KEMENTERIAN PENDIDIKAN MALAYSIA

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN

MODUL X-A Plus / PERFECT SCORE

BIOLOGI 4551/2

http://cikguadura.wordpress.com/

DISEDIAKAN OLEH

MAZINAH BT MUDA
DATIN NORIDAH BT YANGMAN
NURUL UYUN BT ABDULLAH
ROSIAPAH BT DOLLAH
MELI BIN HUSSIN
NORAINI BT SAMIN
HABSHAH BT KHATIB
ZALINA BT AHMAD
SUSANTI BT GAMIN
FATIMAHWATI BT MALEK
MOHD IZANI B SAUFI
MOHD FADHIL BIN MASRON

SMS TENGKU MUHAMMAD FARIS PETRA
SMS TUANKU SYED PUTRA
SMS KUALA SELANGOR
SMS SELANGOR
SMS KUALA TERENGGANU
SMS MUAR
SMS KUCHING
KOLEJ ISLAM SULTAN ALAM SHAH
SMS JOHOR
SMA PERSEKUTUAN LABU
SMS KEPALA BATAS
SMS LABUAN

KEMENTERIAN PENDIDIKAN MALAYSIA

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN

MODUL X-A Plus / PERFECT SCORE

http://cikguadura.wordpress.com/

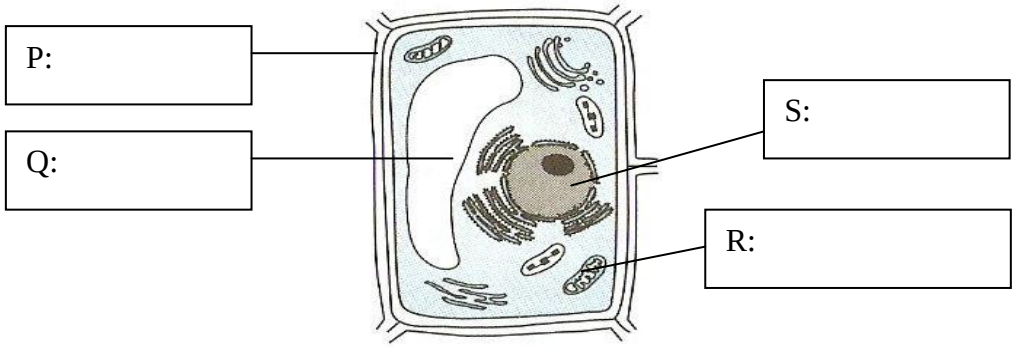
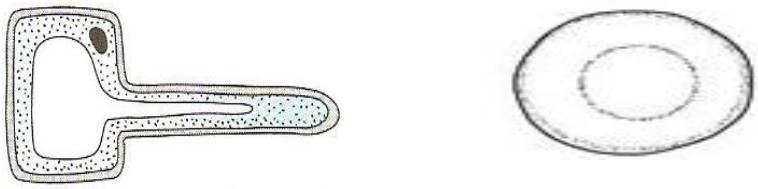
BIOLOGI 4551/2 (STRUKTUR) 2013

EDISI PELAJAR

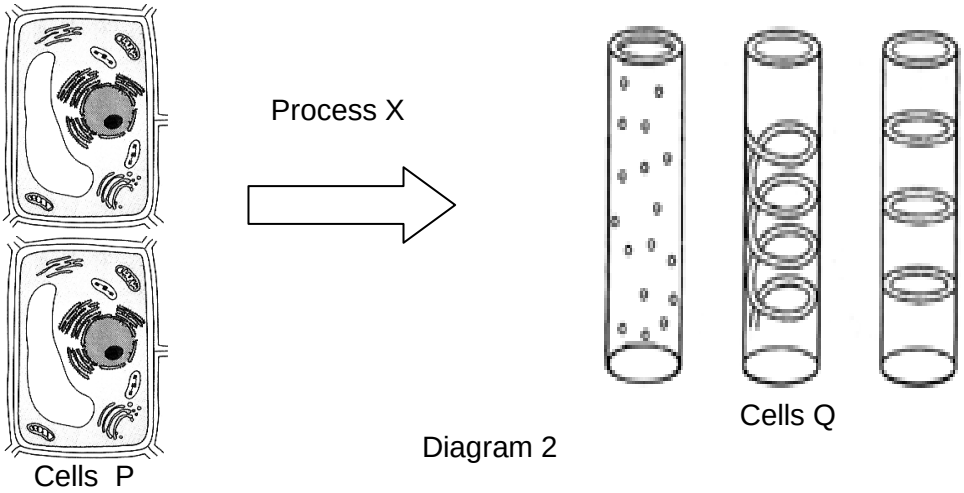
DISEDIAKAN OLEH

MAZINAH BT MUDA — **SMS TENGKU MUHAMMAD FARIS PETRA**
DATIN NORIDAH BT YANGMAN — **SMS TUANKU SYED PUTRA**
NURUL UYUN BT ABDULLAH — **SMS KUALA SELANGOR**
ROSIAPAH BT DOLLAH — **SMS SELANGOR**
MELI BIN HUSSIN — **SMS KUALA TERENGGANU**
NORAINI BT SAMIN — **SMS MUAR**
HABSHAH BT KHATIB — **SMS KUCHING**
ZALINA BT AHMAD — **KOLEJ ISLAM SULTAN ALAM SHAH**
SUSANTI BT GAMIN — **SMS JOHOR**
FATIMAHWATI BT MALEK — **SMA PERSEKUTUAN LABU**
MOHD IZANI B SAUFI — **SMS KEPALA BATAS**
MOHD FADHIL BIN MASRON — **SMS LABUAN**

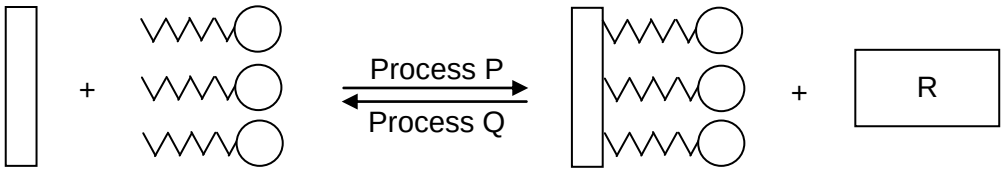
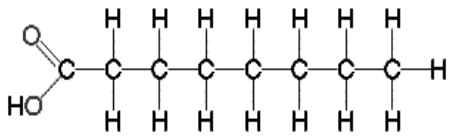
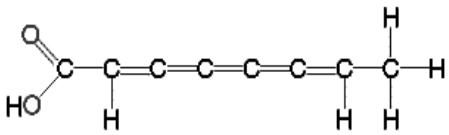
Section A

No	Questions	Marks	Student's tips
1.	Diagram 1(a) shows the structure of a typical plant cell.  **Diagram 1(a)**		
(a)	Label the structures P, Q, R and S in Diagram 1(a) [2marks]		
(b) (i)	Name the process which occur in R? [*2marks*]		
(ii)	Write an equation for the process occur in R. [*2marks*]		
	 M N **Diagram 1(b)**		
(c) (i)	Diagram 1(b) shows two specialised cells , M and N. Name M and N. [*1mark*] **M:** **N :**		
(ii)	State **one** characteristic of M that help them to carry out their function effectively. [*2marks*] **F:** **P:**		

(d)	A pineapple planter wants to produce a large number of pineapple in a short time. [3marks]		
(i)	State one technique to be used by the planter		
(ii)	Explain one problem to be considered in using the technique. **F :** **P :**		
	TOTAL: 12		

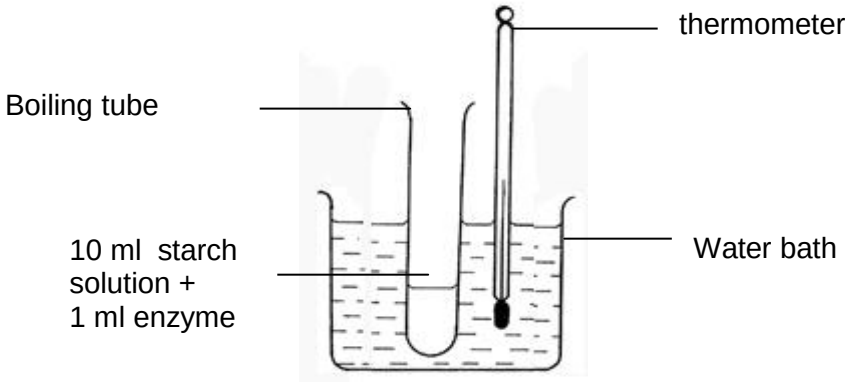
No	Questions	Marks	Student's tips
2.	Diagram 2 shows process X undergone by cells P in forming tissue Q  Diagram 2		
(a)(i)	Name process **X** [*1mark*]		
(ii)	Explain process **X** [*2marks*] Sample answer: **P1:** **P2:**		
(b)	State **two** differences between cells P and cells Q [*2marks*] **P1:** **P2:**		
(c)	Describe the differentiation process of cells P to form cells Q [*2marks*] **P1:** **P2:** **P3:** **P4:**		

(d)	During the formation of cells Q, the plant was unable to synthesize lignin. Explain the effect on the function of a leaf. [*2marks*] **P1:** **P2:** **P3:**		
(e)	Explain the importance of cells Q in ensuring secondary growth plants to have a longer life span. [*2marks*] **P1:** **P2:** **P3:** **P4:**		
	TOTAL MARKS: 12		

No	Questions	Marks	Student's tips
3.	Diagram 3 shows the formation and break down of one molecule lipid.  1 molecule of lipid Diagram 3.1		
(a)	Name molecule R. [1 mark]		Answer must refer to the diagram
(b) **(i)**	Explain processes P and Q. Process P: [3 marks] **P1 :** **P2 :** **P3 :**		
(ii)	Process Q [3 marks] **P1 :** **P2 :** **P3 :**		
(c)	Diagram 3.2 shows two structures of fatty acids in lipids  Diagram 3.2a  Diagram 3.2b		

(c)(i)	State three characteristics of fatty acid in Diagram 3.2a which makes it different from the fatty acid in Diagram 3.2b. [3 marks] **P1 :** **P2 :** **P3 :** **P4 :**		
(c)(ii)	Explain how excessive consumption of fatty acid in Diagram 3.2a leads to cardiovascular diseases. [3 marks] **P1 :** **P2 :** **P3 :** **P4 :**		
	TOTAL MARKS: 12		

No	Questions	Marks	Student`s tips
4	A group of students carried out an experiment to study the effect of temperature on salivary amylase on starch. Diagram 4.1 shows the apparatus set-up used in the experiment.		



The whole experiment in Diagram 4.1 was repeated using different temperature as following:

Boiling tube	P	Q	R	S
Temperature ^0C	10	20	40	40
Enzyme	Fresh amylase	Fresh amylase	Fresh amylase	Boiled amylase

Quantity of starch in the boiling tube was determined every one minute.
Diagram 4.2 shows the graphs of quantity of starch against time.

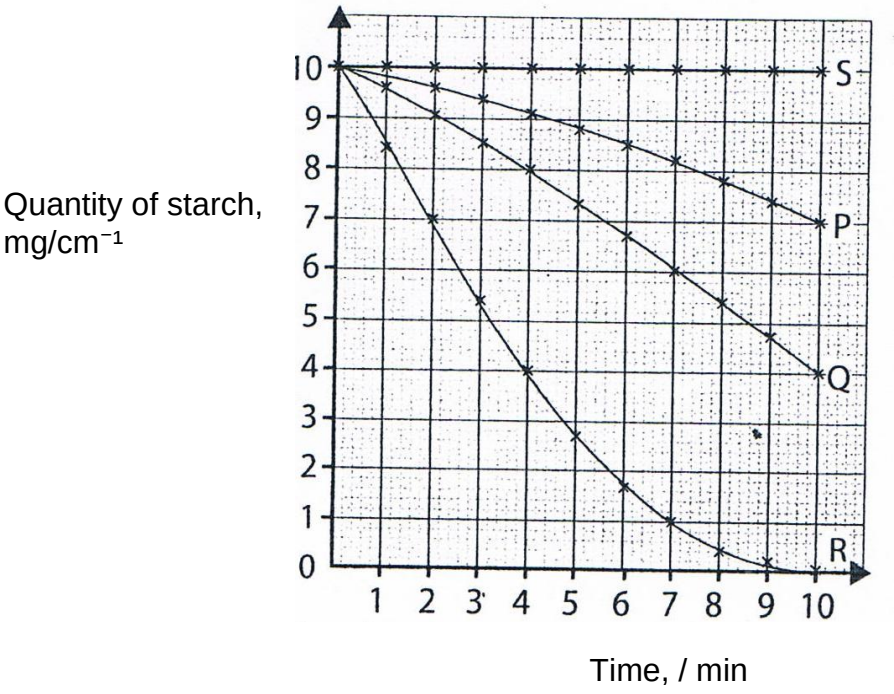


Diagram 4.2

(a)(i) Name the product of this reaction. [1 mark]

.....

(ii) Name the process involved in this reaction. [1 mark]

.....

(b) Explain graph S [3 marks] 3

F:

P1:

P2:

P3:

(c) Explain **one** difference between graph R and Q. [3 marks]

	R	Q
F		
E1		
E2		

(d) State the conclusion from the graphs. [1 mark]

.....

(e) Detergent contain enzyme to wash protein stain.
Suggest how to use the detergent to get efficient result. [3 marks]

P1:

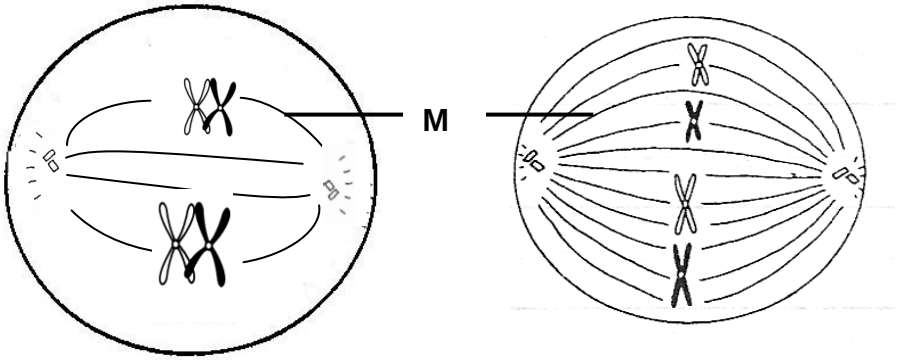
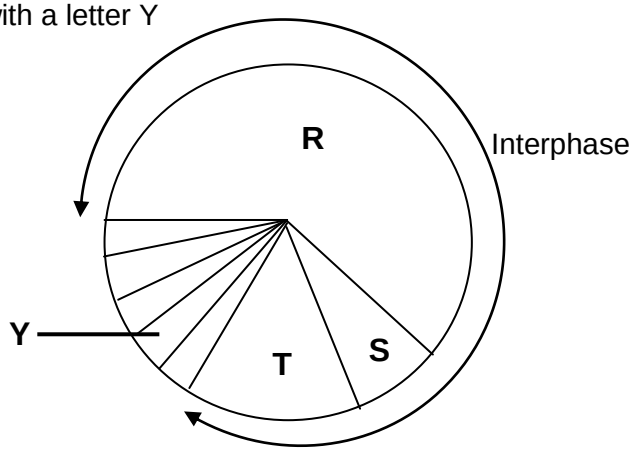
P2:

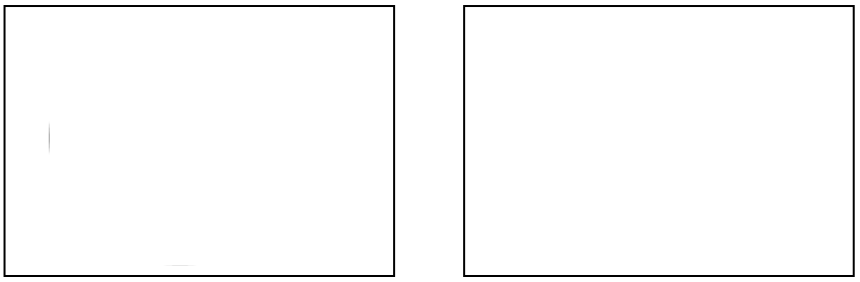
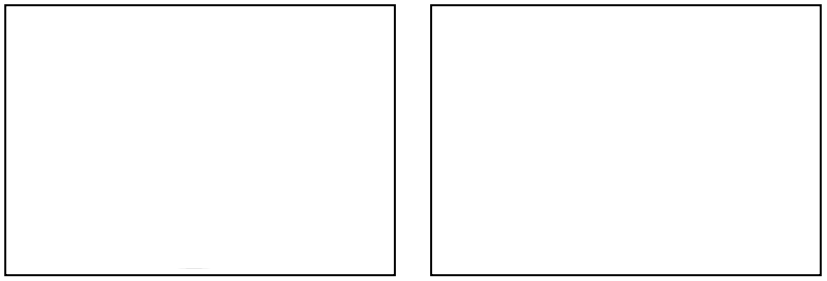
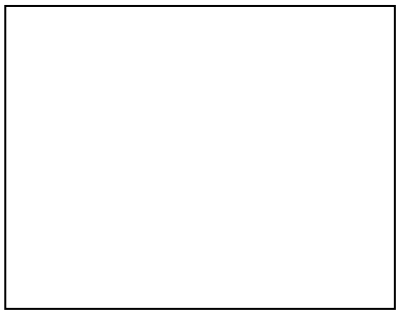
P4:

P3:

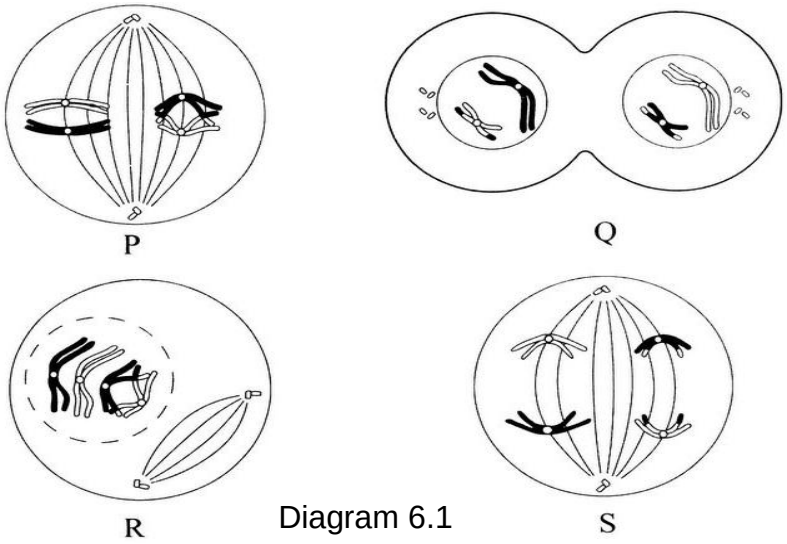
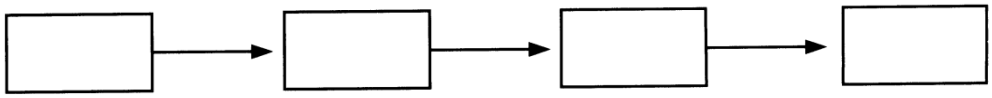
Any 3

TOTAL MARKS: 12

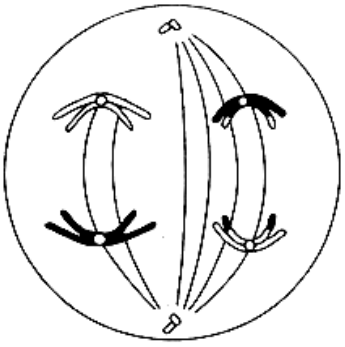
No	Questions	Marks	Student's tips
5.	Diagram 5 below shows cell P and cell Q undergoes one of the stages for two types of cell division.  Cell P Cell Q Diagram 5		
a(i)	State the types of cell divisions shown in Diagram above. [2 marks] **P :** **Q :**		-
(ii)	State one function of P and Q. [2 marks] **P :** **Q :**		
b(i)	Diagram below shows a cell cycle. On the diagram, label the stage shown by cell Q with a letter Y .  		

