SULIT

Biology
Kertas 1
30.8.2012
1 ¼ jam

PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM

TAHUN 2012

BIOLOGY

Kertas 1

Satu Jam Lima Belas Minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Kertas soalan ini adalah dalam dwibahasa.
2. Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.

Kertas soalan ini mengandungi 29 muka surat bercetak.

1 Diagram 1 shows the longitudinal section of a type of vascular tissue in plant.
Rajah 1 menunjukkan keratan memanjang bagi satu jenis tisu vaskular pada tumbuhan.

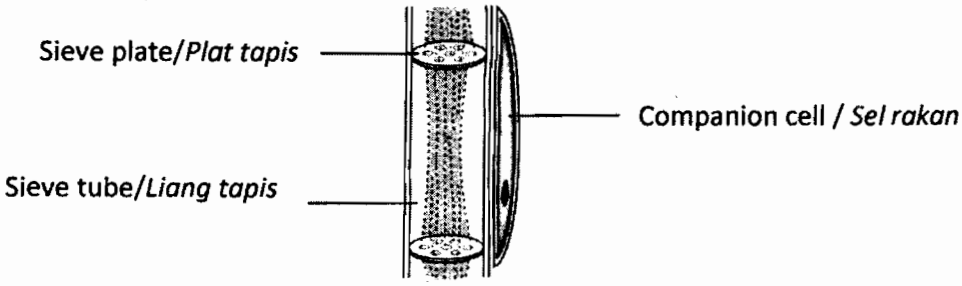


Diagram 1
Rajah 1

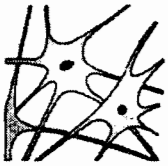
State the function of the tissue.
Nyatakan fungsi tisu tersebut.

A Transport water
Mengangkut air
B Transport minerals
Mengangkut mineral
C Transport oxygen
Mengangkut oksigen
D Transport product of photosynthesis
Mengangkut hasil fotosintesis.

2 The following informations are about organelles and its function.
Which of the following is matched correctly?
Maklumat berikut adalah berkaitan organel dan fungsinya.
Manakah yang berikut dipadankan dengan betul?

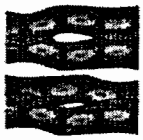
	Organelle ***Organel***	**Function** ***Fungsi***
A	Ribosome *Ribosom*	synthesise lipids *mensintesis lipid*
B	Lysosome *Lisosom*	synthesis energy *mensintesis tenaga*
C	Rough endoplasmic reticulum *Jalinan endoplasma kasar*	transport protein to Golgi apparatus *mengangkut protein ke jasad golgi*
D	Smooth endoplasmic reticulum *Jalinan endoplasma licin*	synthesise protein *mensintesis protein*

3 Which of the following is the cardiac muscle tissue ?
Manakah yang berikut adalah tisu bagi otot kardiak jantung?

A 

B 

C 

D 

4 Diagram 2 shows the structure of the plasma membrane based on the fluid mosaic model.
Rajah 2 menunjukkan struktur membran plasma berdasarkan model cecair mosaik.

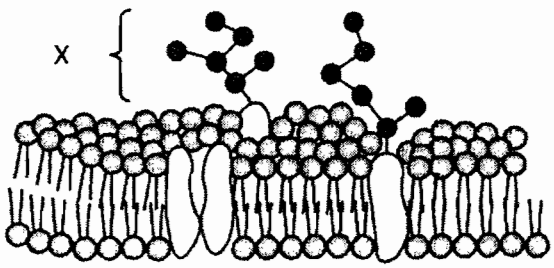
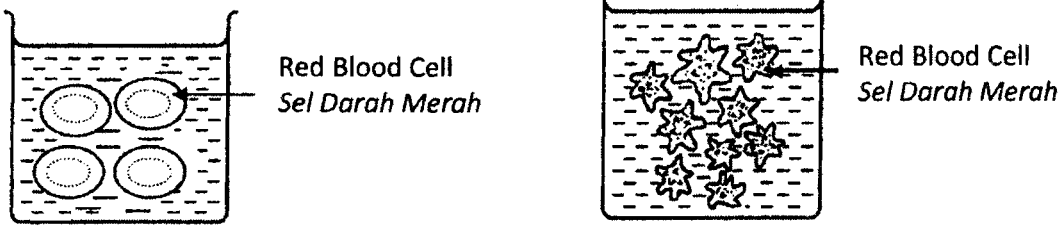


Diagram 2
Rajah 2

What is X?
Apakah X?

A Carrier protein
Protein pembawa
B Phospholipid
Fosfolipid
C Pore protein
Protein liang
D Glycoprotein
Glikoprotein

5 Diagram 3 shows the change in shape of red blood cells after being immersed in a solution for thirty minutes.
Rajah 3 menunjukkan perubahan bentuk sel darah merah selepas direndam dalam suatu larutan selama tiga puluh minit.



Beginning of the experiment
Awal eksperimen

End of the experiment
Akhir eksperimen

Diagram 3
Rajah 3

Which of the following process occurs to the cell?
Manakah proses berikut berlaku pada sel tersebut?

A Plasmolysis
Plasmolisis
B Flaccid
Flasid
C Crenation
Krenasi
D Haemolysis
Hemolisis

6 Diagram 4 shows a visking tubing containing sucrose solution which is immersed in distilled water.
Rajah 4 menunjukkan tiub visking berisi larutan sukrosa yang direndam dalam air suling.

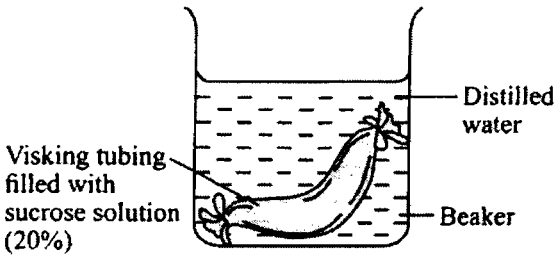


Diagram 4
Rajah 4

Which of the following occurs in the above experiment?
Manakah yang berikut berlaku dalam eksperimen di atas?

A The water molecules diffuse into the visking tubing by osmosis
Molekul air meresap masuk ke dalam tiub visking secara osmosis.
B The sucrose molecules diffuse out of the visking tubing by facilitated diffusion.
Molekul sukrosa meresap keluar daripada tiub visking secara resapan berbantu
C The water molecules diffuse out of the visking tubing by osmosis.
Molekul air meresap keluar daripada tiub visking secara osmosis.
D The sucrose molecules diffuse out of the visking tubing by active transport.
Molekul sukrosa meresap keluar daripada tiub visking secara pengangkutan aktif.

7 Diagram 5 shows the intake of water and mineral ions by root cells.
Rajah 5 menunjukkan pengambilan air dan ion-ion mineral oleh sel-sel akar.

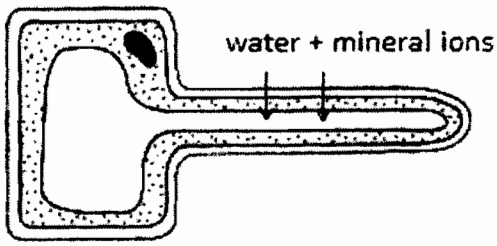


Diagram 5
Rajah 5

How do water and mineral salts move into the root cells?
Bagaimanakah air dan garam-garam mineral memasuki sel-sel akar?

	Water ***Air***	**Mineral ion** ***Ion-ion mineral***
A	Simple diffusion *Resapan ringkas*	Osmosis *Osmosis*
B	Active transport *Pengangkutan aktif*	Facillitated diffusion *Resapan berbantu*
C	Osmosis *Osmosis*	Simple Diffusion *Resapan ringkas*
D	Osmosis *Osmosis*	Active transport *Pengangkutan aktif*

8 Diagram 6 shows the basic structure of a nucleotide.
Rajah 6 menunjukkan struktur asas bagi nukleotida.

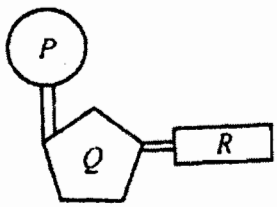


Diagram 6
Rajah 6

Name the components labelled P, Q, and R.
Namakan komponen berlabel P, Q dan R

	P	**Q**	**R**
A	Pentose sugar *Gula pentosa*	Nitrogenous base *Bes bernitrogen*	Phosphate group *Kumpulan fosfat*
B	Phosphate group *Kumpulan fosfat*	Pentose sugar *Gula pentosa*	Nitrogenous base *Bes bernitrogen*
C	Phosphate group *Kumpulan fosfat*	Nitrogenous base *Bes bernitrogen*	Pentose sugar *Gula pentosa*
D	Nitrogenous base *Bes bernitrogen*	Pentose sugar *Gula pentosa*	Phosphate group *Kumpulan fosfat*

9 Diagram 7 shows the cell wall and plasma membrane of a plant cell.
Molecule X is used to build cell wall while molecule Y is used to build plasma membrane.
Rajah 7 menunjukkan dinding sel dan membran plasma bagi sel tumbuhan.
Molekul X digunakan untuk membina dinding sel manakala molekul Y digunakan untuk membina membran plasma.

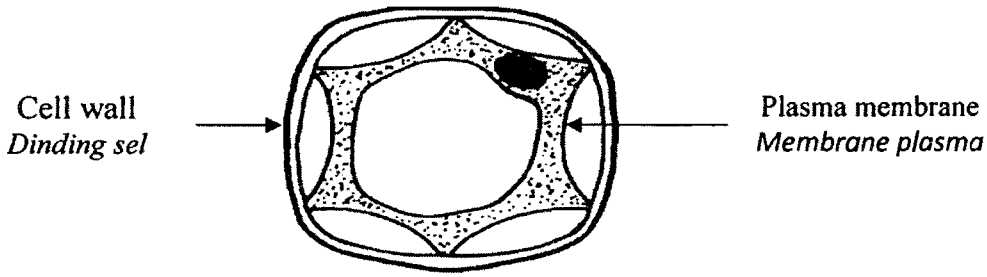


Diagram 7
Rajah 7

What is X and Y
Apakah X dan Y.

	X	Y
A	Cellulose / *selulosa*	Lipids / *Lipid*
B	Protein /*protein*	Glucose / *Glukosa*
C	Amino acids / *Asid amino*	Starch / *kanji*
D	Lipids / *Lipid*	Protein /*protein*

10 Diagram 8 shows the action of an enzyme on a substrate.
Rajah 8 menunjukkan tindakan enzim ke atas substrat.

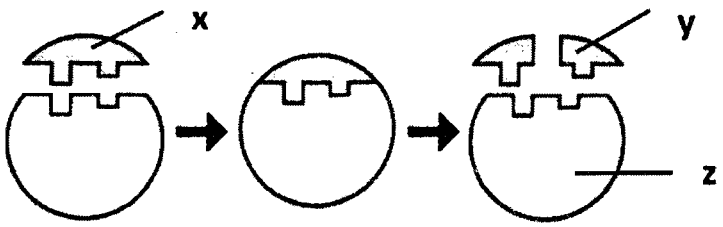


Diagram 8
Rajah 8

Name X ,Y and Z.
Namakan X, Y dan Z.

	X	Y	Z
A	Enzyme/ *Enzim*	Substrate / *Substrat*	Product / *Hasil*
B	Substrate / *Substrat*	Product / *Hasil*	Enzyme / *Enzim*
C	Product / *Hasil*	Substrate / *Substrat*	Enzyme / *Enzim*
D	Product / *Hasil*	Enzyme / *Enzim*	Substrate / *Substrat*

11 The equation shows process X in the formation of disaccharides.
Persamaan menunjukkan proses X dalam pembentukan disakarida.

Process X / *Proses X*

Glucose + Glucose ⟶ Maltose + Water
(Glukosa) (Glukosa) (Maltosa) (Air)

What is process X?
Apakah proses X?

A Hydrolysis
Hidrolisis
B Condensation
Kondensasi
C Reduction
Penurunan
D Evaporation
Evaporasi

12 Which of the following are the common elements in carbohydrate, protein and lipid?
Manakah yang berikut adalah unsur-unsur utama yang terdapat di dalam karbohidrat, protein dan lipid?

A Oxygen, Hydrogen and Nitrogen
Oksigen, Hidrogen dan Nitrogen
B Carbon, Hydrogen and Oxygen
Karbon, Hydrogen dan Oksigen
C Carbon, Oxygen and Nitrogen
Karbon, Oksigen dan Nitrogen
D Carbon, Hydrogen, and Nitrogen
Carbon, Hydrogen dan Nitrogen.

13 Diagram 9 shows a process during cell division
Rajah 9 menunjukkan satu proses semasa pembahagian sel.

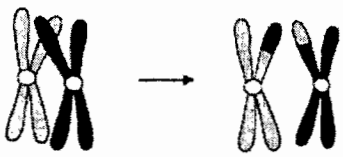


Diagram 9
Rajah 9

Which of the following organs involves in the process?
Antara organ berikut, yang manakah terlibat dalam proses tersebut?

A Skin
Kulit
B Root
Akar
C Anther
Anter
D Heart
Jantung

14 Diagram 10 shows a cell cycle in an animal cell.
Rajah 10 menunjukkan satu kitar sel dalam satu sel haiwan.

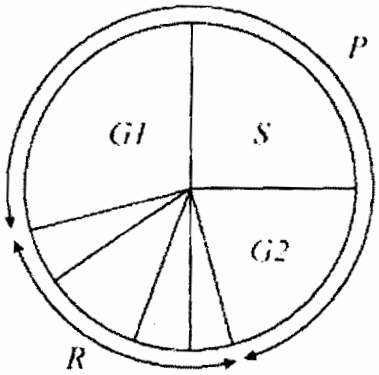


Diagram 10
Rajah 10

What is phases P and R ?
Apakah fasa P dan R ?

	P	R
A	Meiosis *Meiosis*	Interphase *Interfasa*
B	Interphase *Interfasa*	Mitosis *Mitosis*
C	Growth *Pertumbuhan*	Interphase *Interfasa*
D	Meiosis *Meiosis*	Growth *Pertumbuhan*

15 Diagram 11 shows a stage in mitosis.
Rajah 11 menunjukkan satu peringkat dalam mitosis.

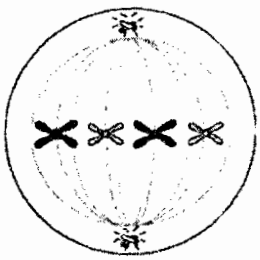


Diagram 11
Rajah 11

What phase is shown in Diagram 11?
Apakah fasa yang ditunjukkan dalam Rajah 11?

A Prophase
Profasa

B Anaphase
Anafasa

C Metaphase
Metafasa

D Telophase
Telofasa

16 Diagram 12 shows the structure of a chloroplast.
Rajah 12 menunjukkan struktur satu kloroplas.

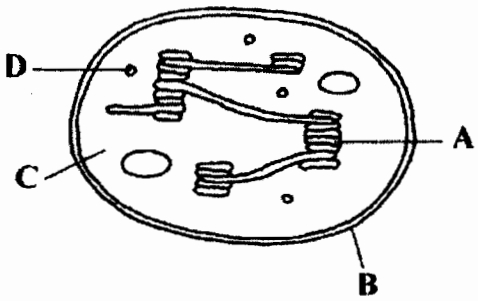


Diagram 12
Rajah 12

Which part A, B, C or D is the site of light reaction (photolysis of water)?
Antara bahagian A, B, C dan D manakah merupakan tapak tindak balas cahaya (fotolisis air)?

17 Diagrams 13 shows the structure of a villus in the ileum.
Rajah 13 menunjukkan struktur vilus di dalam satu ileum

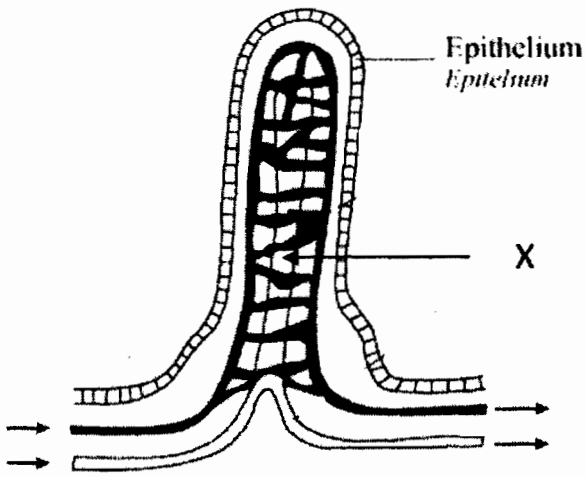


Diagram 13
Rajah 13

What is the function of the part labelled X?
Apakah fungsi bahagian yang berlabel X?

