



964/2

STPM 2022

SIJIL TINGGI PERSEKOLAHAN MALAYSIA

BIOLOGY

PAPER 2

MAJLIS PEPERIKSAAN MALAYSIA  
(MALAYSIAN EXAMINATIONS COUNCIL)

# 1 Hour 30 Minutes

**Instructions to candidates:****DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE ALLOWED TO DO SO.***Answer all questions in Section A.**Answer all questions in Section B.**Answer two questions only in Section C.**All working should be shown. For numerical answers, units should be quoted wherever appropriate.**Answers may be written either in English or Malay.**Fill in your personal details on page 11.***Arahan kepada calon:****JANGAN BUKA KERTAS SOALAN INI SEHINGGA ANDA DIBENARKAN BERBUAT DEMIKIAN.***Jawab semua soalan dalam Bahagian A.**Jawab semua soalan dalam Bahagian B.**Jawab dua soalan sahaja dalam Bahagian C.**Semua kerja hendaklah ditunjukkan. Bagi jawapan berangka, unit hendaklah dinyatakan di mana-mana yang sesuai.**Jawapan boleh ditulis dalam bahasa Inggeris atau bahasa Melayu.**Isi maklumat diri anda pada halaman 11.*

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**This question paper consists of 17 printed pages and 3 blank pages.  
(Kertas soalan ini terdiri daripada 17 halaman bercetak dan 3 halaman kosong.)**

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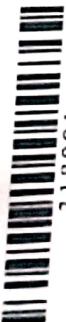
[Turn over (Lihat halaman sebelah)]

\*This question paper is CONFIDENTIAL until the examination is over.

CONFIDENTIAL\*

(\*Kertas soalan ini SULIT sehingga peperiksaan kertas ini tamat.)

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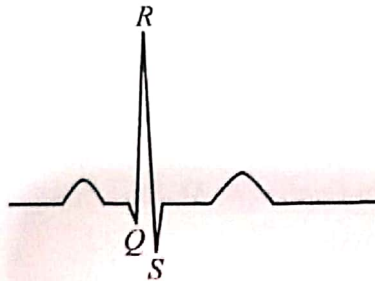


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Indicate the correct answer on the Multiple-choice Answer Sheet provided.

- 1 Which factor of the blood is detected by the chemoreceptors of a person at high altitude?
- A The decrease in pH
  - B The increase in the concentration of oxygen
  - C The increase in the concentration of bicarbonate ions
  - D The decrease in the concentration of carbon dioxide
- 2 Which processes occur during the opening of stomata?
- I The pumping of protons into the guard cells
  - II The activation of the proton pump by the blue light
  - III The movement of potassium ions into the guard cells
  - IV The outward movement of chloride ions from the guard cells
- A I and II                      B I and IV                      C II and III                      D III and IV
- 3 The *QRS* wave of a man's heart is shown by the electrocardiogram below.



What happens to the heart during the *QRS* wave?

- A The propagation of impulse to the sinoatrial node
- B The propagation of impulse throughout the ventricles
- C The propagation of impulse is delayed at the atrioventricular node
- D The propagation of impulse to the heart apex from the bundle branches

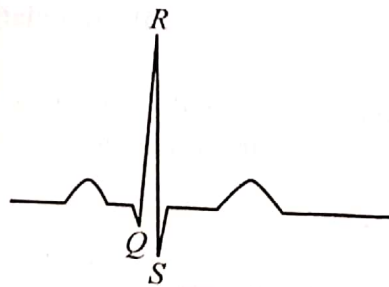


Bahagian A [15 markah]

Jawab semua soalan.

Tandakan jawapan yang betul pada Borang Jawapan Aneka Pilihan yang dibekalkan.

