected to the ulna by tendons.                        | 1m                 |             |
|             | P9:  | When triceps muscle contracts, tendons pull the ulna downwards.            | 1m                 |             |
|             | P10: | At the same time the biceps muscle relaxes.                                | 1m                 |             |
|             |      |  |                    |             |
|             |      |  | Any 8 P            | 8 m         |
|             |      | <b>Symptoms</b>  |                    |             |
| (ii)        | P1:  | Fractures of the vertebrae / wrist / hips                                  | 1m                 |             |
|             | P2:  | Reduction in height  | 1m                 |             |
|             | P3:  | Stooped posture  | 1m                 |             |
|             |      |  | Any 1 P            | 1 m         |
|             |      | <b>To prevent osteoporosis</b>   |                    |             |
|             | P1:  | Taking a diet rich in calcium/ phosphorus /vitamin D                       | 1m                 |             |
|             | P2:  | Regular exercise   | 1m                 |             |
|             | P3:  | Refraining from smoking  | 1m                 |             |
|             |      |  | Any 1 P            | 1 m         |
|             |      |  | <b>Total marks</b> | <b>10 m</b> |

- 7 (a) Diagram 7.1 shows the changes of glucose level in human blood during fasting.

*Rajah 7.1 menunjukkan perubahan aras glukosa dalam darah manusia semasa berpuasa.*

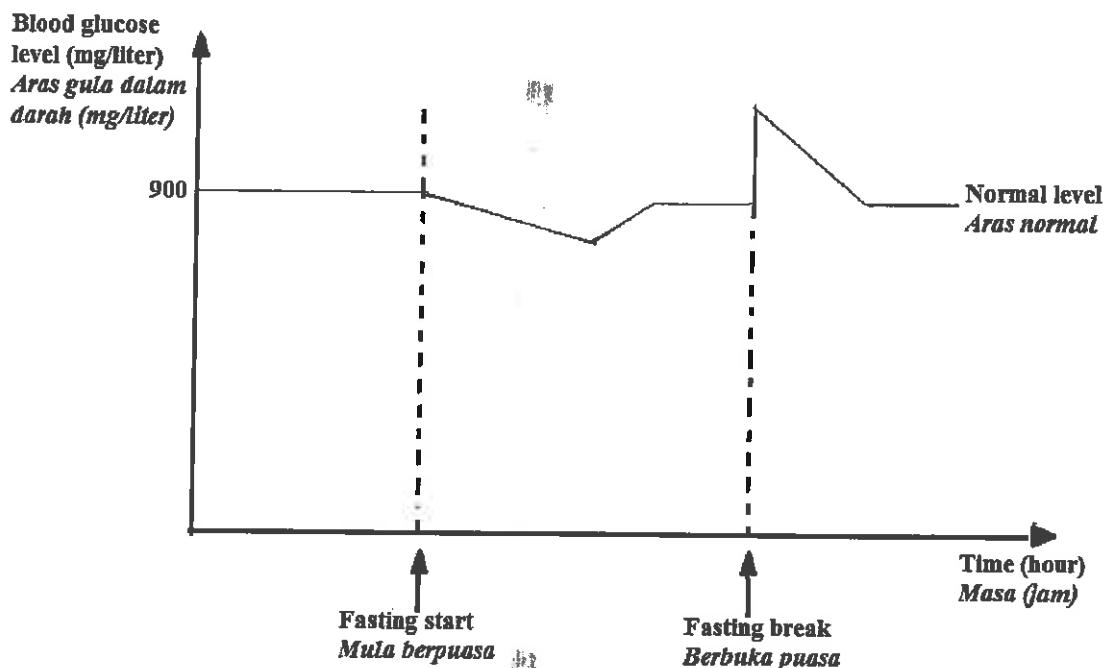


Diagram 7.1

*Rajah 7.1*

The changes of blood glucose level shown in Diagram 7.1 occur in a healthy human.

Name two organs that involve in the regulatory mechanism.

Suggest how these organs play their roles.

*Perubahan aras glukosa darah yang ditunjukkan dalam Rajah 7.1 berlaku di dalam badan seorang yang sihat.*

*Namakan dua organ yang terlibat dalam mekanisme pengawalaturan itu.*

*Cadangkan bagaimana kedua-dua organ ini memainkan peranan masing-masing*

[6 marks]  
[6 markah]

- (b) The transmission of information throughout human body is via the nervous system and the endocrine system.

How these two systems are different?

*Penghantaran maklumat dalam badan manusia adalah melalui sistem saraf dan sistem endokrina adalah berbeza.*

*Bagaimanakah kedua-dua sistem ini berbeza .*

[8 marks]  
[8 markah]

- (c) Diagram 7.2 shows the junction between two neurons, labelled as X.  
*Rajah 7.2 menunjukkan persimpangan di antara dua neuron, dilabelkan X.*

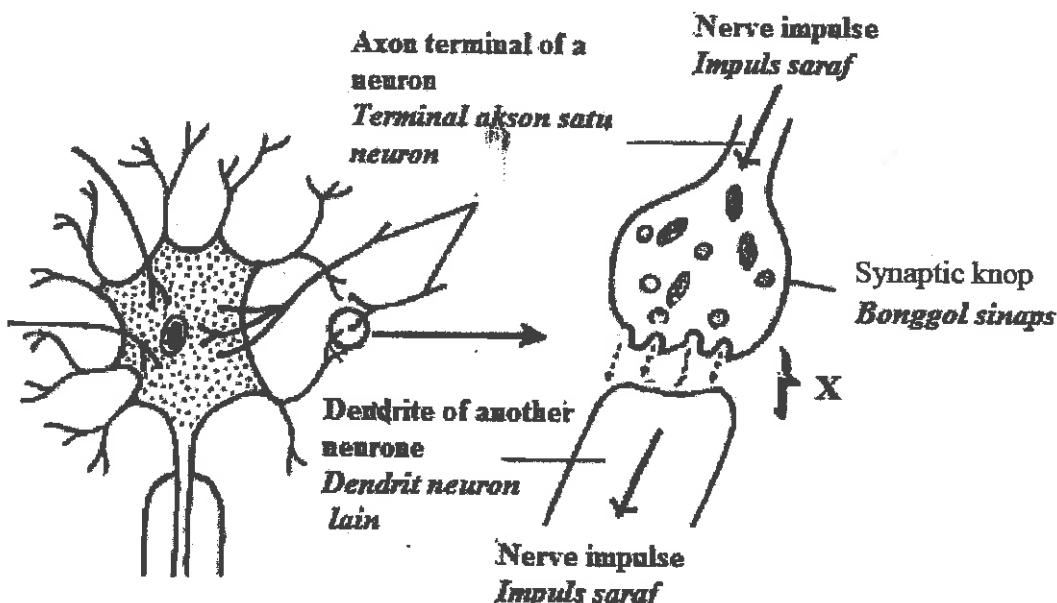


Diagram 7.2

*Rajah 7.2*

Nerve impulses are transmitted along a neurone in the form of electrical impulses with an action potential of  $-60\text{mV}$ . However the action potential cannot cross gap X. The nerve impulses are carried by chemical made by the neurone that is sending the impulse to the next neurone.

Suggest how the transmission of nerve impulses across gap X is affected after a stimulant drug is injected into human body.

*Impuls saraf dijana melintasi suatu neuron dalam bentuk impuls elektrik dengan suatu keupayaan tindakan  $-60\text{mV}$ . Walaubagaimanapun keupayaan tindakan ini tidak boleh melalui celah X. Impuls saraf dibawa oleh bahan kimia yang dibina oleh neuron yang menghantar impuls saraf itu kepada neuron yang seterusnya.*

*Cadangkan bagaimana penghantaran impuls saraf menerusi celah X dipengaruhi selepas dadah perangsang disuntik ke dalam badan manusia.*

[6]

[6 marks]  
 [6 markah]

| No  | Criteria   | Marks |
|-----|--|-------|
| (a) | <p>Able to explain the regulatory mechanism of glucose level in human blood.</p> <p>Sample answers:<br/>Organs : pancreas<br/>liver</p> <p><u>Blood glucose increase</u><br/>P1 (Beta cell of) pancreas secretes insulin<br/>P2 Excess glucose is converted into glycogen<br/>P3 Store in the liver<br/>P4 More glucose is oxidized / respired / burnt / used / converted into lipid</p> <p><u>Blood glucose decrease</u><br/>P5 (Alpha cell of) pancreas secretes glucagon<br/>P6 Glycogen in the liver<br/>P7 is converted into glucose<br/>P8 Less glucose is oxidized / respired / burnt / used / converted into lipid</p> | 6     |

(Anv 6)

| (b)                     | Able to explain the differences between the transmission of information throughout human body via the nervous system and the endocrine system.   | 8                              |                |        |                  |         |            |          |           |                  |           |      |            |      |                   |                  |                 |         |              |        |                         |                  |                              |         |
|-------------------------|--|--------------------------------|----------------|--------|------------------|---------|------------|----------|-----------|------------------|-----------|------|------------|------|-------------------|------------------|-----------------|---------|--------------|--------|-------------------------|------------------|------------------------------|---------|
|                         | <p>Sample answers:</p> <table border="1"> <thead> <tr> <th>Nervous system</th> <th>Aspect</th> <th>Endocrine system</th> </tr> </thead> <tbody> <tr> <td>Neurons</td> <td>P1 – Means</td> <td>Hormones</td> </tr> <tr> <td>Body cell</td> <td>P2 – Explanation</td> <td>Chemicals</td> </tr> <tr> <td>Fast</td> <td>P3 – Speed</td> <td>Slow</td> </tr> <tr> <td>Electrical signal</td> <td>P4 – Explanation</td> <td>Chemical signal</td> </tr> <tr> <td>Shorter</td> <td>P5 – Lasting</td> <td>Longer</td> </tr> <tr> <td>The effect is immediate</td> <td>P6 – Explanation</td> <td>The effect takes longer time</td> </tr> <tr> <td>One way</td> <td>P7 – Direction</td> <td>Depends on target cells/organs</td> </tr> </tbody> </table> |                                | Nervous system | Aspect | Endocrine system | Neurons | P1 – Means | Hormones | Body cell | P2 – Explanation | Chemicals | Fast | P3 – Speed | Slow | Electrical signal | P4 – Explanation | Chemical signal | Shorter | P5 – Lasting | Longer | The effect is immediate | P6 – Explanation | The effect takes longer time | One way |
| Nervous system          | Aspect   | Endocrine system               |                |        |                  |         |            |          |           |                  |           |      |            |      |                   |                  |                 |         |              |        |                         |                  |                              |         |
| Neurons                 | P1 – Means   | Hormones                       |                |        |                  |         |            |          |           |                  |           |      |            |      |                   |                  |                 |         |              |        |                         |                  |                              |         |
| Body cell               | P2 – Explanation   | Chemicals                      |                |        |                  |         |            |          |           |                  |           |      |            |      |                   |                  |                 |         |              |        |                         |                  |                              |         |
| Fast                    | P3 – Speed   | Slow                           |                |        |                  |         |            |          |           |                  |           |      |            |      |                   |                  |                 |         |              |        |                         |                  |                              |         |
| Electrical signal       | P4 – Explanation   | Chemical signal                |                |        |                  |         |            |          |           |                  |           |      |            |      |                   |                  |                 |         |              |        |                         |                  |                              |         |
| Shorter                 | P5 – Lasting   | Longer                         |                |        |                  |         |            |          |           |                  |           |      |            |      |                   |                  |                 |         |              |        |                         |                  |                              |         |
| The effect is immediate | P6 – Explanation   | The effect takes longer time   |                |        |                  |         |            |          |           |                  |           |      |            |      |                   |                  |                 |         |              |        |                         |                  |                              |         |
| One way                 | P7 – Direction   | Depends on target cells/organs |                |        |                  |         |            |          |           |                  |           |      |            |      |                   |                  |                 |         |              |        |                         |                  |                              |         |

|  |   |                          |                      |   |
|--|---|--------------------------|----------------------|---|
|  | Involves synapse  | P8 – Explanation         | No junction          | 1 |
|  | One   | P9 – Target; cell/organs | Can be more than one |   |
|  | Specific  | P10 – Explanation        | Send to many organs  |   |
|  | Neurons   | P11 – Via                | Blood(stream/vessel) |   |
|  | Use neurons / Not involve duct  | P12 – Explanation        | No ducts             |   |
|  | Example of expected answers:  |                          |                      |   |
|  | ▪ Nervous system function by the means of neurons while endocrine system by the means of hormones |                          |                      |   |
|  | ▪ Neurons are body cells while hormones are chemicals   |                          |                      |   |
|  |   |                          |                      |   |
|  |   |                          |                      |   |
|  |   |                          |                      |   |
|  |   |                          |                      |   |

(Anv 8)

|     |   |   |           |
|-----|---|---|-----------|
| (c) | Able to explain the transmission of nerve impulses across a synapse after a stimulant drug is injected into human body.<br><br>Sample answers:<br><br>P1 Synapse<br>P2 (The transmission of nerve impulses) increase<br>P3 More stimulation by neurotransmitter/any example<br>P4 More impulses received by adjacent neurons<br>P5 More impulses received by target cell / organs / effectors<br>P6 Neurotransmitters do not disintegrate after stimulating the next neurons<br>P7 More responses<br>P8 Stimulates the body function/metabolism<br>P9 Gives more energy / sense of energetics<br>P10 Example of drugs: nicotine/caffeine/heroin | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>(Any 6) | 6         |
|     | <b>TOTAL</b>  |   | <b>20</b> |

- (b) (i) The role of coordination and response are carried out by two different systems as shown in Diagram 7.2 (a) and 7.2 (b).  
*Peranan utama di dalam kordinasi dan gerakbalas dijalankan oleh dua sistem berbeza seperti yang ditunjukkan pada Rajah 7.2(a) dan 7.2(b).*

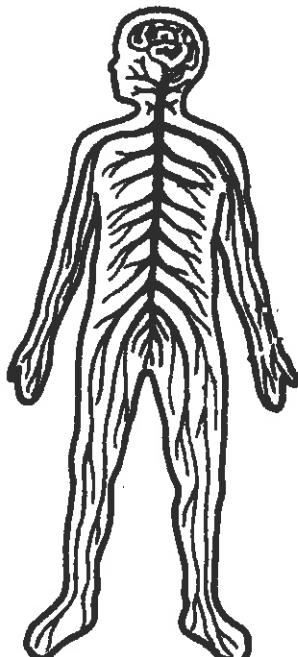


Diagram 7.2 (a)  
*Rajah 7.2 (a)*

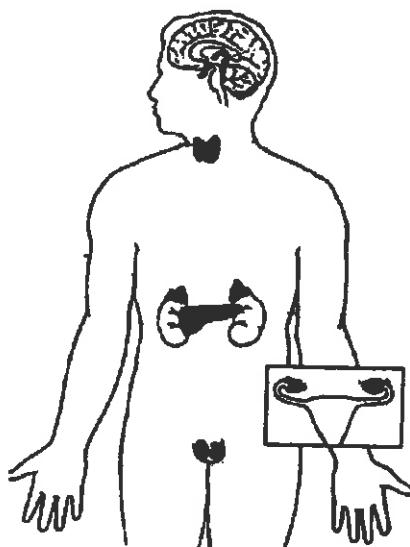


Diagram 7.2 (b)  
*Rajah 7.2 (b)*

Describe both systems based on the structure and function.  
*Huraikan kedua-dua sistem berdasarkan struktur dan fungsinya*

[6 marks]  
*[6 markah]*

- (b) (ii) Diagram 7.3 shows an emergency situation faced by Abu.  
*Rajah 7.3 menunjukkan satu keadaan cemas yang dihadapi oleh Abu.*

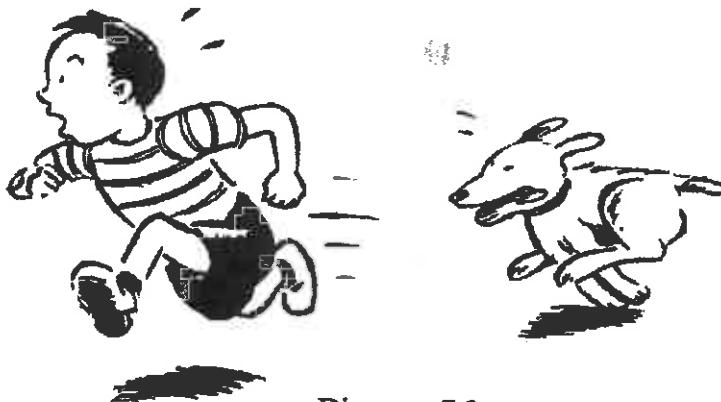


Diagram 7.3  
*Rajah 7.3*

Explain the coordination between the systems shown in Diagram 7.2(a) and 7.2 (b) for Abu to respond towards the situation.  
*Terangkan kordinasi di antara sistem-sistem yang ditunjukkan dalam Rajah 7.2(a) dan 7.2(b) supaya Abu dapat bergerakbalas terhadap situasi tersebut.*