A Absorption of fatty acids and glycerol
Penyerapan asid lemak dan gliserol
B Absorption of amino acids
Penyerapan asid amino
C Absorption of minerals
Penyerapan mineral
D Absorption of glucose
Penyerapan glukosa

18 Table 1 shows the observations of four types of food test on a food sample.
Jadual 1 menunjukkan pemerhatian ke atas empat jenis ujian makanan yang dijalankan bagi satu sampel makanan.

Test tube *Tabung uji*	**Test** *Ujian*	**Observation** *Pemerhatian*
W	Iodine test *Ujian iodin*	Yellowish brown *Perang kekuningan*
X	Benedict's test *Ujian Benedict*	Blue solution *Larutan berwarna biru*
Y	Sudan (III) test *Ujian Sudan (III)*	A layer of red colour oil *Satu lapisan minyak berwarna merah*
Z	Millon's test *Ujian Millon*	Brick red precipitates are formed *Mendakan merah bata terbentuk*

Table 1
Jadual 1

What does the food sample contain?
Apakah kandungan sampel makanan itu ?

A Proteins and lipid
Protein dan lipid
B Protein and starch
Protein dan kanji
C Protein and starch
Protein dan kanji
D Starch and glucose
Kanji dan glukosa

19 Diagram 14 shows part of the human digestive system.
Rajah 14 menunjukkan bahagian sistem pencernaan manusia.

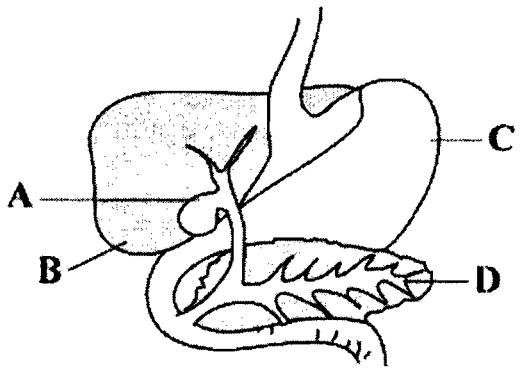


Diagram 14
Rajah 14

Which of the structure, A, B, C or D produces trypsin?
Antara struktur A, B, C dan D manakah yang menghasilkan tripsin?

20 Table 2 shows the results obtained in an experiment to determine the concentration of vitamin C in food samples M, N, O and P.
Jadual 2 di bawah menunjukkan keputusan dalam satu eksperimen yang diperoleh untuk menentukan kepekatan vitamin C dalam sampel M, N, O dan P.

Food Sample *Sampel*	**Volume required to decolourise 1 ml of 0.1% DCPIP solution (ml)** *Isi padu yang diperlukan untuk melunturkan 1 ml larutan DCPIP 0.1% (ml)*
0.1% ascorbic acid *asid askorbik 0.1%*	1.1
M	4.0
N	2.1
O	0.8
P	0.5

Table 2
Jadual 2

Which of the following fruit are represented by M, N, O and P ?
Antara yang berikut, buah yang manakah mewakili M, N, O dan P?

	M	N	O	P
A	Cabbage *Kobis*	Banana *Pisang*	Guava *Jambu batu*	Orange *Oren*
B	Banana *Pisang*	Cabbage *Kobis*	Orange *Oren*	Guava *Jambu batu*
C	Guava *Jambu batu*	Orange *Oren*	Cabbage *Kobis*	Banana *Pisang*
D	Orange *Oren*	Guava *Jambu batu*	Banana *Pisang*	Cabbage *Kobis*

21 Diagram 15 shows a process occurs in an animal cell .
Rajah 15 menunjukkan suatu proses yang berlaku di dalam suatu sel haiwan.

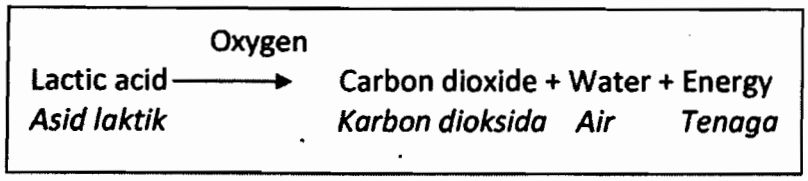
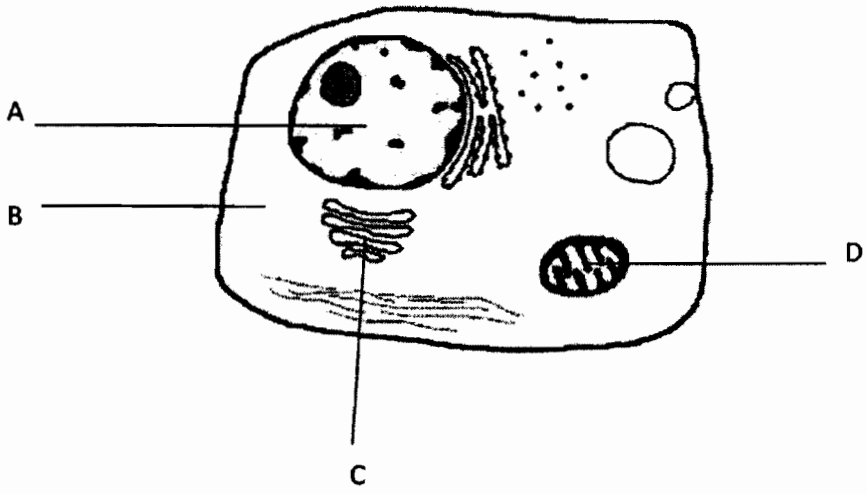


Diagram 15
Rajah 15

Which of the labelled part in the animal cell does this process occurs?
Bahagian berlabel manakah pada rajah struktur sel berikut terlibat dalam proses tersebut?



22 Breathing is an involuntary process which is controlled by respiratory centre located in medulla oblongata.
Which of the following will trigger the respiratory centre to increase the breathing rate?
Respirasi adalah tindakan luar kawal yang dikawal oleh pusat kawalan pernafasan di medulla oblongata.
Manakah antara berikut akan menyebabkan pusat kawalan pernafasan meningkatkan kadar respirasi?

A The blood pH decreases
pH darah menurun
B The blood glucose level decreases
Aras glukosa darah menurun.
C The blood temperature decreases
Suhu darah menurun.
D The blood osmotic pressure decreases
Tekanan darah menurun

23 Diagram 16 shows a cross section of an alveolus with the blood capillary.
Rajah 16 menunjukkan keratan rentas alveolus dengan kapilari darah.

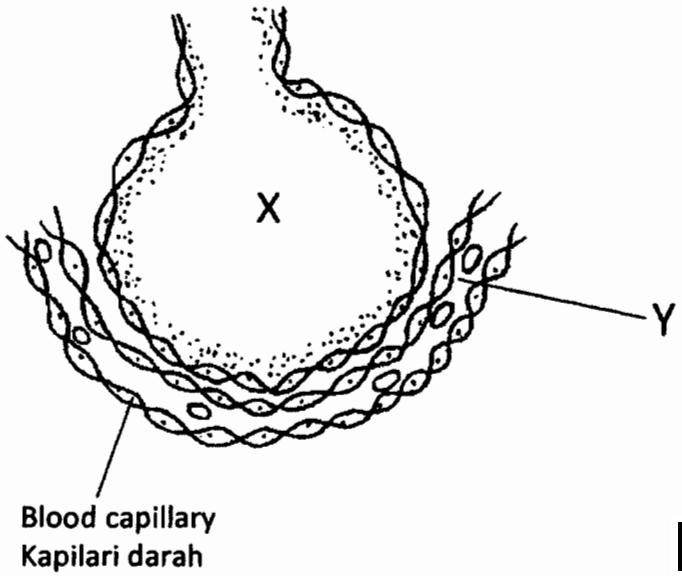


Diagram 16
Rajah 16

Which of the following causes diffusion of oxygen from X into Y ?
Antara berikut manakah yang akan menyebabkan resapan gas oksigen dari X ke Y ?

	X	Y
A	High carbon dioxide concentration *Kepekatan karbon dioksida yang tinggi*	Low oxygen concentration *Kepekatan oxygen yang rendah*
B	High oxygen concentration *Kepekatan oxygen yang tinggi*	Low oxygen concentration *Kepekatan oxygen yang rendah*
C	High carbon dioxide concentration *Kepekatan karbon dioksida yang tinggi*	Low carbon dioxide concentration *Kepekatan karbon dioksida yang rendah*
D	Low oxygen concentration *Kepekatan oxygen yang rendah*	High oxygen concentration *Kepekatan oxygen yang tinggi*

24 Diagram 17 shows the respiratory structure of an insect.
Rajah 17 menunjukkan struktur respirasi serangga.

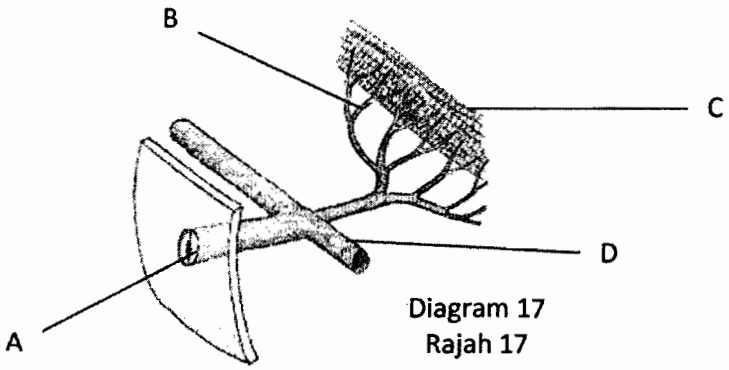


Diagram 17
Rajah 17

Which part does the gaseous exchange occur?
Pada bahagian manakah pertukaran gas berlaku?

25 Table 3 shows the respiratory structure of various living organism.
What are P and Q?
Jadual 3 menunjukkan struktur respirasi pelbagai organisma hidup.
Apakah P dan Q ?

Organism *Organisma*	Respiratory structure *Struktur respirasi*
Human *Manusia*	Lungs *Peparu*
Frog *Katak*	P
Protozoa *Protozoa*	Q

Table 3 / Jadual 3

	P	Q
A	Gills *Insang*	Mucus *Mukus*
B	Lungs *Peparu*	Cell wall *Dinding sel*
C	Skin *Kulit*	Plasma membrane *Membran plasma*
D	Trachea *Trakea*	Skin *Kulit*

26 Diagram 18 shows an interaction between organism X and Y.
Rajah 18 menunjukkan satu interaksi antara organisma X dan Y.

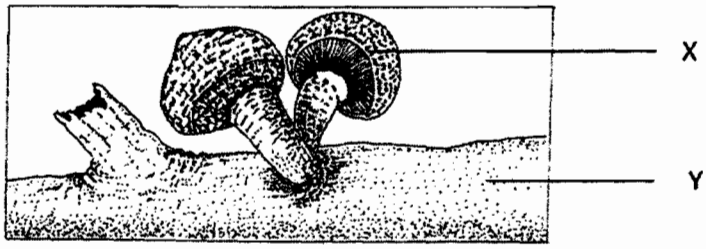


Diagram 18
Rajah 18

What type of interaction that exists between organism X and Y?
Apakah jenis interaksi yang wujud di antara organisma X dan Y ?

A Parasitisme / *parasitik*
B Commensalism/*komensalisma*
C Mutualism/*mutualisma*
D Saprophytism /*saprofitisma*

27 Diagram 19 shows a food chain showing the feeding relationship among the living organism in an ecosystem
Rajah 19 menunjukkan satu rantai makanan yang menunjukkan perhubungan pemakanan di kalangan organisma hidup dalam suatu ekosistem.

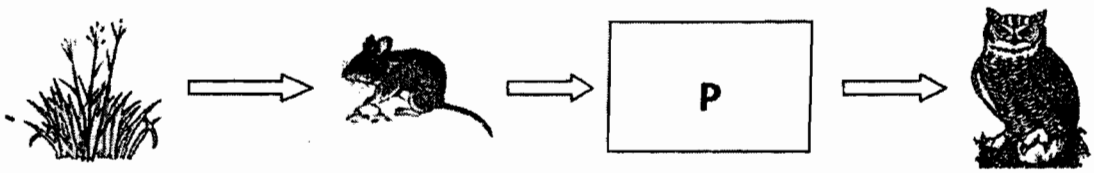


Diagram 19
Rajah 19

Which of the following is P?
Antara organisma berikut yang manakah P ?

A Dog
Anjing
B Rabbit
Arnab
C Snake
Ular
D Grasshopper
Belalang

28 Diagram 20 shows the root system of a mangrove speceies.
Rajah 20 menunjukkan sistem akar speseis pokok bakau.

Diagram 20
Rajah 20

Which of the following species of mangroove trees that has this type of root system?
Manakah antara spesis pokok bakau yang berikut mempunyai sistem akar tersebut?

A *Bruguiera sp.*
B *Avicennia sp.*
C *Rhizophora sp.*
D *Sonneratia sp.*

29 Greenhouse effect is caused mainly by increasing of carbon dioxide in the atmosphere. Which of the following process can reduce the amount of carbon dioxide?
Kesan rumah hijau adalah disebabkan terutamanya oleh peningkatan karbon dioksida di atmosfera.
Yang manakah antara proses berikut boleh mengurangkan kandungan karbon dioksida?

A Photosynthesis
Fotosintesis
B Transpiration
Transpirasi
C Combustion
Pembakaran
D Respiration
Respirasi

30 Diagram 21 shows the phenomenon of oil spill in the sea.
Rajah 21 menunjukkan fenomena tumpahan minyak di lautan.

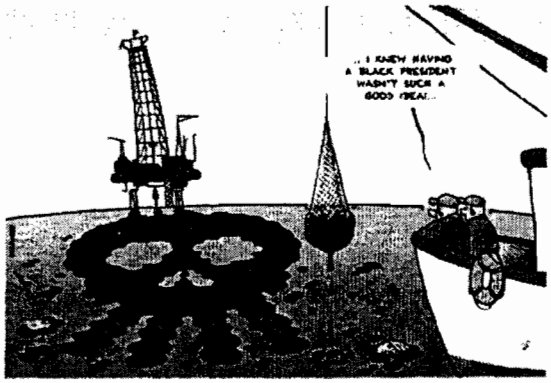


Diagram 21
Rajah 21

What is the effect of oil spill?
Apakah kesan tumpahan minyak ini?

A Prevents the release of carbon dioxide to the atmosphere
Menghalang pembebasan karbon dioksida ke atmosfera
B Reduces the oxygen content in the sea
Mengurangkan kandungan oksigen di dalam lautan
C Causes the spread of fire
Menyebabkan api merebak
D Increase the temperature
Peningkatan suhu

31 Diagram 22 shows the negative effects caused by phenomenon X.
Rajah 22 menunjukkan kesan negatif yang disebabkan oleh fenomena X.

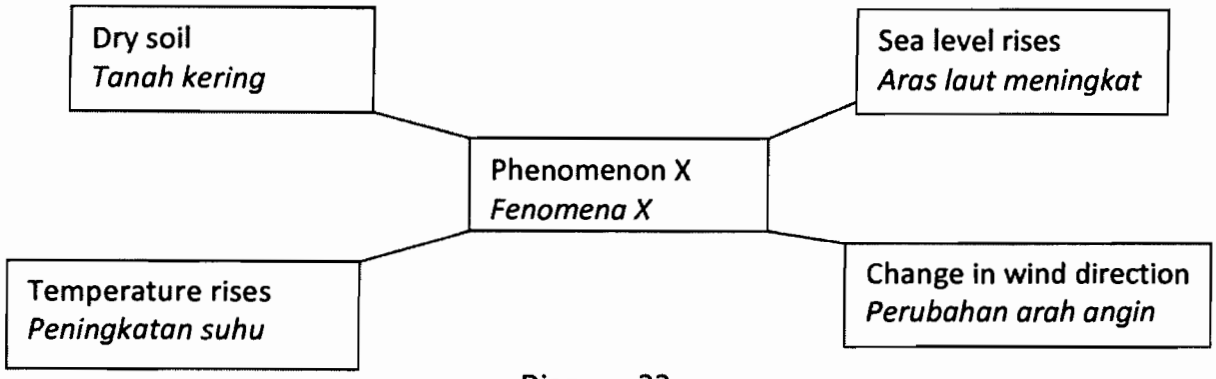


Diagram 22
Rajah 22

What is phenomenon X?
Apakah fenomena X?