(ii)	Describe what happens during sub-phases R, S and T. [3marks] **R :** **S :** **T :**		
c	Draw a daughter cell of cell P and cell Q after both cells have completed the cell division in the boxes provided below. [2 marks]  Cell P Cell Q or  Cell P or 		

d	A boy has been exposed to gamma rays which results in the failure of structure M to be formed. Explain the effects of this gamma rays to the formation of the daughter cells of cell P. [3marks] **F1** : **E1 :** **E2 :**		
	TOTAL MARKS : 12		

No	Questions	Marks	Student's tips
6	Diagram 6.1 shows the different stages in meiosis Iof an animal cell.  Diagram 6.1		
a(i)	Arrange the stages of the cell division in the correct sequence. [1 marks] 		
(ii)	Explain the chromosome behaviour during stage R. [2 marks] **P1 :** **P2 :**		
(iii)	Explain the importance of chromosome behaviour in stage R to the survival of the animal. [3 marks] **P1 :** **P2 :** **P3 :** **P4 :**		

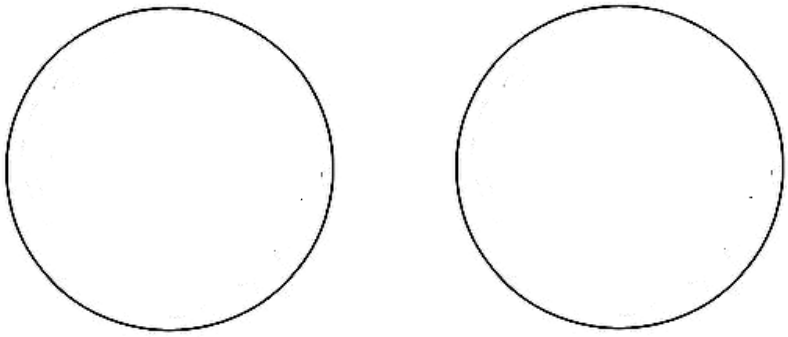
(b) Diagram 6.2 shows spindle fibre of the cell in stage S is failed to form after exposure to a radioactive ray.



S

Diagram 6.2

Complete the diagram below to show the chromosomal number in daughter cell after meiosis I is completed. [2 marks]



Daughter cell 1 Daughter cell 2

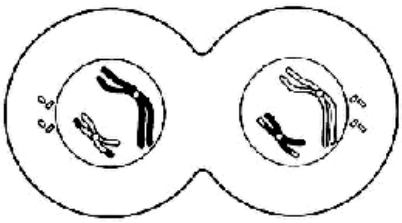
Explain the formation of daughter cell 1 and 2 in b (i). [2 marks]

P1 :

P2 :

P3 :

(c) Diagram 6.3 shows the stage of Q in an animal cell and stage of V in a plant cell.



Q

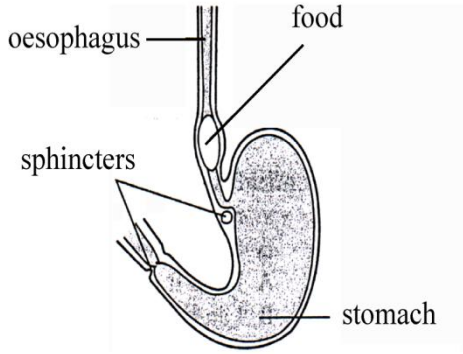
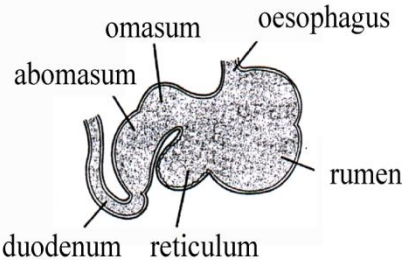
Diagram 6.3 **V**

Explain one difference in the condition of the cell at stage Q and stage V.

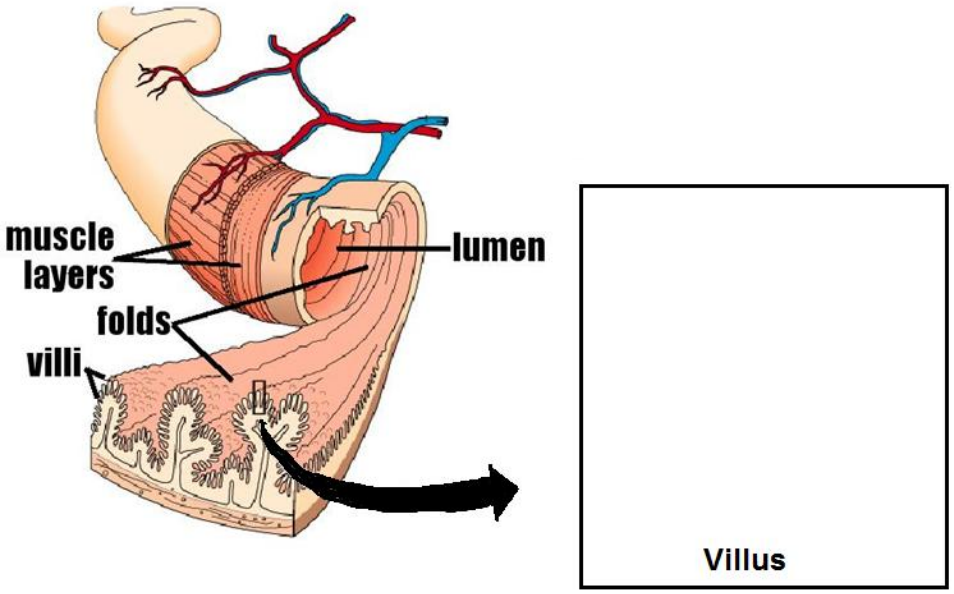
[2 marks]

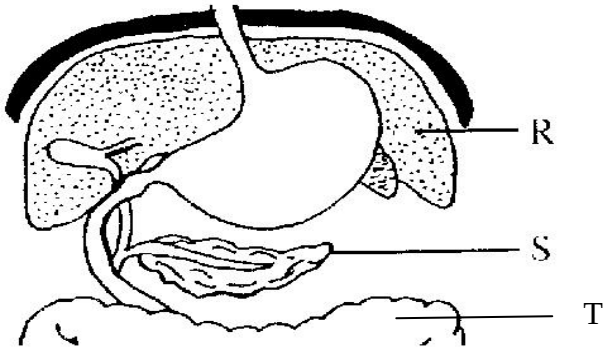
Stage Q	Stage V

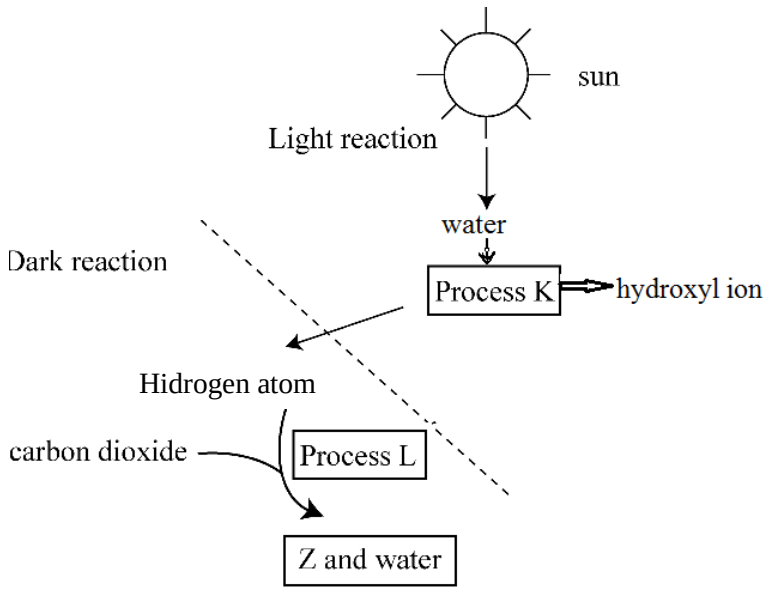
Total Marks:12

No	Questions	Marks	Student's tips
7.	Diagram 7.1 and 7.2 show the stomach of a man and a cow.  Diagram 7.1  Diagram 7.2		
(a)	Based on the Diagram 7.1 and Diagram 7.2, state **one** adaptive characteristic of the cow's stomach compare to the man's stomach . [3 marks]		Answer must refer to the diagram
(b)(i)	Name the compartments of the cow's stomach in correct sequence to show the movement of food starting from the oesophagus. [2 marks]		Correct spelling
(ii)	What is the cow's true stomach? Give a reason for your answer. [2 marks] **F :** **P :**		
(c)	Explain what happens in the largest compartment of the cow's stomach?. [3 marks] **F -** **E1 -** **E2 -**	1 1 1	

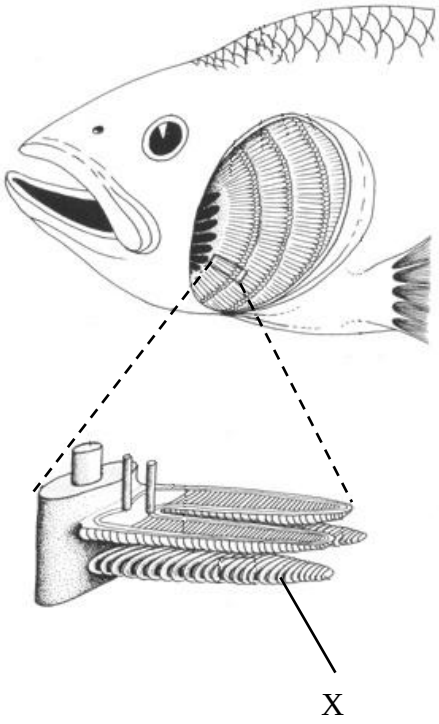
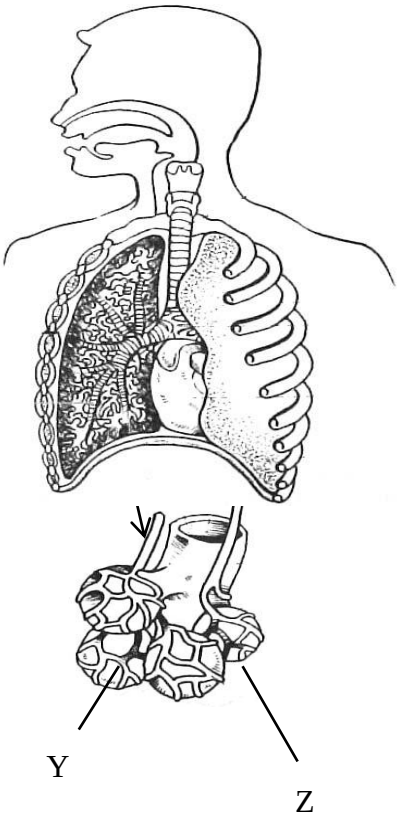
(d)	Describe what happens in the stomach of the man. [3 marks] **P1 :** **P2 :** **P3 :** **P4 :**		
(e)	State **one** similarity between cow's digestive system with rodent's digestive system. [1 mark]		
	TOTAL MARKS: 12		

No	Questions	Marks	Student's tips
8.	Diagram 8.1 shows the small intestine structure that involve in absorption.  Diagram 8.1		
(a)	Draw the villus structure in the Diagram 8.1 with label. [3 marks]		
(b)	State the **two** adaptation structure of villus that facilitates the diffusion of digested food in small intestine. [3 marks] **P1:** **P2:** **P3:** **P4:**		
(c)	Explain the absorption of vitamin A and B by villus. [2 marks] **Vitamin A:** **Vitamin B:**		

(d)	Diagram 8.2 shows a part of the digestive system and the organs related to assimilation.  Diagram 8.2		
(d)(i)	Structure S in Solehin is malfunctioned in controlling blood sugar level. Name the health problem he is facing. [1 mark]		
(d) (ii)	Rice is digested to glucose which is then absorbed in T. This will cause an increase in the blood sugar level. Explain how R and S controls the blood glucose level. [3 marks] **P1:** **P2:** **P3:**		
	TOTAL MARKS: 12		

No	Questions	Marks	Student's tips
9	Green plants synthesize their food through the process of photosynthesis. The chemical process of photosynthesis can be summarized as in the schematic diagram below  		
(a)(i)	Name process K [1 mark] ----------		Correct spelling
(ii)	Where process K occur [1 mark] ----------		
(iii)	State the function of sunlight in process K. [1 mark] ---------- ----------		
(b)	Explain one adaptive characteristic of leave which help in process K [4 marks] **F1 -** **E1 -** **F2 -** **E2 -**		

(c)	Describe how process L can produce the substance Z. [3 marks] **P1 :** **P2 :** **P3 :**		
(d)	Suggest how to increase the production of substance Z? [2 marks] **P1 :** **P2 :**		
(e)	Oxygen is released by the process of photosynthesis. Describe how oxygen is form? **P1 :** **P2 :**		
	TOTAL MARKS:12		

No	Questions	Marks	Student's tips
10.	Diagram 10.1 shows fish respiratory system Diagram 10.2 shows human respiratory system  Diagram 10.1  Diagram 10.2		
(a)	Name structures X and Z. [2 marks] **Structure X:** **Structure Z:**		Correct spelling
(b)	Explain how exchange of oxygen occurs between Z and Y [2 marks] **P1:** **P2:**		

(c) Explain two characteristic which X and Z have in common for efficiency in gases exchange. [4 marks]

F1:

E1:

F2:

E2:

F3:

E3:

F4:

E4:

(d) Explain one difference between respiratory system of human and a fish. [2 marks]

P1:

E1:

E2:

(e) The man is a very heavy smoker. Explain the consequences of the habit to his health. [3 marks]

Substance in cigarette smoke	explanation	consequences
P1 :		

	P2:				
	P3 :				
	P4:				
	P5 :				
	TOTAL MARKS : 12				

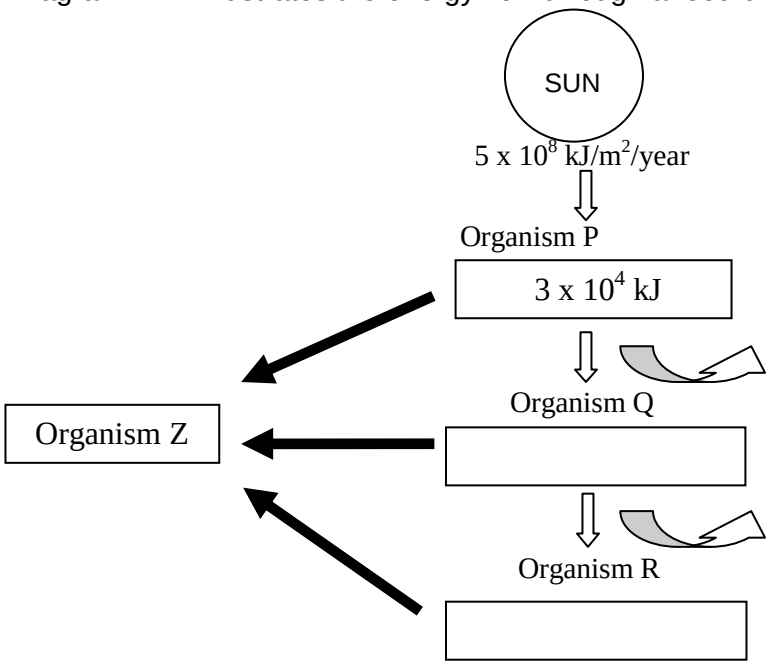
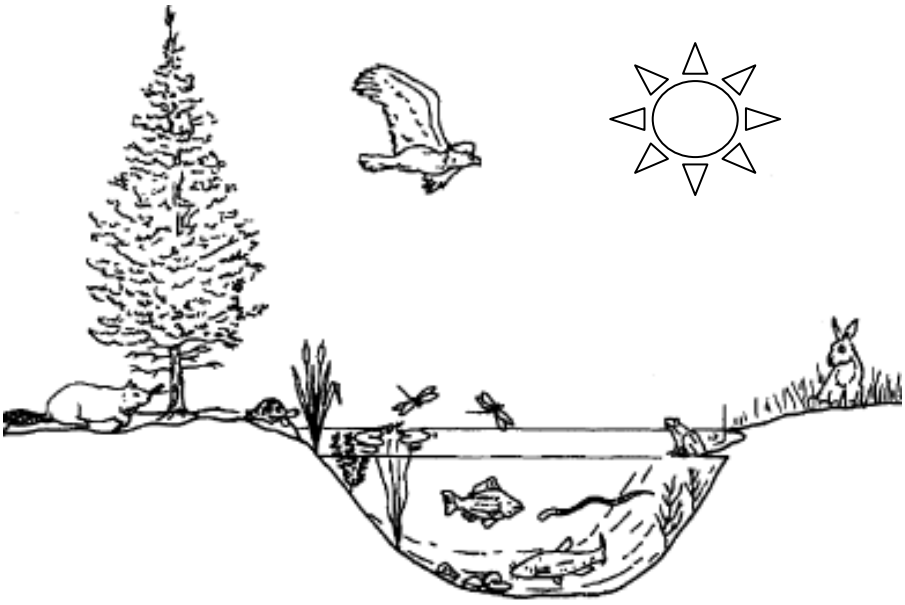
No	Questions	Marks	Student's tips
11	Diagram 11.1 illustrates the energy flow through a food chain.  Diagram 11.1 Key : Energy flow within the ecosystem : Energy flow in dead organism : Energy flow out from the food chain		
(a)(i)	Organism P absorbs 30 x 10^3 kJ of solar energy. Energy loss at each trophic level is 90%. Complete Diagram 11.1 the total energy transferred to Organism Q and Organism R. [2marks]	2	
(a) (ii)	Explain what happens to the energy that is not transferred from one trophic level to the next trophic level. [2 marks] **F1:** **E1:** **E2:**		
(b)	State the role of Organism Z. [1 mark]		

	Diagram 11.2 shows a pond ecosystem,  Diagram 11.2		
(c)(i)	Based on Diagram 11.2, give an example of: [3marks] Organism P: Organism Q: Organism R:		Only organisms from the diagram Suggestion of Organism P, Q, and R **must fit the food chain.**
(ii)	Construct a pyramid of energy based on organisms from (c)(i). [2marks]		
(d)	Give **one** reason why not all light energy from the sun is converted and stored in the producer. **P1:**		
(e)	State **one** factor which will reduce light penetration to the leaf for photosynthesis Sample answers **P1:**		
	TOTAL MARKS:12		

No	Questions	Marks	Student's tips
12	Yogurt is a nutritionally dairy food product prepared by mixing a type of microoraganism. Diagram 12.1 shows different types of yogurt that can be found at the supermarket. I 		
(a) (i)	Diagram 12.2 shows the process in making yogurt. [2 marks] Milk + Microorganism P → Process X → Yogurt Name microorganism P and process X **Microorganism P :** **Process X :**		
(ii)	Explain process X [3 marks] **F:** **P1:** **P2:** **P3:** **P4:**		

(b) (i) Explain the health benefits of taking yogurt. [3 marks]

P1:

P2:

P3:

P4:

(c) The oil spill endangers the livelihood of the area fishermen, potentially harms tourism and local businesses. In addition, the oil spill is a potential environmental tragedy that may have devastating effects on the area's wildlife.