[8 markah]

|          |   |   |   |
|----------|---|---|---|
| 7 b (i)  | F1 Nervous system   | 1 | 6 |
|          | P1 Consists of brain, spinal cord and neurons   | 1 |   |
|          | P2 Stimulates by external stimuli   | 1 |   |
|          | P3 Send information in the form of electrical impulses  | 1 |   |
|          | P4 Impulse is transmitted via neurons to effector   | 1 |   |
|          | F2 Endocrine system   | 1 |   |
|          | P5 Consists of endocrine glands // glands without ducts   | 1 |   |
|          | P6 Stimulates by internal stimuli   | 1 |   |
|          | P7 Send information in the form of chemical impulses/ hormones  | 1 |   |
|          | P8 Hormones is transported by blood to target organ   | 1 |   |
| 7 b (ii) | P1 Stimuli is detected by hypothalamus  | 1 | 8 |
|          | P2 Hypothalamus send impulse through sympathetic nervous system to the effector / heart / respiratory muscle / blood vessel | 1 |   |
|          | P3 Hypothalamus send nerve impulse to adrenal medulla   | 1 |   |
|          | P4 Adrenal medulla secretes adrenaline and noradrenaline  | 1 |   |
|          | P5 Both hormones are sent to target organ / heart / respiratory muscle /blood vessel through blood                          | 1 |   |
|          | P6 These two system cooperate each other  | 1 |   |
|          | P7 Causes increase in blood glucose level   | 1 |   |
|          | P8 Causes blood vessel constrict to increase the blood pressure   | 1 |   |
|          | P9 Causes respiratory muscle to contract and relax faster// increase breathing rate   | 1 |   |
|          | P10 Causes heart to pump faster // increase heart rate  | 1 |   |
|          | P11 To transport more oxygen and glucose to the skeletal muscle & brain   | 1 |   |
|          | P12 Brain more alert to mobilise body into immediate action /run away from the dog  | 1 |   |

8. Diagram 8.1 shows the pathway of a reflex action or reflex arc, when the hand accidentally touches sharp needle.

*Rajah 8.1 menunjukkan laluan satu tindakan reflek atau arka reflek, semasa tangan tidak sengaja menyentuh jarum tajam.*

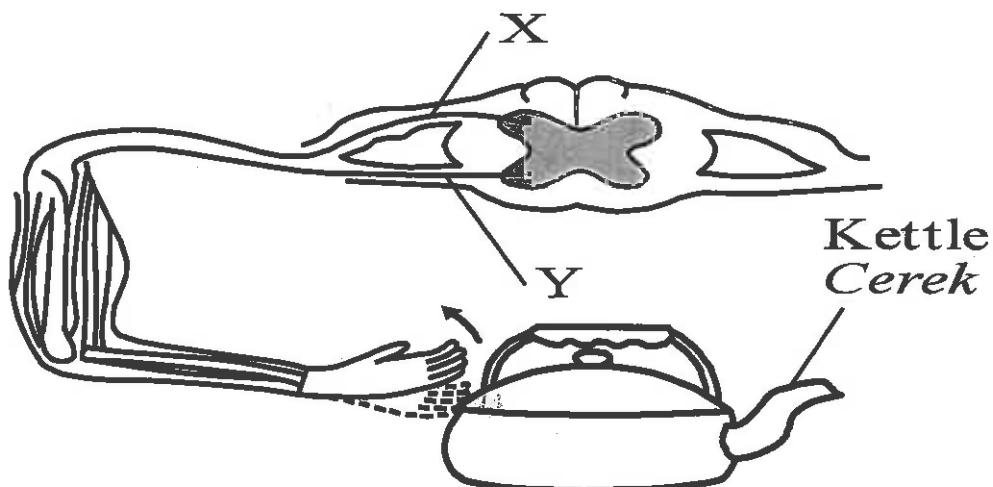


Diagram 8.1  
Rajah 8.1

- a(i) Define reflex action.

*Takrifkan tindakan reflek.*

[ 2 markah ]

- (ii) Based on Diagram 8.1, explain how reflex action functions to avoid the injury.

*Berdasarkan Rajah 8.1, terangkan bagaimana tindakan reflek berfungsi untuk mengelakkan kecederaan.*

[ 8 markah ]

- b) Table 8.1 shows some activities done by a human.

*Jadual 8.1 menunjukkan beberapa aktiviti yang dilakukan oleh manusia.*

|                        |                              |                                   |                           |
|------------------------|------------------------------|-----------------------------------|---------------------------|
| Eating<br><i>Makan</i> | Breathing<br><i>Bernafas</i> | Peristalsis<br><i>Peristalsis</i> | Running<br><i>Berlari</i> |
|------------------------|------------------------------|-----------------------------------|---------------------------|

Table 8.1 / Jadual 8.1

- (i) Based on Table 8.1, classify the activities into voluntary action and involuntary action.

*Berdasarkan Jadual 8.1, kelaskan aktiviti kepada tindakan terkawal dan tindakan luar kawal.*

[ 2 markah ]

- (ii) Explain the comparison and differences between voluntary action and involuntary action.

*Terangkan perbandingan dan perbezaan di antara tindakan terkawal dan tindakan luar kawal.*

[ 8 markah ]

| 8(a)(i)           | <p><i>Dapat memberikan takrif tindakan reflek</i></p> <ul style="list-style-type: none"> <li>- P1 Tindakan balas yang cepat / serta merta /automatik</li> <li>- P2 Hanya melibatkan saraf tunjang // Tidak melibatkan otak</li> </ul>  | 1<br>1<br>2                               |                     |       |        |         |             |             |
|-------------------|--|---|---------------------|-------|--------|---------|-------------|-------------|
| 8(a)(ii)          | <p><i>Dapat menghuraikan arka reflek berdasarkan Rajah 8.1</i></p> <ul style="list-style-type: none"> <li>- P1 Sakit adalah rangsangan</li> <li>- P2 Reseptor mengesan rangsangan / sakit</li> <li>- P3 dan mencetuskan impuls (saraf )</li> <li>- P4 Aferen neuron menghantar impuls ke interneuron / saraf tunjang</li> <li>- P5 Impuls dipindahkan merentasi sinaps ( dalam jirim kelabu ) // Neuron aferen bersinaps dengan interneuron dan kemudian bersinaps dengan neuron eferen</li> <li>- P6 Neuron eferen menghantarkan impuls ke efektor / otot / bisep</li> <li>- P7 Bisep akan mengecut</li> <li>- P8 lalu menarik lengan daripada objek tajam</li> </ul> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>8 |                     |       |        |         |             |             |
| 8(b)(i)           | <p><i>Dapat mengelaskan aktiviti kepada tindakan terkawal dan tindakan luar kawal</i></p> <table border="1"> <thead> <tr> <th>Tindakan terkawal</th> <th>Tindakan luar kawal</th> </tr> </thead> <tbody> <tr> <td>Makan</td> <td>Muntah</td> </tr> <tr> <td>Berlari</td> <td>Peristalsis</td> </tr> </tbody> </table> <p><i>Dapat menerangkan perbandingan dan perbezaan tindakan terkawal dan tindakan luar kawal</i></p> <ul style="list-style-type: none"> <li>- Persamaan :</li> <li>- P1 Kedua-dua tindakan terkawal dan tindakan luar kawal</li> </ul>   | Tindakan terkawal                         | Tindakan luar kawal | Makan | Muntah | Berlari | Peristalsis | 1<br>1<br>1 |
| Tindakan terkawal | Tindakan luar kawal  |   |                     |       |        |         |             |             |
| Makan             | Muntah   |   |                     |       |        |         |             |             |
| Berlari           | Peristalsis  |   |                     |       |        |         |             |             |

|               |  |                 |                                   |                                 |
|---------------|--|-----------------|-----------------------------------|---------------------------------|
| 8(b)(ii)      | melibatkan koordinasi sistem saraf<br>- P2 Kedua-dua tindakan terkawal dan tindakan luar kawal merupakan gerakbalas terhadap rangsangan yang diterima<br>- Perbezaan : |                 |                                   | 1<br>1<br>1<br>1<br>1<br>1<br>8 |
|               | Tindakan Terkawal  | Perbezaan       | Tindakan Luar Kawal               |                                 |
|               | Mengikut kemahuan seseorang  | Cara berlaku    | Tidak mengikut kemahuan seseorang |                                 |
|               | Berlaku di bawah kesedaran seseorang   | Kesedaran       | Berlaku secara tidak disedari     |                                 |
|               | Serebrum   | Pusat integrasi | Medula oblongata                  |                                 |
|               | Rangsangan luar  | Rangsangan      | Rangsangan dalam                  |                                 |
| Jumlah markah |  |                 |                                   | 20                              |

9. (a) Table I shows the content of components in R and S in Diagram 9.1.

*Jadual 1 menunjukkan kandungan komponen di dalam R dan S dalam Rajah 9.1.*

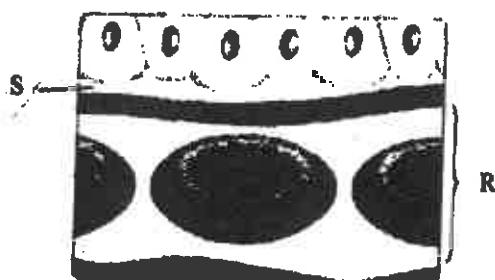


Diagram 9.1  
Rajah 9.1

| Component<br><i>Komponen</i> | Composition<br><i>Komposisi</i> |   |
|------------------------------|---------------------------------|---|
|                              | R                               | S |
| Glucose                      | ✓                               | ✓ |
| Oxygen                       | ✓                               | ✓ |
| Albumen                      | ✓                               | X |
| Urea                         | ✓                               | ✓ |
| Platlets                     | ✓                               | X |
| Leucocytes                   | ✓                               | ✓ |
| Erythrocytes                 | ✓                               | X |

Table I  
Jadual 1

(a) Based on Table I,  
*Berdasarkan Jadual 1,*

Explain why the contents of R and S are different.  
*Terangkan mengapa kandungan dalam R dan S adalah berbeza.*

[10 marks]

(b) Diagram 9.2 shows the organ involved in homeostasis.

*Rajah 9.2 menunjukkan organ yang terlibat dalam homeostasis.*

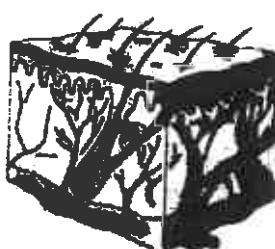


Diagram 9.2  
Rajah 9.2

Does the organ shown in Diagram 9.2 can regulate the human body temperature ?  
Give your reason.

*Adakah organ yang ditunjukkan dalam Rajah 9.2 boleh mengawal atur suhu badan manusia ?  
Beril alasan anda.*

[10 marks]

| NUM  | SCORING CRITERIA   | MARKS |
|------|--|-------|
| 9(a) | <p><i>Able to explain why the different contents in blood and interstitial fluid</i></p> <p><u>Sample answer:</u></p> <p>F1 - Glucose / oxygen present in the R and S. 1<br/> E1 - There is high hydrostatic pressure at the arterial end of the capillaries 1<br/> E2 - glucose / oxygen force out from the R to S 1<br/> E3 - Able to pass through the wall of blood capillaries 1</p> <p>F2 - No albumen / platelets / erythrocytes in the S. 1<br/> E4 - large molecules / components 1<br/> E5 - unable to pass through the capillary wall. 1</p> <p>F3 - Leucocytes present in the R and S 1<br/> E6 - because leucocytes ooze through the openings in the capillary wall 1</p> <p>F4 - Urea present in the R and S 1<br/> E7 - diffuse from the body cells through the S into R 1</p>   | 10 M  |
| 9(b) | <p><i>Able to evaluate whether skin can regulate body temperature and give the reason.</i></p> <p><u>Sample answer:</u></p> <p>Yes 1</p> <p>Reason:<br/>When the body temperature falls</p> <p>F1 : (Cold) receptors/thermoreceptor detects the change of the body temperature falls 1<br/> E1 : Afferent neurone transmitted the nerve impulse to the hypothalamus 1<br/> E2 : Hypothalamus acts as the temperature regulatory centre 1<br/> E3 : Nerve impulse is transmitted from hypothalamus to the skin (by efferent neurone to produce response by negative feedback mechanism) 1 10</p> <p>F2 : Hair erector muscles are stimulated to contract 1<br/> E4 : Hairs become erect 1<br/> E5 : A thick layer of air is trapped 1<br/> E6 : Less heat loss (to the environment by radiation / conduction) 1</p> <p>F3 : Sweat glands inactive 1<br/> E7 : Less sweat produced 1</p> |       |

|  |  |                                |              |           |
|--|--|--------------------------------|--------------|-----------|
|  | E8 : Rate of evaporation (very) low<br>E9 : Heat is conserved<br><br>F4 : Vasoconstriction occurs// blood vessels constrict<br>E10 : Less blood flows close to the body surface<br>E11 : Heat loss (by radiation /conduction) is reduced<br>E12 : Body temperature increase back to normal   | 1<br>1<br><br>1<br>1<br>1<br>1 | <i>Any 9</i> | 10 M      |
|  | <i>Or</i>  |                                |              |           |
|  | <i>When the body temperature high</i>  |                                |              |           |
|  | F1 : (Warm) receptors/thermoreceptor detects the change of the body temperature high<br>E1 : Afferent neurone transmitted the nerve impulse to the hypothalamus<br>E2 : Hypothalamus acts as the temperature regulatory centre<br>E3 : Nerve impulse is transmitted from hypothalamus to the skin (by efferent neurone to produce response by negative feedback mechanism) | 1<br>1<br>1<br>1               |              |           |
|  | F2 : Hair erector muscles are stimulated to relax<br>E4 : Hairs lie flat<br>E5 : Very little layer of air is trapped<br>E6 : More heat loss (to the environment by radiation /conduction)  | 1<br>1<br>1<br>1               |              |           |
|  | F3 : Sweat glands active<br>E7 : More sweat produced<br>E8 : Rate of evaporation (very) high<br>E9 : Heat is lost from the skin, cooling the skin  | 1<br>1<br>1<br>1               |              |           |
|  | F4 : Vasodilation occurs// blood vessels dilate<br>E10 : More blood flows close to the body surface<br>E11 : Heat loss (by radiation /conduction) is increased<br>E12 : Body temperature decrease back to normal   | 1<br>1<br>1<br>1               |              |           |
|  |  |                                | <i>Any 9</i> | 10 M      |
|  |  |                                | <b>TOTAL</b> | <b>20</b> |

9. Diagram 9 shows the mechanism of thermoregulation in human.

Rajah 9 menunjukkan mekanisma kawalatur suhu badan dalam manusia.

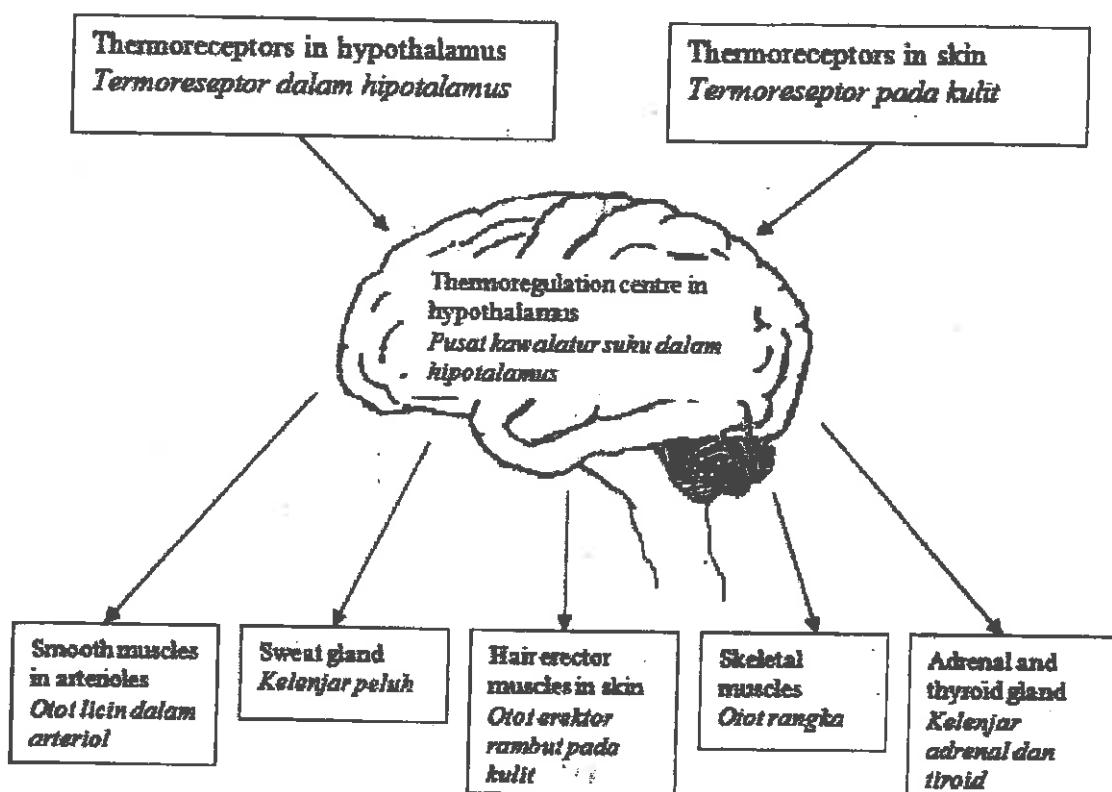


Diagram 9 / Rajah 9

- (a) Based on Diagram 9, explain how the mechanism of thermoregulation acts to regulate body temperature on a hot day.