A Thinning of ozone layer
Penipisan lapisan ozon
B Global Warming
Pemanasan global
C Thermal pollution
Pencemaran terma
D Air pollution
Pencemaran udara

32 Diagram 23 shows the appliances that can leads to a bad phenomenon.
Rajah 23 menunjukkan penggunaan bahan-bahan yang boleh menyebabkan satu fenomena buruk.

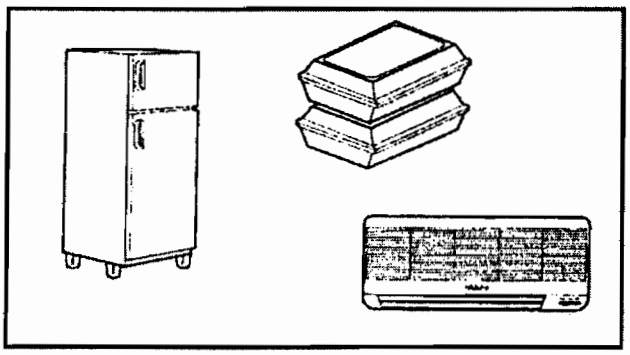


Diagram 23
Rajah 23

Which of the following referred to the phenomenon?
Antara berikut yang manakah dirujuk kepada fenomena ini?

A Air pollution
Pencemaran udara
B Green house effect
Kesan rumah hijau
C Thinning of the ozone layer
Penipisan lapisan ozon
D Reduction in earth temperatures
Penurunan suhu bumi

33 Diagram 24 shows a type of human blood cell.
Rajah 24 menunjukkan sejenis sel darah manusia.

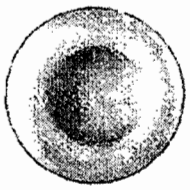


Diagram 24
Rajah 24

What is the main function of this cell?
Apakah fungsi utama sel ini?

A To transport carbon dioxide
Mengangkut karbon dioksida
B To transport antibodies
Mengangkut antibody
C To produce antitoxsin
Menghasilkan antitoksin
D To transport oxygen
Mengangkut oksigen

34 Diagram 25 shows a condition related to blood clotting.
Rajah 25 menunjukkan situasi yang berkaitan dengan pembekuan darah.

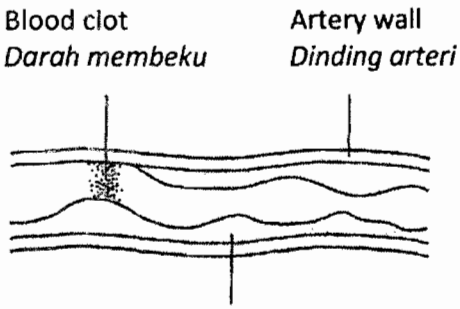


Diagram 25
Rajah 25

Which of the following is caused by the condition?
Antara berikut yang manakah disebabkan oleh keadaan ini?

A Arteriosclerosis
Arteriosklerosis
B Agglutination
Aglutinasi
C Thrombosis
Trombosis
D Lysis
Lisis

35 A girl accidentally injured herself by a rusty nail. Immediately, she was given an anti-tetanus injection.
What type of immunity is the girl obtained?
Seorang budak perempuan telah tercedera kerana terpijak paku berkarat.
Dengan serta merta, dia telah diberi suntikan anti-tetanus.
Apakah keimunan yang diperolehi kanak-kanak perempuan tersebut?

A Active natural immunity
Keimunan aktif semulajadi

B Active artificial immunity
Keimunan aktif buatan

C Passive artificial immunity
Keimunan pasif buatan

D Passive natural immunity
Keimunan pasif semulajadi

36 Diagram 26 shows a human cervical vertebra.
Rajah 26 menunjukkan struktur vertebra serviks manusia.

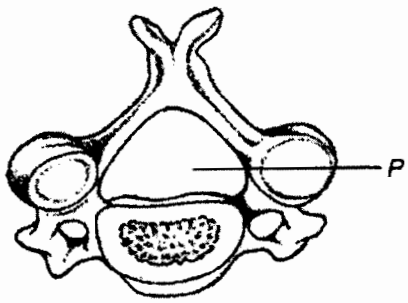


Diagram 26
Rajah 26

Which of the following is the function of the part labelled P?
Antara berikut yang manakah fungsi bagi bahagian berlabel P?

A Enclosed the spinal cord
Melindungi saraf tunjang
B For muscle attachment
Untuk pelekatan otot
C Protect blood vessels
Melindungi salur darah
D Absorbed pressure
Menyerap tekanan

37 Diagram 27 shows the type of tissue in a plants stem.
Rajah 27 menunjukkan bentuk tisu dalam batang sejenis tumbuhan.

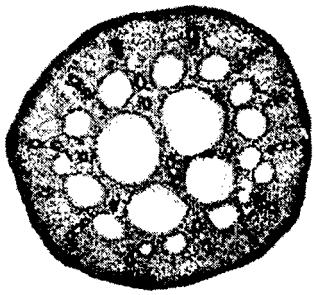


Diagram 27
Rajah 27

What is the type of the tissue?
Apakah jenis tisu itu ?

A Aerenchyma
Aerenkima
B Collenchyma
Kolenkima
C Parenchyma
Parenkima
D Sclerenchyma
Sklerenkima

38 Diagram 28 shows the main parts of the brain.
Rajah 28 menunjukkan bahagian utama otak.

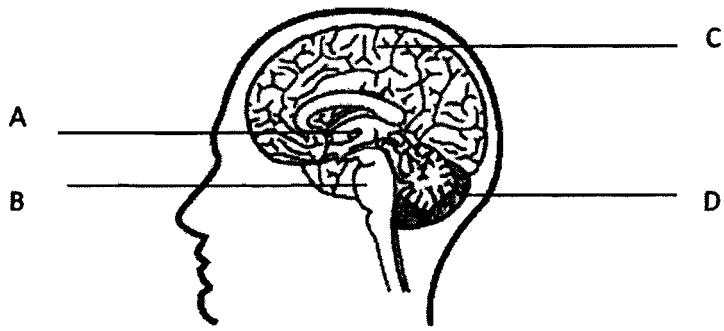


Diagram 28
Rajah 28

Which part controls the breathing rate?
Bahagian manakah yang mengawal kadar pernafasan?

39 Diagram 29 shows a type of neurone
Rajah 29 menunjukkan sejenis neuron

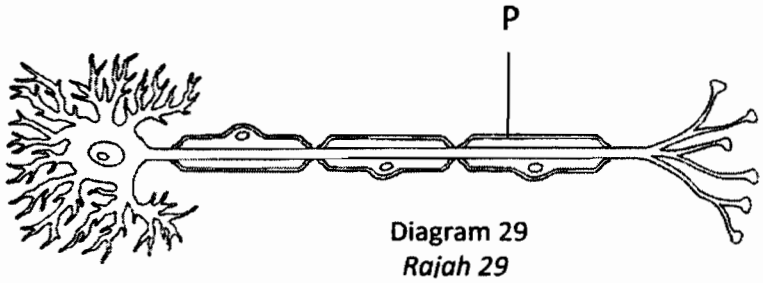


Diagram 29
Rajah 29

P is the structure that surrounds the axon of a neurone.
What is the function of structure P?
P ialah struktur yang membaluti axon sesuatu neuron .
Apakah fungsi struktur P?

A Transmit impulses towards cell body
Membawa impuls ke arah badan sel
B Carry impulses away from body cell
Membawa impuls daripada badan sel
C As an insulating membrane for axon.
Bertindak sebagai membran penebat bagi akson
D Speed up the transmission of impulses
Mempercepatkan penghantaran impuls

40 Table 4 shows the information about the endocrine system and the nervous system. Which of the following is the correct difference between the endocrine system and the nervous system?
Jadual 4 menunjukkan maklumat berkenaan sistem endokrin dan sistem saraf.
Antara yang berikut, yang manakah menunjukkan perbezaan yang betul di antara sistem endokrin dan sistem saraf?

	Endocrine system *Sistem endocrine*	Nervous system *Sistem saraf*
A	Effect last longer *Kesan tahan lama*	Effect disappear very fast *Kesan hilang dengan cepat*
B	Localised effects *Kesan pada bahagian tertentu*	More widespread effects *Kesan kepada banyak bahagian badan*
C	Information carried in electrical form *Maklumat dibawa dalam bentuk elektrik*	Information carried in chemical form *Maklumat dibawa dalam bentuk bahan kimia*
D	Control by cerebrum *Dikawal oleh sereberum*	Control by cerebellum *Dikawal oleh serebellum*

Table 4
Table 4

41 Diagram 30 shows the human endocrine system.
Rajah 30 menunjukkan sistem endokrin manusia.

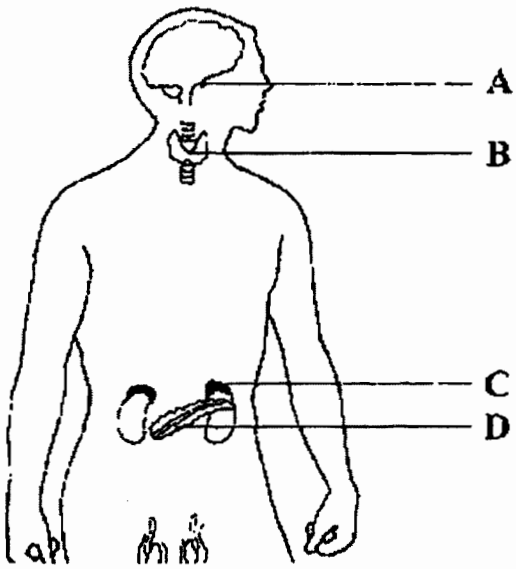


Diagram 30
Rajah 30

Which of the glands A, B,C, or D, is involved in regulates the body metabolism
Antara kelenjar A,B,C atau D yang manakah terlibat dalam mengawalatur metabolisme badan.

42 Diagram 31 shows the female reproductive system of human.
Rajah 31 menunjukkan sistem pembiakan perempuan.

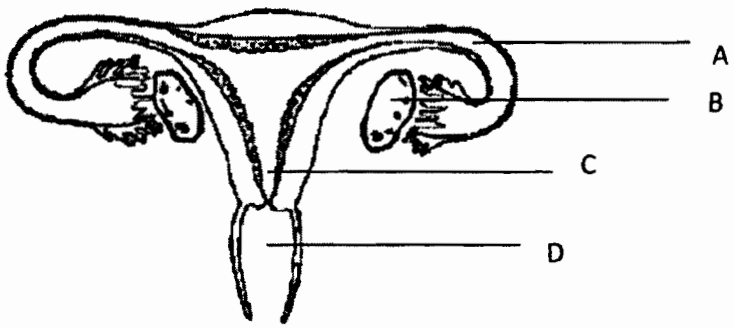


Diagram 31
Rajah 31

Which part labelled A, B, C or D is the site where the fusion of a sperm and an ovum occur?
Bahagian manakah berlabel A, B, C dan D ialah tempat percantuman antara sperma dan ovum berlaku?

43 Diagram 32 shows a cross section through part of a seminiferous tubule in human testis.
Rajah 32 menunjukkan keratan rentas sebahagian tubul seminiferus dalam testis manusia.

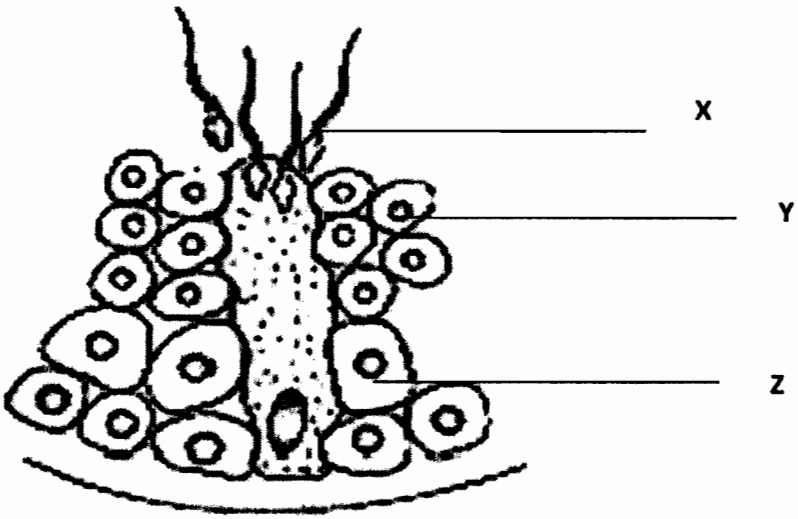


Diagram 32
Rajah 32

Which of the following shows the correct number of chromosomes in X , Y and Z ?
Antara berikut manakah menunjukkan bilangan kromosom yang betul dalam X, Y dan Z ?

	X	Y	Z
A	diploid	haploid	haploid
B	diploid	diploid	haploid
C	haploid	haploid	diploid
D	haploid	diploid	haploid

44 Diagram 33 shows the hormone X and Y released by the pituitary gland during the menstrual cycle.
Rajah 33 menunjukkan hormon X dan Y yang dirembeskan oleh kelenjar pituitari semasa kitar haid.

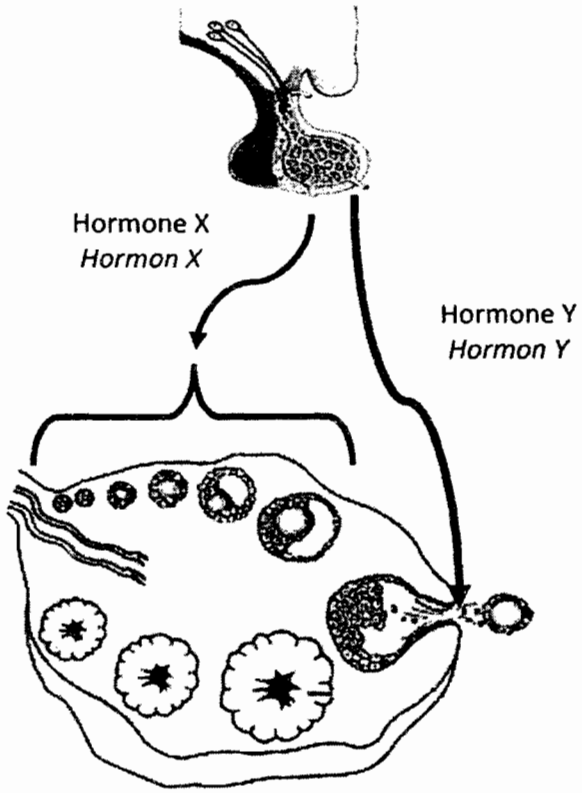


Diagram 33
Rajah 33

What are X and Y ?
Apakah X dan Y ?

	X	Y
A	Follicle Stimulating Hormone *Hormon Perangsang Folikel*	Oestrogen *Estrogen*
B	Follicle Stimulating Hormone *Hormon Perangsang Folikel*	Luteinising Hormone *Hormon Peluteinan*
C	Luteinising Hormone *Hormon Peluteinan*	Follicle Stimulating Hormone *Hormon Perangsang Folikel*
D	Oestrogen *Estrogen*	Follicle Stimulating Hormone *Hormon Perangsang Folikel*

45 Diagram 34 shows the stages in the formation of a twin.
Rajah 34 menunjukkan peringkat dalam pembentukan anak kembar.

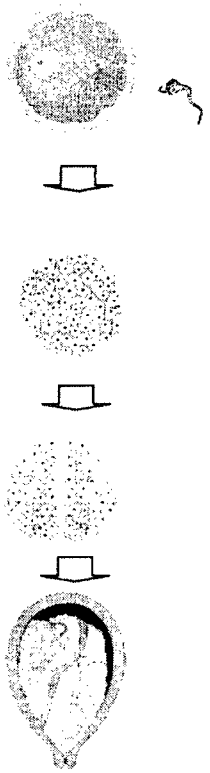


Diagram 34
Rajah 34

Which of the following photographs shows the products of the above fertilisation.
Gambar foto manakah berikut adalah hasil daripada persenyawaan di atas

A 

C 

B 

D 

46 The statements below are about the contributions of science and technology to human reproduction to overcome infertility.
Penyataan berikut adalah tentang sumbangan sains dan teknologi dalam pembiakan manusia bagi mengatasi masalah kemandulan.