Birds will be among the first to experience the effects of the spill.

Diagram 23(b) shows a bird is at risk due to oil spill.

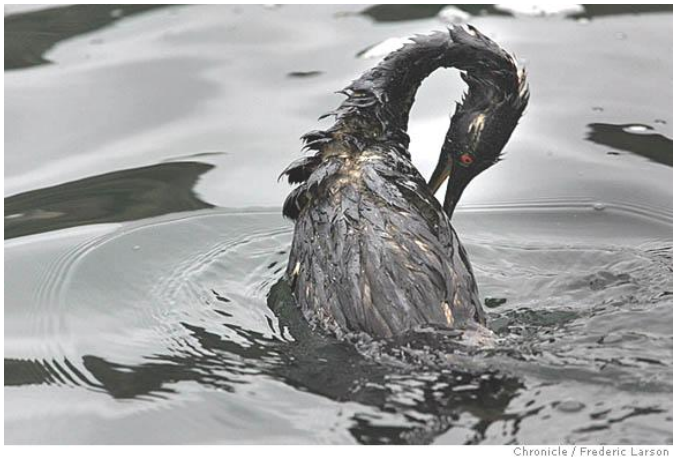


Diagram 23(b)

Explain how beneficial microorganisms help to overcome the problem shown in Diagram 23(b) [4 marks]

F : ……

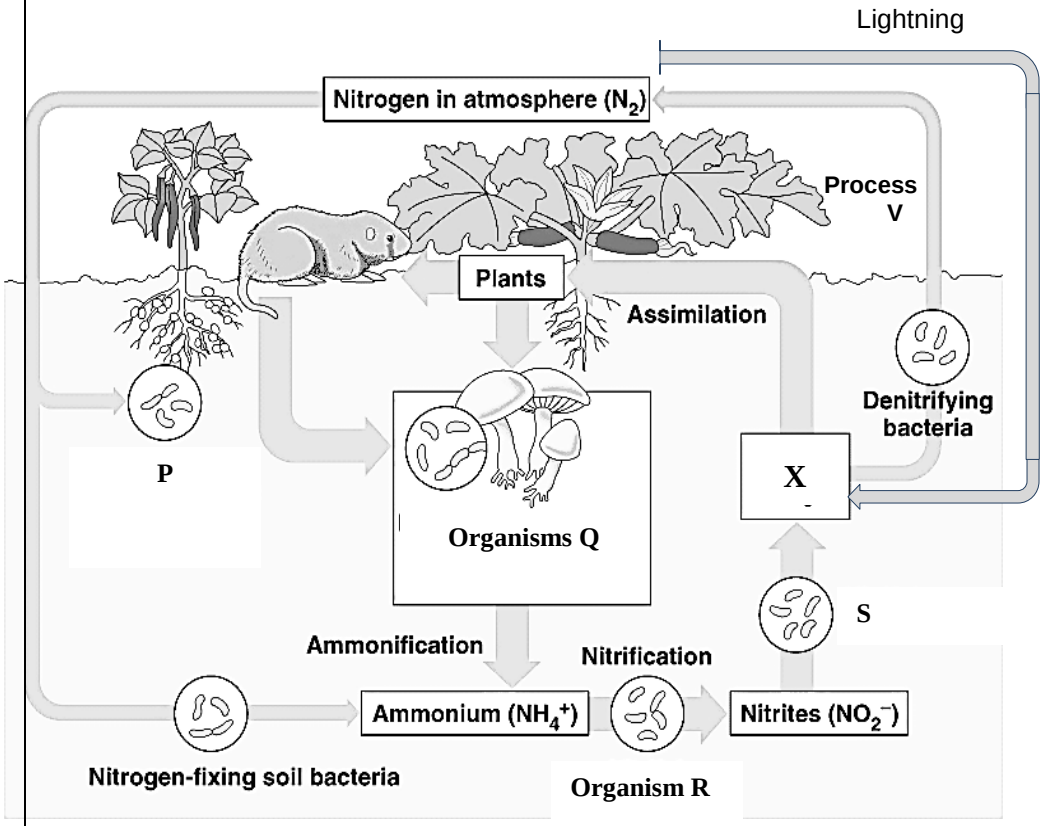
P1: ……..

P2: ……..

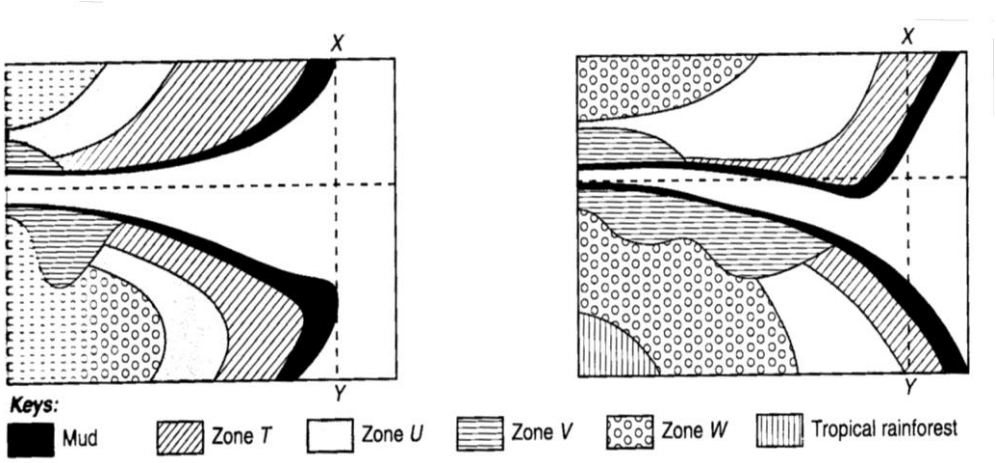
P3: ……..

P4: ……..

TOTAL MARKS : 12

No	Questions	Marks	Student's tips
13	Diagram 13 shows a nitrogen cycle at the agriculture area  	1	Answer must refer to the diagram
(a) (i)	Name the organism P, R and S [2 marks] **P:** **R:** **S:**		
(ii)	State the function of organism R and S [2 marks] **Function R:** **Function S:**	2	

(b)	Explain the relationship between organism P and leguminous plant. [3marks] **P1:** **P2:** **P3:**	3	
(c)	Explain how the organisms Q bring about their function. [3 marks] **F :** **P1:** **P2:** **P3:**	3	
(d)	Explain the process V and process W. [4 marks] **Process V :** **P1:** **P2:** **P3:** **Process W:** **P4:** **P5:** **P6:** **P7:**		
(e)	Explain what will happen to activity of bacteria if this area received acid rain. [2 marks] **P1:** **P2:**		
	TOTAL MARKS:12		

No	Questions	Marks	Student's tips
14	Diagram 14.1 below shows a mangrove swamp at a river mouth in 1950 and 2012 respectively. The line XY shows the position of the beach.  DIAGRAM 14.1		
a) i)	What has happened to the mangrove zone in Diagram 14.1 [1 mark]		
ii)	Name the process that is taking place. [1 mark]		
iii)	Explain the process mention in (a) (ii) [3 marks] **P1 :** **P2:** **P3:** **P4:**		

b) By using suitable keys, sketch the zones of mangrove swamp in Diagram 14.2 in which the following mangrove trees can be found.
Brugueira sp, Avicennia sp, Rhizophora sp.

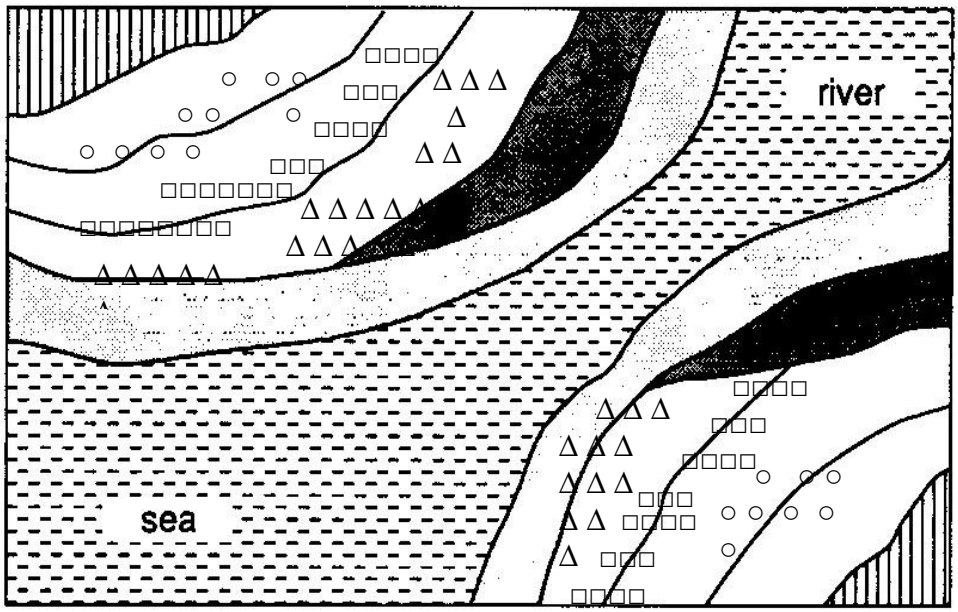
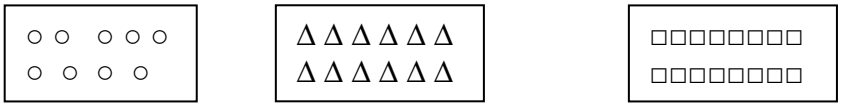


DIAGRAM 14.2



Brugeira sp Avicennia sp Rhizophora sp

b) i) State the type of seedlings produced by the mangrove trees. [1 mark]

ii) Explain how this type of seedling increases the chances of survival of the mangrove trees. [2 marks]

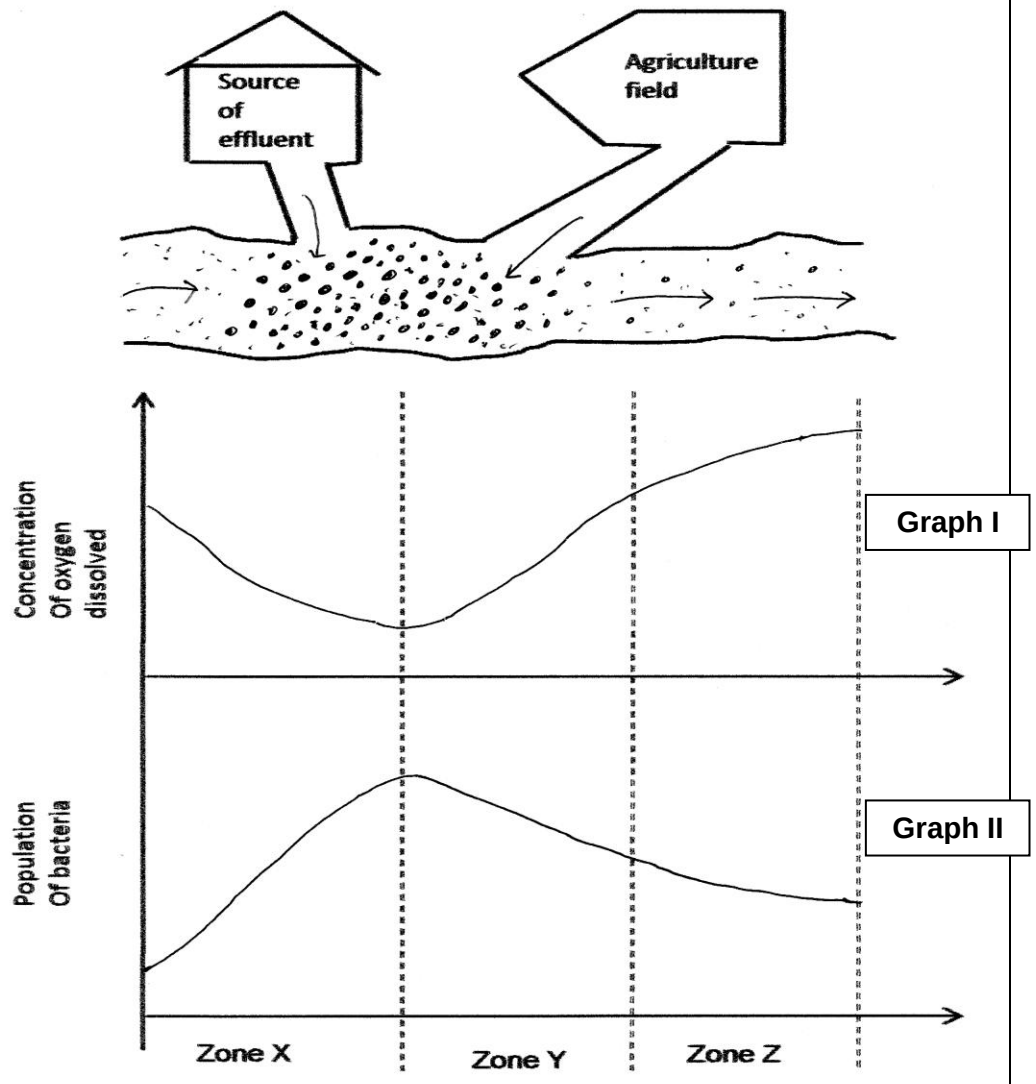
P1 :

P2:

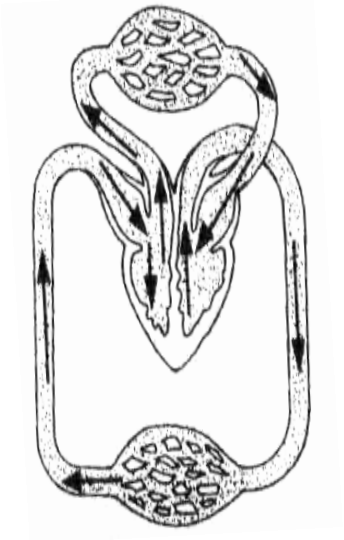
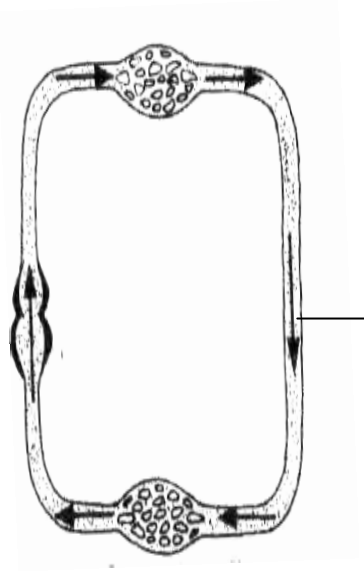
c) State one problem faced by mangrove trees. Explain how mangrove trees overcome this problem. [2 marks]

P1:

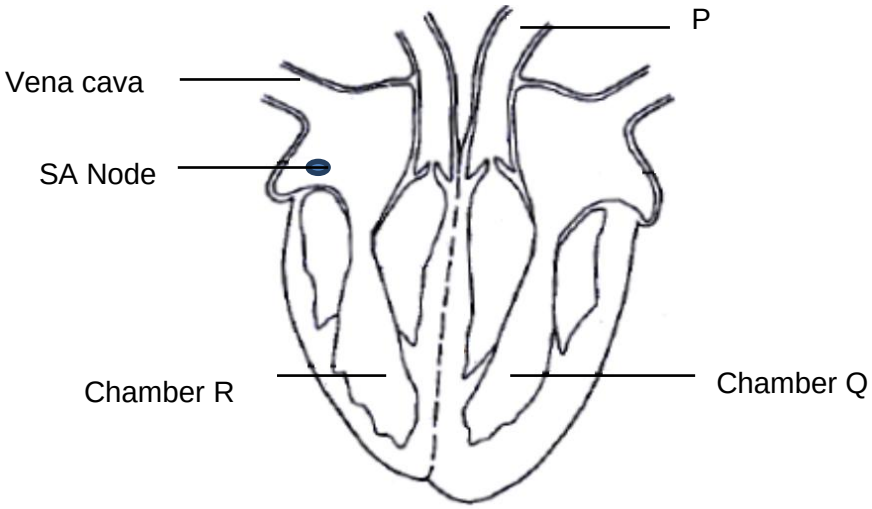
P2:

No	Questions	Marks	Student's tips
15	Diagram 15 shows source of water pollution in a river. It also show effects of the pollution of zone X , zone Y and zone Z along the river. Graph I shows concentration of dissolved oxygen and Graph II shows population of bacteria in the same river.  Diagram 15		
(a)	Name one pollutant which discharging from source of effluent and agricultural field. [2 marks] **P1:** **P2:**		
(b)	Explain the changes of bacteria population shown in zone X. [3 marks] **F :**		

	P1 : **P2 :** **P3 :**		
(c) (i)	At Graph II, draw a graph to show population of fish along zone X , zone Y and Zone Z. [1mark]		
(ii)	Explain the graph which you have drawn in c(i) . [3 marks] **F :** **P1 :** **P2 :** **P3 :**		
(d)	Suggest three ways to reduce the impact of water pollution. [3 marks] **P1:** **P2:** **P3:** **P4:** **P5:**		
	TOTAL MARKS:12		