Berdasarkan Rajah 9, terangkan bagaimana mekanisma kawalatur suhu pada badan bertindak untuk mengawalatur suhu badan pada hari yang panas.

[10 marks] / [10 markah]

**Tropism involves the growth movement of certain parts of the plant towards or away from the stimulus.**

**Tropisma melibatkan pergerakan pertumbuhan bahagian tertentu tumbuhan ke arah atau menjauhi rangsangan.**

- (b) Explain the mechanism involved in:  
Jelaskan mekanisma yang terlibat dalam:

- (i) positive phototropism of shoots  
*fototropisma positif pucuk*
- (ii) positive geotropism of roots  
*geotropisma positif akar*

[10 marks] / [10 markah]

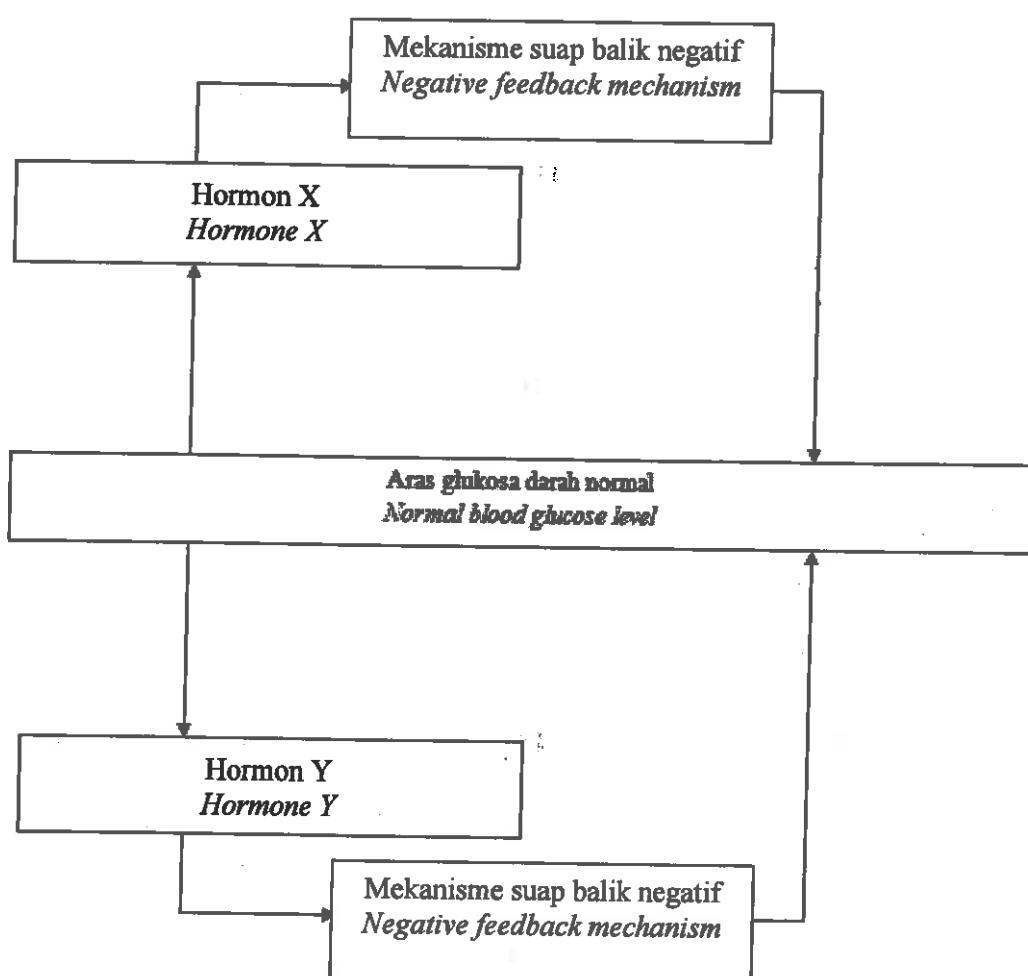
| Question | Marking Scheme  | Sub Mark | Total Mark |
|----------|---|----------|------------|
| 9(a)     | <p>Able to explain how the mechanism of thermoregulation acts to regulate body temperature on a hot day</p> <p>M1 : Changes in the environmental temperature are detected by thermoreceptors in the skin.// Changes in the blood temperature are detected by thermoreceptors in the hypothalamus.<br/> <i>Perubahan dalam suhu persekitaran dikesan oleh termoreseptor pada kulit. // Perubahan suhu darah dikesan oleh termoreseptor pada hipotalamus.</i></p> <p>M2 : These thermoreceptors transmit nerve impulses to the thermoregulation centre in the hypothalamus.<br/> <i>Termoreseptor menghantar impuls saraf kepada pusat termoregulasi pada hipotalamus</i></p> <p>M3 : The hypothalamus/ thermoregulation centre sends nerve impulses / electrical signals to the effectors.<br/> <i>Hipotalamus / pusat regulasi menghantar impuls saraf ke efektor.</i></p> <p>F1 : Smooth muscles in arterioles in the skin relax, causing vasodilation.<br/> <i>Otot licin pada arteriol pada kulit mengendur, menyebabkan vasodilasi.</i></p> <p>E1 : More blood is carried to the surface of the body, where heat is lost by convection and radiation.<br/> <i>Lebih banyak darah diangkat ke permukaan kulit/ badan, di mana kehilangan haba berlaku melalui proses radiasi dan konveksi.</i></p> <p>F2 : The sweat glands secrete sweat onto the surface of the skin, where it evaporates.<br/> <i>Kelenjar peluh merembes peluh ke permukaan kulit, di mana ia tersejat.</i></p> <p>E2 : Water has a high latent heat of evaporation, so this process takes heat from the body and the body cools.<br/> <i>Air mempunyai haba laten yang tinggi, jadi proses ini menghilangkan haba daripada badan dan suhu badan menurun.</i></p> <p>F3 : The hair erector muscles relax, lowering the skin hairs.<br/> <i>Otot rambut erektror mengendur, menurunkan rambut kulit.</i></p> <p>E3 : Only a thin layer of air is trapped between the hairs. Heat lost through conduction and radiation is increased.<br/> <i>Hanya selapis udara yang nipis terperangkap. Haba yang hilang melalui proses konduksi dan radiasi bertambah.</i></p> <p>F4 : The skeletal muscles do not contract and relax involuntarily.<br/> <i>Otot rangka tidak mengecut dan mengendur secara tidak terkawal</i></p> <p>E4 : There is no shivering and no unnecessary generation of heat.<br/> <i>Orang itu tidak menggigil and tiada penghasilan haba yang tidak perlu.</i></p> <p>F5 : The adrenal gland/ thyroid glands secrete less adrenaline/ thyroxine.<br/> <i>Kelenjar adrenal/ tiroid merembes kurang adrenalin/ tiroksin</i></p> |          |            |

|        |  |        |    |
|--------|--|--------|----|
|        | E5.: The body's metabolic rate is reduced. This reduced the generation of respiratory heat.<br><i>Kadar metabolism badan dikurangkan. It mengurangkan penghasilan haba respirasi</i><br>(any 10 M, E or F) / (mana-mana 10.M,F atau E)   | 10 X 1 | 10 |
| (b)(i) | <p>Able to explain the mechanism involved in positive phototropism of shoots</p> <p>P1 : When a shoot is exposed to light from one direction, auxins which are produced in the shoot tip,<br/><i>Apabila pucuk terdedah kepada cahaya dari satu arah, auxin yang dihasilkan pada hujung pucuk,</i></p> <p>P2 : move into the zone of elongation.<br/><i>bergerak ke zon pemanjangan.</i></p> <p>P3 : At the zone of elongation, more auxins move to the shaded side, away from the light.<br/><i>Pada zon pemanjangan, lebih banyak auksin bergerak ke bahagian terlindung, menjauhi cahaya,</i></p> <p>P4 : resulting in a higher concentration of auxins in the shaded region than in the region exposed to light.<br/><i>menyebabkan kepekatan auksin pada bahagian yang terlindung lebih tinggi daripada bahagian yang terdedah kepada cahaya</i></p> <p>P5 : The cells on the shaded region of the shoot elongate more than the cells on the other region.<br/><i>Sel pada bahagian yang terlindung pada pucuk memanjang lebih banyak daripada sel pada bahagian lain.</i></p> <p>P6 : As a result, the shoot grows and bends towards the direction of the light.<br/><i>Akibatnya, pucuk itu tumbuh dan membengkok ke arah cahaya.</i><br/>(any 5P) / (mana-mana 5P)</p> | 5 X 1  | 5  |
| (ii)   | <p>Able to explain the mechanism involved in positive geotropism of roots</p> <p>P7 : Auxins are produced at the root tips and move to the lower side of root,<br/><i>Auksin dihasilkan pada hujung akar dan bergerak ke bahagian bawah akar,</i></p> <p>P8 : due to the pull of gravity<br/><i>disebabkan oleh tarikan graviti</i></p> <p>P9 : More auxins accumulate on the lower side of the root, resulting in a higher concentration of auxins on the lower side.<br/><i>Lebih banyak auksin terkumpul pada bahagian bawah akar, jadi kepekatan auksin pada bahagian bawah lebih tinggi.</i></p> <p>P10 : A high concentration of auxins in the root inhibits elongation of cells.<br/><i>Kepekatan auksin yang tinggi pada akar membantu pemanjangan sel.</i></p> <p>P11: Hence the cells on the lower side of the root grow slower than the cells on the upper side.<br/><i>Oleh itu, sel pada bahagian bawah akar tumbuh lebih lambat daripada sel pada bahagian atas.</i></p>   |        |    |

|  |   |       |    |  |
|--|---|-------|----|--|
|  | P12 : As a result, the root grows and bends downwards, towards the pull of gravity.<br>Akibatnya, akar tumbuh dan membengkok ke bawah, ke arah tarikan graviti.<br><i>(any 5P) / (mana-mana 5P)</i> | 5 X 1 | 5  |  |
|  |   |       | 20 |  |

- 6 Rajah 6.1 menunjukkan mekanisme suap balik negatif dalam pengawalaturan aras gula dalam darah.

*Diagram 6.1 shows negative feedback mechanism in a regulation of blood sugar level.*



Rajah 6.1

*Diagram 6.1*

- (a) (i) Berdasarkan Rajah 6.1, terangkan secara ringkas maksud suap balik negatif.

*Based on Diagram 6.1, explain briefly the meaning of negative feedback mechanism.*

[2 markah]  
[2 marks]

- (ii) Huraikan bagaimana hormon X dan hormon Y mengawalatur aras glukosa dalam darah.

*Describe how hormone X and hormone Y regulate the glucose level in blood.*

[8 markah]  
[8 marks]

(b)

Tropisme melibatkan pergerakan pertumbuhan bahagian tertentu tumbuhan ke arah atau menjauhi rangsangan.

*Tropism involves the growth movement of certain parts of the plant towards or away from the stimulus.*

Berdasarkan pernyataan di atas, terangkan fototropisme positif pucuk dan geotropisme positif akar.

*Based on statement above, explain the positive phototropism of shoots and positive geotropism of roots.*

[10 markah]  
[10 marks]

| NO       | KRITERIA PEMARKAHAN   | MARKAH                                    | JUMLAH |
|----------|---|---|--------|
| 6 (a)(i) | <p><b>Berdasarkan Rajah 6.1, terangkan secara ringkas maksud suap balik negatif</b></p> <ul style="list-style-type: none"> <li>• Mekanisme pembetulan untuk mengembalikan keadaan persekitaran dalam menjadi normal</li> <li>• Apabila aras glukosa dalam darah meningkat, mekanisme pembetulan akan menurunkan semula aras glukosa kepada normal //</li> <li>• Apabila aras glukosa dalam darah menurun, mekanisme pembetulan akan meningkatkan semula aras glukosa kepada normal</li> </ul>   | 1<br>1<br>1                               | 2      |
| (a)(ii)  | <p><b>Huraikan bagaimana hormon X dan hormon Y mengawalatur aras glukosa dalam darah</b></p> <ul style="list-style-type: none"> <li>• Hormon X ialah insulin</li> <li>• Hormon Y ialah glukagon</li> <li>• Apabila aras glukosa dalam darah meningkat daripada aras normal, (sel beta pada kelompok sel Langerhans) di pancreas merembeskan hormon X ke dalam darah</li> <li>• Di hati, Hormon X, menukarkan glukosa berlebihan dalam darah kepada glikogen untuk disimpan di sel-sel hati dan sel-sel otot</li> <li>• Aras glukosa dalam darah menurun semula dan kembali ke aras normal</li> <li>• Apabila aras glukosa dalam darah menurun daripada aras normal, (sel alfa pada kelompok sel Langerhans di) pancreas merembeskan hormon Y ke dalam darah</li> <li>• Di hati, Hormon Y, menukarkan glikogen kepada glukosa</li> <li>• Aras glukosa dalam darah meningkat semula dan kembali ke aras normal</li> </ul> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | 8      |

| NO  | KRITERIA PEMARKAHAN   | MARKAH   | JUMLAH    |
|-----|---|--|-----------|
| (b) | <p><b>Jelaskan mekanisme yang terlibat dalam fototropisme positif pucuk dan geotropisme positif akar</b></p> <ul style="list-style-type: none"> <li>• Sel meristem apeks pada hujung pucuk menghasilkan auksin</li> <li>• Auksin merangsang pemanjangan sel di hujung pucuk</li> <li>• Auksin meresap dari meristem apeks ke zon pemanjangan sel</li> <li>• Kepekatan auksin adalah lebih tinggi di bahagian teduh berbanding bahagian yang terdedah kepada cahaya</li> <li>• Sel-sel di bahagian yang teduh memanjang lebih banyak berbanding bahagian yang terdedah kepada cahaya</li> <li>• Ini menyebabkan hujung pucuk membengkok ke arah cahaya</li> <li>• Meristem apeks hujung akar menghasilkan auksin</li> <li>• Auksin meresap ke dalam zon pemanjangan sel</li> <li>• Daya tarikan graviti menyebabkan auksin berkumpul di bahagian bawah hujung akar</li> <li>• Kepekatan auksin adalah lebih tinggi di bahagian bawah hujung akar berbanding di bahagian atas</li> <li>• Kepekatan auksin yang tinggi dalam akar merencatkan pemanjangan sel</li> <li>• Pemanjangan sel di bahagian bawah akar lebih perlahan daripada bahagian atas.</li> <li>• Maka, akar membengkok dan tumbuh ke bawah ke arah graviti</li> </ul> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>10 MAX |           |
|     | <b>JUMLAH</b>   |  | <b>20</b> |

- 7 (a) Diagram 7.1 shows the negative feedback mechanism in regulating the water balance in human blood.