- The sperms of men with low sperm count are collected over a period of time so that the sperm count will be high enough for fertilization
  Sperma daripada lelaki yang mengandungi bilangan sperma yang rendah dikumpulkan pada satu-satu masa yang sesuai supaya bilangan sperma adalah betul-betul mencukupi bagi membolehkan persenyawaan berlaku.
- The wife can be inseminated with the husband's sperm or sperm from a sperm bank
  Isteri boleh disenyawakan dengan sperma suami atau sperma dari bank sperma
- The sperm are injected directly into the fallopian tube
  Sperma disuntik terus ke dalam tiub falopian

Which of the following methods match to the above statements ?
Manakah kaedah yang berikut sepadan dengan penyataan di atas?

A Artificial insemination / *Permanian beradas*
B In vitro fertilization / *Persenyawaan in-vitro*
C Intrauterine device / *Alat intrauterine*
D Tubal ligation / Ligasi

47 Diagram 35 shows the development of pollen in a pollen sac
Rajah 35 menunjukkan perkembangan debunga dalam kantung debunga
Which combination is true about P , Q and R?
Gabungan manakah yang benar tentang P, Q dan R?

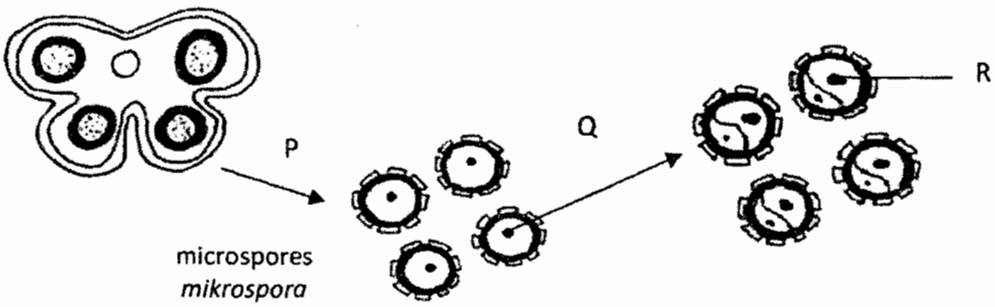


Diagram 35
Rajah 35

	P	Q	R
A	Mitosis	Meiosis	Tube nucleus/*Nukleus tiub*
B	Meiosis	Mitosis	Tube nucleus/*Nucleus tiub*
C	Mitosis	Meiosis	Generative nucleus / *Nukleus generatif*
D	Meiosis	Mitosis	Generative nucleus /*Nukleus generatif*

48 In monohybrid cross, the genotype of two parents are Bb and Bb.
B represents dominant allele for black fur; b represents recessive allele for white fur.
What is the probability of having the offspring with a white fur?
Dalam kacukan monohibrid , genotip induk adalah Bb dan Bb.
B mewakili alel dominan bagi bulu hitam , b mewakili alel resesif bulu putih.
Apakah kebarangkalian anak-anknya mempunyai bulu putih?

A 0.25
B 0.59
C 0.75
D 1.00

49 Diagram 36 shows the karyotype of a person with a genetic abnormality.
Rajah 36 menunjukkan kariotip seseorang dengan genetik yang tidak normal

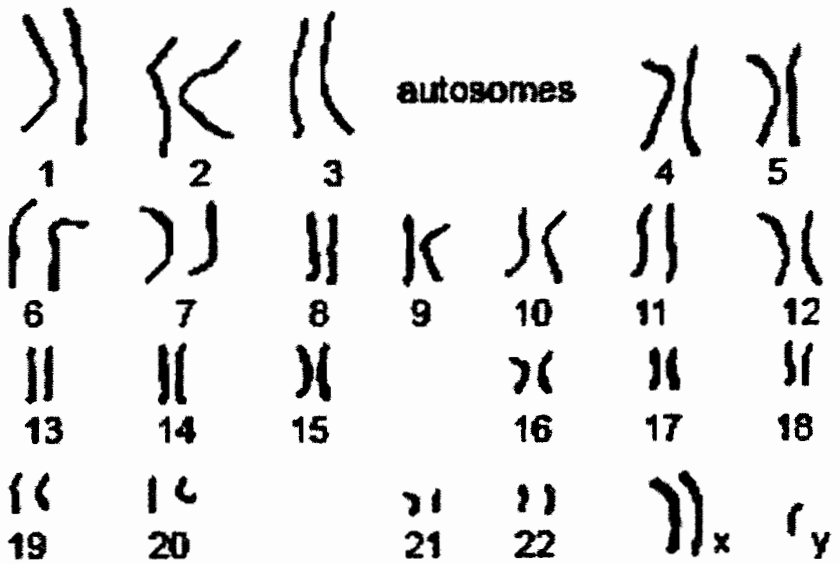


Diagram 36
Rajah 36

Which of the following individual have the karyotype shown in the above diagram ?
Antara individu berikut,yang manakah mempunyai kariotip seperti dalam rajah di atas?

A A male with Klinefelter's syndrome
Lelaki Sindrom Klinefelter
B A female with Klinefelter's syndrome
Perempuan Sindrom Klinefelter
C A male with Down's Syndrome
Lelaki Sindrom Down
D A female with Down's syndrome
Perempuan Sindrom Down

50 The following is the information about individual S and T.
Berikut adalah maklumat tentang individu S dan T

Individual S : Free ear lobes *Individu S : cuping telinga bebas* Individual T : Attached lobes *Individu T : cuping telinga melekap*

Which factor causes the difference in the traits of the two individuals?
Faktor yand manakah yang menyebabkan perbezaan trait bagi kedua-dua individu itu?

A Hormone
Hormone
B Nutrition
Nutrisi
C Environment
Persekitaran
D Genetic
Genetik

No	Jawapan (KERTAS 1 2012)		
1	D	26	D
2	C	27	C
3	D	28	C
4	D	29	A
5	C	30	B
6	A	31	B
7	D	32	C
8	B	33	D
9	A	34	C
10	B	35	C
11	B	36	A
12	B	37	A
13	C	38	B
14	B	39	C
15	C	40	A
16	A	41	B
17	A	42	A
18	A	43	C
19	D	44	B
20	D	45	B
21	B	46	A
22	A	47	D
23	B	48	A
24	C	49	B
25	C	50	D

SULIT

Biology
Kertas 2
30.8.2012
2 ½ jam

PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM

TAHUN 2012

BIOLOGY
Kertas 2

Dua Jam Tiga Puluh Minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa*
2. *Soalan dalam bahasa Inggeris mendahului soalan sepadan dalam bahasa Melayu.*
3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu*

Untuk Kegunaan Guru Pemeriksa			
Nama Pemeriksa :			
Bahagian	Soalan	Markah Penuh	Markah Diperoleh
A	1	12	
	2	12	
	3	12	
	4	12	
	5	12	
B	6	20	
	7	20	
	8	20	
	9	20	
Jumlah			

Kertas soalan ini mengandungi 22 halaman bercetak

Section A
Bahagian A
[60 marks] / [*60 markah*]

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

1 Diagram 1.1 shows the structure of an animal cell found in pancreas.
The function of the cell is to produce extracellular enzyme.
Rajah 1.1 menunjukkan sel haiwan yang dijumpai di dalam pancreas.
Fungsi sel tersebut ialah menghasilkan enzim luar sel.

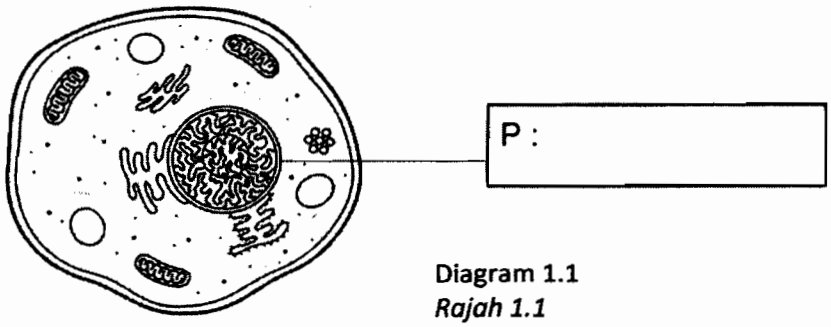


Diagram 1.1
Rajah 1.1

(a) (i) Name P.
Namakan P.

[1 mark]
[1 *markah*]

(ii) State the function of P.
Nyatakan fungsi P.

.....

[1 mark]
[1 *markah*]

(b) Diagram 1.2 shows structure X which is the main component of P.
Structure X plays an important role in producing the extracelluar enzyme.
Rajah 1.2 menunjukkan struktur X iaitu komponen utama dalam P. Struktur X memainkan peranan penting dalam penghasilan enzim luar sel.

Diagram 1.2
Rajah 1.2

(i) What is X ?
Apakah X?

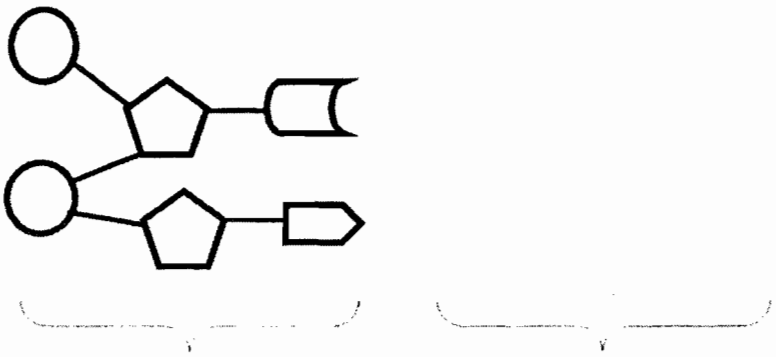
.....

[1 mark]
[1 *markah*]

Lihat Muka Surat Sebelah

(ii) X is made of DNA which consists of two polynucleotide chains.
Diagram below shows an incomplete structure of DNA at one polynucleotide chain.
Complete the diagram by drawing the structure at the another polynucleotide chain .

X dibina daripada DNA yang terdiri daripada dua rantaian polinukleotida.
Rajah di bawah menunjukkan struktur X yang tidak lengkap pada satu rantai polinukleotida.
Lengkapkan rajah tersebut dengan melukiskan struktur pada rantai polinukleotida yang satu lagi



Polynucleotide Chain – 1
Rantai polinukleotida - 1

Polyucleotide Chain – 2
Rantai polinukleotida - 2

[2 marks]
[2 *markah*]

(c) (i) Explain the role of X in the production of an extracellular enzyme.
Terangkan peranan X dalam penghasilan enzim luar sel.

.....

.....

.....

.....

.....

[4 marks]
[4 *markah*]

(ii) Give one example of an extracellular enzyme produced by the cell.
Berikan satu contoh enzim luar sel yang dihasilkan oleh sel tersebut

.....

[1 mark]
[1 *markah*]

(d) The cell is exposed to the radioactive rays.
Explain how this affect the function of the cell
Sel telah terdedah kepada pancaran radioaktif.
Terangkan kesannya keatas fungsi sel tersebut

.....

.....

[2 marks]
[2 markah]

2 Diagram 2.1 shows the action of sucrase on a substrate.
Rajah 2.1 menunjukkan tindakan enzim sukrase terhadap satu substrat.

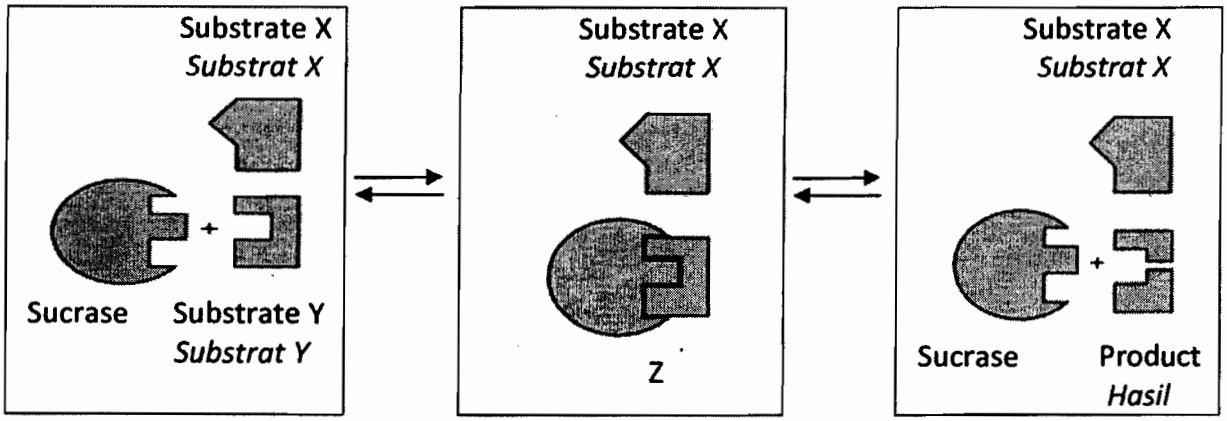


Diagram 2.1
Rajah 2.1

(a) Name the substrate Y , Z and product?
Namakan substrat Y, Z dan hasil?

(i) Substrate Y :
Substrat Y : .....

(ii)
Z : .....

(iii) Product :
Hasil : . .....

[3 *marks]*
[3 markah]

(b) Explain why substrate Y, but not substrate X, can combine with the enzyme.
Terangkan mengapa substrat Y, tetapi bukan substrat X boleh bergabung engan enzim.

.....

.....

.....

[2 marks]
[2 markah]

(c) Based on Diagram 2.1, state **two** characteristics of the enzyme.
*Berdasarkan Rajah 2.1, nyatakan **dua** ciri bagi enzim.*

.....

.....

.....

.....

[2 marks]
[2 markah]

(d) Diagram 2.2 shows the results of an experiment in which two similar shirts P and Q with same blood stains. The shirts were washed by using enzyme-containing washing powder at two different temperatures, 35°C and 65°C.

Rajah 2.2 menunjukkan hasil satu eksperimen di mana dua baju yang sama, P dan Q dengan kotoran darah yang sama. Baju tersebut dicuci menggunakan serbuk pencuci yang mengandungi enzim pada dua suhu yang berlainan, 35°C and 65°C.

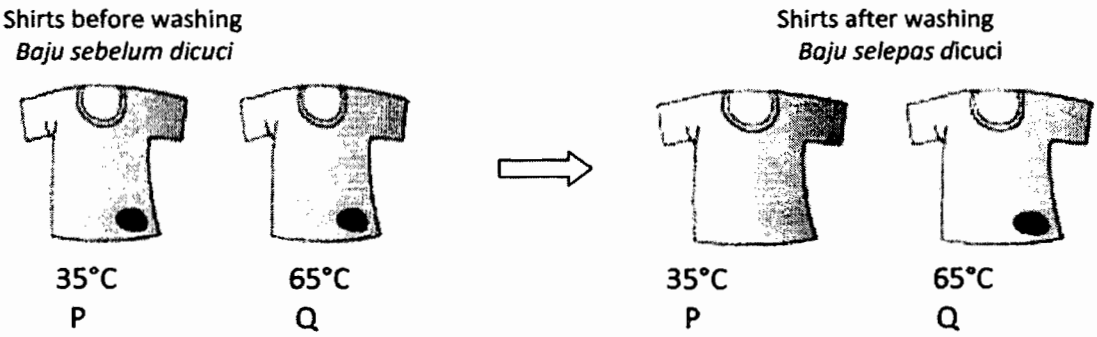


Diagram 2.2
Rajah 2.2

(i) Explain the result of washing the shirts in Diagram 2.2 at:
Terangkan hasil keputusan dalam Rajah 2.2 bagi setiap baju yang dicuci.

35°C : .....

.....

.....

65°C : .....

.....

.....

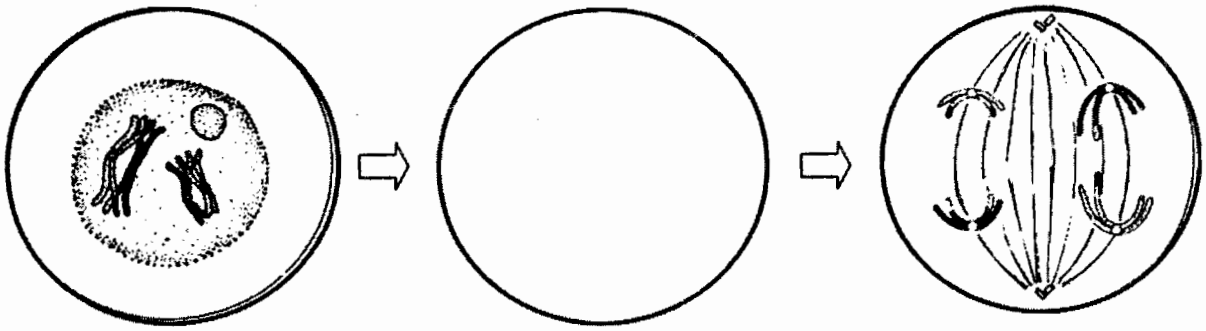
[4 marks]
[4 markah]

(ii) Name the enzyme present in washing powder to remove blood stains.
Namakan enzim yang terdapat dalam serbuk pencuci untuk menyingkirkan kotoran darah.