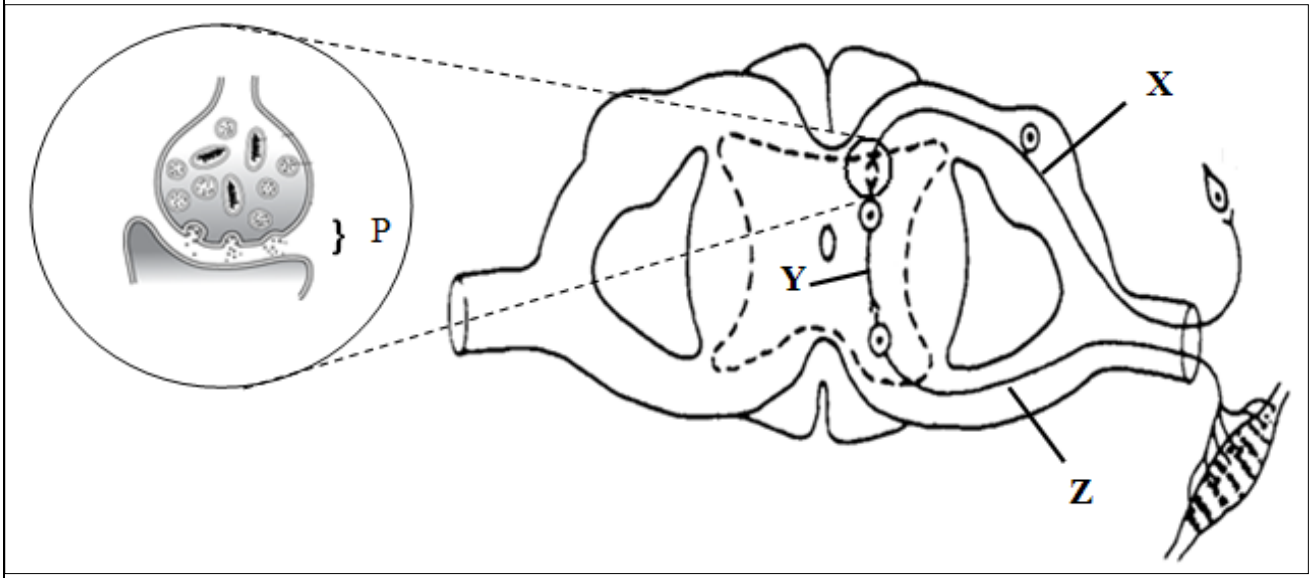
No	Questions	Marks	Student's tips
16	Diagram 16.1 and 16.2 shows the circulatory system of an organism P and the circulatory system of an organism Q  Body cells Diagram 16.1  X Body cells Diagram 16.2		
(a)	State the types of circulatory system and name one example of organism for each diagram. [2 marks] Diagram 16.1 : Type of circulatory system : ..... Example or organism : ..... Diagram 16.2 : Type of circulatory system : ..... Example or organism :		
(b)	State two differences between the hearts of both organisms. [2 marks] **P1** : ..... **P2 :**		

(c)	Explain one difference between the structure of blood vessels W and X. [2 marks] **F1 :** **P1 :** **OR** **F2 :** **P2 :**		
(d)	Explain one change in the blood contents in blood vessels Y and Z. [3 marks] **P1:** **P2:** **P3:** **P4:**		
(e)	Explain why the circulatory system shown in Diagram 16.1 is more efficient than the circulatory system in Diagram 16.2. [3 marks] **P1:** **P2:** **P3:**		
	TOTAL MARKS: 12		

No	Questions	Marks	Student's tips
17.	A human heart is situated in the thoracic cavity. It pumps blood which carries all the vital materials that help the body function. It contain four cambers and strong muscles. Diagram 17 shows a human heart.  Diagram 17		
(a)(i)	Name the muscle which build up the heart. [1 mark]		
(ii)	Explain the characteristic of the muscle which allow the heart to function efficiently . [2 marks] **F :** ..... **P1 :** ..... **P2 :** ..... **P3 :**		
(iii)	Explain **one** difference of oxygen concentration in blood which flow into chamber R and chamber Q. [2 marks]		

	Chamber R	Chamber Q
F		
P1		
P2		

b(i)	The sino-atrial node located in the right atrial wall that acts like a pacemaker. Explain the role of the pacemaker to ensure the heart pumps blood efficiently. [2 marks] **F :** **P1 :** **P2 :** **P3 :**		
b(ii)	Although the function of pacemaker is to ensure the heart pumps blood efficiently, the pacemaker itself is regulated by two set of nerves and hormones. Explain the statement above. [2 marks] **F1 :** **P1 :** **P2 :** **P3 :**		
c	When we listen to our heartbeat through a stethoscope, we can hear a lubb-dubb sound. [3 marks] Explain why. **F :** **P1 :** **P2 :**		
	TOTAL MARKS: 12		

No	Questions	Marks	Student`s Tips
18	Diagram 18 shows the cross section of the spinal cord and the reflex arc.  Diagram 18		
(a)	On diagram 18 draw the arrow on X, Y and Z to show the direction of the nerves impulses on the reflex arc. [1 mark]		
(b)(i)	Name X, Y and Z in the box provided. [3 marks] X | Y | Z | |		
(ii)	State **two** differences between X and Z. [2 marks] **P1:** **P2:** **P3:**		

(c)(i)	Diagram 18 shows gap P between the axon terminal and dendrite terminal of two neurones. [1 mark] Name gap P		
(ii)	Name one of chemical substances which is released across P. [1 mark]		
(d)	A disease related to the nervous system which usually affect the elderly people is caused by lack of the chemical substances in (c) (ii)		
(i)	Name the disease. [1 mark]		
(ii)	Explain your answer in (d)(i) [3 marks] **F :** **P1 :** **P2 :** **Or** **F :** **P1 :**		
	TOTAL MARKS:12		

No	Questions	Marks	Student's tips
19	A series of experiment in Diagrams 19.1 and Diagram 19.2 were conducted to study the effect of the tip on the growth of corn coleoptiles.		

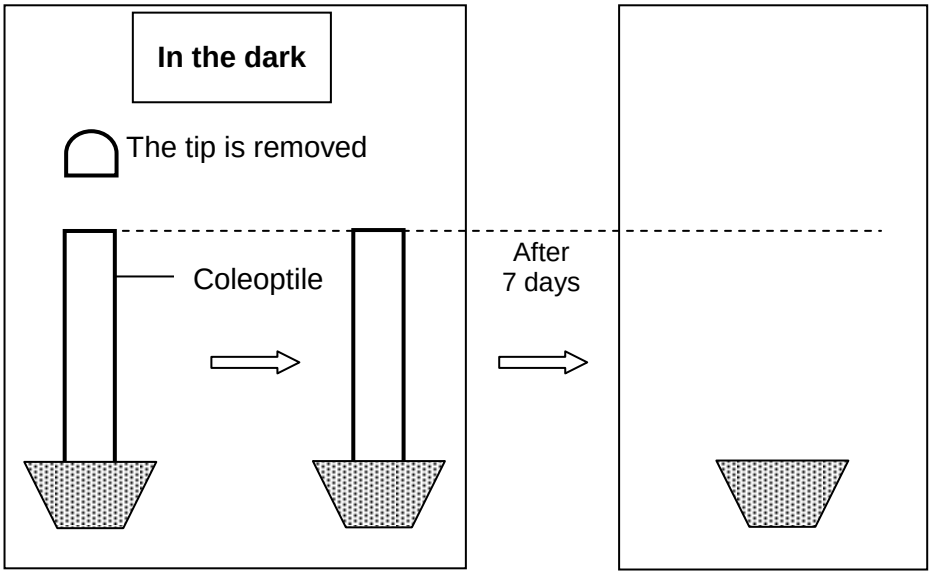


Diagram 19.1

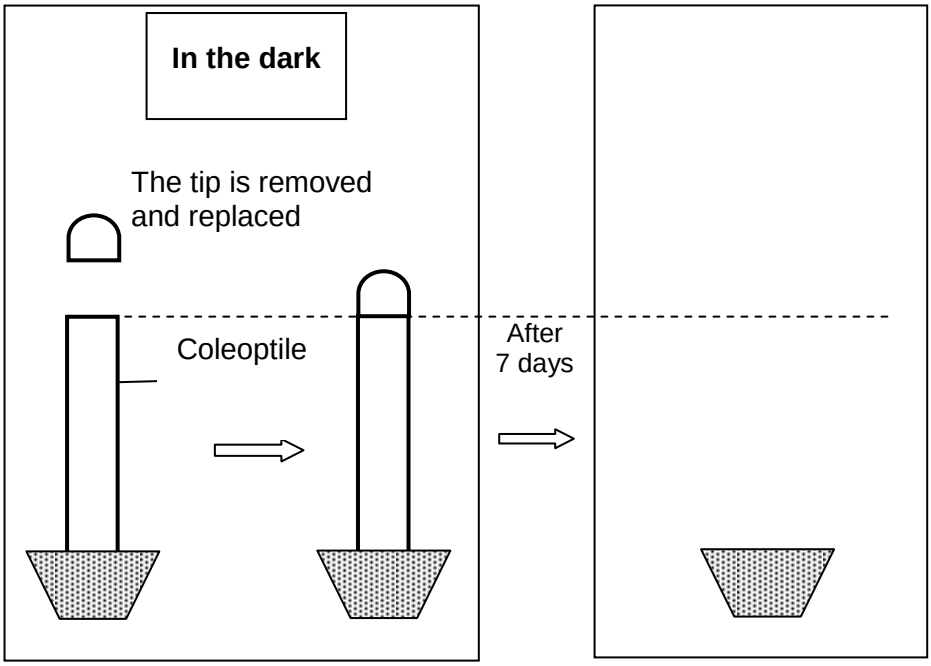
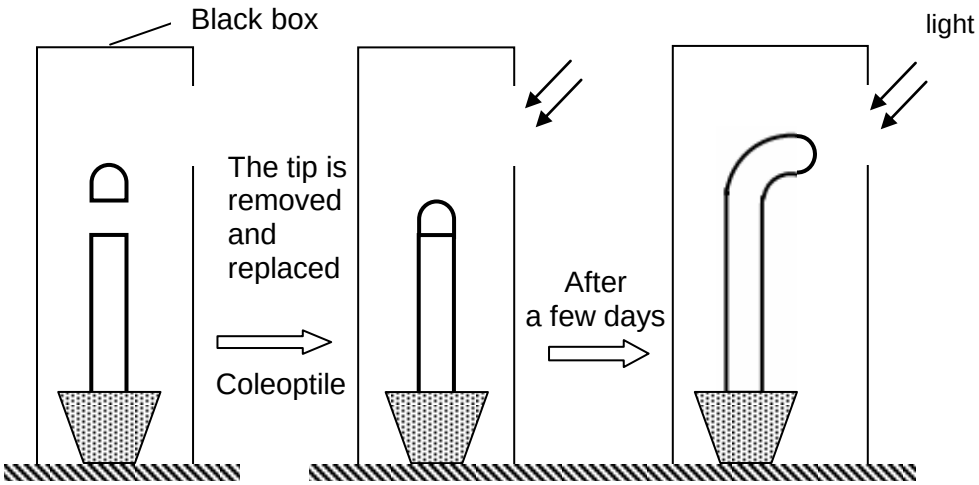
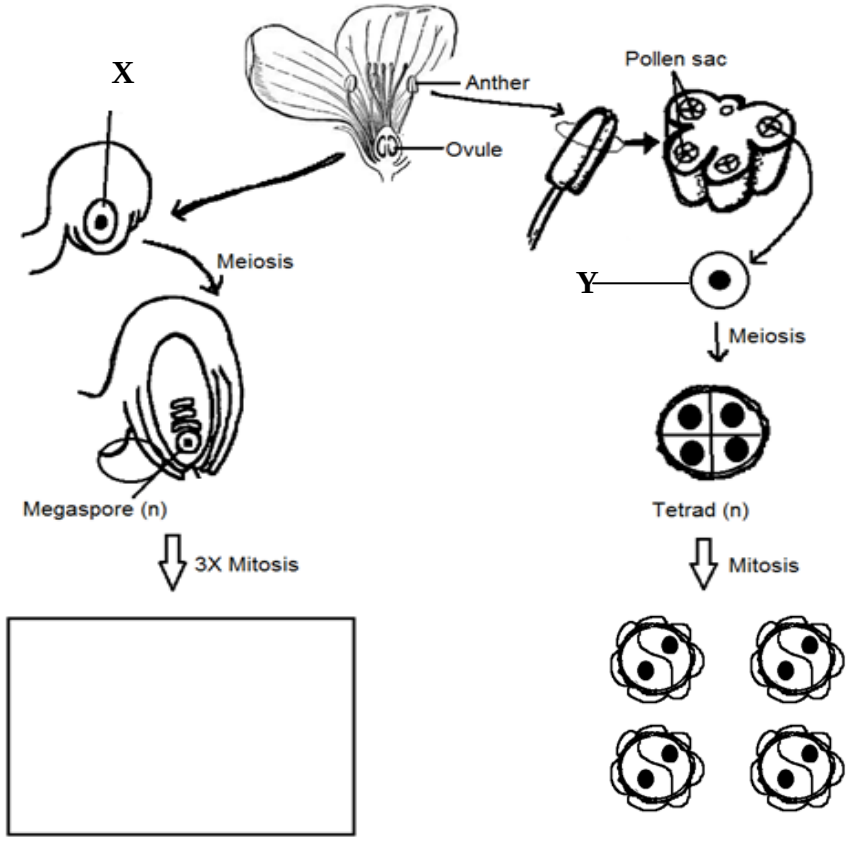
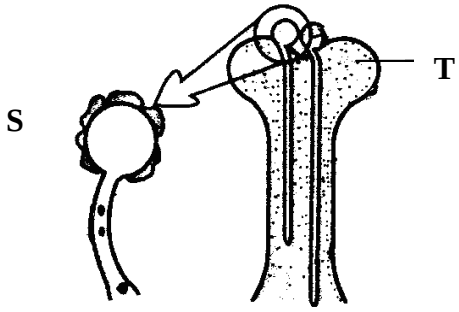


Diagram 19.2

Notes : *Diagram 19.1 – The coleoptile / tip should not exceed the dotted line @ shows no elongation. Diagram 2 – The coleoptile / tip must exceed the dotted line @ elongation occurs / straight upward.*

No	Questions	Marks	Student's tips
a(i)	On the Diagram 19.1 and Diagram 19.2, draw your observation in the space given. [2 marks]		
(ii)	Give the reason for the answer in (a) (i). [2 marks] **P1:** **P2:** **P3:** Or **P1:** **P2:**		
b	 Diagram 19.3 The result in Diagram 19.3 shows that the coleoptile bends towards light. Explain the result. [3 marks] **P1 :** **P2 :** **P3 :**		

No	Questions	Marks	Student's tips
c(i)	Name a plant hormone that can be found in the shoot tip? [1 mark]		
(ii)	What is the effect of plant hormone in c (i) on the growth of plant? [2marks]		
d(i)	Plant hormones are used extensively in agriculture to modify plant growth and development. What is the function of the hormone in culture tissue? [1 mark]		
(ii)	Explain the use of hormone in parthenocarpic fruit development [2 marks] **P1 :** **P2 :** **P3 :**		
	TOTAL MARKS :12		

No	Questions	Marks	Student's tips
20	Diagram 20.1 shows the gamete formation in flowering plant.  Diagram 20.1		
(a)	Label the structure X and Y. [2 marks] X : Y :		
(b)	Draw and label the nucleus in mature embryo sac in provided space. [1mark]		
(c)	Reproduction in plants involves the fusion of male and female gametes. Diagram 20.2 shows the process before fertilization occur in flowering plant.  		

(c)(i)	Name the process in Diagram 20.2. [1 mark]		
(c)(ii)	Explain what happen to structure S when it lands on structure T. [3 marks] **P1:** **P2:** **P3:**		
(d)	After the fertilization, the fruit is developing from the flower. Relate the structure of a fruit to the major flower parts. [2 marks] **P1:** **P2:**		
(e)	Structure S involve in the double fertilisation. Explain the importance of double fertilisation [3 marks] Sample answer : **P1:** **P2:** **P3:** **P4 :**		
	TOTAL MARKS: 12		

No	Questions	Marks	Student's tips
21	A group of student carries out a study of variation of fingerprints and body weight of Form 5 student at their school. The result of the study is shown in the Table 1 and Table 2.		

Types of fingerprints	Whorl 	Curves 	Composite 	Loops 
No of student	15	24	32	25

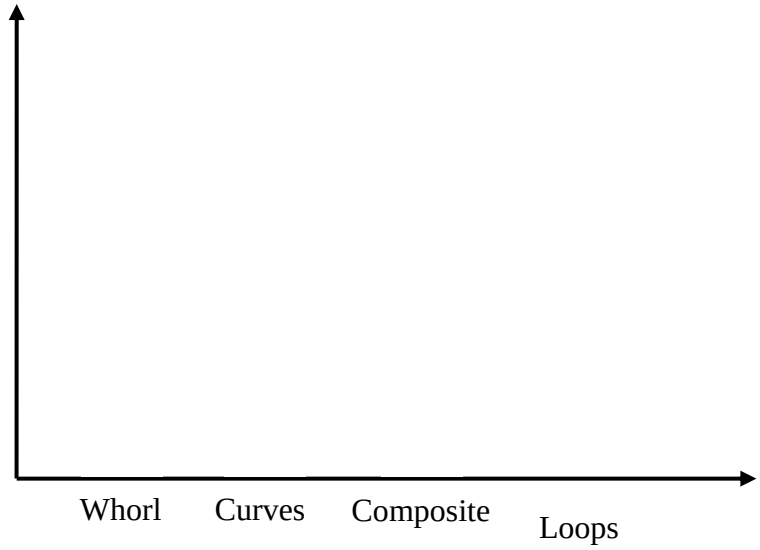
Table 1: Number of student according to types of fingerprints

Range of body weight(kg)	<40	40-44	45-49	50-54	55-59	60-64	>65
No of student	12	15	21	27	24	18	6

Table 2: Body weight distribution among students

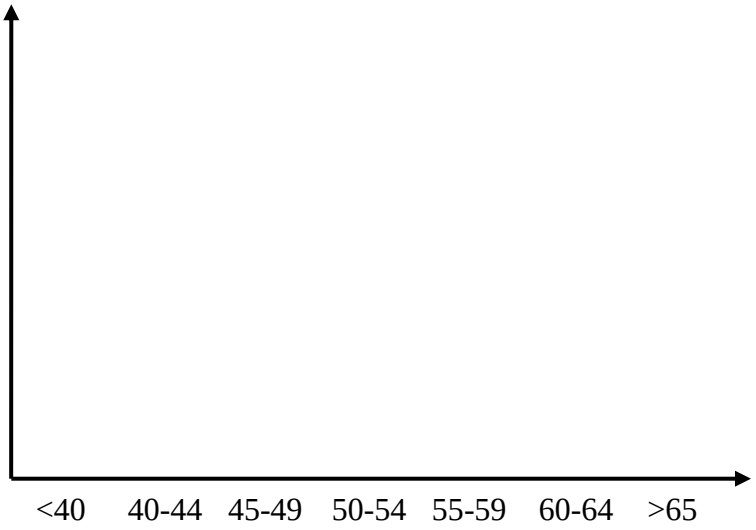
(a)(i) Based on Table 1 and Table 2, draw a frequency distribution histogram to show

(i) The number of students against their types of fingerprints.



(a)
(ii)

(i) The number of students against their height



[4 marks]

(b)

State **two** differences between the variation shown by the types of fingerprints and the type of their height of the students. [2 marks]

Height (continuous variation)	**Type of fingerprint** (discontinuous variation)

-

(c)

Explain the importance of variation. [2 marks]

F:

P:

(d) Mutation is one of the factors that cause variation. Diagram 21 shows two types of chromosomal mutation.