*Rajah 7.1 menunjukkan mekanisme sambalik negatif dalam mengawalatur keseimbangan air di dalam darah manusia.*

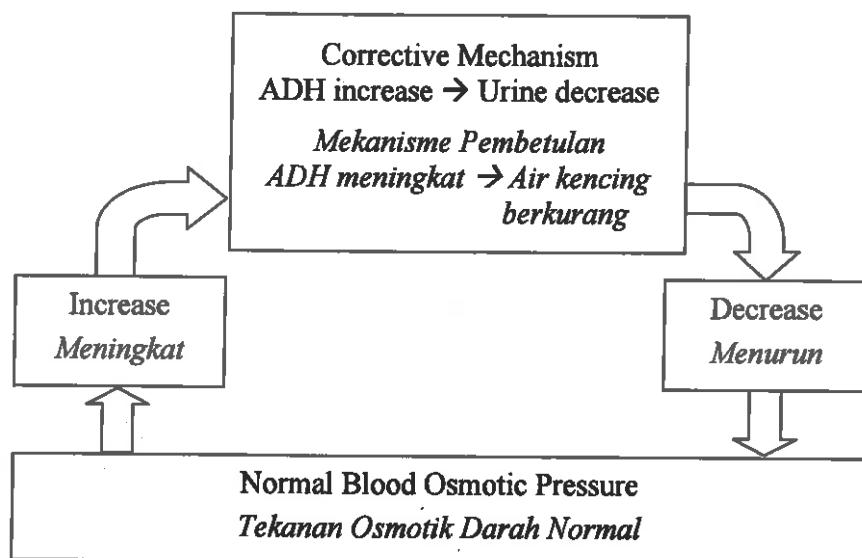


Diagram 7.1

*Rajah 7.1*

Explain the corrective mechanism when the osmotic pressure of the blood increases.

*Terangkan mekanisme pembetulan apabila tekanan osmotik darah meningkat.*

[6 marks]  
[6 markah]

- (b) Diagram 7.2 shows the sequence of organs and tissue that responded when a man was attacked by a robber.

*Rajah 7.2 menunjukkan urutan organ-organ dan tisu yang bergerak balas apabila seorang lelaki diserang oleh perompak.*

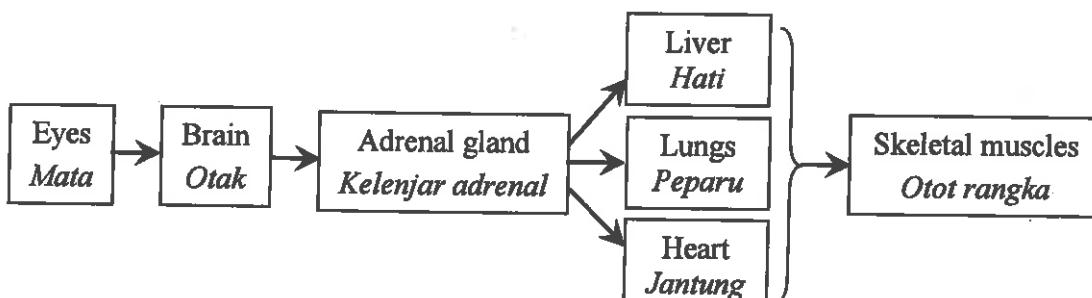


Diagram 7.2  
Rajah 7.2

Explain the involvement of nervous system and endocrine system in this situation.

*Bincangkan penglibatan sistem saraf dan sistem endokrin dalam situasi ini.*

[8 marks]  
[8 markah]

- (c) Diagram 7.3 shows transmission of impulse through a synapse.

*Rajah 7.3 menunjukkan penghantaran impuls melalui satu sinaps.*

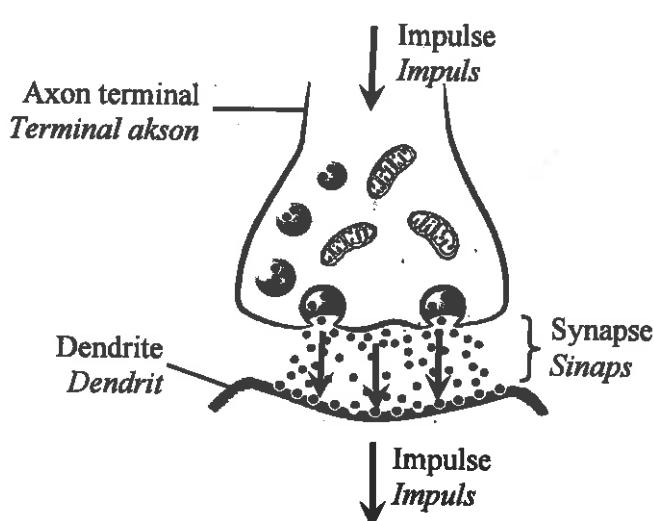


Diagram 7.3  
Rajah 7.3

Explain the effect of a pain killer drug on the transmission of nerve impulses.

*Terangkan kesan ubat tahan sakit ke atas penghantaran impuls saraf.*

[6 marks]  
[6 markah]

## Question 7

| No    | Criteria   | Marks |
|-------|--|-------|
| (a)   | Able to explain the corrective mechanism when the osmotic pressure of the blood increases.<br><br>Sample answer: <ul style="list-style-type: none"><li>▪ Water content in the blood is low // Blood is hypertonic</li><li>▪ Detected by osmoreceptor</li><li>▪ In hypothalamus</li><li>▪ Send nerve impulse to pituitary gland</li><li>▪ Secretes ADH</li><li>▪ Transported by blood to kidney</li><li>▪ Distal convoluted tubule / collecting duct of nephron</li><li>▪ More permeable towards water</li><li>▪ More water reabsorbed by blood (and less urine produced)</li></ul>   | 6     |
| (b)   | Able to explain the involvement of nervous system and endocrine system in the situation.<br><br>Sample answer: <ul style="list-style-type: none"><li>▪ The receptors / eyes detect stimulus</li><li>▪ Sent nerve impulse to brain</li><li>▪ Integration and interpretation of information</li><li>▪ Sent nerve impulse to adrenal gland</li><li>▪ Secretes adrenalin</li><li>▪ Transported by blood (to liver, lungs and heart)</li><li>▪ (In the liver,) glycogen converted into glucose</li><li>▪ Increase breathing rate</li><li>▪ Increase ventilation rate // gaseous exchange in the lungs</li><li>▪ Increase heartbeats</li><li>▪ More blood / glucose / oxygen (in skeletal muscles)</li><li>▪ More cellular respiration</li><li>▪ More energy released</li><li>▪ For muscles contraction // To respond / fight back / run away.</li></ul> | 8     |
| (c)   | Able to explain the effect of a pain killer drug on the transmission of nerve impulses.<br><br>Sample answer: <ul style="list-style-type: none"><li>▪ Nerve impulses reach axon terminal / synaptic knob</li><li>▪ Energy from mitochondria</li><li>▪ Vesicles containing neurotransmitter</li><li>▪ Merged / fused with (pre-synaptic) membrane</li><li>▪ Releases neurotransmitters</li><li>▪ Into synapse</li><li>▪ Drugs Neutralised / blocked / disintegrate the neurotransmitters</li><li>▪ No / less neurotransmitters reach dendrite / next neurone</li><li>▪ No / less new nerve impulses transmitted.</li></ul>  | 8     |
| TOTAL |  | 20    |

- 7(a) Diagram 7.1 shows the development of pollen.  
*Rajah 7.1 menunjukkan perkembangan debunga.*

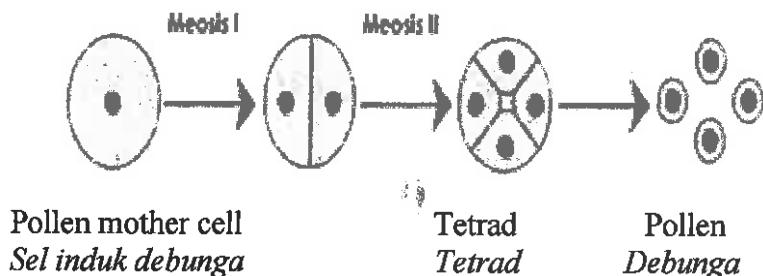


Diagram 7.1 // Rajah 7.1

Describe the development of pollen based on the diagram above.  
*Huraikan perkembangan debunga berdasarkan rajah di atas.*

[ 4 marks]

- (b) Diagram 7.2 shows the mature carpel where the process of double fertilisation occurs in the plant. Explain the process.  
*Rajah 7.2 menunjukkan karpel matang dimana proses persenyawaan gandadua dalam tumbuhan berlaku. Terangkan proses tersebut.*

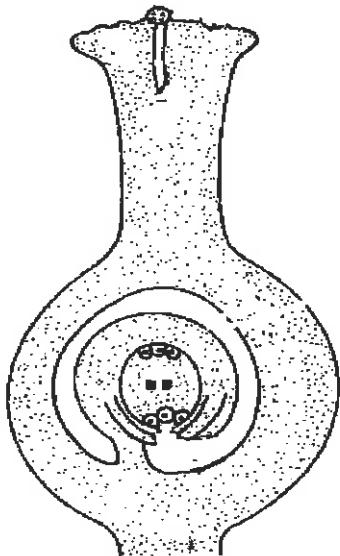


Diagram 7.2 // Rajah 7.2

[6 marks]

- (c) Diagram 7.3 shows the process of secondary growth in plant.  
*Rajah 7.3 menunjukkan proses pertumbuhan sekunder dalam tumbuhan.*

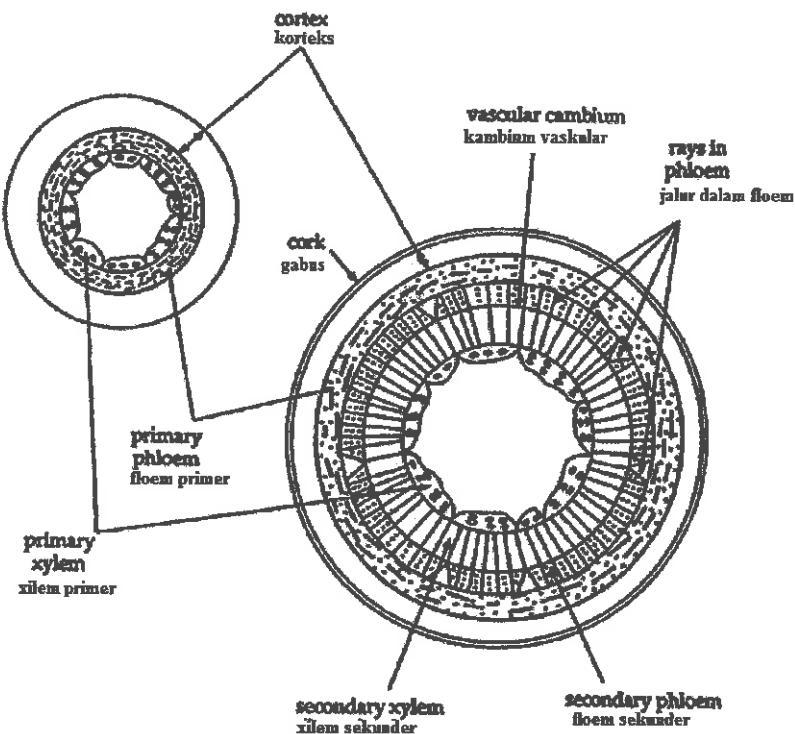


Diagram 7.3 // Rajah 7.3

Based on the above diagram, explain the process of secondary growth in plant  
*Berdasarkan rajah di atas, terangkan proses pertumbuhan sekunder dalam tumbuhan.*

[6 marks]

- (d) Explain the important of secondary growth in plant.  
*Terangkan kepentingan pertumbuhan sekunder dalam tumbuhan.*

[4 marks]

| No   | Mark Scheme   | Mark                                     |
|------|---|--|
| 7(a) | <p><i>Able to explain the development of pollen based on the diagram above.</i></p> <p><b>Suggested answer:</b></p> <p>E1: pollen mother cell ( diploid) undergo meiosis I<br/> E2: 2 cell stage of pollen cell (haploid) is form<br/> E3: 2 cell stage undergo meiosis II<br/> E4: tetrad stage is form<br/> E5: after the secretion of cell wall, the pollen is form</p>  | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>max 4 |
| 7(b) | <p><i>Able to explain the process of double fertilisation occurs in the plant.</i></p> <p><b>Suggested answer:</b></p> <p>E1- The pollen tube grows down the style towards the ovule<br/> E2- The sugar solution (sucrose) secreted by the stigma stimulates the pollen grain to germinate and form a pollen tube<br/> E3- The generative nucleus divides by mitosis to form two male gamete nuclei<br/> E4- The male gamete nuclei move down the pollen tube led by the tube nucleus</p> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1     |

|      |   |   |
|------|---|---|
|      | <p>E5- When the pollen tube reaches the ovary, it penetrates the ovule through the micropyle<br/> E6- The tube nucleus degenerates, leaving a clear passage for the male nuclei to enter the embryo sac<br/> E7- Double fertilization occurs in the ovule. One male nucleus fuses with the egg nucleus to form a diploid zygote(2n)<br/> E8- The other male nucleus fuses with the two polar nuclei to form a triploid nucleus(3n)</p>  | 1<br>1<br>1<br>1<br>Max 6                               |
| 7(c) | <p><i>Able to explain the process of secondary growth in plant</i></p> <p><b>Suggested answer:</b></p> <p>F1:Vascular cambium divides actively radially<br/> F1:forming cambium ring/ intervascular cambium<br/> F2:Cambium cells divides tangentially,<br/> F2:cell in the outside differentiate to form secondary phloem<br/> F3:while the inner cell differentiate to form secondary xylem</p>   | 1<br>1<br>1<br>1<br>1<br>1                              |
|      | <p>E4:primary xylem pushed towards the pith<br/> E5:and primary phloem pushed towards the epidermis<br/> E6:the walls of secondary xylem will be thickened with lignin<br/> E7:this give tissues mechanical strength to support the plant<br/> E8:the tissues outside become increasingly compressed<br/> E9:the circumference/ diameter increased caused the epidermis to be stretched<br/> E10:the ruptured epidermis will be replaced by cork as a result of the activity of cork cambium<br/> F3:cork cambium divides tangentially<br/> E11:form secondary cortex/inner cell and cork/ outer cell</p> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>max 6 |

|      |  |              |           |
|------|--|--------------|-----------|
| 7(d) | <p><i>Able to explain the important of secondary growth in plant.</i></p> <p><b>Suggested answer:</b></p> <p>P1: Increase the diameters of the plant stems and roots for additional mechanical support</p> <p>P2: Produces secondary xylem called wood to support and strengthen the growing plant</p> <p>P3: Produces more secondary phloem and secondary xylem to accommodate the increase in demand for water, mineral and organic nutrient</p> <p>P4: produced new phloem and xylem tissues to replace old and damaged ones</p> <p>P5: Produces a thick and tough bark which reduces evaporation of water from the surface of stem, also protects the plant against of insect and parasite fungi</p> <p>P6: Increase the opportunities to produce seeds and propagate as plant that undergo secondary growth live longer</p> <p>P7: produce large quantities of fruit for local consumption and export</p> |              |           |
|      |  | <b>TOTAL</b> | <b>20</b> |

- 8 Diagram 8.1 shows the structure of a flower. P, Q and R are parts of the flower that plays a role in reproduction.

*Rajah 8.1 menunjukkan struktur suatu bunga. P, Q dan R adalah bahagian pada bunga yang memainkan peranan dalam pembiakan.*

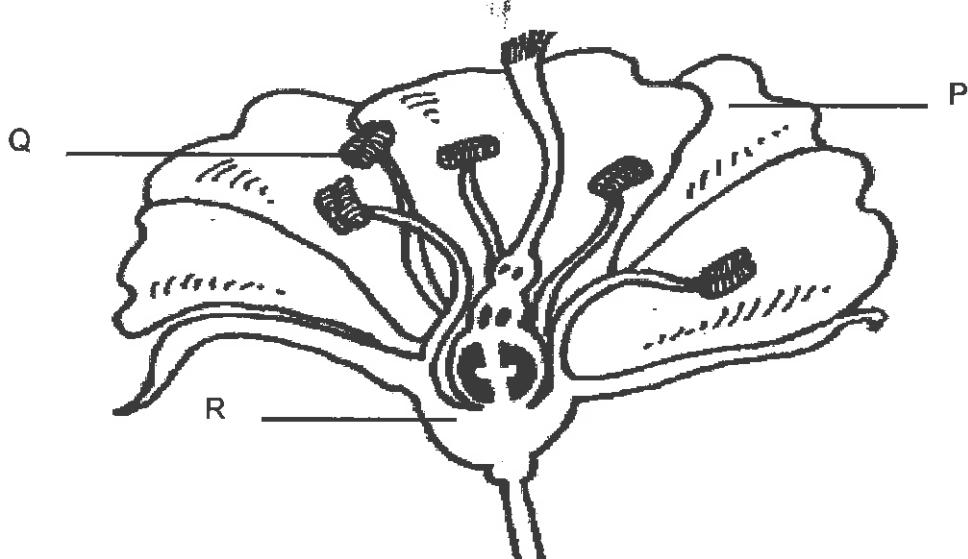


Diagram 8.1/Rajah 8.1

- (a) Identify the parts P, Q, and R of a flower and explain how they help to ensure the survival of the plants in the ecosystem.

*Kenal pasti bahagian P, Q, dan R suatu bunga dan terangkan bagaimana mereka membantu memastikan kemandirian tumbuhan dalam suatu ekosistem.*

[6 marks/6 markah]

- (b) Diagram 8.2 shows a process that occurs in the stigma of a flower.