- 1 Faktor darah yang manakah yang dikesan oleh kemoreseptor bagi seseorang yang berada di altitud tinggi?
- A Penurunan pH
  - B Peningkatan dalam kepekatan oksigen
  - C Peningkatan dalam kepekatan ion bikarbonat
  - D Penurunan dalam kepekatan karbon dioksida
- 2 Proses yang manakah yang berlaku semasa pembukaan stomata?
- I Pengepaman proton ke dalam sel pengawal
  - II Pengaktifan pam proton oleh cahaya biru
  - III Pergerakan ion kalium ke dalam sel pengawal
  - IV Pergerakan keluar ion klorida daripada sel pengawal
- A I dan II                      B I dan IV                      C II dan III                      D III dan IV
- 3 Gelombang *QRS* bagi jantung seorang lelaki ditunjukkan oleh elektrokardiogram di bawah.



- Apakah yang berlaku kepada jantung semasa gelombang *QRS* itu?
- A Perambatan impuls ke nodus sinoatrial
  - B Perambatan impuls ke seluruh ventrikel
  - C Perambatan impuls dilambatkan di nodus atrioventrikular
  - D Perambatan impuls ke apeks jantung daripada cabang berkas



- 4 Which process causes the phenomenon of guttation that could be seen in the early morning?
- The condensation of the surrounding air moisture
  - The transpiration of water vapours by the leaves
  - The cohesion and adhesion of water in the xylem vessel
  - The upwards movement of water and minerals in the xylem by root pressure

- 5 The signaling pathway of the human nervous system is given below.



What are represented by  $P$ ,  $Q$  and  $R$ ?

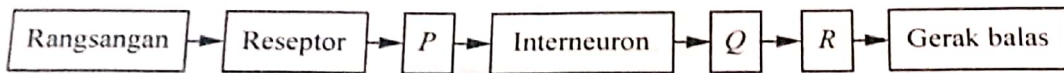
- |   | $P$            | $Q$            | $R$            |
|---|----------------|----------------|----------------|
| A | Adrenal gland  | Motor neuron   | Sensory neuron |
| B | Motor neuron   | Sensory neuron | Adrenal gland  |
| C | Sensory neuron | Adrenal gland  | Motor neuron   |
| D | Sensory neuron | Motor neuron   | Adrenal gland  |
- 6 Potassium ions continuously outflow after an action potential. Hence, the membrane potential becomes more negative than the resting potential. Which is the phase that represents the event?
- Depolarisation
  - Polarisation
  - Hyperpolarisation
  - Repolarisation
- 7 Initially, a long day plant is exposed to far red light. Then, the plant is exposed to red light. Which is the effect of the exposures to the lights on the long day plant?
- $P_r$  has no effect towards the plant, hence the plant will not flower.
  - The red light cancels the effect of the far red light, hence the plant will flower.
  - The red light cancels the effect of the far red light, hence the plant will not flower.
  - $P_r$  converts to  $P_{fr}$ , then  $P_{fr}$  converts back to  $P_r$ , hence the plant will flower.
- 8 Which are the functions of progesterone during pregnancy?
- Inhibits the secretion of prolactin
  - Inhibits the degeneration of the corpus luteum
  - Stimulates the secretion of luteinising hormone
  - Stimulates the development of the mammary glands
- I and III
  - I and IV
  - II and III
  - II and IV



4 Proses yang manakah yang menyebabkan berlakunya fenomena gutasi yang boleh dilihat pada awal pagi?

- A Kondensasi lembapan udara persekitaran
- B Transpirasi wap air oleh daun
- C Lekitan dan lekatan air dalam salur xilem
- D Pergerakan ke atas bagi air dan mineral dalam xilem oleh tekanan akar

5 Laluan isyarat bagi sistem saraf manusia diberikan di bawah.



Apakah yang diwakili oleh P, Q, dan R?

- |   | P                | Q                | R                |
|---|------------------|------------------|------------------|
| A | Kelenjar adrenal | Neuron motor     | Neuron deria     |
| B | Neuron motor     | Neuron deria     | Kelenjar adrenal |
| C | Neuron deria     | Kelenjar adrenal | Neuron motor     |
| D | Neuron deria     | Neuron motor     | Kelenjar adrenal |

6 Ion kalium mengalir keluar secara berterusan selepas satu keupayaan tindakan. Oleh itu, keupayaan membran menjadi lebih negatif daripada keupayaan rehat. Fasa yang manakah yang mewakili peristiwa itu?