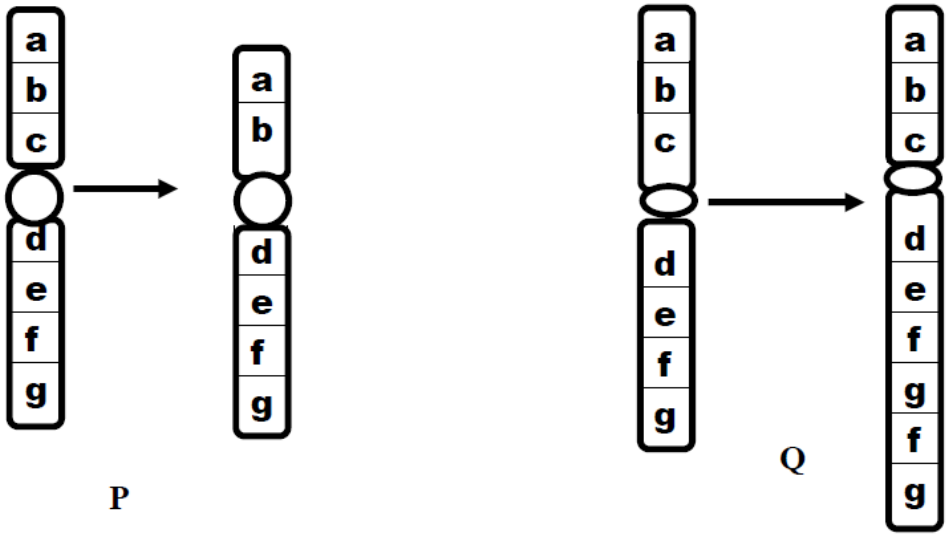


Diagram 21

Name the processes involved in the mutation of P and Q. [2 marks]

Answer:

P:

Q:

(ii) Explain one bad effect cause by mutation.

(e) If we were to plant some cloned banana plant, it will grow into adult banana plants with some physical variation like height and number of fruits even though they have the same genotype.
Explain how that variation occurs amongst the cloned banana plants.
[3 marks]

F:

P1:

P2:

P3:

No	Questions	Marks	Student's tips
22	Table 1 shows three examples of variation between Individual P and Individual Q.		

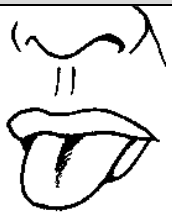
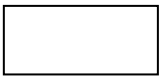
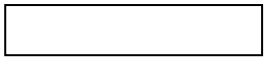
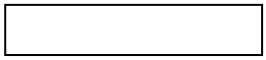
Individual P	Individual Q	Continuous Variation	Discontinuous Variation
			
			
			

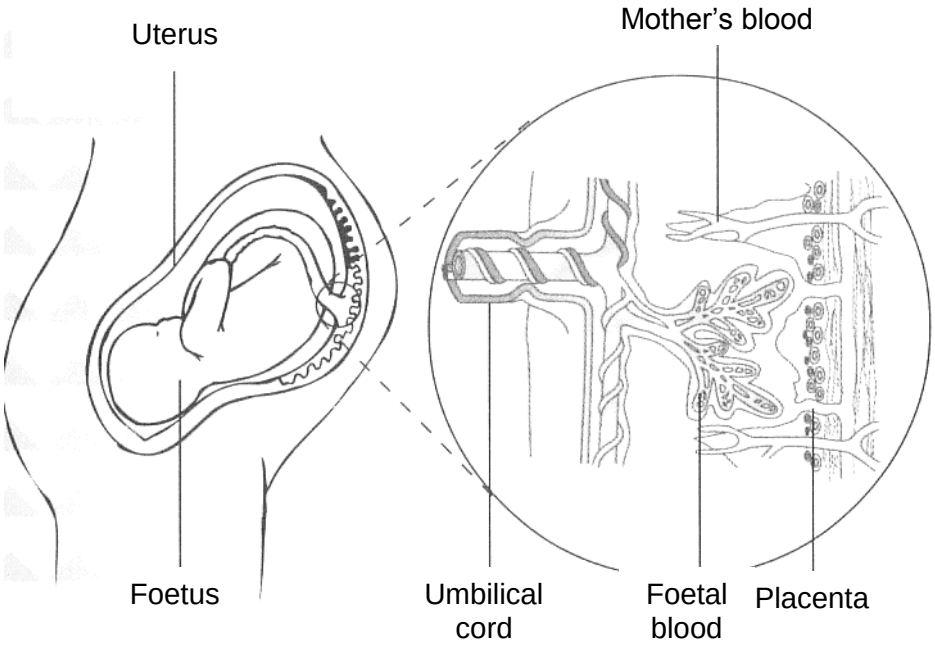
Table 1

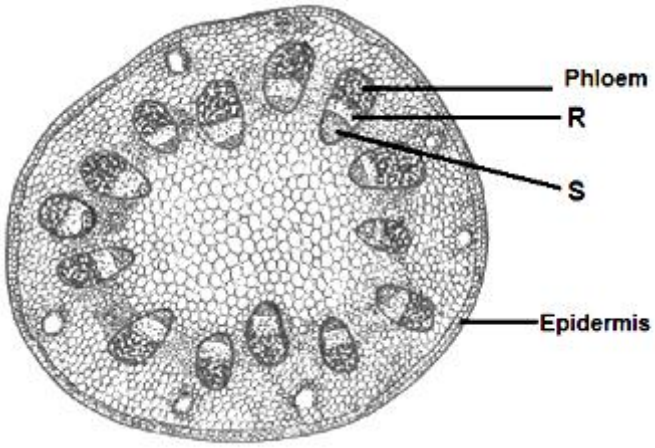
(a)	Use a tick (√) in the correct boxes to show the type of each variation. [3 marks]		
(b)	State the meaning of variation [1 mark]		
(c)	State two differences between continuous variation and discontinuous variation. [2 marks]		

Continuous Variation	**Discontinuous Variation**

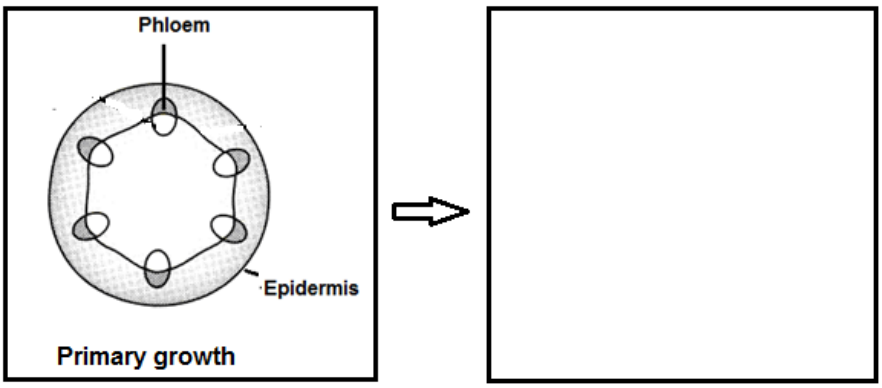
d.	Diagram show two varieties of rabbit, *Lepus alleni* and *Lepus articus* 		
d(i)	State whether the different characteristics between *Lepus alleni* and *Lepus articus* are examples of variation? [2 marks]		
d(ii)	Explain two different characteristics between *Lepus alleni* and *Lepus articus* on how to help them to survive in their respective habitat [4 marks] *Lepus alleni* **F1 :** **E1 :** **E2 :** *Lepus articus* **F1 :** **E1 :** **E2 :**		
	TOTAL MARKS:12		

No	Questions	Marks	Student's tips
23	Diagram 23.1 shows part of a genetic diagram about the inheritance of Rhesus factor in a family. The trait of the husband is rhesus positive, while the wife is rhesus negative. 'Rh' is the dominant gene, while 'rh' is the recessive gene. Parent : Husband X Wife Phenotype : Rhesus Positive Rhesus Negetive Genotype :  Gamete :  Offspring Genotype :  Phenotype :  Phenotypic Ratio:  Diagram 23.1		
(a)	Complete the genetic diagram. [4 marks]		
(b)	Describe the Rhesus factor in humans [2 marks] **P1 :** **P2 :**		
(c)	Explain the inheritance of Rhesus factor by the offspring. [2 marks] Sample answers: **P1 :** **P2:**		

(d)	Diagram 23.2 shows the position of the foetus and the structure of placenta during the second pregnancy of the wife.  		
(d) (i)	Explain the complication faced by the foetus during the second pregnancy. [2 marks] **P1:** **P2:** **P3:**		
(ii)	State one treatment the wife should undergo to avoid the complication in (d) (i). [2 marks] **P1 :** **P2 :**		
	TOTAL MARKS : 12		

No	Questions	Marks	Student's tips
24	Diagram 24.1 shows a cross section of a plant's stem.  Diagram 24.1		
(a)(i)	Name structure R and S. [2 marks] R : S :		
(ii)	Explain the adaptive structure of S related to its function. [2 marks] F: E:		
(b)(i)	Tissue R plays important role in plant secondary growth. Explain the function of tissue R. [2 marks] F: P:		

(ii) Draw diagram in the box given to show the secondary growth of dicot stem.



Answer:

(c) Explain the benefits of the plant that undergo secondary growth as in (b)(ii) compared to plant in 24.2(i)
How does this affect their life span, survival and economic value? [4marks]

Criteria	Plants with secondary growth
Life span	**P1:** **P2:**
Survival	**P3:** **P4:** **P5:** **P6:** **P7:**
Economic value	**P8:** **P9:** **P10:** **P11:**

1 P At least from each criteria

TOTAL MARKS: 12

KEMENTERIAN PENDIDIKAN MALAYSIA

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN

MODUL X-A Plus / PERFECT SCORE

BIOLOGI 4551/2 (STRUKTUR) 2013

EDISI GURU

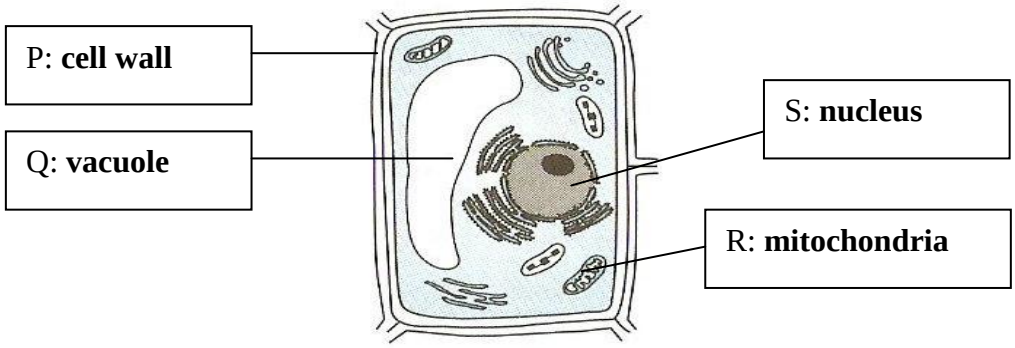
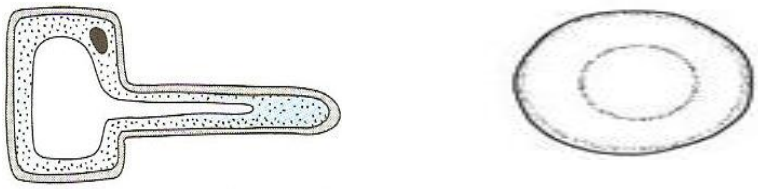
http://cikguadura.wordpress.com/

DISEDIAKAN OLEH

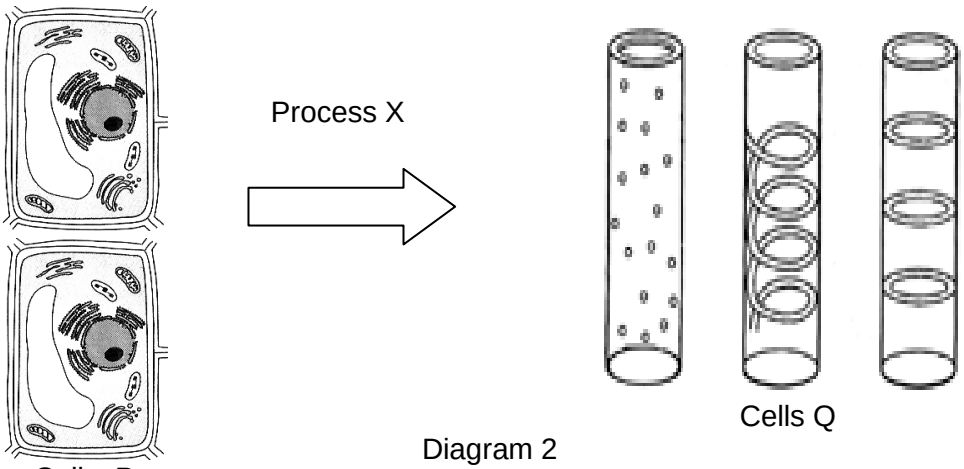
MAZINAH BT MUDA
DATIN NORIDAH BT YANGMAN
NURUL UYUN BT ABDULLAH
ROSIAPAH BT DOLLAH
HJ MELI BIN HUSSIN
NORAINI BT SAMIN
HABSHAH BT KHATIB
ZALINA BT AHMAD
SUSANTI BT GAMIN
FATIMAHWATI BT MALEK
MOHD IZANI B SAUFI
MOHD FADHIL BIN MASRON

SMS TENGKU MUHAMMAD FARIS PETRA
SMS TUANKU SYED PUTRA
SMS KUALA SELANGOR
SMS SELANGOR
SMS KUALA TERENGGANU
SMS MUAR
SMS KUCHING
KOLEJ ISLAM SULTAN ALAM SHAH
SMS JOHOR
SMA PERSEKUTUAN LABU
SMS KEPALA BATAS
SMS LABUAN

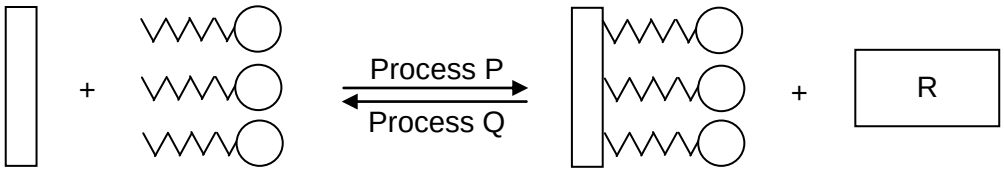
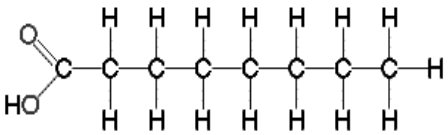
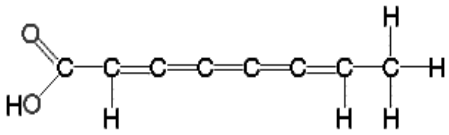
Section A

No	Questions	Marks	Student's tips
1.	Diagram 1(a) shows the structure of a typical plant cell.  **Diagram 1(a)**		
(a)	Label the structures P, Q, R and S in Diagram 1(a)	2	
(b) (i)	Name the process which occur in R? **Cellular respiration // syenthesis of energy / ATP**	2	
(ii)	Write an equation for the process occur in R. **$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + 2898KJ$ //** **glucose + oxygen $\longrightarrow$ carbon dioxide + water**	2	
	 M N **Diagram 1(b)**		
(c) (i)	Diagram 1(b) shows two specialised cells , M and N. Name M and N. **M: Root hair cell** **N : Red blood cell**	1	
(ii)	State **one** characteristic of M that help them to carry out their function effectively. **F: having proturding / projection/** **P: to increase total surface area for efficient absorption of water and minerals.**	2	

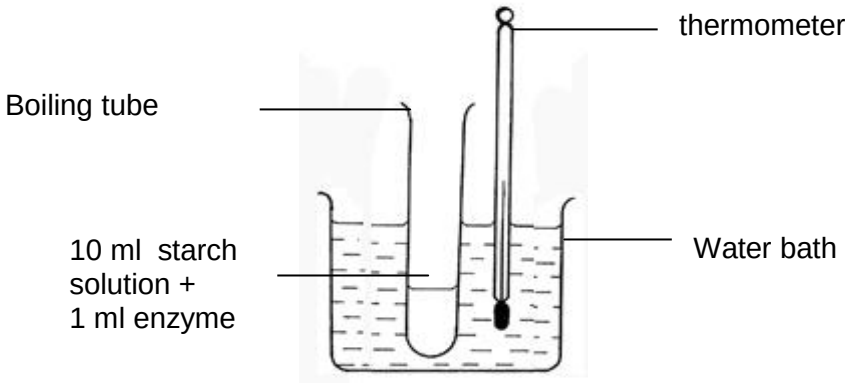
(d) (i) (ii)	A pineapple planter wants to produce a large number of pineapple in a short time. State one technique to be used by the planter **Tissue culture** Explain one problem to be considered in using the technique. **F : no variation among clones** **P : wide spread of disease // huge destruction of diseases**	3	
	TOTAL	**12**	

No	Questions	Marks	Student's tips
2.	Diagram 2 shows process X undergone by cells P in forming tissue Q  Diagram 2		
(a)(i)	Name process X **Cell specialization// cell differentiation**	1	
(a)(ii)	Explain process X Sample answer: **P1: The cell grows and changes in structure and shapes** **P2: to carry out specific function**	1 1	
(b)	State **two** differences between cells P and cells Q **P1: Cells P has thin wall whereas cells Q has thick wall (thickened by lignin)** **P2: Cells P has organelles in it whereas cells Q is hollow (no organelles found in it)**	(2M) 1 1	
(c)	Describe the differentiation process of cells P to form cells Q Sample answer: **P1: Cell P elongated and joined end to end** **P2: the wall of cells P at the joints dissolved/breakdown** **P3: to form a long, continuous tube hollow tube (from root to leaves** **P4: the wall form Cell Q is thickened by lignin**	2M 1 1 1 1	

(d)	During the formation of cells Q, the plant was unable to synthesise lignin. Explain the effect on the function of a leaf. **Sample answer:** **P1: The leaf cannot carry out photosynthesis** **P2: No transport of water** **P3: Without lignin, cells Q cannot get support; therefore it collapses**	(2M) 1 1 1	
(e)	Explain the importance of cells Q in ensuring secondary growth plants to have a longer life span **P1: Cells Q is strong to form a continuous tube** **P2: To transport water and dissolved mineral** **P3: To ensure photosynthesis can continuously occur** **P4: To provide support and strengthen the growing plant**	(3M) 1 1 1 1	
	TOTAL MARKS	**12**	

No	Questions	Marks	Student's tips
3.	Diagram 3 shows the formation and break down of one molecule lipid.  1 molecule of lipid Diagram 3.1		
(a)	Name molecule R. **Water**	1 1	- Answer must refer to the diagram
(b) **(i)** **(ii)**	Explain processes P and Q. Process P: [3 marks] ▪ **Condensation** ▪ **One (molecule of) glycerol** ▪ **React with three (molecule of) fatty acids** ▪ **(Three molecules of) water is released** (Any 3) Process Q [3 marks] ▪ **Hydrolysis** ▪ **(Three) Water (molecules) break down the lipid** ▪ **into glycerol and fatty acids**	1 1	
(c)	Diagram 3.2 shows two structures of fatty acids in lipids  Diagram 3.2a  Diagram 3.2b		

(c)(i)	State three characteristics of fatty acid in Diagram 3.2a which makes it different from the fatty acid in Diagram 3.2b. **Able to state the characteristic of unsaturated fats.** **Sample answers:** ▪ **No double bond between the carbon atoms** ▪ **Maximum number of hydrogen atoms** ▪ **High melting/freezing points** ▪ **Contains more cholesterol** (Any 3) [3 marks]	1 1	
(c)(ii)	Explain how excessive consumption of fatty acid in Diagram 3.2a leads to cardiovascular diseases. **Able to explain how excessive consumption of saturated fatty acid leads to cardiovascular diseases.** **Sample answers:** ▪ **Increase cholesterol level (in blood)** ▪ **Deposits on the inner walls of arteries / Atherosclerosis** ▪ **Blocks blood flow / supply of oxygen** ▪ **Angina / stroke / hypertension / heart attack / myocardial infarction**	1 1 1 1 (Any 3)	
	TOTAL MARKS	**12**	

No	Questions	Marks	Student`s tips
4	A group of students carried out an experiment to study the effect of temperature on salivary amylase on starch. Diagram 4.1 shows the apparatus set-up used in the experiment.  The whole experiment in Diagram 4.1 was repeated using different temperature as following:		

Boiling tube	P	Q	R	S
Temperature 0C	10	20	40	40
Enzyme	Fresh amylase	Fresh amylase	Fresh amylase	Boiled amylase

Quantity of starch in the boiling tube was determined every one minute.
Diagram 4.2 shows the graphs of quantity of starch against time.