.....

[1 mark]
[1 markah]

3 Diagram 3.1 shows a part of stages in a cell division of an organism.
Rajah 3.1 menunjukkan sebahagian peringkat dalam pembahagian sel suatu organism.



Stage X
Peringkat X
(a)

Stage Y
Peringkat Y
(b)

Stage Z
Peringkat Z
(c)

Diagram 3.1
Rajah 3.1

(a) (i) Based on Diagram 3.1 , name the type of cell division.
Berdasarkan pada Rajah 3.1, namakan jenis pembahagian sel

.....

[1 mark]
[1 *markah*]

(ii) State your reason in a (i)
Nyatakan alasan anda di a(i).

.....

.....

[2 mark]
[2 *markah*]

Lihat Muka Surat Sebelah

(b) . (i) Draw the chromosomal behavior in stage Y in diagram 3.1(b)
Lukiskan tingkahlaku kromosom di peringkat Y dalam Rajah 3.1(b)

[1 mark]
[*1 markah*]

(ii) Name stage X and Z
Namakan peringkat X dan peringkat Z.

Stage X : .....
Peringkat X

Stage Z : .....
Peringkat Z

[2 marks]
[*2 markah*]

(c) (i) State the event that occur during stage X in Diagram 3.1 (a).
Nyatakan peristiwa yang berlaku semasa peringkat X seperti Rajah 3.1(a)

.....

[1 mark]
[*1 markah*]

(ii) Explain one important of the event in c(i) .
Terangkan satu kepentingan peristiwa di c(i)

.....

.....

.....

.....

[2 marks]
[*1 markah*]

Lihat Muka Surat Sebelah

(d) Diagram 3.2 shows the sister chromatids that fail to separate during anaphase II.
Rajah 3.2 menunjukkan sel kromatid yang gagal terpisah semasa anafasa II.

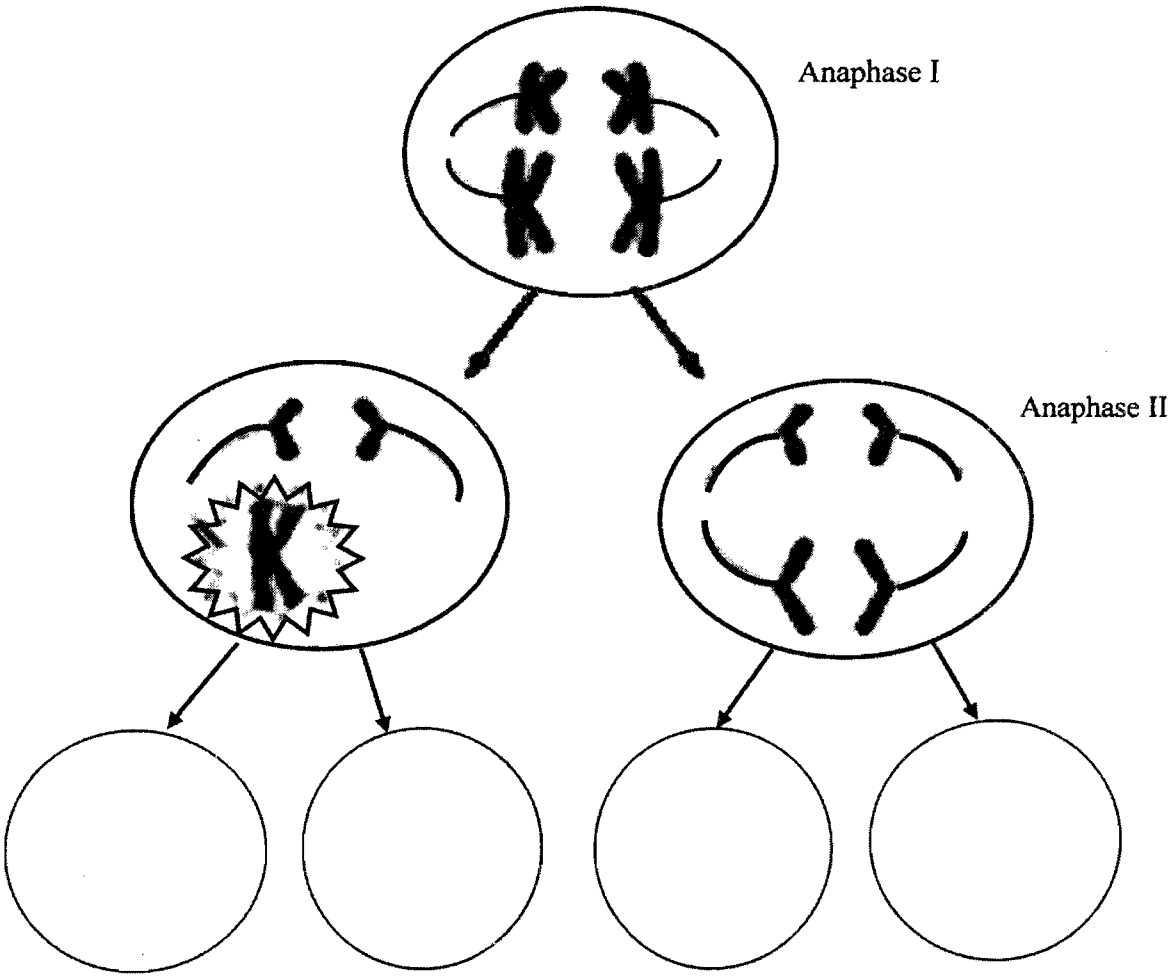


Diagram 3.2
Rajah 3.2

(i) Draw the possible chromatid that occur after the nondisjunction in Diagram 3.2
Lukiskan kemungkinan kromatid yang terbentuk selepas nondisjunksi di Rajah 3.2

[2 mark]
[*2 markah*]

(ii) Name the disorder that may occur when a normal gamete fertilize with the nondisjunction affecting human chromosomes 21 that occur as in Diagram 3.2 .
Namakan kecacatan yang mungkin berlaku apabila satu gamet normal disenyawakan dengan kromosom 21 manusia seperti dalam Rajah 3.2 yang terjejas akibat nondisjunksi.

.....

[1 mark]
[*1 markah*]

4 Diagram 4.1 shows the formation of fluid X from blood circulatory system.
Rajah 4.1 menunjukkan pembentukan cecair X daripada system peredaran darah.

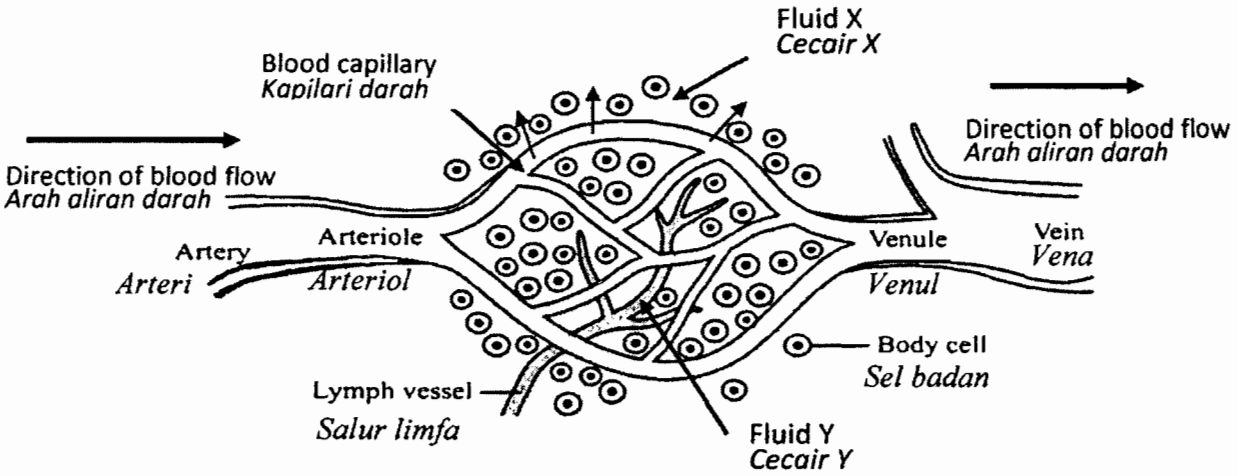


Diagram 4.1
Rajah 4.1

(a) Fluid X is originated from blood plasma which leaves the blood capillary into the intercellular spaces between the cells.
Cecair X adalah berasal daripada plasma darah yang meninggalkan kapilari darah dan memasuki ruang-ruang antara sel.

(i) Name fluid X?
Namakan cecair X?

.....

[1 mark]
[*1 markah*]

(ii) State the importance of fluid X to the body cells.
Nyatakan kepentingan cecair X kepada sel-sel badan.

.....

.....

[1 mark]
[*1 markah*]

(b) Explain how fluid X is formed.
Terangkan bagaimana cecair X dihasilkan.

.....

.....

.....

.....

[3 marks]
[*3 markah*]

(c) 90% of fluid X returns to blood circulatory system while the remain 10 % diffuse into the lymph vessel known as fluid Y.
90% cecair X balik semula ke dalam sistem peredaran darah manakala 10% daripadanya meresap ke dalam salur limfa dan dikenali sebagai cecair Y.

(i) Name fluid Y.
Namakan cecair Y.

.....

[1 mark]
[*1 markah*]

(ii) State **ONE** difference in composition between fluid Y and blood.
*Nyatakan **SATU** perbezaan dari segi komposisi antara cecair Y dan darah.*

.....

.....

[1 mark]
[*1* mark]

(iii) State **TWO** functions of lymphatic system.
*Nyatakan **DUA** fungsi sistem limfa.*

.....

.....

.....

[2 marks]
[*2 markah*]

Lihat Muka Surat Sebelah

(d) Diagram 4.2 shows an individual suffering from a disease caused by the blockage of the lymphatic system.
Rajah 4.2 menunjukkan individu menderita penyakit yang disebabkan oleh sistem limfa yang tersumbat.

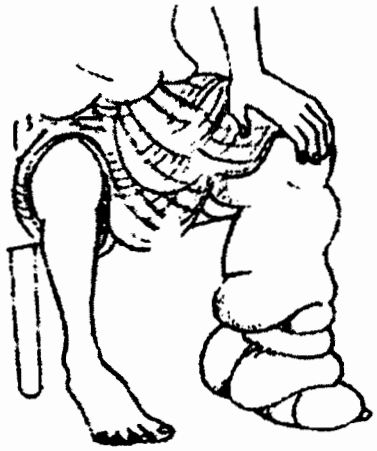


Diagram 4.2
Rajah 4.2

(i) Name the disease.
Namakan penyakit ini.

.....

[1 mark]
[*1 markah*]

(ii) Explain how the disease can happen.
Terangkan bagaimana penyakit ini boleh terjadi.

.....

.....

.....

.....

[2 marks]
[*2 markah*]

5. Diagram 5.1 shows a portion of the schematics diagram of the formation of sperms.
Rajah 5.1 menunjukkan sebahagian daripada skema pembentukan sperma.

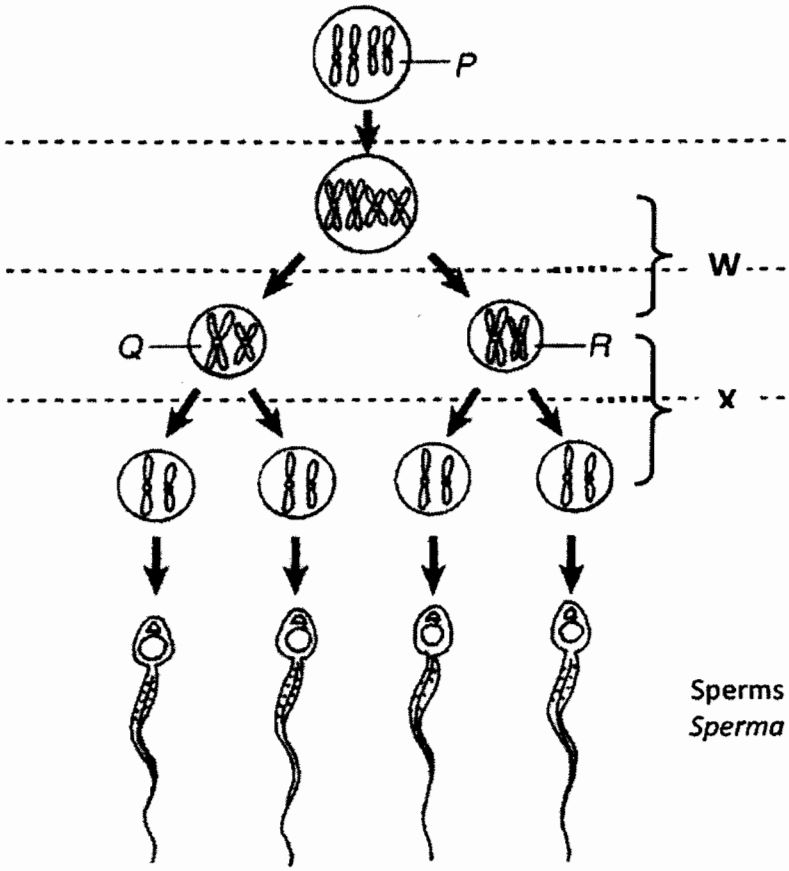


Diagram 5.1
Rajah 5.1

(a) State the chromosome numbers of cells P,Q and R.
Nyatakan bilangan kromosom untuk sel P,Q dan R.

P : .....

Q : .....

R : .....

[3 marks
[*3 markah*]

(b) Name the cell division at W and X.
Namakan pembahagian sel di W dan X.

W : .....

X : .....

[2 marks]
[2 *markah*]

(c) Explain the importance of both the process of W and X in sperm formation.
Terangkan kepentingan kedua-dua proses W dan X dalam proses pembentukan sperma.

.....

.....

.....

[2 marks]
[*2 markah*]

(d) Diagram 5.2 shows the structure of a sperm.
Rajah 5.2 menunjukkan struktur sperma

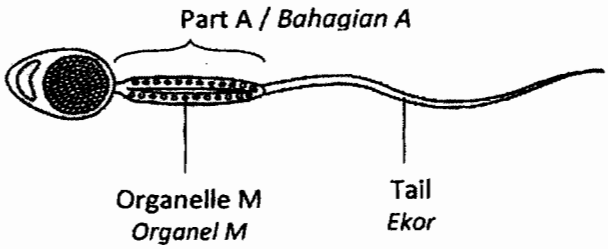


Diagram 5.2
Rajah 5.2

(i) Name organelle M which is found abundantly in part A.
Namakan organel M yang ditemui dengan banyaknya dalam bahagian A.

.....

[1 mark]
[*1 markah*]

(ii) What is the role of organelle M?
Apakah peranan organel M

.....

.....

[1 mark]
[*1 markah*]

(iii) State the function of the tail.
Nyatakan fungsi ekor

.....

[1 mark]
[*1 markah*]

(e) A married couple, who has been married for 10 years, fails to have a baby. Examination by a doctor revealed that the husband has a low sperm count. Describe one method that would help the couple to have a child
Sepasang suami isteri yang telah berkahwin selama 10 tahun telah gagal mempunyai anak. Ujian oleh doktor telah menunjukkan bahawa suami mempunyai bilangan sperma yang sedikit. Terangkan satu cara untuk pasangan ini memperolehi cahaya mata.

.....

.....

.....

.....

[2 marks]
[*2 markah*]

Section B
Bahagian B

[40 marks]
[40 markah]

Answer any **two** questions from this section.
*Jawab mana-mana **dua** soalan daripada bahagian ini*

6 Diagram 6.1 shows the movement of water and carbon dioxide in plant.

Rajah 6.1 menunjukkan pergerakan air dan karbon dioksida dalam tumbuhan.