- A Penyahkutuban
- B Pengutuban
- C Hiperkutuban
- D Pengutuban semula

7 Pada awalnya, satu tumbuhan panjang-siang didedahkan kepada cahaya merah lampau. Kemudian, tumbuhan itu didedahkan kepada cahaya merah. Yang manakah kesan pendedahan cahaya terhadap tumbuhan panjang-siang itu?

- A  $P_r$  tidak mempunyai kesan terhadap tumbuhan, oleh itu tumbuhan tidak akan berbunga.
- B Cahaya merah membatalkan kesan cahaya merah lampau, oleh itu tumbuhan akan berbunga.
- C Cahaya merah membatalkan kesan cahaya merah lampau, oleh itu tumbuhan tidak akan berbunga.
- D  $P_r$  bertukar kepada  $P_{fr}$ , kemudian  $P_{fr}$  bertukar semula kepada  $P_r$ , oleh itu tumbuhan akan berbunga.

8 Yang manakah fungsi bagi progesteron semasa kehamilan?

- I Merencat perembesan prolaktin
- II Merencat kemerosotan korpus luteum
- III Merangsang perembesan hormon peluteinan
- IV Merangsang perkembangan kelenjar mamari

- A I dan III
- B I dan IV
- C II dan III
- D II dan IV



9 The embryonic layers and their derivative organs are given in the table below.

<i>Embryonic layer</i>	<i>Derivative organ</i>
I Ectoderm	<i>P</i> Bone
II Mesoderm	<i>Q</i> Liver
III Endoderm	<i>R</i> Muscle
	<i>S</i> Pancreas
	<i>T</i> Hair follicle
	<i>U</i> Sweat gland

Which embryonic layers correspond correctly to their derivative organs?

- |          | <i>I</i>              | <i>II</i>             | <i>III</i>            |
|----------|-----------------------|-----------------------|-----------------------|
| <b>A</b> | <i>P</i> and <i>R</i> | <i>Q</i> and <i>S</i> | <i>T</i> and <i>U</i> |
| <b>B</b> | <i>P</i> and <i>T</i> | <i>Q</i> and <i>S</i> | <i>R</i> and <i>U</i> |
| <b>C</b> | <i>T</i> and <i>U</i> | <i>P</i> and <i>R</i> | <i>Q</i> and <i>S</i> |
| <b>D</b> | <i>R</i> and <i>S</i> | <i>Q</i> and <i>U</i> | <i>P</i> and <i>T</i> |

10 The stage of an embryonic development in a seed is shown in the diagram below.



What is represented by the stage shown in the above diagram?

- A** The embryo becomes ball of cells
- B** The cotyledons continue to elongate
- C** The cotyledons begin to emerge
- D** The embryo starts to enter the multicellular stage

11 Which are true about the homeostatic responses of a person who stays in a cold room for 15 minutes?

- I** The metabolic rate increases
- II** The activity of the muscle decreases
- III** The blood vessel of the skin constrict
- IV** The heat is radiated from the surface of the skin

- |                    |                   |                     |                    |
|--------------------|-------------------|---------------------|--------------------|
| <b>A</b> I and III | <b>B</b> I and IV | <b>C</b> II and III | <b>D</b> II and IV |
|--------------------|-------------------|---------------------|--------------------|



9 Lapisan embrio dan organ terbitannya diberikan dalam jadual di bawah.

Lapisan embrio	Organ terbitan
I Ektoderma	P Tulang
II Mesoderma	Q Hati
III Endoderma	R Otot
	S Pankreas
	T Folikel rambut
	U Kelenjar peluh

Lapisan embrio yang manakah yang berpadanan dengan betul kepada organ terbitannya?

- |   | I       | II      | III     |
|---|---------|---------|---------|
| A | P dan R | Q dan S | T dan U |
| B | P dan T | Q dan S | R dan U |
| C | T dan U | P dan R | Q dan S |
| D | R dan S | Q dan U | P dan T |

10 Peringkat bagi perkembangan satu embrio dalam biji benih ditunjukkan dalam gambar rajah di bawah.



Apakah yang diwakili oleh peringkat yang ditunjukkan dalam gambar rajah di atas?