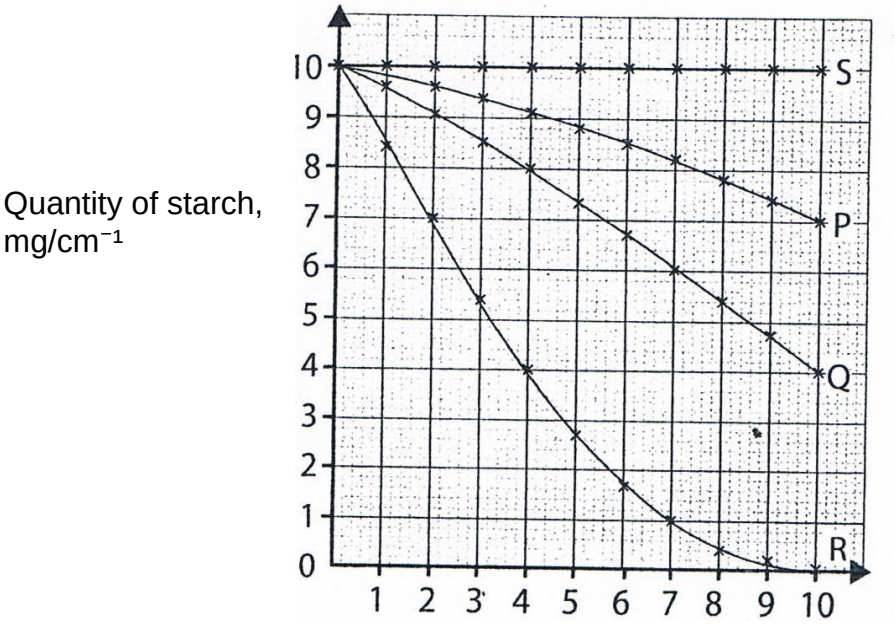


Diagram 4.1

<table>
<tr><td>(a)(i)</td><td>Name the product of this reaction.

Maltose</td><td>1</td><td></td></tr>
<tr><td>(ii)</td><td>Name the process involved in this reaction.

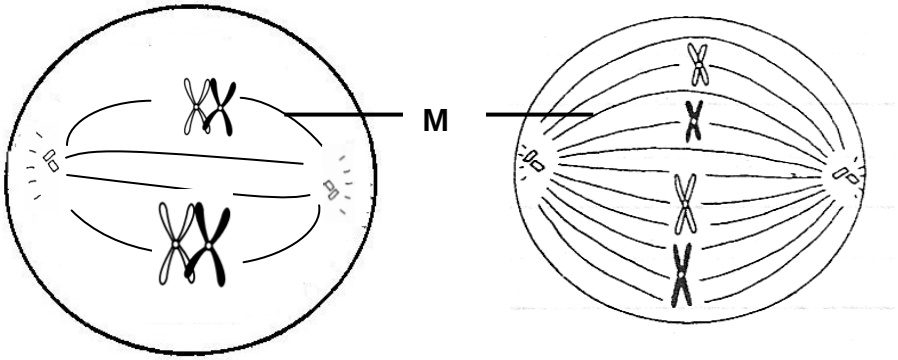
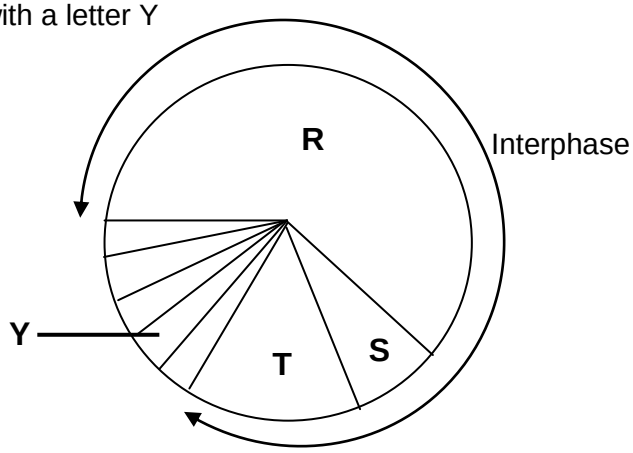
Hydrolyse / digestion / breakdown</td><td>1</td><td></td></tr>
<tr><td>(b)</td><td>Explain graph S

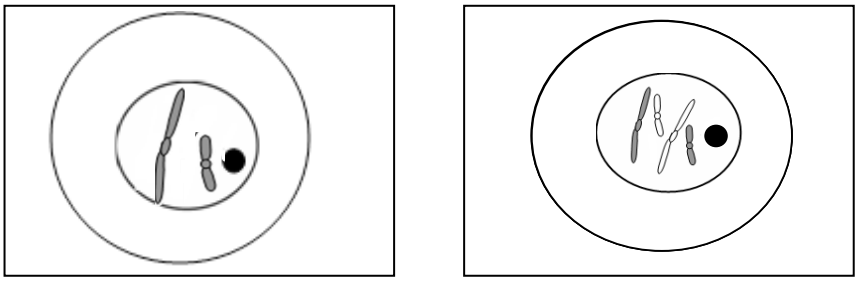
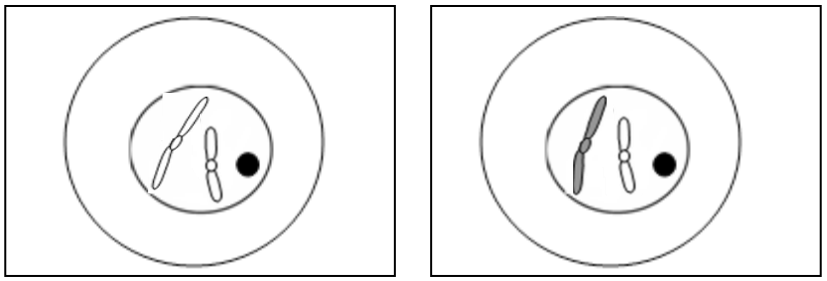
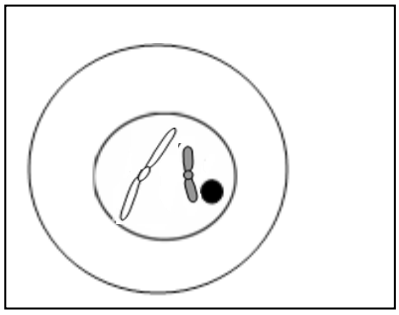
F: shape of graph is straight line,
P1: no changes in quantity of strach/maintain from 0 minute to 10 minutes.
P2: enzyme denatured by high temperature
P3: no hydrolysed of starch</td><td>3</td><td></td></tr>
<tr><td>(c)</td><td>Explain one difference between graph R and Q.

<table>
<tr><th></th><th>R</th><th>Q</th></tr>
<tr><td>F</td><td>40°C // optimum temperature</td><td>20°C // low temperature</td></tr>
<tr><td>E1</td><td>Maximum Enzyme reaction</td><td>Slow enzyme reaction slow</td></tr>
<tr><td>E2</td><td>Most of the starch was hydrolysed</td><td>Little amount of starch was hydrolysed</td></tr>
</table>
</td><td>3</td><td></td></tr>
<tr><td>(d)</td><td>State the conclusion from the graphs.

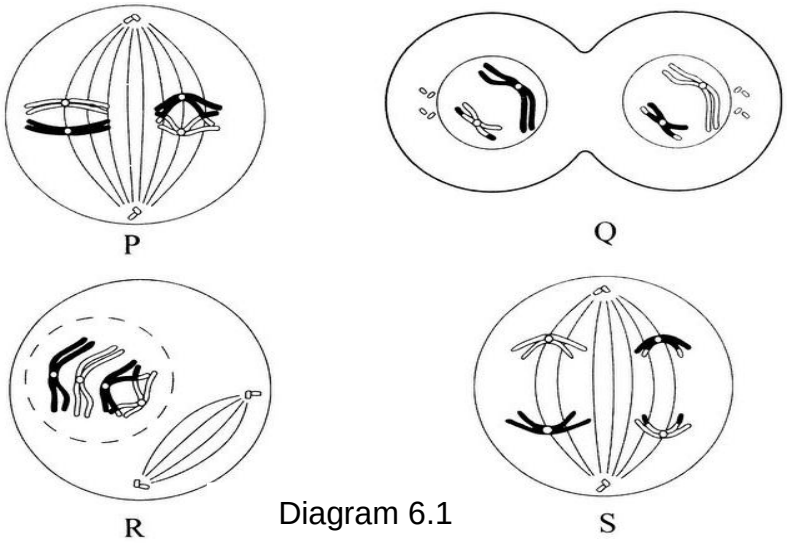
Optimum temperature for activity amylase is 40°C</td><td>1</td><td></td></tr>
<tr><td>(e)</td><td>Detergent contain enzyme to wash protein stain.
Suggest how to use the detergent to get efficient result.

P1: use detergent which contain protease / pepsin
P2: because blood stain has protien
P4: used water with the temperature 37- 40°C
P3: soak the cloth at least in 10 minutes//any minute
Any 3</td><td>3</td><td></td></tr>
<tr><td></td><td>TOTAL</td><td>12</td><td></td></tr>
</table>

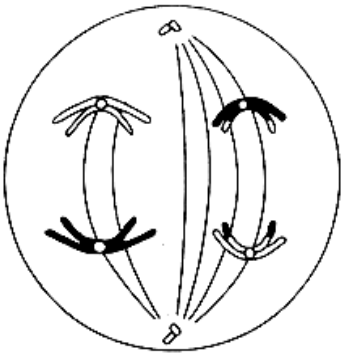
No	Questions	Marks	Student's tips
5.	Diagram 5 below shows cell P and cell Q undergoes one of the stages for two types of cell division.  Cell P Cell Q		
a(i)	State the types of cell divisions shown in Diagram above. **P : <u>Meiosis</u> Q : <u>Mitosis</u>** [2 marks]	1 1	-
(ii)	State one function of P and Q. **P : <u>Produce gamete</u>** **Q : <u>Replace dead //damage cell // repair damaged tissue // asexual reproduction // increasing the number of cells / growth</u>** [2 marks]	1 1	
b(i)	Diagram below shows a cell cycle. On the diagram, label the stage shown by cell Q with a letter Y .  		

(ii)	Describe what happens during sub-phases R, S and T. [3*marks*] **R : <u>Proteins and new organelles are being synthesized.</u>** **S : <u>Synthesis of DNA / replication choromosome (genetic material) occurs.</u>** **T :<u>The cell accumulates energy and completes its final preparations for division.</u>**	1 1 1	
c	Draw a daughter cell of cell P and cell Q after both cells have completed the cell division in the boxes provided below.  Cell P Cell Q or  [2 marks] Cell P Cell P or  Note : Number of chromosome, n=2 (cell P) Number of chromosome, 2n=4 (cell Q) The type (colour) of chromosomes	1 1	

d	A boy has been exposed to gamma rays which results in the failure of structure M to be formed. Explain the effects of this gamma rays to the formation of the daughter cells of cell P. **F1** : **The reproductive cells to have either extra or less number of chromosomes.** **E1 : causes sister chormatid pulled to one side of poles.** **E2 : sister chomatid cannot be saperated.**	1 1 1	

No	Questions http://cikguadura.wordpress.com/	Marks	Student's tips
6	Diagram 6.1 shows the different stages in meiosis Iof an animal cell.  Diagram 6.1		
a(i)	Arrange the stages of the cell division in the correct sequence. [1 marks] R → P → S → Q		
(ii)	Explain the chromosome behaviour during stage R. [2 marks] **P1 : Homologous chromosome pair up// synapsis occurs** **P2 : non sister chromatid / homologous chromosome exchange its genetic information**		
(iii)	Explain the importance of chromosome behaviour in stage R to the survival of the animal. [3 marks] **P1 : (This behaviour) will cause variation** **P2 : (Variation causes) animal able to adapt with any changes in environment // able to cause natural selection/** **P3 : (variation cause) animal has better resistance to disease** **P3 : Animal has greater advantage in eluding predators or capture prey**		

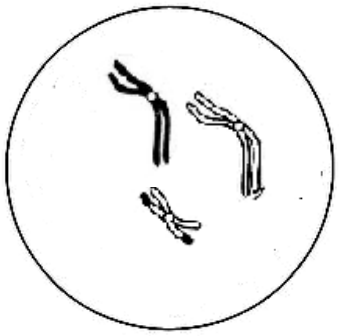
(b) Diagram 6.1 shows spindle fibre of the cell in stage S is failed to form after exposure to a radioactive ray.



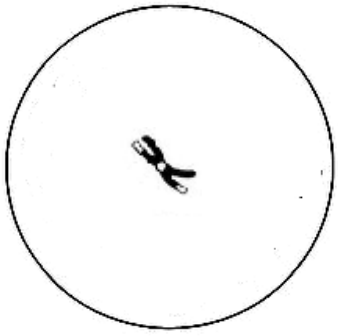
S

Diagram 6.1

Complete the diagram below to show the chromosomal number in daughter cell after meiosis I is completed.



Daughter cell 1



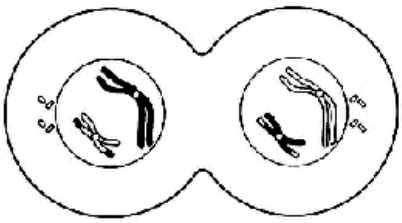
Daughter cell 2

[2 marks]

Explain the formation of daughter cell 1 and 2 in b (i). [2 marks]

P1 : Homologous chromosome is not separated //non-disjunction of Homologous Chromosome
P2 : during Anaphase 2
P3 : cause one daughter has extra one chromosome while the other one has less one chromosome// number of chromosome in daughter cell is not equal.

(c) Diagram 6.3 shows the stage of Q in an animal cell and stage of V in a plant cell.



Q

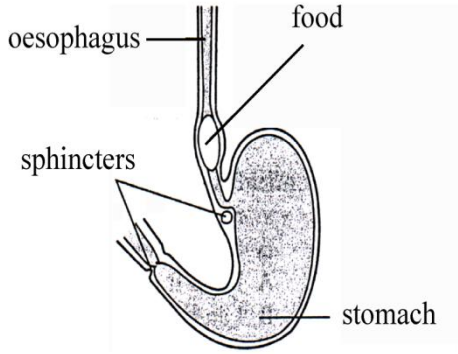
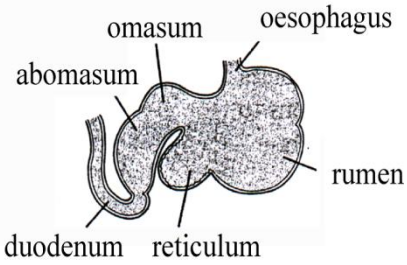
Diagram 6.3 **V**

Explain one difference in the condition of the cell at stage Q and stage V.

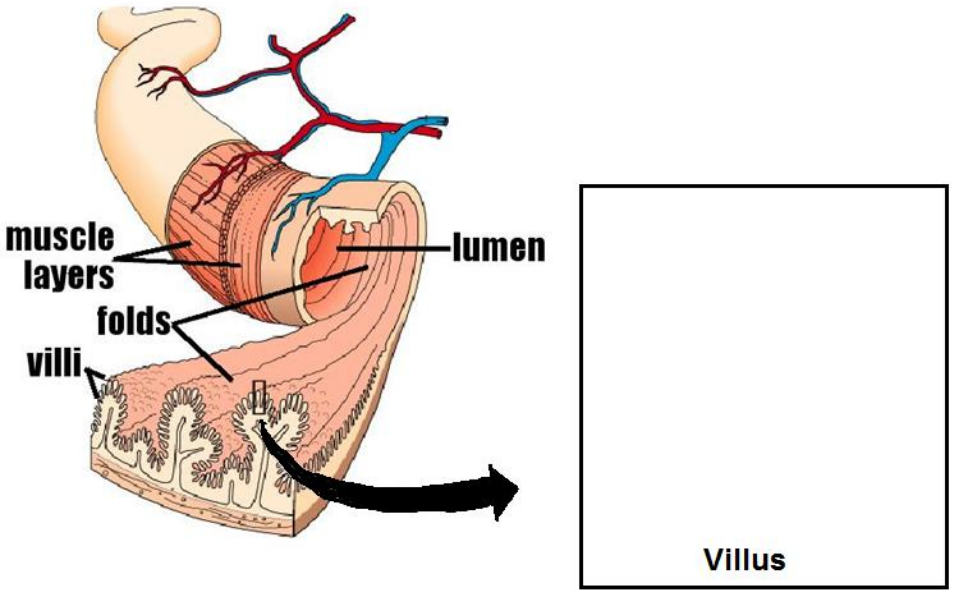
[2 marks]

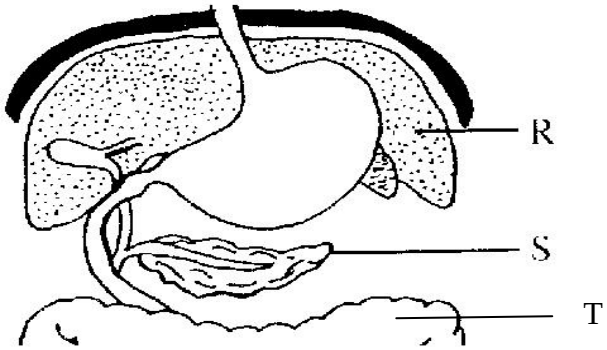
Stage Q	**Stage V**
D1 : contraction of actin filament // formation of cleavage furrow	D1 : formation of vesicle in the Cytoplasm// formation of cell plate
E : to divide cytoplasm// undergo cytoplasmic division/ cytokines	