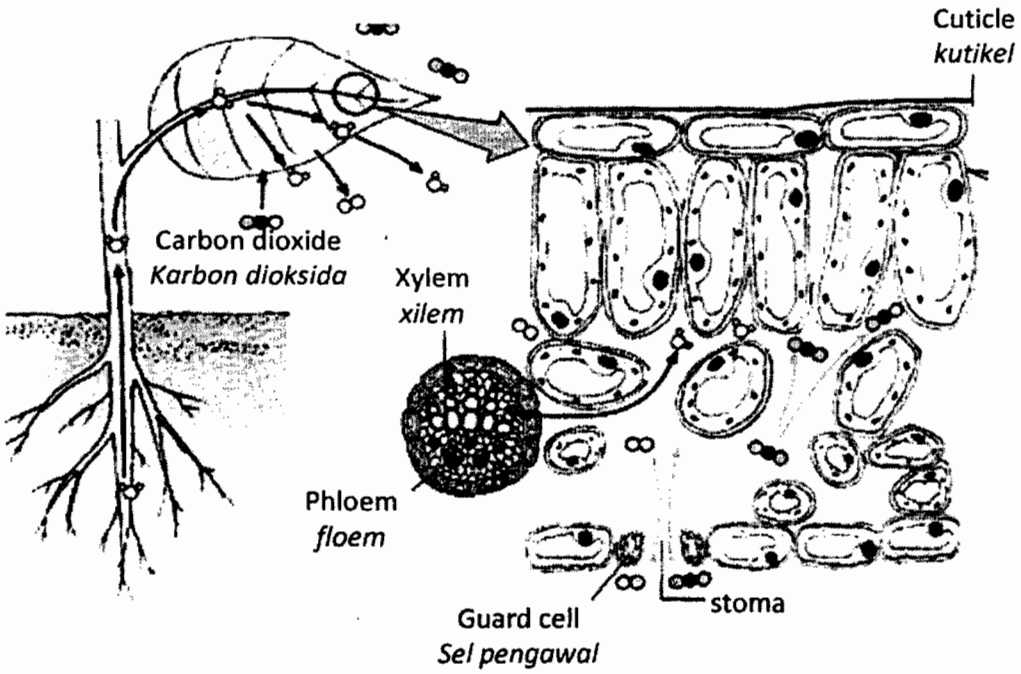


Diagram 6.1
Rajah 6.1

(a) Based of the structure above, explain the adaptation of the leaf to carry out photosynthesis efficiently

[10 marks]

Berdasarkan struktur di atas, terangkan penyesuaian pada daun untuk menjalankan proses fotosintesis dengan cekap.

[10 markah]

(b) Diagram *6.* 2 shows a method of plant cultivation without use of soil .

Rajah 6.2 menunjukkan satu kaedah penanaman tanpa menggunakan tanah.

[Lihat halaman sebelah

Diagram 6.2
Rajah 6.2

Describe the method used.

[4 marks]

Terangkan kaedah yang digunakan.

[4 markah]

(c)

Genetically Modified Organisms (GMO) are organisms which carry the genetic information or beneficial genes from other organisms.
Nowadays, the crops such as wheat, soya bean, paddy and tomatoes are widely to be cultivated commercially as genetically modified plant.

Organisma yang diubahsuai secara genetik (GMO) adalah satu organisma yang membawa maklumat genetik atau gen manfaat daripada organisma lain.
Pada masa sekarang, tanaman seperti gandum, kacang soya, padi dan tomato secara meluas ditanam sebagai tumbuhan yang diubahsuai secara genetik.

Based on the information above, discuss the advantages and the disadvantages of producing genetically modified organisms in food production .

[6 marks]

Berdasarkan maklumat di atas, bincangkan kebaikan dan keburukan menghasilkan organisma yang terubahsuai kandungan genetiknya dalam penghasilan makanan.

[6 markah]

7 Diagram 7.1 shows two types of microorganisms.
Rajah 7.1 menunjukkan dua jenis mikroorganisma

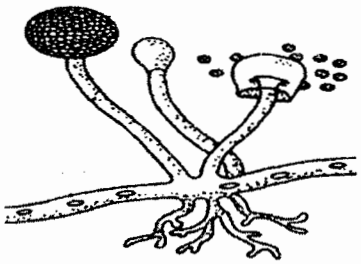
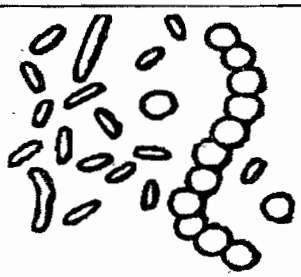
	
Microorganism P *Mikroorganisma P*	Microorganism Q *Mikroorganisma Q*

Diagram 7.1
Rajah 7.1

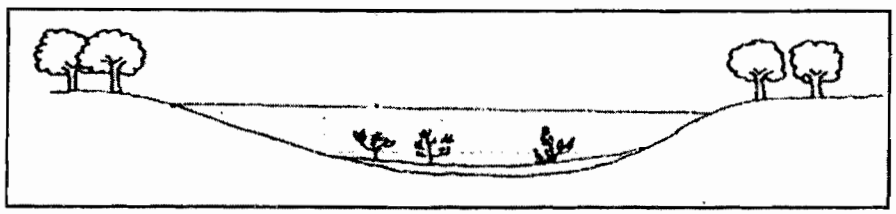
(a) Name microorganism P and microorganism Q .
Compare and contrast microorganisms P and Q with respect to their harmful and beneficial effects on humans.

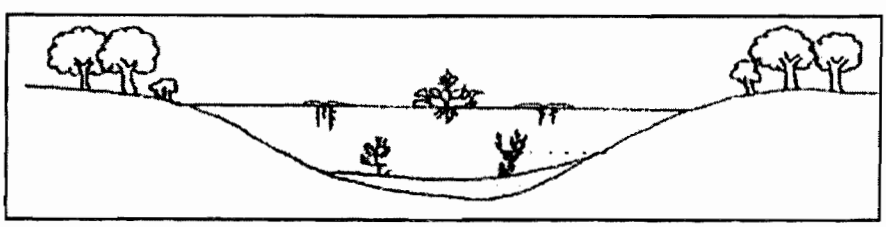
[10 marks]

Namakan mikroorganisma P dan mikroorganisma Q.
Banding dan bezakan mikroorganisma P dan mikroorganisma Q berdasarkan kesan buruk dan kesan baiknya terhadap manusia.

[10 markah]

(b) Diagram 7.2 shows the process of colonisation and succession in a freshwater pond.
Rajah 7.2 menunjukkan proses pengkolonian dan penyesaran dalam kolam air tawar.





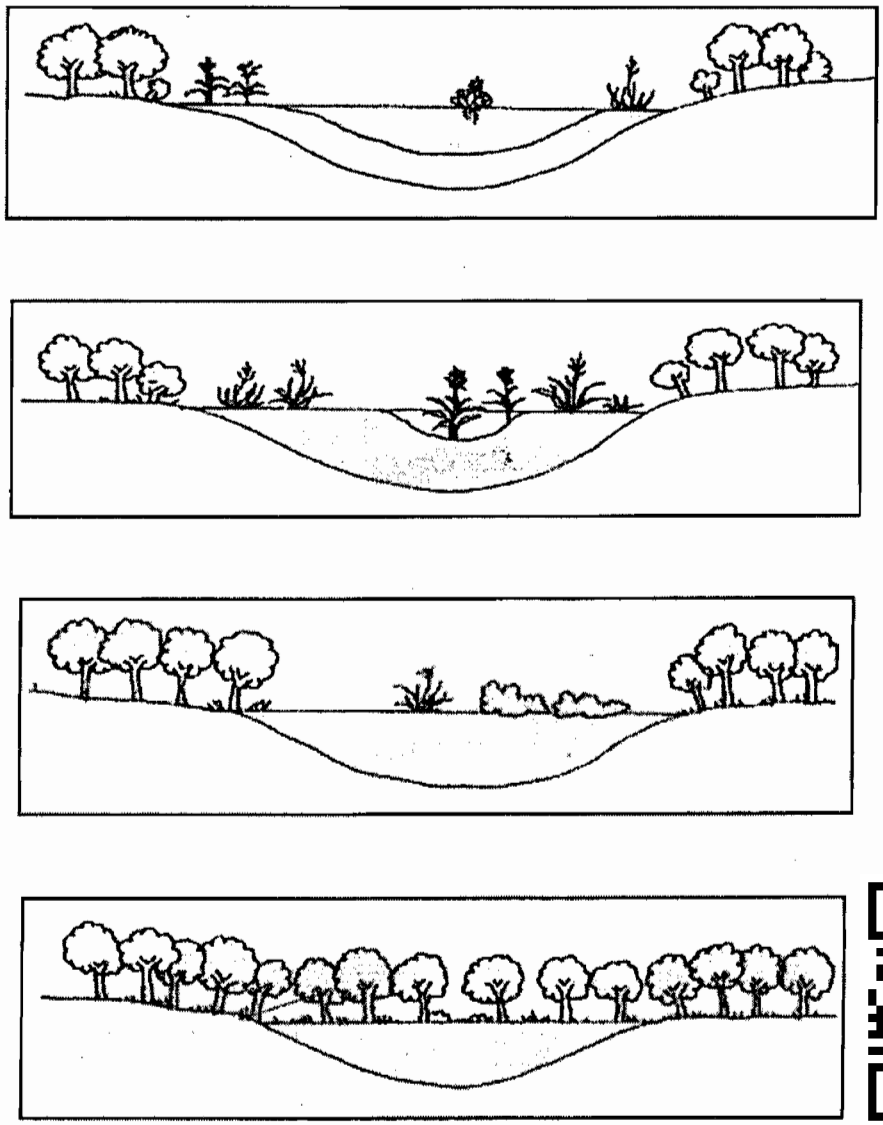


Diagram 7.2
Rajah 7.2

Based on Diagram 7.2 , explain what is meant by colonisation and succession and how the process bring about the formation of the primary forest in a habitat.

[10 marks]

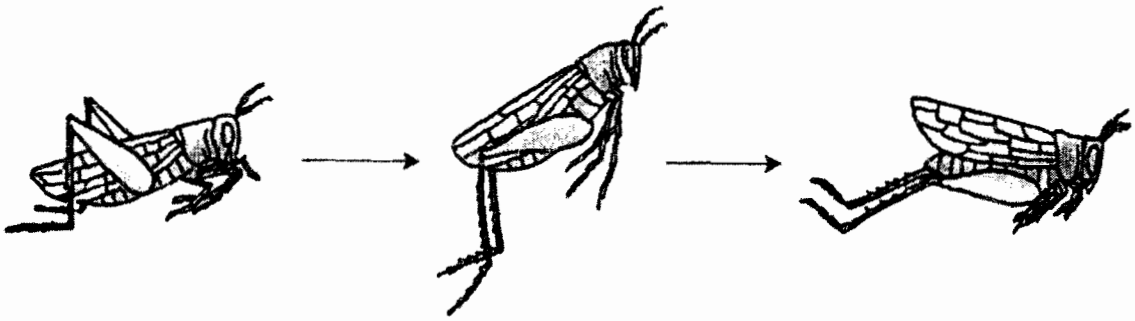
Berdasarkan Rajah 7.2, terangkan apakah yang dimaksudkan dengan pengkolonian dan penyesaran dan bagaimana pengkolonian dan penyesaran membawa kepada pembentukan hutan primer dalam suatu habitat.

[10 markah]

[Lihat halaman sebelah

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.

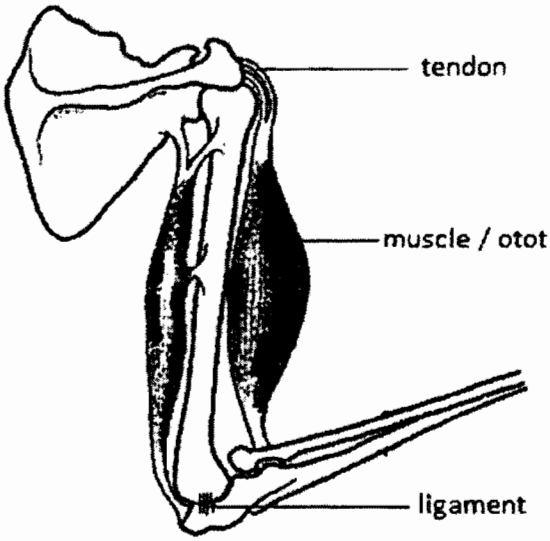


Diagram 8.3
Rajah 8.3

(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 lengan manusia 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]

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 *Jenis Kepala Sawit*	Genotype *Genotip*	Phenotype *Fenotip*	
OP1	hhFF		Thin husk / *Sabut tebal* Thick flesh / *Isi tebal*
OP2	hhFf		Thin husk / *Sabut nipis* Thick flesh / *Isi tebal*
OP3	HHff		Thick husk/*Sabut tebal* Thin flesh / *Isi nipis*
OP4	HhFf		Thick husk/*Sabut tebal* 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.

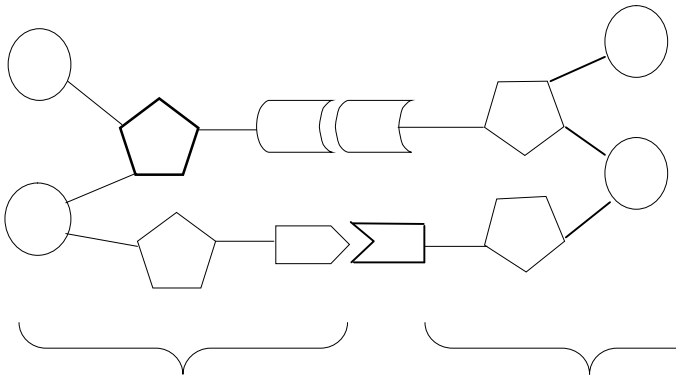
[6 marks]

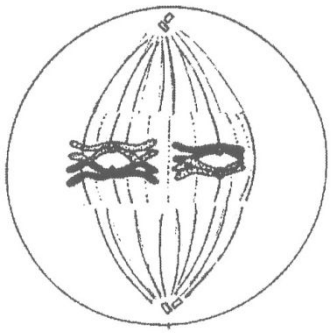
Terangkan kenapa sepasang suami isteri normal boleh melahirkan anak albino.

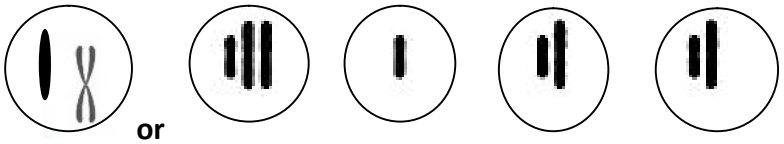
[6 markah]

Marking Scheme
(60 Marks)

PAPER 2
(4551/2)
Structured Question
Section A

				Sub Mark	Total Mark
1	(a)	(i)	P : Nucleus	1	2
		(ii)	Control the activity of the cell // Store the genetics materials / information.	1	
	(b)	(i)	Chromosome	1	3
		(ii)	 Nucleotide Chain – 1 *Rantai nukleotida - 1* Nucleotide Chain – 2 *Rantai nukleotida - 2* Drawing: 1 m Nitrogenous bases matched correctly : 1m	2	
	(c)	(i)	Information for synthesis enzyme is carried by X / (DNA). Different sequences of bases in X / (DNA) are codes to make different enzymes. RNA copies the information from DNA in the nucleus. Messenger RNA is formed to translate codes into a sequence of amino acids// Ribosome interprets the information carried by RNA The amino acids are bonded together to form specific enzymes Any 4	1 1 1 1 1 1	4
		(i)	Lipase/ amylase / trypsin	1	1
	(d)		Radioactiverays cause gene/chromosome mutation Changes the information in gene/chromosome Synthesis of enzyme/protein changes / stop. Any 2	1 1 1	2
			Total :	**12m**	

2.					
	(a)	(i)	Y: Sucrose	1	3
		(ii)	Z: Enzyme – subatrate complex	1	
		(iii)	Product : Glucose / Fructose	1	
	(b)		Substrate X does not have a specific active site to fit into the enzyme // Only substrate Y, has a shape which exactly fits into the enzyme.	1	2
			The action of enzyme is based on the lock and key hypothesis	1	
	(c)		enzyme reaction is highly specific reaction enzymes are not destroyed by the reactions which they catalysed	1 1	2
	(d)	(i)	At 35°C: (Shirt B does not have blood stain remaining.) F: The rate of enzymatic activity is the highest P: 35°C is the optimum temperature for enzymatic activity. At 65°C: (Shirt Q has the largest amount of blood stains remaining.) F: The rate of enzymatic activity is lower P: The enzyme must have been denatured at the high temperature of the wash at 65°C	 1 1 1 1	Max 4
		(ii)	Amylase/ protease/ lipase	1	1
				Total:	**12m**
3.	(a)	(i)	Meiosis	1	1
		(ii)	P1: The crossing over process occur during prophase P2: The tetrad (sister chromatids) are formed.	1 1	2
	(b)	(i)	 L- location of homologous chromosome at metaphase plate	1	1