- A Embrio membentuk bebola sel
- B Kotiledon terus memanjang
- C Kotiledon mula muncul
- D Embrio mula memasuki peringkat multisel

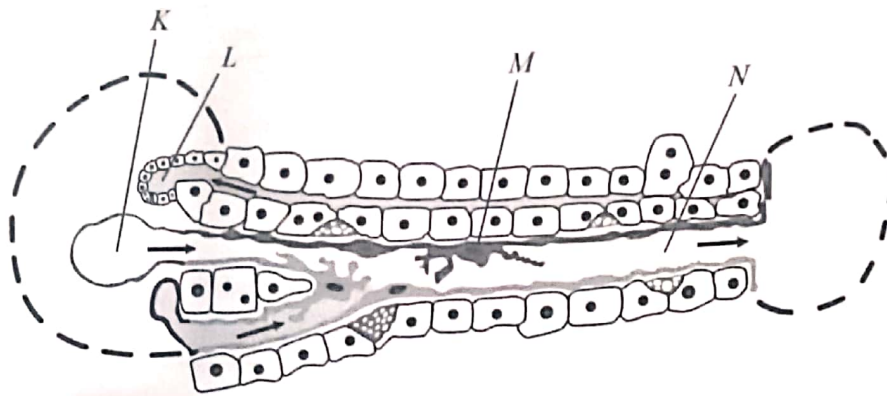
11 Yang manakah yang benar tentang gerak balas homeostasis bagi seseorang yang berada dalam bilik sejuk selama 15 minit?

- I Kadar metabolisme meningkat
- II Aktiviti bagi otot berkurang
- III Salur darah kulit mencerut
- IV Haba dibebaskan secara sinaran daripada permukaan kulit

- A I dan III      B I dan IV      C II dan III      D II dan IV



12 A cross section of a liver lobule is shown in the diagram below.



Which structure represents sinusoid?

- A K                      B L                      C M                      D N

13 Which is the function of immunoglobulin M?

- A Responds towards allergic reaction  
 B Binds to and neutralises the toxins  
 C Promotes agglutination reactions  
 D Blocks the attachment of pathogen to mucous membrane

14 Which is true about a patient who might experience a rejection reaction after receiving a transplanted liver?

- A The immune system recognises the transplanted liver as self  
 B The MHC molecules of the transplanted liver are identical to his own  
 C The antibodies released by the body's immune response lyses the transplanted liver cells  
 D The MHC molecules of the transplanted liver stimulate the immune response of the recipient body to reject it

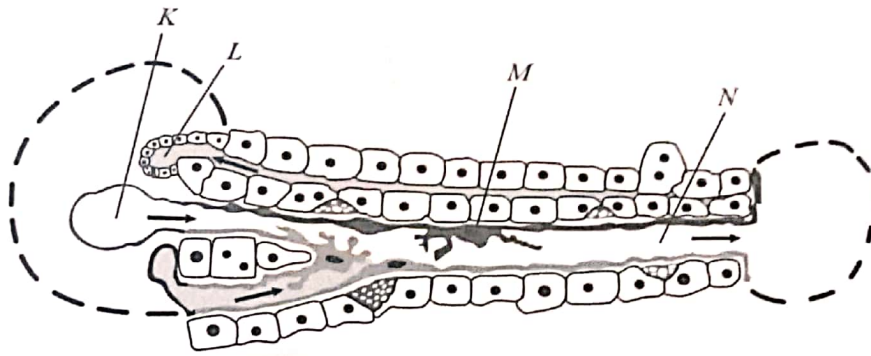
15 Which is the mode of transmission of tuberculosis?

- A Air                                      B Food  
 C Water                                    D Vector





12 Satu keratan rentas bagi lobul hati ditunjukkan dalam gambar rajah di bawah.



Struktur yang manakah yang mewakili sinusoid?