*Rajah 8.2 menunjukkan suatu proses yang berlaku dalam stigma bunga.*

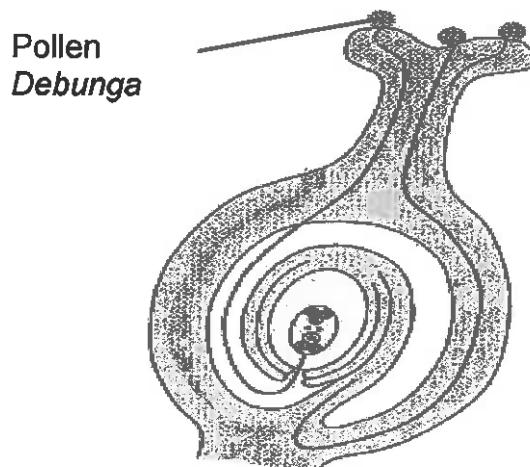


Diagram 8.2/Rajah 8.2

Discuss the process that occurs to the pollen.

*Bincangkan proses yang berlaku kepada debunga.*

[4 marks/4 markah]

- (c) Diagram 8.3 shows the growth curve of an insect.  
*Rajah 8.3 menunjukkan lengkung pertumbuhan suatu serangga.*

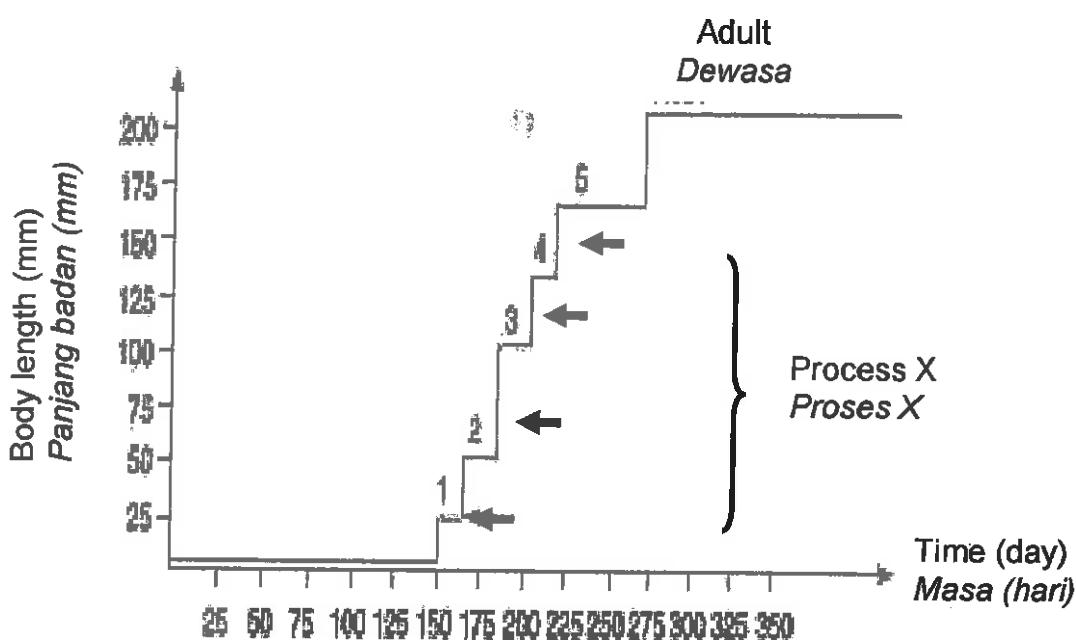


Diagram 8.3/Rajah 8.3

- (i) Explain process X in the growth curve.  
*Terangkan proses X dalam lengkung pertumbuhan tersebut.* [5 marks/5 markah]
- (ii) Diagram 8.4 (a) and 8.4 (b) show two types of plants.  
*Rajah 8.4 (a) dan 8.4 (b) menunjukkan dua jenis tumbuhan.*



Diagram 8.4 (a)/Rajah 8.4 (a)

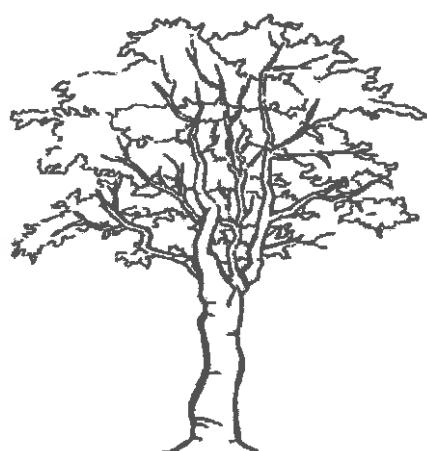


Diagram 8.4 (b)/Rajah 8.4 (b)

Based on the growth curve, discuss the similarities and differences between the two plants.

*Berdasarkan lengkung pertumbuhan, bincangkan persamaan dan perbezaan di antara kedua-dua tumbuhan tersebut.*

[5 marks/5 markah]

| 8 (a)       | <p>Able to identify the parts of the flower and explain how they help to ensure the survival of the species.</p> <p><b>Sample answer :</b></p> <table border="1" data-bbox="366 421 1247 637"> <thead> <tr> <th data-bbox="366 421 806 457">Parts</th><th data-bbox="806 421 1247 457">Function</th></tr> </thead> <tbody> <tr> <td data-bbox="366 457 806 637">P is anther</td><td data-bbox="806 457 1247 637"> <ul style="list-style-type: none"> <li>• To produce pollen grains for fertilization</li> <li>• As male reproductive organ</li> </ul> </td></tr> </tbody> </table>  | Parts      | Function  | P is anther | <ul style="list-style-type: none"> <li>• To produce pollen grains for fertilization</li> <li>• As male reproductive organ</li> </ul> |   | 6 |
|-------------|--|------------|---|-------------|--|---|---|
| Parts       | Function   |            |   |             |  |   |   |
| P is anther | <ul style="list-style-type: none"> <li>• To produce pollen grains for fertilization</li> <li>• As male reproductive organ</li> </ul>   |            |   |             |  |   |   |
|             | <table border="1" data-bbox="366 637 1247 1049"> <tbody> <tr> <td data-bbox="366 637 806 915">Q is ovary</td><td data-bbox="806 637 1247 915"> <ul style="list-style-type: none"> <li>• Contain ovule/embryo sac for fertilization</li> <li>• Become fruits after fertilization</li> <li>• As female reproductive organ</li> </ul> </td></tr> <tr> <td data-bbox="366 915 806 1049">R is petal</td><td data-bbox="806 915 1247 1049"> <ul style="list-style-type: none"> <li>• Colourful to attract pollination agent/insects for pollination</li> </ul> </td></tr> </tbody> </table>  | Q is ovary | <ul style="list-style-type: none"> <li>• Contain ovule/embryo sac for fertilization</li> <li>• Become fruits after fertilization</li> <li>• As female reproductive organ</li> </ul> | R is petal  | <ul style="list-style-type: none"> <li>• Colourful to attract pollination agent/insects for pollination</li> </ul>                   | 2 |   |
| Q is ovary  | <ul style="list-style-type: none"> <li>• Contain ovule/embryo sac for fertilization</li> <li>• Become fruits after fertilization</li> <li>• As female reproductive organ</li> </ul>  |            |   |             |  |   |   |
| R is petal  | <ul style="list-style-type: none"> <li>• Colourful to attract pollination agent/insects for pollination</li> </ul>   |            |   |             |  |   |   |
| (b)         | <p>Able to discuss germination of pollen in stigma.</p> <p><b>Sample answer :</b></p> <p>P1: when pollen/pollen grains landed on stigma, sucrose solution is secreted</p> <p>P2 : to stimulate germination of pollen</p> <p>P3 : Pollen tube grows from the pollen</p> <p>P4 : In the pollen tube, generative nucleus divides by mitosis to form two male gametes</p> <p>P5 : The pollen tube nucleus leads the male gametes towards the ovary</p> <p>P6 : when the pollen tube reach the ovary, the tube nucleus disintegrates and burst open the pollen tube</p> <p>P7 : to allow the male gametes to enter the ovary through the micropyle</p> <p style="text-align: right;">Any four</p> | 4          |   |             |  |   |   |

|         |   |                            |   |
|---------|---|----------------------------|---|
| (c) (i) | Able to explain process X in the growth curve.<br>Sample answer :<br><br>P1 : Process X is ecdysis<br>P2 : For growth, the insect sucks in air to break the old exoskeleton<br>P3 : to expand its body to increase the size<br>P4 : before the old exoskeleton hardens<br>P5 : occurs periodically/several times until adult<br>P6 : produce a step-like growth curve | 1<br>1<br>1<br>1<br>1<br>1 | 5 |
|         |   | Any five                   |   |

|                              | Similarities :<br>P1 : Both show sigmoid growth curve<br>P2 : Both have xylem and phloem to transport water and food for growth | 1<br>1 |
|------------------------------|---|--------|
|                              | Differences   |        |
| Diagram 8.4 (a)              | Diagram 8.4 (b)   |        |
| Annual plant                 | Perennial plant   | 1      |
| Undergo primary growth       | Undergo primary and secondary growth  | 1      |
| Do not have woody tissue     | Have woody tissue   | 1      |
| Do not have lateral meristem | Have lateral meristem   | 1      |
| Do not have annual rings     | Have annual rings   | 1      |
| Do not have thick bark       | Have thick bark   | 1      |
| Usually short                | Usually tall  | 1      |
| Have short life span         | Have long life span   | 1      |

Any five

6. Diagram 6.1 shows the formation of pollen grain in anther of a plant.  
*Rajah 6.1 menunjukkan pembentukan butir debunga dalam anter pada tumbuhan*

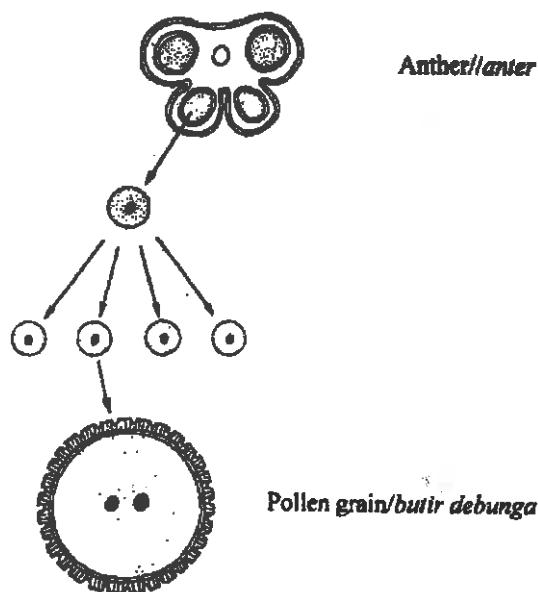


Diagram 6.1  
*Rajah 6.1*

- (a) Based on Diagram 6.1, explain the formation of pollen grain.  
*Berdasarkan Rajah 6.1, terangkan pembentukan butir debunga.*
- [4 marks]
- (b) Fertilisation in plant occurs when nucleus in pollen grain fused with the nucleus in embryo sac in ovule. Based on your Biology knowledge, explain the development of ovule in ovary to form mature embryo sac.  
*Persenyawaan dalam tumbuhan berlaku bila nukleus dalam butir debunga bercantum dengan nukleus dalam pundi embrio di dalam ovul. Berdasarkan pengetahuan biologi anda, terangkan perkembangan ovul dalam ovarium untuk membentuk pundi embrio yang matang.*
- [6 marks]
- (c) Diagram 6.2 shows the process of fertilisation in flowering plants  
*Rajah 6.2 menunjukkan proses persenyawaan dalam tumbuhan berbunga.*

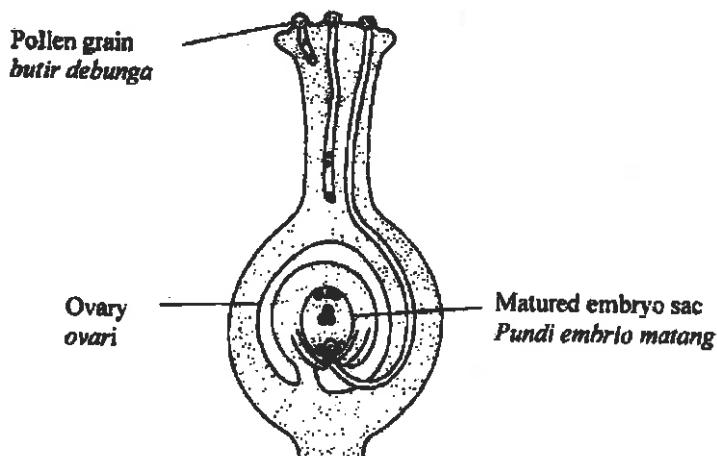


Diagram 6.2 // Rajah 6.2

Based on Diagram 6.2, describe how this process occurs  
*Berdasarkan Rajah 6.2, terangkan bagaimana proses itu berlaku.*

| NUM. | SCORING CRITERIA  | MARKS |   |
|------|---|-------|---|
| 6(a) | <b>Able to explain the formation of pollen grain</b><br><br><i>Suggested answer:</i><br>F - Pollen grains are formed in the anther, an anther has four pollen sacs.<br>E1 - Each pollen sac contains hundreds of cells called pollen mother cells ( $2n$ )<br>E2 - Each pollen mother cell undergoes meiosis to produce four haploid pollen cells/microspores ( $n$ ).<br>E4 - The nucleus of each microspores then divided by mitosis to form a tube nucleus and generative nucleus  | 1     | 4 |
| 6(b) | <b>Able to explain the development of ovule.</b><br><br><i>Suggested answer:</i><br>F- The ovule develops from the ovarian tissue.<br>E1- inside the ovule is a central mass of parenchyma tissue/nucellus<br>E2- only one diploid cell megasporangium /embryo sac mother cell ( $2n$ ) enlarges<br>E3 - Embryo sac mother cell undergoes meiosis to form a row of four haploid cells/megaspores<br>E4 - Three of the four megaspores degenerated, leaving one in the ovule<br>E5 - The left megasporangium enlarges and nucleus undergoes mitosis three times to form eight haploid nuclei   | 1     |   |
|      | E6 - Three of the eight nuclei (migrate to one end of the cell) to form antipodal cells, another two nuclei to form polar nuclei and one of the three nuclei develops into an egg cell/female gamete/ovum and two synergids cell  | 1     | 6 |
| 6(c) | <b>Able to describe the fertilisation in flowering plant.</b><br><br><i>Suggested answer:</i><br>P1 - Pollen grains have been released from the anther to the stigma for pollination by insects or wind<br>P2 – When pollen grain lands on stigma, epidermal cells secrete sucrose solution<br>P3-(sucrose solution) stimulates the pollen grain to germinate and form a pollen tube<br>P4 - The pollen tube grows down the style towards the ovule<br>P5 – it secretes enzymes to digest surrounding tissues as it grows downwards<br>P6-The generative nucleus(follows behind it) divides by mitosis to form two male gamete nuclei<br>P7 - The male gamete nuclei move down the pollen tube lead by the tube nucleus<br>P8 - When the pollen tube reaches the ovary, it penetrates the ovule through the micropyle<br>P9 - The tube nucleus degenerates, leaving a clear passage for the male nuclei to enter the embryo sac<br>P10- one male gamete fuses with the egg cell to form diploid zygote<br>P11- the other male gamete fuses with two polar nuclei to form triploid nucleus which divide by mitosis to form endosperm tissue.<br>P12- this fertilisation is called double fertilisation | 10    |   |
|      | <i>Any 10 points</i>  |       |   |

- 6 (a) Diagram 6.1 shows the growth process of a plant.

*Rajah 6.1 menunjukkan proses pertumbuhan pada tumbuhan*

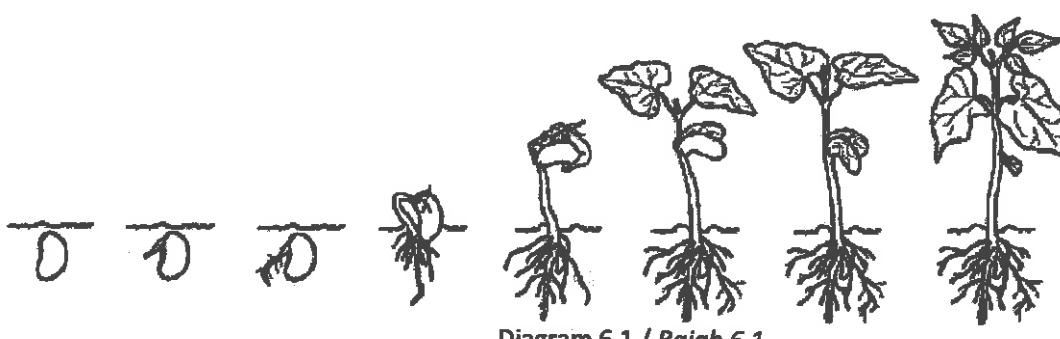


Diagram 6.1 / Rajah 6.1

Base on the diagram 6.1, describe the process briefly.