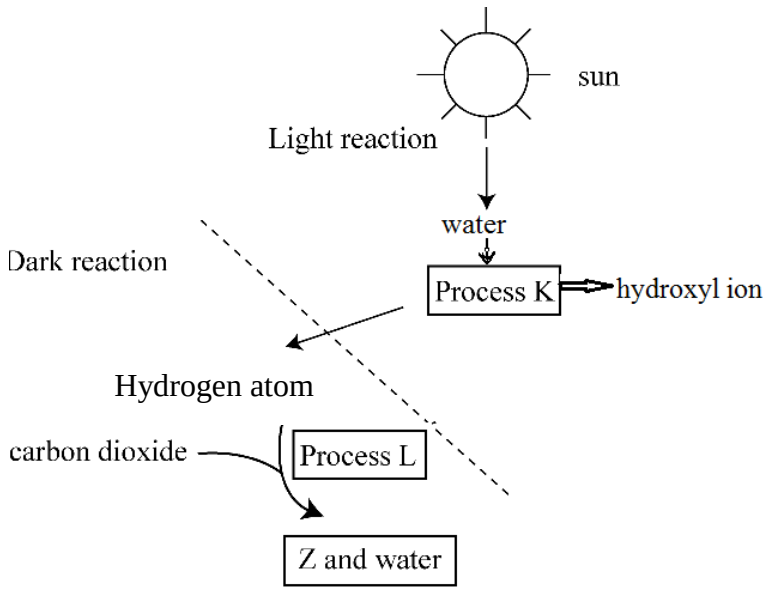
	Total Marks	12	

No	Questions	Marks	Student's tips
7	Diagram 7.1 and 7.2 show the stomach of a man and a cow.   Diagram 7.1 Diagram 7.2		
(a)	Based on the Diagram 7.1 and Diagram 7.2 state **one** adaptive characteristic of the cow's stomach compare to the man's stomach . **Cow's stomach has 4 chambers/compartment while man's stomach has only 1 chamber/compartmen**	1	- Answer must refer to the diagram
(b)(i)	Name the compartments of the cow's stomach in correct sequence to show the movement of food starting from the oesophagus. **Oesophagus → rumen → reticulum → mouth → omasum → Abomasum → duodenum**	2	- Correct spelling
(ii)	What is the cow's true stomach? Give a reason for your answer. **Abomasums** **because there are glands in the inner epithelium lining of the stomach which can secretes enzymes**	1 1	
(c)	Explain what happens in the largest compartment of the cow's stomach?. **F - digestion of cellulose by cellulase** **E1 - there are large communities of bacteria and protozoa which able To produce cellulase.** **E2 - Part of the breakdown products are absorbed by the bacteria.**	1 1 1	

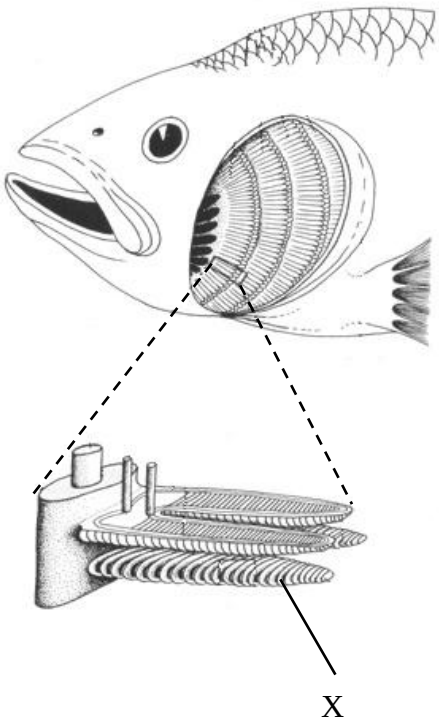
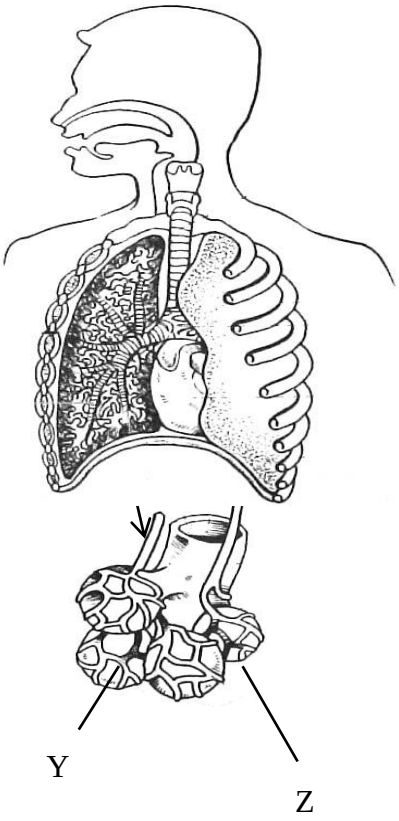
(d)	Describe what happens in the stomach of the man. - **Digestion of large protein molecules into smaller chain or polypeptides by pepsin** - **Digestion of milk protein by rennin** - **Coagulates milk by converting the soluble milk protein / caseinogens into insoluble casein** - **it can stay in the stomach for a number of hour**	1 1 1	
(e)	State **one** similarity between cow's digestive system with rodent's digestive system. - **Both have compartment with large communities of bacteria and protozoa which able to produce cellulase for the digestion of cellulose.**	1	
	TOTAL MARKS	**12**	

No	Questions	Marks	Student's tips
8	Diagram 8.1 shows the small intestine structure that involve in absorption.  Diagram 8.1	1 1 1	
(a)	Draw the villus structure in the Diagram 8.1 with label. [3 marks]		
(b)	State the **two** adaptation structure of villus that facilitates the diffusion of digested food in small intestine. **P1: The lining of villus is made of one cell thick** **P2: Surface area of villus is large / Numerous of microvilli** **P3: Rich of blood capillaries** **P4: Has lacteal** *Any two* [2 marks]	1 1	
(c)	Explain the absorption of vitamin A and B by villus. **Vitamin A: Diffuse into (cell and to) lacteal** **Vitamin B: Diffuse into (cell and to) blood capillaries** [2 marks]	1 1	

(d)	Diagram 8.2 shows a part of the digestive system and the organs related to assimilation.  Diagram 8.2		
(d)(i)	Structure S in Solehin is malfunctioned in controlling blood sugar level. Name the health problem he is facing. [1 marks] **Diabetis Mellitus/ Insipidus**	1	
(d) (ii)	Rice is digested to glucose which is then absorbed in T. This will cause an increase in the blood sugar level. Explain how R and S controls the blood glucose level. **P1:** (When the blood glucose level increase) **S secretes insulin** (and carry by blood vessel to R) **P2: R use insulin to convert glucose into glycogen** **P3: Glycogen store in liver** [4 marks]	1 1 1	
	TOTAL MARKS	**12**	

no	Questions	Marks	Student's tips
9	Green plants synthesize their food through the process of photosynthesis. The chemical process of photosynthesis can be summarized as in the schematic diagram below  		
(a)(i)	Name process K **Photolysis of water**	 1	- Correct spelling -
(ii)	Where process K occur **At Grana in the chloroplast**	 1	
(iii)	State the function of sunlight in process K. **P1 : Provide light energy which use to split water molecules into hydrogen ions (H^+) and hydroxyl ions (OH^-) // Provide light energy which excites the electrons of chlorophyll molecules to higher energy levels – the electrons leave the chlorophyll molecules.**	 1	
(b)	Explain one adaptive characteristic of leave which help in process K **F1 - Broad and thin** **E1 - Broader surface area over volume ratio, more light can be absorb at one time.** **F2 - Flat shape** **E2 - easier for light to penetrate and easier to reach the palisades mesophyll tissue** Any 2 F+E	 1 1 1 1	

(c)	Describe how process L can produce the substance Z. **P1 : The hydrogen atom combines with carbon dioxide to form glucose and water** **P2 : It occurs in a series of chemical reactions which require ATP** **P3 : The reaction occur in the stroma**	 1 1 1	
(d)	Suggest how to increase the production of substance Z? - **Supply with higher concentration of carbon dioxide** - **Supply with higher light intensity**	 1 1	
(e)	Oxygen is released by the process of photosynthesis. Describe how oxygen in form? **P1 : Hydroxyl ions (OH^-) loses an electron to form a hydroxyl group [OH].** **P2 : The hydroxyl groups [OH] then combine to form water and gaseous oxygen**	 1 1	
	TOTAL MARKS	**12**	

No	Questions	Marks	Student's tips
10	Diagram 10.1 shows fish respiratory system Diagram 10.2 shows human respiratory system  Diagram 10.1  Diagram 10.2		
(a)	Name structures X and Z. **Structure X: Gill Filament / Lamella** **Structure Z: Alveolus**	 1 1	Correct spelling
(b)	Explain how exchange of oxygen occurs between Z and Y **P1: Partial pressure of oxygen in alveolus / Z is higher compare to in blood capillary / Y** **P2: Oxygen diffused from alveolus / Z into the blood capillary / Y**	 1 1	

(c) Explain two characteristic which X and Z have in common for efficiency in gases exchange. [4marks]

F1: Both consist of many tiny structures // human has many alveolus and fish has many filaments	1
E1: lamellas to increase total surface	
F2: Both X and Z are surrounded by many / very dense network of blood capillaries	1
E2: to transport gases/oxygen rapidly	1
F3: Both X and Z have very thin cell membranes / surfaces, only one cell thick for diffusion of gases to be more efficient	1
E3: gases diffusion easily/rapidly	
F4: Both X and Z are moist,	**Any 4**
E4: the gases easily dissolved in the moist,	

(d) Explain one difference between respiratory system of human and a fish. [2 marks]

P1: The respiratory organ of fish consists of (4 pairs of) gills while the respiratory organ of human consists of (a pair of)lungs.	1
E1: gills are covered by operculum while lungs are covered by rib cage.	1
E2: The surface of each gills filaments has many plate-like projections called lamella while have many air sacs called alveoli//respiratory surface for gills is lamella while respiratory surface for lungs is alveolus.	1
	Any 2

(e) The man is a very heavy smoker. Explain the consequences of the habit to his health.

Substance in cigarette smoke	**explanation**	**consequences**	
P1 : carcinogenic substance/ nicotine/ benzo-α-pyrene	Stimulate cell mutation// cell divide uncontrollably	Causes lungs cancer	3 1 1
P2: Tar/carbon	Deposit on the surface of alveolus/logged the lungs	Cause black lungs//difficulty in breathing	1 Or 1 1 1

	P3 : Carbon monoxide	Combine with haemoglobin to form carboxyheamoglobin	Reduce transportation of oxygen to cells.	1 1	
	P4: Nitrogen dioxide/ sulfur dioxide	Irritate the cell lining the trachea /alveolus /lungs	Reduce surface for gases exchange/ reduce the number of alveolus //Bronchitis// Emphysema	1	
	P5 : Heat	Increase temperature in lung	Cause dryness/ reduce moisture on the surface of alveolus/ less oxygen dissolve // Laryngitis		
			TOTAL		

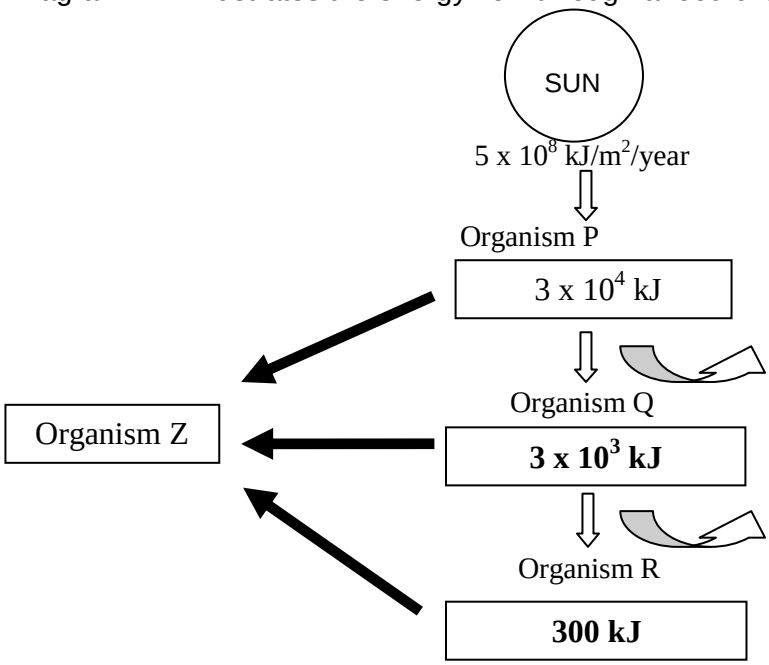
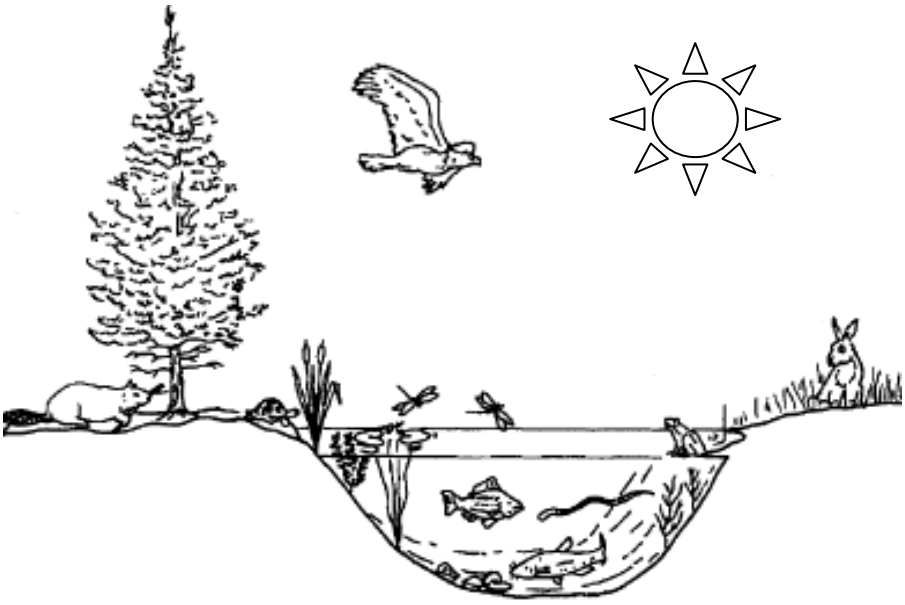
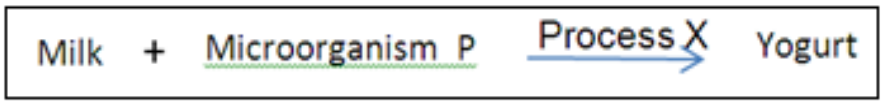
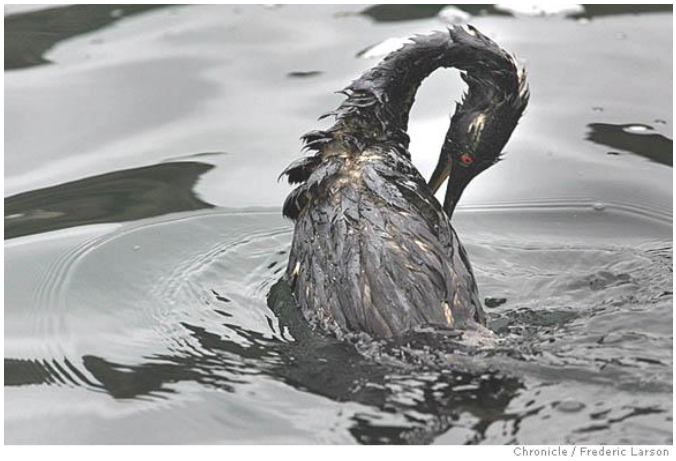
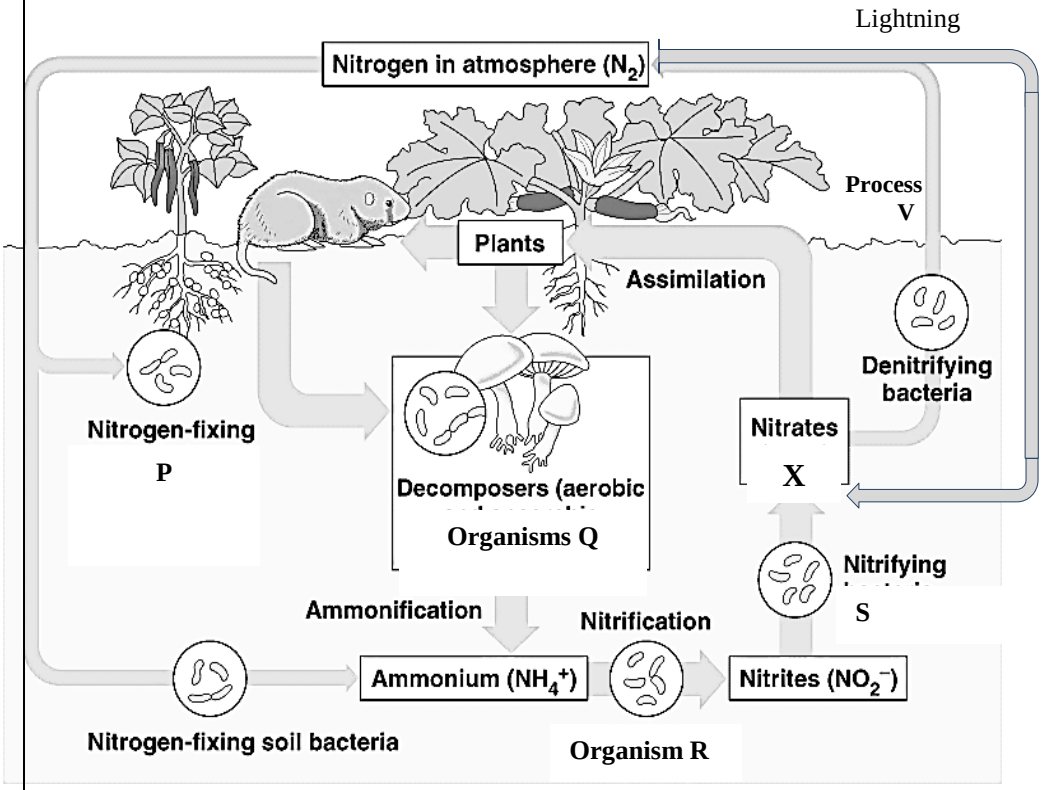
No	Questions	Marks	Student's tips
11	Diagram 11.1 illustrates the energy flow through a food chain.  Diagram 11.1 Key : Energy flow within the ecosystem : Energy flow in dead organism : Energy flow out from the food chain		
(a)(i)	Organism P absorbs 30 x 10^3 kJ of solar energy. Energy loss at each trophic level is 90%. Complete Diagram 11.1 the total energy transferred to Organism Q and Organism R. [2marks]	2	
(a) (ii)	Explain what happens to the energy that is not transferred from one trophic level to the next trophic level. **F1: The energy is lost to the environment** **E1: through the organisms cellular respiration which are used for growth, movements, and maintaining the body heat.** **E2: The energy also lost through the excretion of faeces.**	2	
(b)	State the role of organism Z. [1marks] **Decompose dead organic matter**	1	