- A K                      B L                      C M                      D N

13 Yang manakah fungsi bagi imunoglobulin M?

- A Bergerak balas terhadap tindak balas alahan  
 B Mengikat kepada toksin dan meneutralkan toksin  
 C Menggalakkan tindak balas pengaglutinatan  
 D Menghalang pelekatan patogen kepada membran mukus

14 Yang manakah yang benar tentang pesakit yang mungkin mengalami tindak balas penolakan selepas menerima hati yang dipindahkan?

- A Sistem keimunan mengenali hati yang dipindahkan itu sebagai diri  
 B Molekul MHC hati yang dipindahkan adalah sama seperti pesakit itu  
 C Antibodi yang dibebaskan oleh gerak balas keimunan tubuh melisiskan sel hati yang dipindahkan itu  
 D Molekul MHC bagi hati yang dipindahkan itu merangsang gerak balas keimunan bagi tubuh penerima untuk menolaknya

15 Yang manakah mod penyebaran bagi tuberkulosis?

- A Udara                      B Makanan  
 C Air                          D Vektor

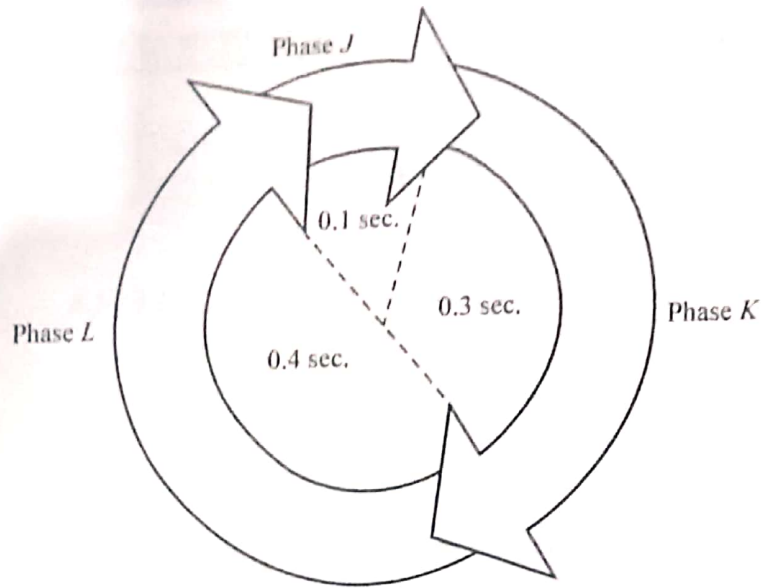


Section B [15 marks]

Answer all questions.

Write the answers in the spaces provided.

16 The phases of the cardiac cycle at rest for a normal adult is shown in the diagram below.



(a) Identify the phases *J*, *K* and *L*.

[3]

Phase *J*:.....

Phase *K*:.....

Phase *L*:.....

(b) Which valve opens during phase *J*? State your reason.

[2]

.....  
.....

(c) Why is the “dub” sound produced? Explain your answer.

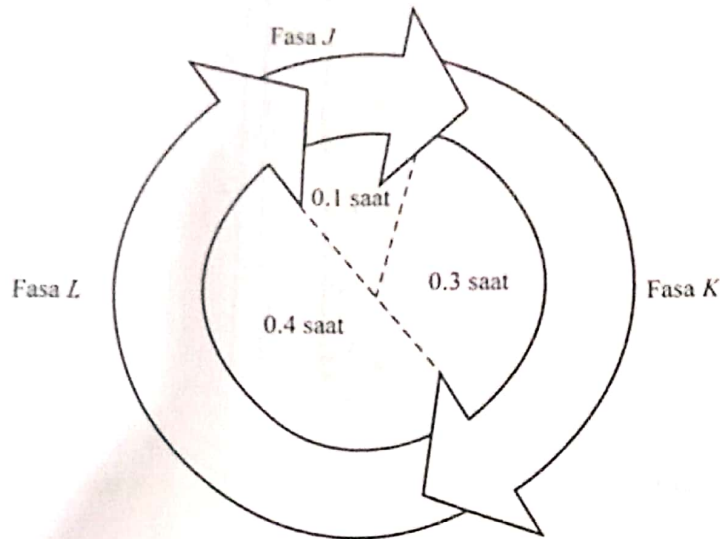
[2]

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



**Bahagian B [15 markah]***Jawab semua soalan.**Tulis jawapan pada ruang yang disediakan.*

16 Fasa bagi kitar kardiak semasa rehat bagi seorang dewasa yang normal ditunjukkan dalam gambar rajah di bawah.



(a) Kenal pasti fasa *J*, fasa *K*, dan fasa *L*. [3]

Fasa *J*:.....