	(b)	(ii)	X : prophase I Z : anaphase I	1 1	2
	(c)	(i)	Crossing over	1	1
		(ii)	P1: (the crossing over results) in exchange of genetic material between non-sister chromatids of a bivalent, P2: (which results in) the formation of new combinations of alleles on a chromosome// causes variation	1 1	2
	(d)	(i)	 **or** D: all correct the number of sister chromatids formed S : all correct the sequence of sister chromatids formed	1 1	2
		(ii)	Down Syndrome	1	1
			Total	**12m**	
4.					
(a)	(i)	X: Interstitial fluid		1m	2
	(ii)	Supplies the cell with their cellular requirement / oxygen / nutrient / glucose/ amino acids // eliminate the excretory substances / carbon dioxide/ urea from the cell.		1m	
(b)		Blood flows from arteries into capillaries which have a smaller diameter.		1m	3
		Causes high hydrostatic pressure at the arterial end (of capillaries)		1m	
		Forces some fluid out through the blood capillary wall		1m	
(c)	(i)	Y: Lymph		1m	1
	(ii)	Fluid Y does not contain erythrocytes and large protein molecules as (they are too large to pass through the capillary wall.)		1m	1
	(iii)	Returns the excess interstitial fluid / fluid X back into blood circulatory system		1m	2
		Lymphocytes produce antibodies (to destroy pathogen).		1m	
		Transport lipid, fat-soluble vitamin / vitamin A, D, E, K to blood circulatory system.		1m	
			Any 2		

(d)	(i)	Oedema / tissue become swollen		1m	
					2
	(ii)	Excess interstitial fluid accumulates in the spaces between the cells.		1m	
		Because lymph vessels are blocked.		1m	
		Excess interstitial fluid is not returned to the blood circulatory system.		1m	
		Any 2			
		Total:		**12m**	
5.					
	(a)		P : 2n Q : n R : n	**1m** **1m** **1m**	**3**
	(b)		W : Meiosis I X : Meiosis II	1m 1m	2
	(c)		1. To produce haploid sperm / gamete 2. To ensure continuous species // to ensure the zygote formed through fertilization is diploid. 3. Form genetic variation Any 2	1m 1m 1m	2
	(d)	(i)	Mitochondria	1m	
		(ii)	To produce energy through cellular respiration for the sperms to swim to the ovum.	1m	3
		(iii)	To propel the sperm forward when swimming towards the ovum.	1m	
	(e)		Artificial insemination sperms form a donor can be obtained from a sperm bank sperms is injected into the uterus of a woman during ovulation Any 2	1m 1m 1m	2
			Total :	**12m**	

Skema Soalan Essei Biologi 2012

QUESTION NO		MARKING CRITERIA	SUB MARKS	TOTAL MARKS
6(a)	P1	Epidermis with layer of cuticle/ coated with a wax	1	
	P2	Prevent <u>excess</u> transpiration/loss of water	1	
		OR		
	P1	// Epidermis are transparent	1	
	P2	Allow light easily penetrate the leaf (and reach the chloroplast)	1	2 m
	P3	Stoma is flanked by (two) guard cells	1	
	P4	which regulate the size of the stoma.	1	
	P5	Stoma allow the exchange of gases/ carbon dioxide from atmosphere diffuse into the leaf/ water vapour /oxygen diffuses out of the air.	1	
	P6	Palisade mesophyll cells are packed tightly	1	
	P7	to receive maximum amount of sunlight	1	
	P8	contains high density of chloroplasts	1	
	P9	Spongy mesophyll cells are irregular shape/ loosely arranged	1	
	P10	Increase the internal surface area for gaseous exchange/	1	
		to form a lot of air spaces /Allow easy diffusion of water and carbon dioxide	1	
	P11	Vascular bundle/veins contains xylem and floem	1	
	P12	Xylem transport water/minerals salt// give mechanicals support	1	
	P13	Floem transport organic products of photosynthesis /glucose (away from the leaf) [any 8 P]	1	8 m
		Total marks		**10 m**

QUESTION NO		MARKING CRITERIA	SUB MARKS	TOTAL MARKS
6(b)	P1	Hydroponic (Name of the technique)	1	
	P2	grow plants in culture solutions	1	
	P3	the root of the plants are immersed in solution	1	
	P4	which contains all the macronutrient and micronutrient in the correct proportion	1	
	P5	the culture solution is aerated	1	
	P6	to provide suffient oxygen for respiration [Any 4 P]	1	4 m
		Advantages :		
6(c)	P1	Used to produce disease resistant/pest resistant plants	1	
	P2	Less pesticides are used	1	
	P3	Less pollution to the environment // better health for consumers.	1	
	P4	Increase yield of crops / profitability	1	
	P5	Help to solve problems of insufficient food	1	
	P6	Increase resistance in plant to herbicide eg. soya bean plantation	1	
	P7	Higher vitamin A / beta carotene content in rice / tomato /accept suitable example of crops	1	
	P8	Help to solve problems of malnutrition.	1	
	P9	Produce crop with longer shelf lifes	1	
	P10	Prevent food wastage [any 4 P]	1	4 m
		Disadvantages		
	P11	Pest resistant genes may be transferred to weeds cause difficult to control growth of weeds.	1	
	P12	Some genetic modified crops may have animal genes	1	
	P13	Genetic modified organisms may affect the survival of other organisms in the ecosystem.	1	
	P14	Cause the imbalance of nature / ecosystem [any 2 P]	1	2 m
		Total marks		**10 m**

QUESTION NO		MARKING CRITERIA	SUB MARKS	TOTAL MARKS
7(a)		- Microorganism P is fungi/ *Mucor sp*. and - microorganism Q is bacteria	1 1	2 m
		<u>Similarities</u> **Beneficial effects:**		5 m
	P1	- Microorganisms P and Q are used to make antibiotics .	1	
	P2	- Streptomycin is produced by *streptomycin sp(Q)* ; while penicillin is produced by *penicillium chrysogenum(P)*	1	
	P3	- Microorganisms P and Q are used in production of energy from biomass.	1	
	P4	- Microorganism Q can be used to produce biogas while Microorganism P is used in production of gasohol.	1	
	P5	- Microorganisms P and Q are decomposers	1	
	P6	- Breakdown the dead plants/animal/waste product of animal	1	
	P7	- And release nutrients into the soil	1	
	P8	**Harmful effects:** - P and Q can cause sexual transmitted diseases [any 5 P]	1	
		<u>Differences</u> **Beneficial effects :**		3 m
	P9	- Q is used in the manufacture of bio-plastics and insulin but not P	1	
	P10	- Q is used to clean oil spills at sea due to leakage of oil tankers whereas P cannot be used for this purpose	1	
	P11	- Q is used to treat sewage but not P	1	
	P12	**Harmful effects** - Microorganism Q causes diseases like cholera/food poisoning /tuberculosis whereas	1	
	P13	- P causes diseases such as ringworm [Any 3 P]	1	
		Total marks		**10 m**

QUESTION NO		MARKING CRITERIA	SUB MARKS	TOTAL MARKS
7(b)	-	Colonisation is a process whereby a species colonises in a newly	1	
		formed area/pond	1	
	-	Succession is a process whereby one species of organism /		
		a community changes the environment/habitat	1	
	-	which results in the species/organism being replaced by other species		2 m
	P1	Activities of pioneer species(submerge plants)/ examples causes a change in the environments/ habitat	1	
	P2	The remains of plants/ decayed bodies deposited to the pond bed	1	
	P3	Pond become shallower	1	
	P4	(also) add nutrients to pond water	1	
	P5	Promotes the growth of floating plants/examples to replace the pioneer species/submerged plants	1	
	P6	Floating plants covers water surface, preventing light from penetrating the water/causes less rate of plants photosynthesis in the pond	1	
	P7	Results in greater rate of plants death which sink to the bottom of pond	1	
	P8	Making the pond more shallower	1	
	P9	Floating plants are gradually replaced by amphibious plants/successor	1	
	P10	The successor causes further changes to the habitat/pond, make it unfavourable for the emergent/amphibian plants to grow	1	
	P11	Amphibious plants are replace by land/terrestrial community which dominates the area.	1	
		[maximum 8 marks]		8 m
		Total marks		**10 m**

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) (i)	P1:	In Diagram 8.3 (a), Biceps muscle is attached to the radius by tendons	1m	
	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
		Symptoms		
(ii)	P1:	Fractures of the vertebrae / wrist / hips	1m	
	P2:	Reduction in height	1m	
	P3:	Stooped posture	1m	
		Any 1 P		1 m
		To prevent osteoporosis		
	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
		Total marks		**10 m**

<table>
<tr><th colspan="2">QUESTION NO</th><th>MARKING CRITERIA</th><th>SUB MARKS</th><th>TOTAL MARKS</th></tr>
<tr><td>9
(a)(i)</td><td>P1</td><td>: Choose OP1 and OP3
<table><tr><td>Gametes from OP 1

Gametes From OP3</td><td>hF</td><td>hF</td><td>hF</td><td>hF</td></tr><tr><td>Hf</td><td>HhFf</td><td>HhFf</td><td>HhFf</td><td>HhFf</td></tr><tr><td>Hf</td><td>HhFf</td><td>HhFf</td><td>HhFf</td><td>HhFf</td></tr><tr><td>Hf</td><td>HhFf</td><td>HhFf</td><td>HhFf</td><td>HhFf</td></tr><tr><td>Hf</td><td>HhFf</td><td>HhFf</td><td>HhFf</td><td>HhFf</td></tr></table></td><td>1</td><td rowspan="8">6 m</td></tr>
<tr><td></td><td>P2</td><td>: label the column in the table correctly.</td><td>1</td></tr>
<tr><td></td><td>P3</td><td>: state or show OP1 produce gamete with genotype hF</td><td>1</td></tr>
<tr><td></td><td>P4</td><td>: state or show OP3 produce gamete with genotype Hf</td><td>1</td></tr>
<tr><td></td><td>P5</td><td>: state or show the genotype of all of the offspring is HhFf.</td><td>1</td></tr>
<tr><td></td><td>P6</td><td>: phenotype of HhFf is thick husk and thick flesh</td><td>1</td></tr>
<tr><td></td><td>P7</td><td>: all / 100% of the offspring are thick husk and thick flesh.
[Any 6]</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(a)(ii)</td><td>P1</td><td>: choose OP3</td><td>1</td><td rowspan="9"></td></tr>
<tr><td></td><td>P2</td><td>: Use tissue culture technique</td><td>1</td></tr>
<tr><td></td><td>P3</td><td>: Cut a small piece of leaf or shoot of OP3</td><td>1</td></tr>
<tr><td></td><td>P4</td><td>: Wash and treat with 10% decolouring/bleaching agent</td><td>1</td></tr>
<tr><td></td><td>P5</td><td>: Cut the piece of leaf / shoot in small fragment</td><td>1</td></tr>
<tr><td></td><td>P6</td><td>: Transfer into sterile medium with suitable nutrients and pH.</td><td>1</td></tr>
<tr><td></td><td>P7</td><td>: Keep in optimum temperature.</td><td>1</td></tr>
<tr><td></td><td>P8</td><td>: Plant cells divide through mitosis.</td><td>1</td></tr>
<tr><td></td><td>P9</td><td>: Produce many new cells and form callus</td><td>1</td></tr>
</table>

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

SULIT

Biology
Kertas 3
30.8.2012
1 ½ jam

PROGRAM PENINGKATAN PRESTASI AKADEMIK SPM

TAHUN 2012

BIOLOGY

Kertas 3

Satu Jam Tiga Puluh Minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa*
2. *Soalan dalam bahasa Inggeris mendahului soalan sepadan dalam bahasa Melayu.*
3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu*

Untuk Kegunaan Guru Pemeriksa		
Nama Pemeriksa :		
Soalan	Markah Penuh	Markah Diperoleh
1	33	
2	17	
Jumlah	50	

Kertas soalan ini mengandungi 10 halaman bercetak

Answer **all** questions.
*Jawab **semua** soalan*

1. Goldfish is a cold-blooded organism. The body temperature varies with the surrounding temperature as well as the rate of respiration.
Ikan emas ialah sejenis haiwan berdarah sejuk. Suhu badannya berupaya berubah mengikut suhu persekitaran, begitu juga kadar respirasinya.

An experiment was carried out to investigate the effect of water temperature on the rate at which a goldfish opens and closes its mouth.
Satu eksperimen telah dijalankan untuk mengkaji kesan suhu air ke atas kadar seekor ikan emas membuka dan menutup mulutnya.

The following steps were carried out.
Langkah-langkah berikut telah dijalankan.

Step 1. In the experiment, the temperature of the water in an aquarium is fixed at 6°C. A goldfish is placed in the aquarium.

Langkah 1. *Dalam eksperimen ini, suhu air dalam sebuah akuarium telah diubah dan ditetapkan pada 6°C. Seekor ikan emas dimasukkan ke dalam akuarium itu.*

Step 2. The goldfish is left in the water for 30 minutes to adapt to the water temperature.

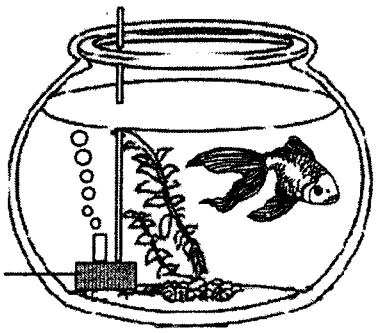
Langkah 2. *Ikan emas itu dibiarkan berada dalam air selama 30 minit supaya ia dapat menyesuaikan diri dengan suhu air.*

Step 3. After 30 minutes, start the stop watch, measure and record the time taken for the goldfish to open and close the mouth for 50 times.

Langkah 3. *Selepas 30 minit, mulakan jam randik, ukur dan rekodkan masa yang diambil oleh ikan emas untuk membuka dan menutup mulutnya sebanyak 50 kali.*

Step 4. Repeat step 1 to step 3 by fixing the temperature at 10°C and 14°C.

Langkah 4. *Ulangi langkah 1 sehingga langkah 3 dengan menetapkan suhu pada 10°C and 14°C .*



Air pump (to supply oxygen)
Pam udara (membekal oksigen)

The results of the experiment are shown in Table 1
Keputusan eksperimen ditunjukkan dalam Jadual 1.

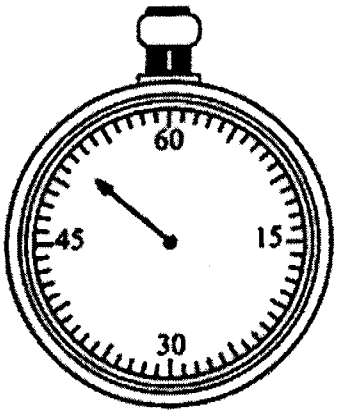
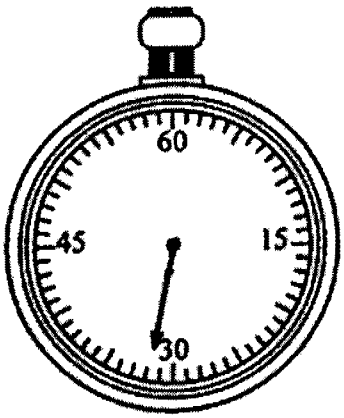
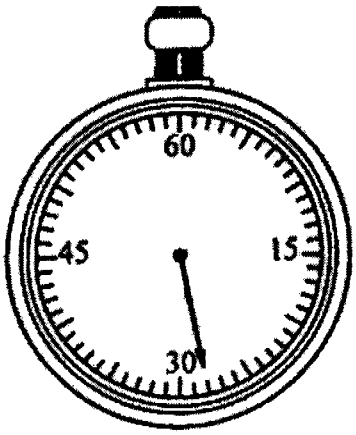
Temperature of the water. *Suhu air*	Observation *Pemerhatian*	Time taken for the goldfish to open and close the mouth for 50 times. *Masa yang diambil oleh ikan emas untuk membuka dan menutup mulutnya sebanyak 50 kali.*
6°C		_____ seconds *saat*
10°C		_____ seconds *saat*
14°C		_____ seconds *saat*

Table 1
Jadual 1

(a) Record the time taken for the goldfish to open and close the mouth for 50 times in Table 1.
Rekod masa yang diambil oleh ikan emas untuk membuka dan menutup mulutnya sebanyak 50 kali dalam Jadual 1.

[3 marks / *markah*]

(b) (i) State two different observations made from Table 1.
Nyatakan dua pemerhatian yang berbeza yang dibuat daripada Jadual 2.

Observation 1 / *Pemerhatian 1 :*

.....