*Berdasarkan Rajah 6.1, terangkan proses ini secara ringkas.*

[4 marks/ markah]

- (b) Diagram 6.2 shows the stages of secondary growth in a dicotyledonous stem.

*Rajah 6.2 menunjukkan peringkat pertumbuhan sekunder di dalam batang dikotiledon.*

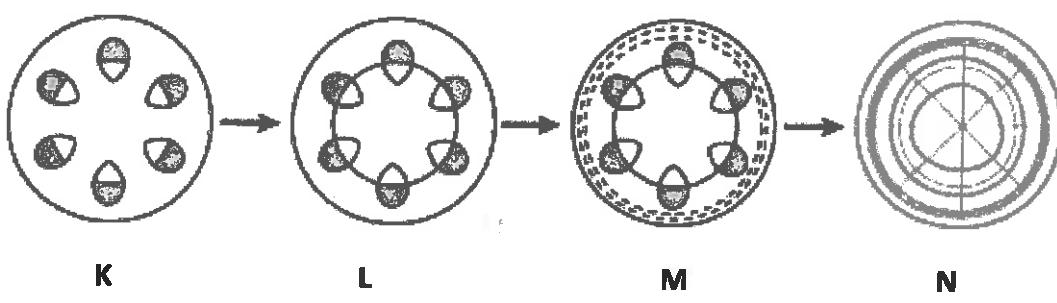


Diagram 6.2 / Rajah 6.2

- (i) Describe the stages and the processes of secondary growth in a dicotyledonous stem.

*Huraikan peringkat dan proses pertumbuhan sekunder dalam batang dikotiledon*

[8 marks/markah]

- (ii) What are the advantages for plants to undergo secondary growth?

Discuss the importance of secondary growth.

*Apakah kebaikan untuk tumbuhan mengalami pertumbuhan sekunder? Bincangkan kepentingan pertumbuhan sekunder.*

[8 marks/markah]

| QUESTION NO |            | MARKING CRITERIA  | SUB MARK S  | TOTAL MARK S |
|-------------|------------|---|---|--------------|
| 6           | (a)        | Able to describe the growth process   |   |              |
|             |            | P1- Primary growth<br>P2- irreversible process<br>P3- increase in the number of cells/size/mass/height/leaves<br>P4- process of differentiation /specialization of the organs<br>P5- due to cell division/mitosis<br>P6- cell elongation/enlargement  | 1<br>1<br>1<br>1<br>1<br>1                          | Any 4        |
|             | (b)<br>(i) | Able to describe process in the secondary growth of a dicot plant.  |   |              |
|             |            | P1- growth involves the lateral meristem tissues<br>P2- begins when vascular cambium divides<br>P3- to produce two layers of cells (the inner layer and the outer layer)<br>P4- the inner layer will form the secondary xylem<br>P5- the outer layer will form secondary phloem<br>P6- This result – the primary xylem will be pushed towards the pith and the secondary xylem will be pushed towards the epidermis<br>P7- The walls of secondary xylem will be thickened with lignin<br>P8- this give tissues mechanical strength to support the plant<br>P9- (Secondary xylem grow outwards), the tissues outside become increasingly compressed<br>P10- The circumference increased caused the epidermis to be stretched sideways<br>P11- The ruptured epidermis will be replaced by cork as a result of the activity of cork cambium. | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | Any 8        |
|             | (ii)       | Able to give the importance of secondary growth   |   |              |
|             |            | P1- Increase the diameter of plant stems and roots<br>P2- gives mechanical support<br>P3- increase the amount of vascular tissue, xylem and phloem<br>P4- accommodate the increase demand of water and minerals salt and organic nutrients<br>P5- more sugars and other organic products can be transported from the leaves to the other part of the trees.<br>P6- Produces new xylem and phloem to replace old and damage tissues<br>P7- Produce a thick trunk/tough bark<br>P8- reduces the evaporation of water from the surface of the stem<br>P9- and protects the stem and plant<br>P10- can continue living and growing for many years<br>P11- as a result they can produce flower and seed season after season thus increasing the chances of propagation and continuation of the species.  | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | Any 8        |
|             |            | total   |   | 20           |

- 8 Diagram 8 shows the structure of flower.

*Rajah 8 menunjukkan struktur sekuntum bunga.*

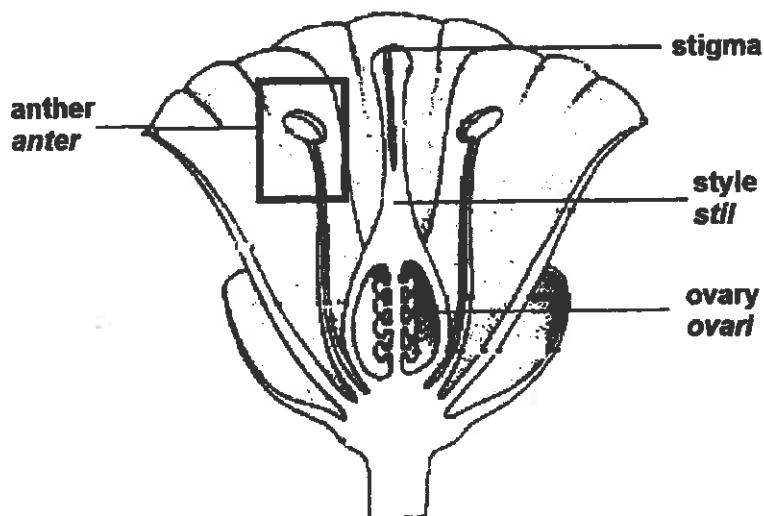


Diagram 8

*Rajah 8*

- (a) Based on Diagram 8, describe the process that occurs in the anther.  
*Berdasarkan Rajah 8,uraikan proses yang berlaku di dalam anter.*

[6 marks]

[6 markah]

- (b) (i) The product from the process in (a) is transferred onto the stigma through pollination.  
Explain the process that will occur in the style and ovary after pollination. [10 marks]  
*Hasil dari proses di (a) dipindahkan ke stigma melalui pendebungaan.  
Terangkan proses yang akan berlaku di dalam stil dan ovarii selepas  
pendebungaan.*

[10 markah]

- (ii) Explain the significance of the process that occurs in ovaries of flowering plants.  
[4 marks]

*Terangkan signifikansi proses yang berlaku di dalam ovari pada tumbuhan  
berbunga.*

[4 markah]

|          |   |   |    |
|----------|---|---|----|
| 8 a      | P1 Pollen mother cells in the pollen sac are diploid cells<br>P2 These cells undergoes meiosis<br>P3 to produce four haploid microspores/ tetrad<br>P4 Nucleus of each microspore divides by mitosis<br>P5 Forming haploid tube nucleus and generative nucleus<br>P6 These microspores develop into pollen grains   | 1<br>1<br>1<br>1<br>1<br>1                          | 5  |
|          |   | Max 5   |    |
| 8 b (i)  | P1 On the stigma, sugar stimulates pollen grains to germinate<br>P2 Form pollen tube<br>P3 Pollen tubes grows into the style and towards the ovule, led by tube nucleus<br>P4 Generative nucleus undergoes mitosis and form two male gamete nuclei<br>P5 Pollen tube penetrates the ovule through micropyle<br>P6 Tube nucleus disintegrates<br>P7 One male nuclei fuses with the egg cells to form diploid zygote<br>P8 Another male nucleus fuses with the two polar nuclei to form triploid zygote<br>P9 This process is known as double fertilization<br>P10 Triploid nucleus divide to form endosperm (ie nutritive tissues)<br>P11 Diploid zygote divides and grows into embryo | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | 10 |
|          |   | Max 10  |    |
| 8 b (ii) | P1 After double fertilisation, the outer layer of ovule dries up and develops a hard seed coat<br>P2 To protect both embryo and endosperm<br>P3 Ovule will develop into seed<br>P4 Ovary enlarges and form fruit<br>P5 Ovary wall develops into fruit wall that cover & protect the fruit<br>P6 This will ensure the flowering plant to survive<br>P8 The endosperm of the seed provides nutrition and energy to the embryo for its growth  | 1<br>1<br>1<br>1<br>1<br>1<br>1                     | 5  |
|          |   | Max 5   |    |

- 9 Diagram 9.1 shows two pairs of homologous chromosomes of a parent. A father has genotype  $I^A I^O$  and his wife has genotype  $I^B I^O$ .

Rajah 9.1 menunjukkan dua pasang kromosom homolog induk. Suami mempunyai genotip  $I^A I^O$  dan isterinya genotip  $I^B I^O$ .

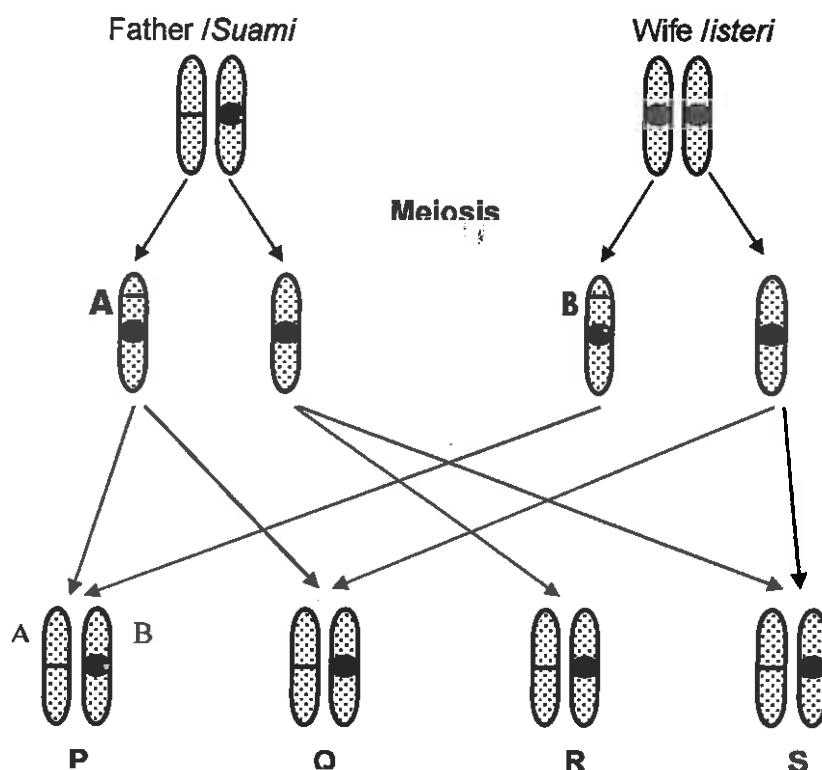


Diagram 9.1 / Rajah 9.1

- a (i) Predict the genotype and phenotype of the offspring Q, R and S.

Ramalkan genotip dan fenotip bagi anak Q, R and S.

[ 3 markah ]

- (ii) Based on Diagram 9.1, explain the result using Mendel's First Law.

Berdasarkan Rajah 9.1, terangkan keputusan berdasarkan Hukum Mendel Pertama.

[ 3 markah ]

- b) In your opinion, explain the causes of variation in the inheritance of different phenotypes in human.

*Pada pendapat anda, terangkan punca-punca variasi yang membawa kepada perbezaan fenotip manusia.*

[ 8 markah ]

- c) Diagram 9.2 shows the karyotype of an individuals who has experienced chromosomal mutation.

*Rajah 9.2 menunjukkan kariotip seorang individu yang telah mengalami mutasi kromosom.*

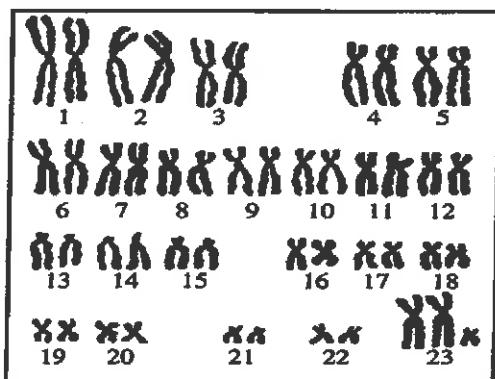


Diagram 9.2 / Rajah 9.2

Explain the cause of mutation in Diagram 9.2

*Terangkan sebab berlakunya mutasi dalam Rajah 9.1*

[ 6 markah ]

| 9(a)(i)  | <p><i>Dapat meramalkan genotip dan fenotip bagi anak.</i></p> <table border="1"> <thead> <tr> <th></th><th>Genotip</th><th>Fenotip</th></tr> </thead> <tbody> <tr> <td>Q</td><td>I<sup>A</sup>I<sup>O</sup></td><td>Kumpulan darah A</td></tr> <tr> <td>R</td><td>I<sup>B</sup>I<sup>O</sup></td><td>Kumpulan darah B</td></tr> <tr> <td>S</td><td>I<sup>O</sup>I<sup>O</sup></td><td>Kumpulan darah O</td></tr> </tbody> </table> |                  | Genotip | Fenotip | Q | I <sup>A</sup> I <sup>O</sup> | Kumpulan darah A | R | I <sup>B</sup> I <sup>O</sup> | Kumpulan darah B | S | I <sup>O</sup> I <sup>O</sup> | Kumpulan darah O | 1<br>1<br>1<br>3 |
|----------|--|------------------|---------|---------|---|-------------------------------|------------------|---|-------------------------------|------------------|---|-------------------------------|------------------|------------------|
|          | Genotip  | Fenotip          |         |         |   |                               |                  |   |                               |                  |   |                               |                  |                  |
| Q        | I <sup>A</sup> I <sup>O</sup>  | Kumpulan darah A |         |         |   |                               |                  |   |                               |                  |   |                               |                  |                  |
| R        | I <sup>B</sup> I <sup>O</sup>  | Kumpulan darah B |         |         |   |                               |                  |   |                               |                  |   |                               |                  |                  |
| S        | I <sup>O</sup> I <sup>O</sup>  | Kumpulan darah O |         |         |   |                               |                  |   |                               |                  |   |                               |                  |                  |
| 9(a)(ii) | <p><i>Dapat menerangkan keputusan berdasarkan Hukum Mendel Pertama</i></p> <ul style="list-style-type: none"> <li>- P1 Hukum Mendel Pertama menyatakan bahawa sesuatu ciri pada organisma ditentukan oleh sepasang alel</li> <li>- P2 Semasa pembentukan gamet, pasangan alel bersegregasi/berpisah semasa meiosis 1</li> <li>- P3 Hanya salah satu alel sahaja daripada pasangan alel ini akan hadir dalam satu gamet</li> </ul>  | 1<br>1<br>1<br>3 |         |         |   |                               |                  |   |                               |                  |   |                               |                  |                  |

|      |   |       |
|------|---|-------|
| 9(b) | <p><i>Dapat menerangkan punca-punca variasi yang membawa kepada perbezaan fenotip manusia</i></p> <ul style="list-style-type: none"> <li>• Pindah silang semasa profasa 1 meiosis</li> <li>- P1 Kromatid daripada kromosom homolog tak seiras akan bersilang</li> <li>- P2 menyebabkan pertukaran bahan genetik</li> <li>- P3 lalu menghasilkan kombinasi genetik yang baru           <ul style="list-style-type: none"> <li>• Penyusunan kromosom homolog secara bebas</li> </ul> </li> <li>- P4 Semasa metaphase 1, kromosom homolog tersusun secara rawak di atas satah khatulistiwa</li> <li>- P5 Semasa anafase 1, setiap pasangan homolog berpisah</li> <li>- P6 Lalu menghasilkan gamet dengan kombinasi genetik yang berlainan           <ul style="list-style-type: none"> <li>• Persenyawaan secara rawak</li> </ul> </li> <li>- P7 Sperma/gamet jantan dan ovum/gamet betina dengan pelbagai kombinasi genetik bersenyawa secara rawak</li> <li>- P8 Zigot yang terhasil mempunyai kombinasi diploid yang pelbagai/variasi wujud antara individu yang sama spesies           <ul style="list-style-type: none"> <li>• Mutasi</li> </ul> </li> <li>- P9 Mutasi menyebabkan perubahan berkekalan pada kandungan genetik/genotip sesuatu organisme</li> </ul> |       |
| 9(c) | <p><i>Dapat menerangkan sebab berlakunya mutasi dalam rajah 9</i></p> <ul style="list-style-type: none"> <li>- P1 Individu mengalami Sindrom Klinefelter</li> <li>- P2 akibat berlebihan satu kromosom X</li> <li>- P3 Pendedahan kepada bahan mutagen / bersifat karsinogenik</li> <li>- P4 menyebabkan kromosom seks / pasangan kromosom ke 23 gagal berpisah</li> <li>- P5 Semasa anafase 1/ meiosis 1</li> </ul>  | Max 8 |

|               |   |       |
|---------------|---|-------|
|               | <ul style="list-style-type: none"><li>- P6 Lalu menghasilkan sperma/ovum yang mempunyai nombor kromosom yang abnormal / <math>n+1</math> / <math>n-1</math></li><li>- P7 Persenyawaan antara ovum normal dan sperma <math>n-1</math> menghasilkan zigot dengan 47 kromosom//kromosom seks XXY</li></ul> | 1     |
|               |   | 1     |
| Jumlah markah |   | Max 6 |
| Jumlah markah |   | 20    |

End....