Fasa *K*:.....

Fasa *L*:.....

(b) Injap yang manakah yang terbuka semasa fasa *J*? Nyatakan alasan anda. [2]

.....

.....

(c) Mengapakah bunyi "dub" terhasil? Jelaskan jawapan anda. [2]

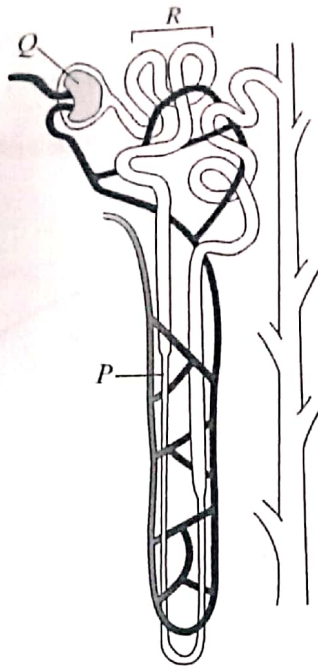
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.....

.....



17 A structure of a nephron is shown in the diagram below.



(a) Name *P*, *Q* and *R*.

[3]

*P*:.....

*Q*:.....

*R*:.....

(b) Explain the reabsorption of water into the blood through *R*.

[3]

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

(c) Explain **one** factor which contributes to the filtration at *Q*.

[2]

.....  
.....

*Please tear off along the perforated line.*



17 Satu struktur nefron ditunjukkan dalam gambar rajah di bawah



(a) Namakan *P*, *Q*, dan *R*.

[3]

*P*: .....

*Q*: .....

*R*: .....

(b) Jelaskan penyerapan semula air ke dalam darah melalui *R*.

[3]

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

(c) Jelaskan satu faktor yang menyumbang kepada penurasan di *Q*.

[2]

.....  
 .....



## Section C [30 marks]

Answer two questions only.

You may answer all the questions, but only the first two answers will be marked. Write the answers on the answer sheets provided. Begin each answer on a new page of the answer sheet.

- 18 (a) Describe the behavioural responses of large mammals to regulate body temperature during a hot sunny day. [5]
- (b) Describe the mechanism of immune response when a person's body is infected by bacteria. [10]
- 19 (a) Describe the roles of gibberellin and abscisic acid in plants. [6]
- (b) Explain the process of corn seed germination which involves the nutrients' mobilisation. [9]
- 20 (a) Describe the process of embryonic development in a durian seed. [10]
- (b) Describe the adaptations of cactus to reduce water loss. [5]



**Bahagian C [30 markah]**

Jawab **dua** soalan sahaja.

*Anda boleh menjawab semua soalan, tetapi hanya dua jawapan pertama yang akan diperiksa. Tulis jawapan pada helaian jawapan yang disediakan. Mulakan setiap jawapan pada halaman baharu helaian jawapan.*

- 18 (a) Perihalkan gerak balas perilaku bagi mamalia yang besar untuk mengawal atur suhu tubuh semasa hari yang panas terik. [5]  
(b) Perihalkan mekanisme bagi gerak balas keimunan apabila tubuh seseorang dijangkiti oleh bakteria. [10]
- 19 (a) Perihalkan peranan gibberelin dan peranan asid absisik dalam tumbuhan. [6]  
(b) Jelaskan proses percambahan biji benih jagung yang melibatkan mobilisasi nutrien. [9]
- 20 (a) Perihalkan proses perkembangan embrio dalam sebiji benih durian. [10]  
(b) Perihalkan penyesuaian bagi kaktus untuk mengurangkan kehilangan air. [5]