.....

.....

Observation 2 / *Pemerhatian 2 :*

.....

.....

.....

[3 marks / *markah*]

(ii) State the inferences from the observations in 1(b)(i)
Nyatakan inferens daripada pemerhatian di 1(b)(i)

Inference from observation 1 / *Inferens daripada pemerhatian 1 :*

.....

.....

.....

Inference from observation 2 / *Inferens daripada pemerhatian 2 :*

.....

.....

.....

[3 marks / *markah*]

(c) Complete Table 2 based on this experiment.
Lengkapkan Jadual 2 berdasarkan eksperimen ini.

Variable ***Pembolehubah***	**Method to handle the variable** ***Cara mengendali pembolehubah***
Manipulated variable *Pembolehubah dimanipulasikan*	....
Responding variable *Pembolehubah bergerak balas*	....
Constant variable *Pembolehubah dimalarkan*	....

Table 2 / *Jadual 2*

[3 marks / *markah*]

(d) State the hypothesis for this experiment.
Nyatakan hipotesis bagi eksperimen ini.

.....

.....

.....

.....

[3 marks / *markah*]

(e) (i) Construct a table and record all the data collected in this experiment.
Your table should have the following titles :
Bina satu jadual dan rekodkan semua data yang dikumpul dalam eksperimen ini.
Jadual anda hendaklah mengandungi tajuk-tajuk berikut :

- Water temperature
  suhu air
- Time taken for the goldfish to open and close the mouth for 50 times.
  Masa yang diambil oleh ikan emas membuka dan menutup mulut 50 kali.
- Rate of respiration of the goldfish (numbers of mouth openings / minute)
  Kadar respirasi ikan emas (bilangan kali membuka mulut / minit)

[3 marks / *markah*]

(ii) Use the data from 1(e)(i), draw a graph of the rate of respiration against the temperature of the water.
Gunakan data dari 1(e)(i), lukiskan graf kadar respirasi melawan suhu air.

[3 marks / *markah*]

(f) Based on the graph in 1(e)(ii), explain the relationship between the rate of respiration of the goldfish and the water temperature.
Berdasarkan graf di 1(e)(ii), terangkan hubungan antara kadar respirasi ikan emas dengan suhu air.

.....

.....

.....

.....

.....

[3 marks / *markah*]

(g) State the operational definition for the rate of respiration of the goldfish.
Nyatakan definisi secara operasi bagi kadar respirasi ikan emas.

.....

.....

.....

.....

.....

[3 marks / *markah*]

(h) The experiment is repeated at 10°C by removing the air pump from the aquarium.
Predict the outcome of this experiment.
Explain your prediction.
Eksperimen ini diulangi pada suhu 10°C dengan mengeluarkan pam udara dari akuarium.
Ramalkan hasil eksperimen ini.
Terangkan ramalan anda.

.....

.....

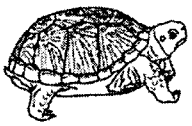
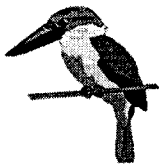
.....

.....

.....

[3 marks / *markah*]

(i) Using the list provided below, classify the warm-blooded animals and cold-blooded animals in Table 3.
Menggunakan senarai yang disediakan di bawah,klasifikasikan haiwan berdarah panas dan haiwan berdarah sejuk dalam Jadual 3.

				
Penguin	Whale	Crocodile	Turtle	Bird

Warm-blooded animals *Haiwan berdarah panas*	**Cold-blooded animals** *Haiwan berdarah sejuk*

Table 3
Jadual 3

[3 marks / *markah*]

2. Diagram 2 shows different areas along a river that causes water pollution.
Rajah 2 menunjukkan kawasan berbeza di sepanjang sebatang sungai yang menyebabkan pencemaran air.

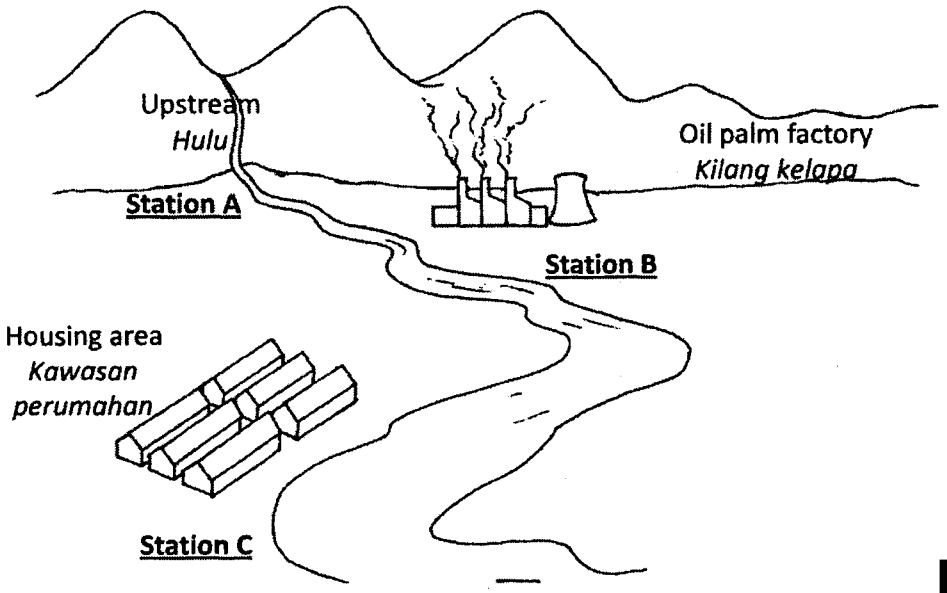


Diagram 2
Rajah 2

The Department of Environment (DOE) has received complaints from the residents of a housing area concerning the activities of an oil palm factory which is believed to have contaminated a nearby river.
Jabatan Alam Sekitar (JAS) telah menerima aduan daripada penduduk-penduduk di kawasan perumahan yang berkenaan dengan kegiatan sebuah kilang kelapa sawit yang dipercayai telah dicemari sungai berdekatan.

The disposal of sewage and domestic waste into the river can encourage the growth of microorganisms. Eutrophication can increase the number of microorganisms and hence water pollution. The water pollution level in a river can be determined by testing water samples from different parts of the river as shown below.

Pelupusan kumbahan dan sisa domestik ke dalam sungai boleh menggalakkan pertumbuhan mikroorganisma. Eutrofikasi boleh menambah bilangan mikroorganisma dan dengan itu menyebabkan pencemaran air. Tahap pencemaran air dalam sungai boleh ditentukan dengan menguji sampel-sampel air daripada bahagian-bahagian yang berlainan.

Station 1 : near oil palm factory
Stesen 1: berhampiran kilang kelapa sawit

Station 2 : near a housing area
Station 2: berhampiran kawasan perumahan

Station 3 : mouth of the river
Stesen 3: muara sungai

Based on the above situation, as a representative of the DOE, you are required to design a laboratory experiment to study the degree of water pollution at three different stations along the river.
Berdasarkan situasi diatas, sebagai wakil daripada Jabatan Alam Sekitar anda di minta untuk mereka bentu satu eksperimen makmal untuk mengkaji tahap pencemaran air di tiga stesen sepanjang sungai itu.

The planning of your experiment must include the following aspects:
Perancangan eksperimen anda hendaklah meliputi aspek-aspek berikut:

- Problem statement
  Pernyataan masalah
- Hypothesis
  Hipotesis
- Variables
  Pembolehubah
- List of apparatus and materials
  Senarai radas dan bahan
- Experimental procedure
  Prosedur eksperimen
- Presentation of data
  Persembahan data

SKEMA JAWAPAN PEPRIKSAAN PERCUBAAN SPM 2012

BIOLOGY PAPER 3

1 (a) Able to record all 3 readings in Table 1.

Temperature	Time taken for the goldfish to open and close the mouth 50 times (seconds)
6^oC	52
10^oC	32
14^oC	28

1 (b) (i) Able to state two different observations correctly

Sample answers

1. The time taken for the goldfish to open and close the mouth 50 times is 52 s at 6^oC.
2. The time taken for the gold fish to open and close the mouth 50 times is the slowest/longest at 6^oC compare to the water temperature at 10^oC and 12^oC.
3. At water temperature 6^oC / 10^oC / 14^oC, the time taken for the goldfish to open and close the mouth 50 times is 52 / 32 / 28 seconds.

1 (b) (ii) Able to make two inferences correctly.

P1: Infer the body temperature of the goldfish
- Body temperature of goldfish increase with the surrounding temperature.

P2 Infer the metabolism rate of the goldfish.
- Metabolism rate of the goldfish increase with the surrounding temperature.

P3 Infer the rate of respiration of the goldfish
- Rate of respiration of the goldfish increase with the surrounding temperature.

Any TWO P's

Sample answers

(1) As the surrounding temperature increase, body temperature of the goldfish increase, this will cause the metabolism rate of the goldfish also increase.

(2) As the surrounding temperature increase, body temperature of the goldfish increase, this will cause the rate of respiration of the goldfish also increase.

(3) The higher the water temperature, the higher the rate of respiration of the goldfish.

1 (c) Able to state all 3 variables and methods to handle variables correctly.

Variables	Method to handle the variable
Manipulated variable Water temperature	Change and fix the water temperature at 6^oC, 10^oC and 14^oC.
Responding variable Time taken for goldfish to open and close the mouth 50 times.	Count the numbers of opening the mouth for 50 times and record the time taken using a stopwatch.

Constant variable
 	
Oxygen supply in the water.
// goldfish
// the volume of the water in the aquarium.
	Fix the rate of the air pump in the aquarium.
	Use the same goldfish
	Fix the same volume of the water in the aquarium.

1 (d) Able to state hypothesis correctly

P1: Manipulated variable
P2: Responding variable
P3: Relationship

Sample answers:

1. As the water/surrounding temperature increase, the time taken for the goldfish to open and close the mouth 50 time decrease / the higher the rate of respiration of the goldfish.

2. The higher the water / surrounding temperature, the faster the time taken for the goldfish to open and close the mouth / the higher the rate of respiration of the goldfish.

1(e) (i) Able to construct a table and record all data correctly

Water temperature	Time taken for the goldfish to open and close the mouth 50 times (seconds)	Rate of respiration of the goldfish (numbers of mouth openings / minute)
$6^{o}C$	52	= (50/52) X 60 = 57.7
$10^{o}C$	32	= (50/32) X 60 = 93.8
$14^{o}C$	28	= (50/28) X 60 = 107.1

Criteria:
(T) Able to state all 3 titles with units correctly
(D) Able to record all data correctly
(C) Able to calculate the rate of the respiration.

1 (e) (ii) Able to plot the graph correctly

Criteria:

(P) Able to draw both axes with uniform scale.
(T) Able to plot all 3 points
(B) Able to draw a line through all 3 points only.

1 (f) Able to state and explain the relationship between the rate of respiration of the goldfish and the water temperature..

Criteria:

R: Relationship (1m)
E1: Body temperature increase / decrease
E2: Rate of metabolism increase / decrease
E3: More / less energy / oxygen is needed
E4: Rate of respiration increase / decrease

Any TWO E's (2m)

Sample answers:

1. The higher the temperature of the water, the higher the rate of the respiration of the goldfish, because the body metabolism rate increase, more oxygen is needed.

1 (g) Able to define operationally rate of respiration based on the results of this experiment

Criteria:

P1: Rate of respiration is the numbers of opening the mouth per minute.
P2: to obtain dissolved oxygen / air from the water.
P3: the rate of respiration / numbers of opening the mouth per minute is influenced by the water temperature.

Sample answer:

1. Rate of respiration of the goldfish is the numbers of opening the mouth to obtain dissolved oxygen in the water. The numbers of opening the mouth is influenced by the water temperature.

1 (h) Able to predict and explain the outcome of the experiment correctly.

Criteria:

P: correct prediction = time taken for opening the mouth decrease / less than 32s. // rate of respiration increase (1m)

E1: less (dissolved) oxygen in the water

E2: increase the rate of opening the mouth

E3: to increase the intake of oxygen.

Any TWO E's (2m)

1 (i) Able to list all the warm-blooded animals and cold-blooded animals correctly.

Warm-blooded animal	Cold-blooded animal
Penguin Whale Bird	Crocodile Turtle

Question 2

Question	Mark Scheme	Marks
2(i)	Able to state a problem statement correctly based on the following criteria: P1: Manipulated variable – water sample from different sources P2: Responding variable – time taken for decolourisation of methylene blue solution / BOD / level of pollution P3: Relationship between the variables in a question form <u>Sample answers</u> 1. What is the level of water pollution in the river at location C // B // A compared to location B // A // C and location A // C // B? 2. What is the effect of water samples from different sources to the time taken for decolourisation of methylene blue solution / BOD / level of pollution? 3. How do the water samples from different sources affect the time taken for decolourisation of methylene blue solution / BOD / level of pollution?	3
	Able to state a problem statement inaccurately <u>Sample answers</u> 1. Which station of water samples from different sources affects the time taken for decolourisation of methylene blue solution / BOD / level of water pollution. 2. What is the effect of different water sample to the level of water pollution / BOD/ time taken for decolourisation of methylene blue solution?	2
	Able to state a problem statement at idea level	1

	Sample answers 1. Factories are the most polluted water.	
	No response or incorrect response	0
2(ii)	Able to state a hypothesis correctly based on the following criteria: C1: Manipulated variable - water samples from different source C2: Responding variable - time taken for decolourisation of methylene blue solution C3: Relation between the variables - H Sample answers 1. The water at location C is more polluted compared to location B and location A. 2. The water at location C is the most polluted compared to other location. Note : wrong hypothesis is accepted	3
	Able to state a hypothesis inaccurately Sample answer 1. The different the water samples from different sources, the different the time taken for decolourisation of methylene blue solution.	2
	Able to state a hypothesis at idea level Sample answers 1. Water sample at oil factory area is the most polluted water	1

	No response or incorrect response	0
2(iii)	Able to state all three variables correctly Manipulated variable: Location of water Responding variable: Time to decolourise methylene blue solution // level of water Pollution Constant variable: Volume of water sample // volume of methylene blue solution // concentration of methylene blue solution	3
	Able to state any two variables correctly	2
	Able to state any one variable correctly	1
	No response or incorrect response	0
2(iv)	Able to list the important apparatus and materials correctly Sample answers Materials : Water samples at different sources, methlyene blue solution	3

	Apparatus: stop watch, reagent bottle, syringe with needle, beaker, measuring cylinder, cupboard, glass cover 7A + 2M	
	Able to list at least 5-6 apparatus and 2 materials correctly 5 - 6 A + 2M	2
	Able to list at least 3 - 4 apparatus and 2 materials correctly 3 - 4 A + 2M	1
	No response or incorrect response	0
2(v)	Able to describe the steps of the experiment procedure or method correctly based on the following criteria: K1 : Steps to set up the apparatus K2 : Steps to handle the fixed variable K3 : Steps to handle the manipulated variable K4 : Steps to handle the responding variable K5 : Precautionary steps / steps taken to get accurate results / readings <u>Sample answer</u> 1. Water sample from different locations (A, B and C) are taken . 2. 100 ml of water sample from each location filled into different reagent bottles. 3. 1 ml methylene blue solution is added at the bottom part of the water by using syringe. 4. Do not shake the bottles. (precaution) 5. The reagent bottles are closed immediately. 6. Step 2 to 4 is repeated by using distilled water. 7. All the bottles are placed in the dark cupboard and time is recorded. 8. Each bottle is observed after a day. 9. Time for methylene blue solution decolourise is recorded. 10. The results are recorded in the table.	

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>Scoring rubric

All K1 – K5 present</td><td>3</td></tr>
<tr><td></td><td>Any 3 – 4 K present</td><td>2</td></tr>
<tr><td></td><td>Any 2 K</td><td>1</td></tr>
<tr><td></td><td>No response or incorrect response</td><td>0</td></tr>
<tr><td>2(vi)</td><td>Able to construct a table to record data based on the following criteria :

C1 : Manipulated variable with parameter and unit

C2 : Operating responding variable and responding variable with unit

<u>Sample answer</u>
<table>
<tr><th>Water sample / location</th><th>Time to decolourise methylene blue solution (minute // hour)</th><th>Level of water pollution</th></tr>
<tr><td>A</td><td></td><td></td></tr>
<tr><td>B</td><td></td><td></td></tr>
<tr><td>C</td><td></td><td></td></tr>
</table></td><td>2</td></tr>
</table>

	Able to construct a table to record data based on one aspect only	1
	No response or incorrect response	0