7. Diagram 7.1 shows the blood group of a married couple and their offspring. The couple has three boys and one girl but all of them have different types of blood group.  
*Rajah 7.1 menunjukkan jenis kumpulan darah bagi satu keluarga. Pasangan tersebut mempunyai tiga anak lelaki dan seorang anak perempuan dengan kumpulan darah yang berbeza.*

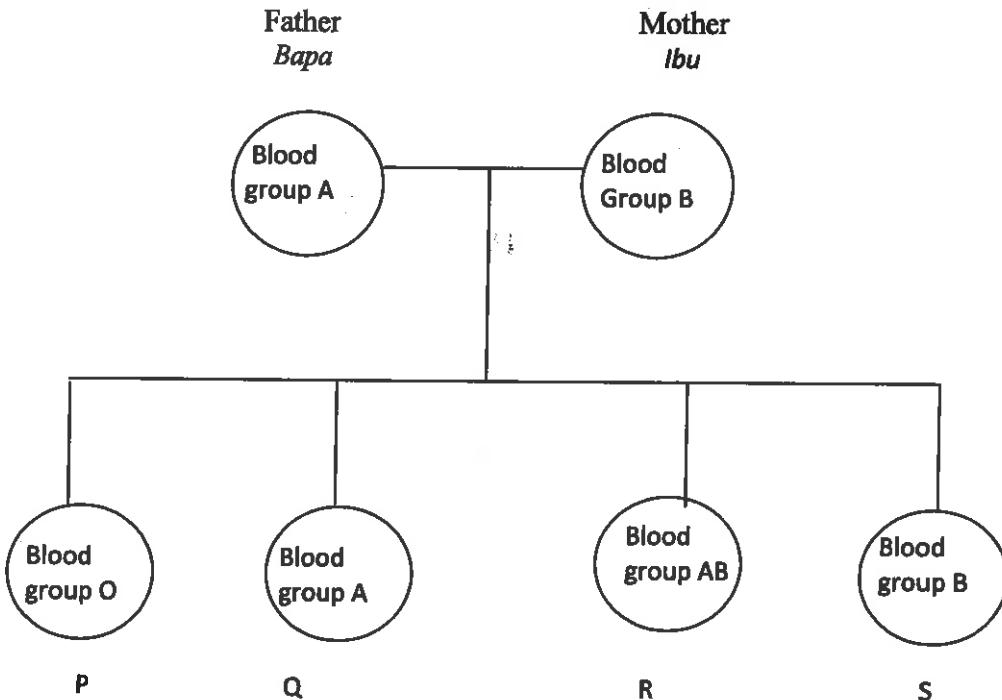


Diagram 7.1

*Rajah 7.1*

- (a) State the alleles that determine the ABO blood group.  
*Nyatakan alel-alel yang menentukan kumpulan darah ABO.*

[ 2 marks / markah]

- (b) Based on Mendel's First Law , with the help of Punnet square schematic diagram , explain why the blood of each member in the family is different

*Berdasarkan Hukum Mendel yang pertama dan dengan bantuan rajah segiempat Punnet, terangkan kenapa setiap ahli dalam keluarga tersebut mempunyai jenis darah yang berbeza.*

[ 4 marks / markah]

- (c) Male offspring P lost plenty of blood during an accident. He needs to replace the blood lost. Explain why her parents are not suitable donors to offspring P.

*Anak lelaki P kehilangan banyak darah dalam satu kemalangan. Beliau perlu menggantikan darah yang hilang.*

*Terangkan mengapa ibubapanya bukan penderma yang sesuai kepada anak P.*

[ 4 marks / markah]

- (d) Colour blindness is a defect in which the person cannot distinguish red and green colours. It is a sex-linked disease which can be inherited.

A normal man has a wife who is a carrier of colour blindness.

With the help of a schematic diagram, explain the possibility genetic combination (phenotype) of their children to inherit colour blindness

*Buta warna ialah satu kecacatan di mana seseorang itu tidak dapat membezakan warna merah dan hijau. Ia merupakan penyakit gen terangkai seks yang boleh diwarisi.*

*Seorang lelaki normal mempunyai seorang isteri pembawa buta warna.*

*Dengan bantuan rajah skematik, terangkan kemungkinan kombinasi genetic (fenotip) untuk anak mereka mewarisi buta warna*

[ 10 marks / markah]

| QUESTION NO | MARKING CRITERIA   | SUB MARKS   | TOTAL MARKS |
|-------------|--|---|-------------|
| 7           | <p><b>Able to state alleles that determine the ABO blood group</b><br/><u>Sample answer</u></p> <p>1. The ABO blood is controlled by two alleles <math>I^A, I^B</math><br/>2. Allele <math>I^A</math> and <math>I^B</math> are codominant to allele <math>I^O</math> which is recessive.<br/>3. can be expressed equally in the phenotype of the heterozygous offspring.</p>   | 1<br>1<br>1<br>Any 2  |             |
|             | <p><b>Able to state the genotype of the parents</b><br/><b>Able to show the formation of gamete during meiosis using a schematic diagram.</b><br/><b>Able to explain why the blood group type is different for each member in the family</b><br/><u>Sample answer</u></p> <p>Parents              Father              X              Mother<br/>Phenotype            Blood Group A                   Blood group B<br/>Genotype            <math>I^A I^O</math>                              <math>I^B I^O</math></p> <p>Gametes    Meiosis</p> <p>Gamete              <math>I^A</math>              <math>I^O</math>              <math>I^B</math>              <math>I^O</math></p> <p>Random fertilization</p> <p>Offspring</p> <p>Genotype      <math>I^A I^B</math>      <math>I^A I^O</math>      <math>I^O I^B</math>      <math>I^O I^O</math></p> <p>Phenotype: blood AB : blood B : blood A : blood O</p> <p>Phenotype ratio : 1 : 1 : 1 : 1</p> <p>Every child in this family has 25% chances of getting different blood group.</p> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>Max 4 |             |
| (c)         | Father has blood group A; he has antigen A and antibody B in his blood.<br>Mother has blood group B, she has antigen B and antibody A in her blood<br>P has blood group O, he has no antigen A or B but has both antibody A and B in his blood<br>If father is the donor, agglutination will occur as P's antibody A will react with father's antigen A<br>If mother is the donor, agglutination will also occur as P's antibody B will react with mother's antigen B.   | 1<br>1<br>1<br>1<br>1<br>max: 4   |             |
|             |  | total   | 10          |
| (d)         | The allele for colour blindness is recessive.<br>Found on the X chromosome.<br>Mother is a carrier carrying one recessive allele for colour blindness and  | 1<br>1<br>1   |             |

|  |   |   |
|--|---|---|
|  | one dominant allele for normal vision // P's mother : $XX^b$  |   |
|  | Father is normal carrying one dominant allele for normal vision in his X chromosome and none in his Y chromosome // P's father : XY | 1 |
|  | Let $X^b$ represents the X chromosome carrying the colour blind allele.   |   |
|  | Let X represents the X chromosome carrying the normal allele.   |   |
|  | XY : normal male  |   |
|  | $X^bY$ : colour blind male  |   |
|  | $XX$ : normal female  |   |
|  | $XX^b$ : carrier (normal) female  |   |
|  | $X^bX^b$ : colour blind female.   |   |

Sample answer

|                      |   |                |             |                |  |        |
|----------------------|---|----------------|-------------|----------------|--|--------|
| Parents              |   | Father         | X           | Mother         |  |        |
| Phenotype            |   | Normal male    | X           | Carrier female |  | 1      |
| Genotype             |   | XY             |             | $XX^b$         |  | 1      |
| Gamete               |   | X              |             | $X^b$          |  | 1      |
|                      |   | Y              |             |                |  | 1      |
|                      |   |                | Meiosis     |                |  | 1      |
| Random fertilization |   |                |             |                |  | 1      |
| Offspring            |   |                |             |                |  | 1      |
| Genotype             | XX  | $XX^b$         | XY          | $X^bY$         |  | 1      |
| Offspring            |   |                |             |                |  | 1      |
| Phenotype:           | Normal female   | Carrier female | Normal male | Colour blind   |  | 1      |
|                      |   |                |             |                |  | 1      |
|                      | 50% of the males are colour blind while 100% of the females are normal. |                |             |                |  | Any 10 |
|                      |   |                |             |                |  | 10     |

- 9 (a) Diagram 9.1 shows four varieties of oil palm in the collection of an Agricultural Centre. A farmer plans to plant oil palm with thick flesh and thick husk. He decided to use cross breeding method.

*Rajah 9.1 menunjukkan empat jenis baka kelapa sawit yang disimpan dalam satu Pusat Pertanian. Seorang pengusaha ladang ingin menanam kelapa sawit yang bersabut tebal dan berisi tebal. Dia membuat keputusan untuk menggunakan kaedah Pengacukan Bersilang.*

| Oil Palm Variety<br>Jenis Kepala<br>Sawit | Genotype<br>Genotip | Phenotype<br>Fenotip  |  |
|---|---------------------|---|--|
| OP1                                       | hhFF                |    | Thin husk / Sabut tebal<br>Thick flesh / Isi tebal |
| OP2                                       | hhFf                |   | Thin husk / Sabut nipis<br>Thick flesh / Isi tebal |
| OP3                                       | HHff                |  | Thick husk/Sabut tebal<br>Thin flesh / Isi nipis   |
| OP4                                       | HhFf                |  | Thick husk/Sabut tebal<br>Thick flesh/ Isi tebal   |

**Key :** H : Represents dominant allele for thick husk

F : Represents dominant allele for thick flesh.

**Petunjuk :** H : mewakili alel dominan bagi sabut tebal

F : mewakili alel dominan bagi isi tebal

Diagram 9.1

Rajah 9.1

- (i) Explain by using a Punnet square, which two varieties should the farmer choose from the Agricultural Centre for the cross breeding to ensure that all the offspring produced are thick husk and thick flesh.

[6 marks]

*Terangkan dengan menggunakan segiempat Punnet, yang manakah dua jenis kelapa sawit yang pengusaha ladang itu harus pilih dari Pusat Pertanian untuk dikacukkan bagi memastikan semua anak pokok yang dihasilkan adalah bersabut tebal dan berisi tebal.*

[6 markah]

- (ii) A farmer came to the Agricultural Centre to ask for consultancy, he plans to plant oil palms with thick husk and thin flesh.

Explain a method that the farmer can use to produce a big number of the oil palm in a short period of time.

[8 marks]

*Seorang pengusaha ladang datang ke Pusat Pertanian itu untuk mendapatkan khidmat pakar rujuk, dia bercadang untuk menanam kelapa sawit yang bersabut tebal dan berisi nipis.*

*Terangkan satu kaedah yang pengusaha ladang itu boleh gunakan untuk menghasilkan sejumlah besar kelapa sawit jenis itu dalam masa yang pendek.*

[8 markah]

- (b) Diagram 9.2 shows an albino boy in an African village.

*Rajah 9.2 menunjukkan seorang budak albino di sebuah perkampungan di Afrika.*



Diagram 9.2

Rajah 9.2

Explain why a pair of normal parents could produce an albino offspring.

[6 marks]

*Terangkan kenapa sepasang suami isteri normal boleh melahirkan anak albino.*

[6 markah]

| QUESTION NO       | MARKING CRITERIA |  |      |      |  | SUB MARKS | TOTAL MARKS       |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|-------------------|------------------|--|------|------|--|-----------|-------------------|----|----|----|----|------------------|----|------|------|------|--|----|------|------|------|--|----|------|------|------|--|----|------|------|------|
| 9<br>(a)(i)       | P1               | : Choose OP1 and OP3   |      |      |  |           |                   |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   |                  | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Gametes from OP 1</td> <td>hF</td> <td>hF</td> <td>hF</td> <td>hF</td> </tr> <tr> <td>Gametes From OP3</td> <td>Hf</td> <td>HhFf</td> <td>HhFf</td> <td>HhFf</td> </tr> <tr> <td></td> <td>Hf</td> <td>HhFf</td> <td>HhFf</td> <td>HhFf</td> </tr> <tr> <td></td> <td>Hf</td> <td>HhFf</td> <td>HhFf</td> <td>HhFf</td> </tr> <tr> <td></td> <td>Hf</td> <td>HhFf</td> <td>HhFf</td> <td>HhFf</td> </tr> </table> |      |      |  |           | Gametes from OP 1 | hF | hF | hF | hF | Gametes From OP3 | Hf | HhFf | HhFf | HhFf |  | Hf | HhFf | HhFf | HhFf |  | Hf | HhFf | HhFf | HhFf |  | Hf | HhFf | HhFf | HhFf |
| Gametes from OP 1 | hF               | hF   | hF   | hF   |  |           |                   |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
| Gametes From OP3  | Hf               | HhFf   | HhFf | HhFf |  |           |                   |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | Hf               | HhFf   | HhFf | HhFf |  |           |                   |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | Hf               | HhFf   | HhFf | HhFf |  |           |                   |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | Hf               | HhFf   | HhFf | HhFf |  |           |                   |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P2               | : label the column in the table correctly.   |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P3               | : state or show OP1 produce gamete with genotype hF  |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P4               | : state or show OP3 produce gamete with genotype Hf  |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P5               | : state or show the genotype of all of the offspring is HhFf.  |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P6               | : phenotype of HhFf is thick husk and thick flesh  |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P7               | : all / 100% of the offspring are thick husk and thick flesh.<br>[Any 6]   |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   |                  |  |      |      |  |           | 6 m               |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   |                  |  |      |      |  |           |                   |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
| (a)(ii)           | P1               | : choose OP3   |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P2               | : Use tissue culture technique   |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P3               | : Cut a small piece of leaf or shoot of OP3  |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P4               | : Wash and treat with 10% decolouring/bleaching agent  |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P5               | : Cut the piece of leaf / shoot in small fragment  |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P6               | : Transfer into sterile medium with suitable nutrients and pH.   |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P7               | : Keep in optimum temperature.   |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P8               | : Plant cells divide through mitosis.  |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |
|                   | P9               | : Produce many new cells and form callus   |      |      |  |           | 1                 |    |    |    |    |                  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |  |    |      |      |      |

|      |  |   |  |             |
|------|--|---|--|-------------|
|      | P10<br>P11<br>P12                      | : Callus grow roots and form a new plant.<br>: New plants / offspring have same genetic materials as plant<br>: all the new plants are thick husk and thin flesh.   | 1<br>1   |             |
|      |  |   | [ Any 8]   | <b>8 m</b>  |
| 9(b) | P1<br>P2<br>P3<br>P4<br>P5<br>P6<br>P7 | OP3.<br>: Albinism is caused by recessive allele / gene (a).<br>: Albinism is homozygote (aa).<br>: Both the parents are carrier (Aa).<br>: Genotype of both the parents are heterozygote (Aa).<br>: Both the parents produce gametes that carry the Allele for Albinism (a).<br>: Through meiosis.<br>: The gametes fuse through fertilization and form the zygote which is homozygote (aa). | 1<br>1<br>1<br>1<br>1<br>1<br>1                                  |             |
|      |  |   | [ Any 6]<br>Accept schematics diagram , reward P4, P5, P6 and P7 | <b>6 m</b>  |
|      |  |   | <b>Total marks</b>   | <b>20 m</b> |

8

Diagram 8.1 shows different physical features of leaves and chickens.

Rajah 8.1 menunjukkan sifat fizikal yang berbeza untuk daun dan ayam.



Diagram 8.1

Rajah 8.1

- (a) As the saying goes ‘variety is the spice of life’, and we are indeed blessed with a world full of diverse plants, animals, human beings and microorganisms, each unique in its own way. The difference between organisms of the same species are known as variation. Explain what will happen if variation is not exist.

*Kepelbagaiannya merupakan rencah kehidupan dan kita sepatutnya bersyukur dengan dunia yang dipenuhi dengan pelbagai tumbuhan, haiwan, manusia dan mikroorganisma yang setiap satunya mempunyai keunikan tersendiri. Perbezaan di antara organisma dalam spesies yang sama dikenali sebagai variasi. Terangkan apakah yang akan berlaku jika variasi tidak wujud.*

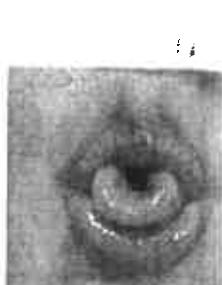
[5 marks]  
[5 markah]

- (b) Diagram 8.2 (i) and (ii) show types of variation.

Rajah 8.2 (i) dan (ii) menunjukkan jenis variasi.



(i)



(ii)

Diagram 8.2  
Rajah 8.2

Based on Diagram 8.2, explain the differences between the variation.

Berdasarkan Rajah 8.2, terangkan perbezaan di antara variasi tersebut.

[6 marks]  
[6 markah]

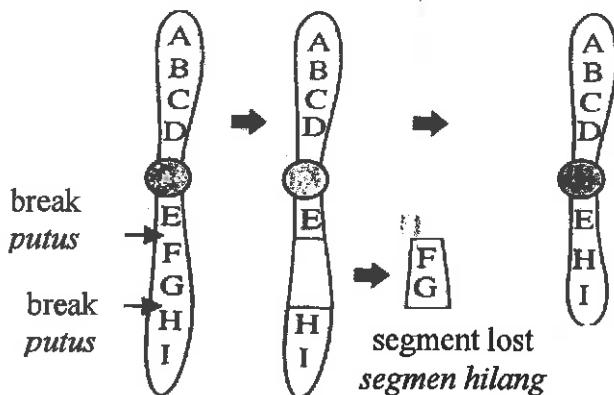


Diagram 8.3

Rajah 8.3

- (c) Diagram 8.3 shows chromosomal mutation which change in chromosome structure.

*Rajah 8.3 menunjukkan mutasi kromosom di mana perubahan dalam struktur kromosom.*

- (i) Explain the process occurred and state factors that causes it.

*Terangkan proses yang berlaku dan nyatakan faktor-faktor penyebabnya.*

[5 marks]  
[5 markah]

(ii)

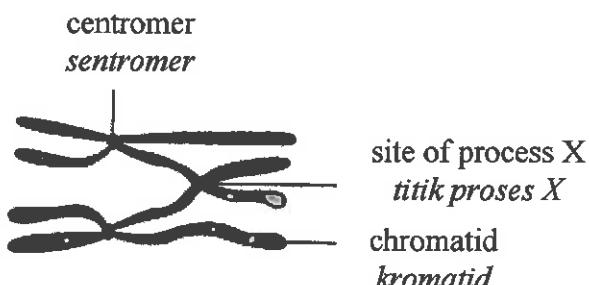


Diagram 8.4

Rajah 8.4

Explain the effects of the process shown in Diagram 8.4 on variation.

*Terangkan kesan-kesan proses seperti dalam Rajah 8.4 ke atas variasi.*

[4 marks]  
[4 markah]

| No  | Skema   | Markah      |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
|---|---|-------------|-------------|---------------------------|---------------------|---|---|------------------------------------|------------------------------|---|---|------------------------------------|--|---|---|---|
| 8a  | <p><b>Dapat menerangkan keadaan jika variasi tidak wujud</b><br/> <b>Contoh jawapan</b><br/>           P1 – suatu organism tidak dapat beradaptasi dengan baik (kepada persekitaran)<br/>           P2 – organism tidak dapat menyamar (dalam persekitaran) // sebarang penerangan yang sesuai berkaitan dengan ketiadaan penyamaran<br/>           P3 – mudah dilihat/dikenalpasti oleh pemangsa // sebarang penerangan berkaitan dengan ketiadaan pemangsaan<br/>           P4 – kadar pembiakan semakin berkurangan<br/>           P5 – kurang bermandiri // menyebabkan kepupusan</p>   | 5           |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
| b   | <p><b>Dapat menerangkan perbezaan di antara variasi selanjar dan variasi tidak selanjar</b><br/> <b>Contoh jawapan</b></p> <table border="1"> <thead> <tr> <th>Rajah 8.2 i</th> <th>Rajah 8.2ii</th> </tr> </thead> <tbody> <tr> <td>P1 Variasi tidak selanjar</td> <td>P1 Variasi selanjar</td> </tr> <tr> <td>P2 Menunjukkan ekstrem/perbezaan ketara //tiada perantaraan</td> <td>P2 Menunjukkan perubahan yang beransur/kecil//ada perantaraan</td> </tr> <tr> <td>P3 Tidak boleh diukur / kualitatif</td> <td>P3 Boleh diukur//kuantitatif</td> </tr> <tr> <td>P4 Lengkungan diskrit / graf diskrit //carta palang // bukan taburan normal</td> <td>P4 Lengkungan bentuk loceng / lengkungan normal // taburan normal</td> </tr> <tr> <td>P5 Dipengaruhi oleh faktor genetik</td> <td>P5 Dipengaruhi oleh faktor persekitaran (dan faktor genetik)</td> </tr> <tr> <td>P6 Dikawal oleh gen tunggal // Dikawal oleh sepasang alel</td> <td>P6 Dikawal oleh beberapa gen // Dikawal oleh beberapa pasang alel</td> </tr> </tbody> </table> | Rajah 8.2 i | Rajah 8.2ii | P1 Variasi tidak selanjar | P1 Variasi selanjar | P2 Menunjukkan ekstrem/perbezaan ketara //tiada perantaraan | P2 Menunjukkan perubahan yang beransur/kecil//ada perantaraan | P3 Tidak boleh diukur / kualitatif | P3 Boleh diukur//kuantitatif | P4 Lengkungan diskrit / graf diskrit //carta palang // bukan taburan normal | P4 Lengkungan bentuk loceng / lengkungan normal // taburan normal | P5 Dipengaruhi oleh faktor genetik | P5 Dipengaruhi oleh faktor persekitaran (dan faktor genetik) | P6 Dikawal oleh gen tunggal // Dikawal oleh sepasang alel | P6 Dikawal oleh beberapa gen // Dikawal oleh beberapa pasang alel | 6 |
| Rajah 8.2 i   | Rajah 8.2ii   |             |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
| P1 Variasi tidak selanjar   | P1 Variasi selanjar   |             |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
| P2 Menunjukkan ekstrem/perbezaan ketara //tiada perantaraan                 | P2 Menunjukkan perubahan yang beransur/kecil//ada perantaraan   |             |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
| P3 Tidak boleh diukur / kualitatif  | P3 Boleh diukur//kuantitatif  |             |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
| P4 Lengkungan diskrit / graf diskrit //carta palang // bukan taburan normal | P4 Lengkungan bentuk loceng / lengkungan normal // taburan normal   |             |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
| P5 Dipengaruhi oleh faktor genetik  | P5 Dipengaruhi oleh faktor persekitaran (dan faktor genetik)  |             |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
| P6 Dikawal oleh gen tunggal // Dikawal oleh sepasang alel                   | P6 Dikawal oleh beberapa gen // Dikawal oleh beberapa pasang alel   |             |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
| c.i   | <p><b>Dapat menerangkan proses yang berlaku seperti dalam Rajah 8.3 dan menyatakan dua faktor penyebabnya</b><br/> <b>Contoh jawapan</b><br/>           P1 – mutasi ialah perubahan (dalam turutan nukleotida DNA) secara spontan/rawak pada kandungan genetik dalam sel organisma<br/>           P2 – (mutasi kromosom ialah) perubahan pada struktur kromosom / bilangan kromosom semasa meiosis<br/>           P3 – proses : pelenyapan<br/>           P4 – faktor penyebab : sinaran:sinar X / gamma / UV / radiasi nuclear / sinaran radioaktif<br/>           P5 – faktor penyebab : bahan kimia : benzena / formaldehid / karbon tetraklorida / asbestos / mustard gas / tar / racun perosak</p>   | 5           |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |
| c.ii  | <p><b>Dapat menerangkan kesan-kesan proses seperti dalam Rajah 8.4 ke atas variasi</b><br/> <b>Contoh jawapan</b><br/>           P1 – proses X ialah pindah silang<br/>           P2 – pertukaran bahan genetik pada segmen kromatid<br/>           P3 – kombinasi gen baru dihasilkan<br/>           P4 – kromatid berpisah semasa anafasa II<br/>           P5 – menghasilkan gamet yang mempunyai kepelbagaiian kombinasi gen<br/>           P6 – titik proses X ialah kiasma</p>  | 4           |             |                           |                     |   |   |                                    |                              |   |   |                                    |  |   |   |   |

Mana-mana empat

9.(a)(i) Diagram 9.1 and 9.2 shows the histogram about distribution of genetic variation in human.

*Rajah 9.1 dan 9.2 memunjukkan histogram mengenai taburan variasi genetik dalam manusia.*

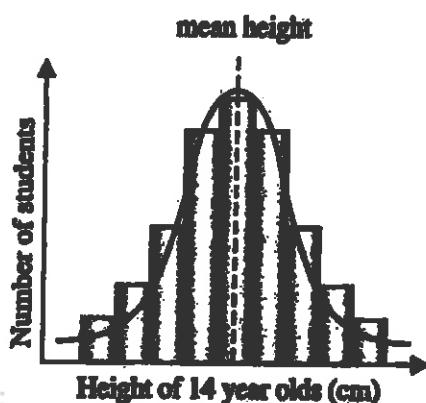


Diagram 9.1  
Rajah 9.1

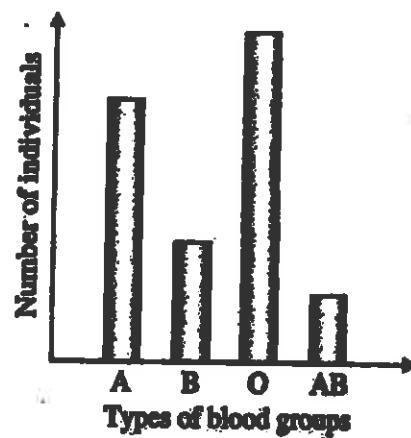


Diagram 9.2  
Rajah 9.2

With a suitable example, explain the differences of two kinds of variation.

*Dengan menggunakan contoh yang sesuai, terangkan perbezaan di antara kedua-dua variasi tersebut.*

[7 marks]

- (ii) What is the importance of variation to organism?  
*Apakah kepentingan variasi kepada organisme?*

[3 marks]

- (b) The variation of ABO blood group determined by three different alleles, but an individual can carry only two of the three alleles.

With schematic diagram, explain the possibilities of the blood group and the genotypes of the offspring if the father's blood group is A and the mother's blood group is B.

*Variasi dalam kumpulan darah ABO ditentukan oleh tiga alel yang berbeza, tetapi setiap individu hanya membawa dua daripada tiga alel tersebut.*

*Dengan gambarajah skema, terangkan kebarangkalian kumpulan darah dan genotip pada anak jika ayahnya mempunyai kumpulan darah A dan ibu kumpulan darah B.*

[10 marks]

| Num  | SCORING CRITERIA  | Mark                 | Remark                  |   |   |  |  |   |  |                                     |  |  |  |   |  |        |       |
|--|---|----------------------|-------------------------|---|---|--|--|---|--|-------------------------------------|--|--|--|---|--|--------|-------|
| 9(a)   | <p>Able to</p> <p>(i) State the example of continuous variation and discontinuous variation and the difference of continuous variation and discontinuous variation</p> <p><b>Sample answer:</b><br/>           Example of continuous variation: Height or weight<br/>           Example of discontinuous variation: ABO blood group</p> <p><b>Differences</b></p> <table border="1" data-bbox="231 1296 1112 1924"> <tbody> <tr> <td data-bbox="231 1296 710 1363">Continuous variation</td><td data-bbox="710 1296 1112 1363">Discontinuous variation</td></tr> <tr> <td data-bbox="231 1363 710 1431">Graf distribution shows a normal distribution</td><td data-bbox="710 1363 1112 1431">Graf distribution shows a discrete distribution</td></tr> <tr> <td data-bbox="231 1431 710 1565">The characters are quantitative / can be measured and graded (from one extreme to the other)</td><td data-bbox="710 1431 1112 1565">The characters are qualitative / cannot be measured and graded (from one extreme to the other)</td></tr> <tr> <td data-bbox="231 1565 710 1677">Exhibits a spectrum of phenotypes with intermediate character</td><td data-bbox="710 1565 1112 1677">Exhibits a few distinctive phenotypes with no intermediate character</td></tr> <tr> <td data-bbox="231 1677 710 1745">Influenced by environmental factors</td><td data-bbox="710 1677 1112 1745">Is not Influenced by environmental factors</td></tr> <tr> <td data-bbox="231 1745 710 1857">Two or more genes control the same character</td><td data-bbox="710 1745 1112 1857">A single genes determines the differences in the traits of the character</td></tr> <tr> <td data-bbox="231 1857 710 1924">The phenotype is usually controlled by many pair of alleles</td><td data-bbox="710 1857 1112 1924">The phenotype is controlled by a pair of alleles</td></tr> </tbody> </table> | Continuous variation | Discontinuous variation | Graf distribution shows a normal distribution | Graf distribution shows a discrete distribution | The characters are quantitative / can be measured and graded (from one extreme to the other) | The characters are qualitative / cannot be measured and graded (from one extreme to the other) | Exhibits a spectrum of phenotypes with intermediate character | Exhibits a few distinctive phenotypes with no intermediate character | Influenced by environmental factors | Is not Influenced by environmental factors | Two or more genes control the same character | A single genes determines the differences in the traits of the character | The phenotype is usually controlled by many pair of alleles | The phenotype is controlled by a pair of alleles | 1<br>1 | Max 7 |
| Continuous variation   | Discontinuous variation   |                      |                         |   |   |  |  |   |  |                                     |  |  |  |   |  |        |       |
| Graf distribution shows a normal distribution  | Graf distribution shows a discrete distribution   |                      |                         |   |   |  |  |   |  |                                     |  |  |  |   |  |        |       |
| The characters are quantitative / can be measured and graded (from one extreme to the other) | The characters are qualitative / cannot be measured and graded (from one extreme to the other)  |                      |                         |   |   |  |  |   |  |                                     |  |  |  |   |  |        |       |
| Exhibits a spectrum of phenotypes with intermediate character                                | Exhibits a few distinctive phenotypes with no intermediate character  |                      |                         |   |   |  |  |   |  |                                     |  |  |  |   |  |        |       |
| Influenced by environmental factors  | Is not Influenced by environmental factors  |                      |                         |   |   |  |  |   |  |                                     |  |  |  |   |  |        |       |
| Two or more genes control the same character   | A single genes determines the differences in the traits of the character  |                      |                         |   |   |  |  |   |  |                                     |  |  |  |   |  |        |       |
| The phenotype is usually controlled by many pair of alleles                                  | The phenotype is controlled by a pair of alleles  |                      |                         |   |   |  |  |   |  |                                     |  |  |  |   |  |        |       |

|  |   |                           |          |
|--|---|---------------------------|----------|
|  | (ii) Able to state the importance of variation to organism<br><br>Sample answer:<br>P1: variation provided better adaptation for organism to survive in the changing environment<br>P2: variation are essential to the survival of species / to survive more successfully<br>P3; variation be able to organism explore a new habitat<br>P4: to ensure organism survival from predator | 1<br>1<br>1<br>1<br>Any 3 |          |
|  |   |                           | Total 10 |

| Num  | SCORING CRITERIA   | Mark                                      | Remark |
|------|--|---|--------|
| 9(b) | <p>Able to explain the possibilities of the blood group and the genotypes of the offspring when the father's blood group is A and the mother's blood group is B.</p> <p>Sample answer:<br/>There are four possibilities;</p> <p>(a) Parent's genotype: <math>I^A I^A</math>      X      <math>I^B I^B</math><br/>           Gamete                  <math>I^A</math>                                  <math>I^B</math><br/> <br/>           Genotype F1                  <math>I^A I^B</math><br/> <br/>           Phenotype F1                  All offspring have Blood group AB</p> <p>(b) Parent's genotype: <math>I^A I^A</math>      X      <math>I^B I^O</math><br/>           Gamete                  <math>I^A</math>                          <math>I^B</math>      <math>I^O</math><br/> <br/>           Genotype F1                  <math>I^A I^B</math>      <math>I^A I^O</math><br/> <br/>           Phenotype F1                  50% of offspring have blood group AB and 50% have blood group A</p> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | 3<br>3 |

|  |  |   |        |
|--|--|---|--------|
|  | <p>(c) Parent's genotype: <math>I^A I^O \times I^B I^B</math></p> <p>Gamete</p> <p>Genotype F1</p> <p>Phenotype F1</p> | 1 | 3      |
|  |  | 1 |        |
|  |  | 1 |        |
|  |  | 1 |        |
|  |  |   | Max 10 |