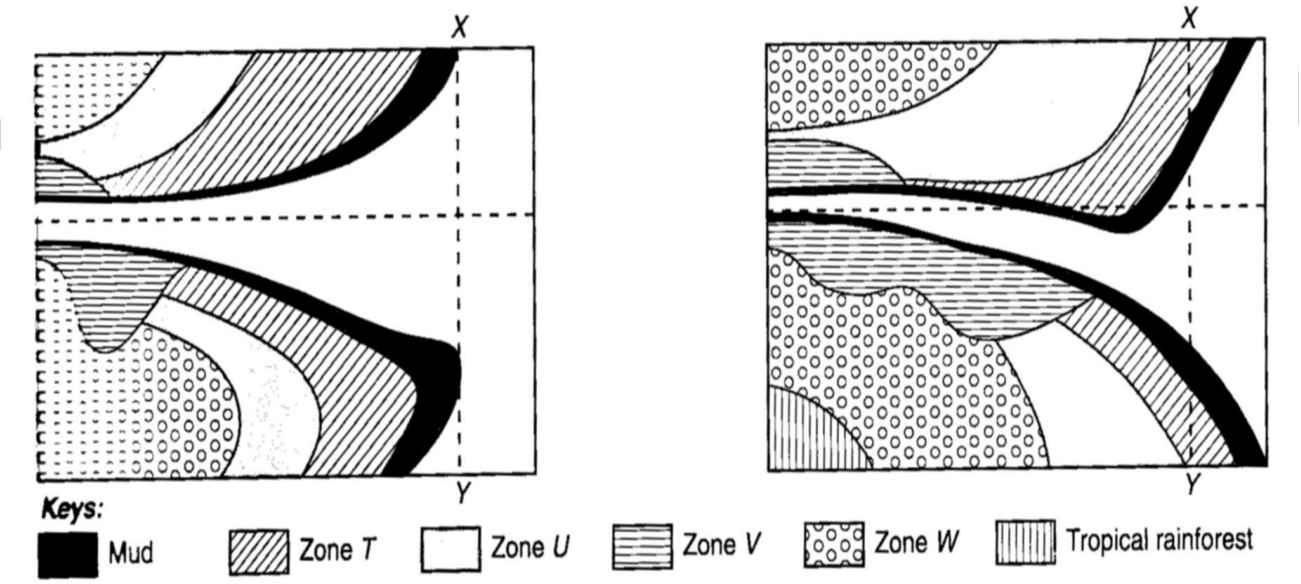
	Diagram 11.2 shows a pond ecosystem,  Diagram 11.2		
(c)(i)	Based on Diagram 11.2, give an example of: [3marks] Organism P:**Grass / Water Lilly / *Hydrilla sp. /Cabomba sp. / Elodea sp.*** Organism Q: **Rabbit / Dragonfly / Fish** Organism R: **Eagle / Frog / Beaver / Eel**	1 1 1 3 marks	Only organisms from the diagram Suggestion of Organism P, Q, and R **must fit the food chain.**
(ii)	Construct a pyramid of energy based on organisms from (c)(i). [2marks] **Eagle: $3x10^2$ kJ** **Rabbit: 3×10^3 kJ** **Grass: 3×10^4 kJ** **Correct energy value on each trophic level** **Correct trophic level with the respective organisms**	2	
(d)	Give **one** reason why not all light energy from the sun is converted and stored in the producer. **P1: The light energy is reflected back to the atmosphere by the leaf surface.**	1	
(e)	State **one** factor which will reduce light penetration to the leaf for photosynthesis Sample answers **P1: Haze/air pollutants/fog/smoke.**	1	
	TOTAL MARKS	**12 marks**	

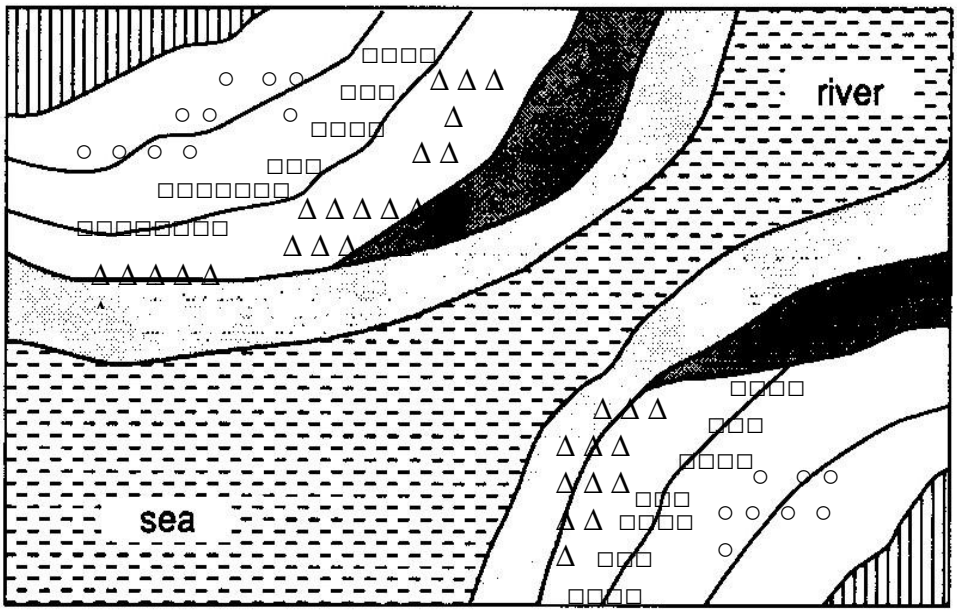
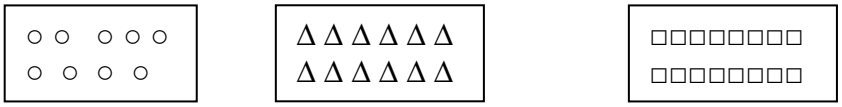
No	Questions	Marks	Student's tips
12	Yogurt is a nutritionally dairy food product prepared by mixing a type of microoraganism. Diagram 12.1 shows different types of yogurt that can be found at the supermarket. 		
(a) (i)	Diagram 12.2 shows the process in making yogurt. [2 marks]  Name microorganism P and process X **Microorganism P : Lactobacillus / bacteria** **Process X : Fermentation**	1 1	
(ii)	Explain process X [3 marks] **F: Fermentation of lactose** **P1: bacteria turned lactose into lactic acid** **P2: Lactic acid act on the protein** **P3: to make it thicker and sour** **P4: act at 80^0C**	1 1 1	
(b) (i)	Explain the health benefits of taking yogurt. [3 marks] **P1: to improve lactose digestion** **P2: restoration of microflora in the digestive tract // contain probiotic to help in regulation of digestion.** **P3: to stimulate the alimentary canal immune system// strengthen immune system** **P4: help to lose weight**		

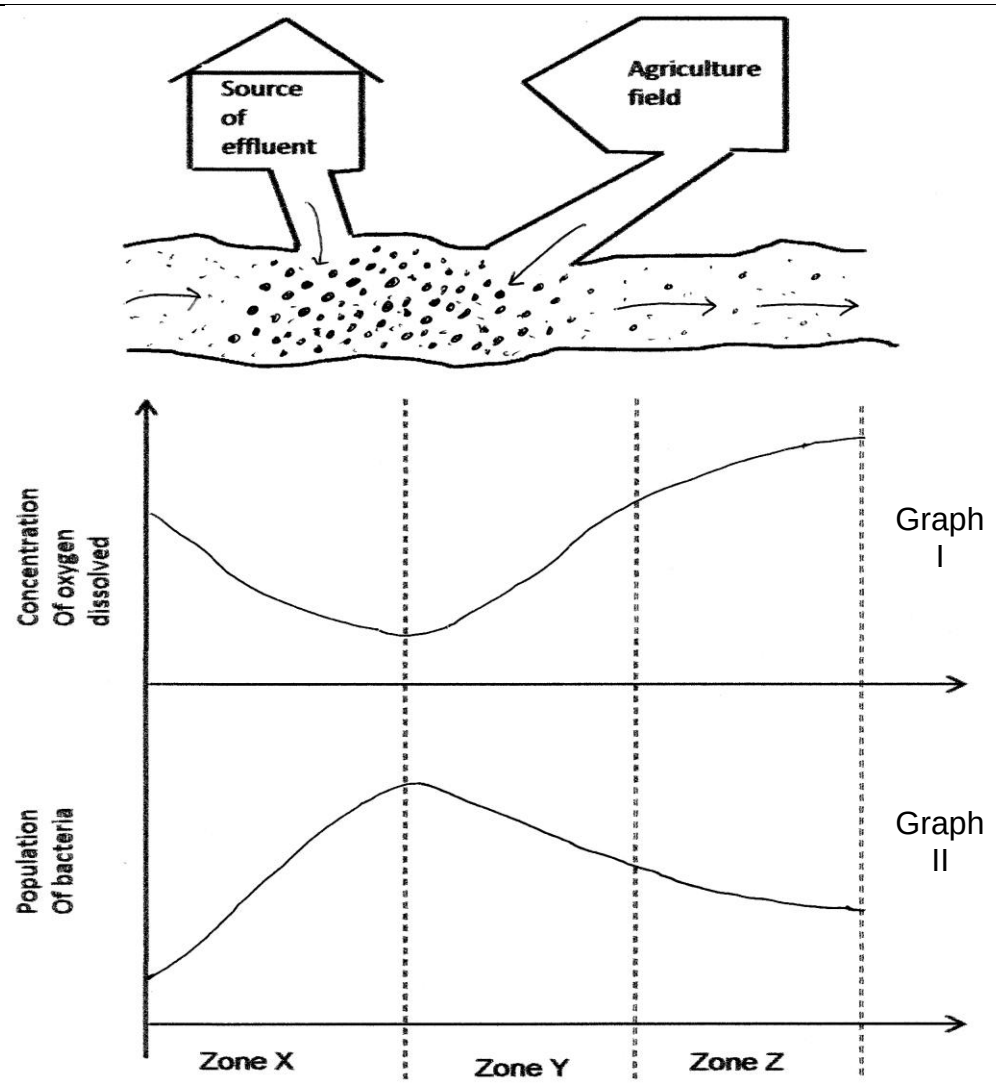
(c)	The oil spill endangers the livelihood of the area fishermen, potentially harms tourism and local businesses. In addition, the oil spill is a potential environmental tragedy that may have devastating effects on the area's wildlife. Birds will be among the first to experience the effects of the spill. Diagram 12.3 shows a bird is at risk due to oil spill.  Diagram 12.3 Explain how beneficial microorganisms help to overcome the problem shown in Diagram 12.3 [4 marks] **F : natural biodegradation process** **P1: add a chemical/ oil spill dispersants to the oil spill** **P2: increase the surface area of oil molecule** **P3: stimulate the growth of bacteria** **P4: bacteria digest the oil spill**		
	TOTAL MARKS : 12		

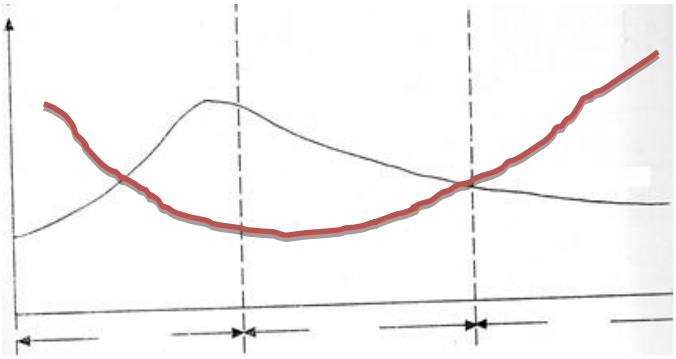
No	Questions	Marks	Student's tips
13	Diagram 13 shows a nitrogen cycle at the agriculture area  Diagram 13	1	Answer must refer to the diagram
(a) (i)	Name the organism P, R and S **Answer:** **P: Rhizobium sp.** **R: Nitrosomonas sp.** **S: Nitrobacter sp.**	2	
(ii)	State the function of organism R and S **Sample answer:** **Function R: (Nitrogen fixation process) to convert ammonium compound into Y** **Function S: (Nitrification process) to convert nitrites to nitrate**	2	

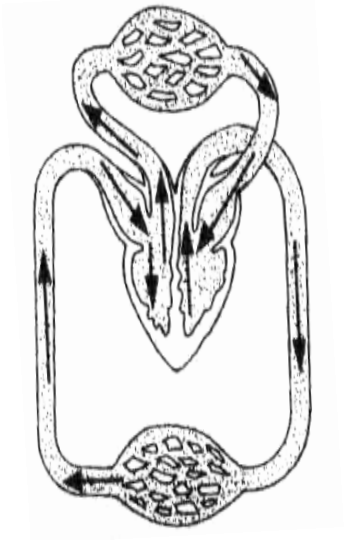
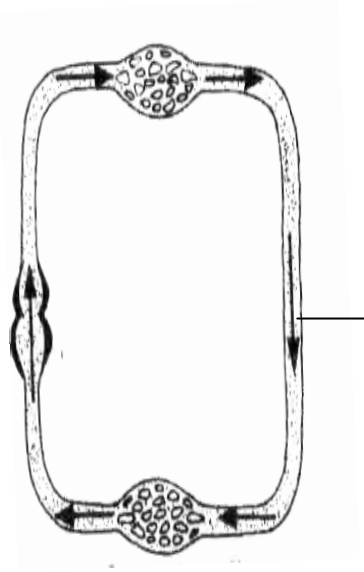
(b)	Explain the relationship between organism P and leguminous plant. ***Sample answer:*** **P1: Symbiosis / Mutualism relationship / Symbion in the root nodules of leguminous plant** **P2: Organism P / Rhizobium convert nitrogen into nitrogen compound / ammonium compound / nitrate ion that used by host / leguminous plant** **P3: Plant / Legume gives shelter and energy-rich compound/ carbohydrate to organism P / Rhizobium**	3	
(c)	Explain how the organisms Q bring about their function. **Sample answer:** **F : Q is saprophyte / saprophytic bacteria and fungi** **P1: lives on dead plants / organic matter** **P2: secrete enzymes externally** **P3: to decompose organic substances into simple molecules // ammonification occurs**	3	
(d)	Explain the process V and process W. **Sample answer:** **Process V :** **P1: Denitrification process** **P2: denitrifying bacteria convert nitrates to free nitrogen gas and oxygen** **P3: Oxygen is used by bacteria while the nitrogen is returned to atmosphere** **Process W:** **P4: Atmospheric nitrogen fixation** **P5: lightning combines atmospheric nitrogen and oxygen to form nitrogen dioxide** **P6: (nitrogen dioxide) dissolves in rainwater to form nitrous and nitric Acid** **P7: react with base in the soil to form nitrates**	4	
(e)	Explain what will happen to activity of bacteria if this area received acid rain. **Sample answer:** **P1: the activity of bacteria become reduced / stopped** **P2: because at lower pH bacteria become inactive or died**	2	

No	Questions	Marks	Student's tips
14	Diagram 14.1 below shows a mangrove swamp at a river mouth in 1950 and 2012 respectively. The line XY shows the position of the beach.  DIAGRAM 14.1		
a) i)	What has happened to the mangrove zone in Diagram 13.1. **The mangrove zone become broader toword the sea from their original position**	1	
ii)	Name the process that is taking place. **Colonisation and Succession**	1	
iii)	Explain the process mention in (a) ii) **P1 : The roots of the pioneer species trap the mud, causing the soil to become more compact** **P2: At the same time the soil level increases, there by exposing its exposure to the tides and this makes the soil unsuitable for the pioneer species .** **P3: The species in zone U are the successors , which take over the area of zone T** **P4: Slowly, succession of the species in zone W takes place** **Any 3**	3	

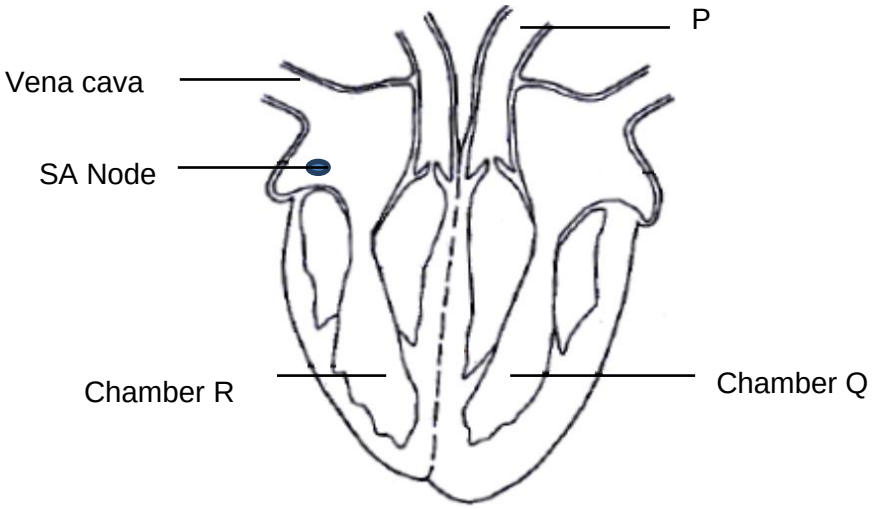
b)	By using suitable keys, sketch the zones of mangrove swamp in Diagram 14.2 in which the following mangrove trees can be found. *Brugueira sp, Avicennia sp, Rhizophora sp*.  DIAGRAM 14.2  Brugeira sp Avicennia sp Rhizophora sp	3	
b) i)	State the type of seedlings produced by the mangrove trees. **Viviparous seedling**	1	
ii)	Explain how this type of seedling increases the chances of survival of the mangrove trees. **P1 : The seedling are able to germinate while still being attached to the parent plant.** **P2: As the seedling fall into the water , they can float horizontally and, subsequently, get washed up on mudflats/ where the radical of the seedling anchor into the mudflats/ settle and grow into new plants**	2	
c)	State one problem faced by mangrove trees. Explain how mangrove trees overcome this problem. **P1: The mangrove trees are exposed to direct sunlight which results in a high rate of transpiration.** **P2: This problem is overcome by the thick and succulent leaves of mangrove trees which can store water / any examples..**	2	

No	Questions	Marks	Student's tips
15	Diagram 15 shows source of water pollution in a river. It also show effects of the pollution of zone X , zone Y and zone Z along the river. Graph I shows concentration of dissolved oxygen and Graph II shows population of bacteria in the same river.		
	 Diagram 15		
(a)	Name one pollutant which discharging from source of effluent and agricultural field. **P1: Pollutant from source of effluent : detergent / faeces / nitrate / rubbish** **P2: Pollutant from agricultural field : pesticide / fertilizer / herbicide / nitrates / phosphates**	2	

(b)	Explain the changes of bacteria population shown in zone X. **F : zone X , population increase** **P1 : because (zone X is near to source of effluent / agriculture field) , most pollutant was discharged to the zone X** **P2 : growth rate of bacteria increase** **P3 : to decomposed decayed material** *Any three*	3	
(c) (i)	At Graph II, draw a graph to show population of fish along zone X , zone Y and Zone Z. 	1	
(ii)	Explain the graph which you have drawn in c(i) . **F : decrease at zone X, decrease at zone Y and increase back at zone Z** **P1 : (at zone X, population of bacteria increase,) more oxygen used by bacteria to decompose decay material / BOD increase, so less oxygen (dissolved fish) for fish , (most fish died)** **P2 : (at zone Y, population of bacteria decreases), less oxygen used by bacteria / BOD decreases, more fish survived.** **P3 : (at zone Z , population of bacteria decreases), more oxygen dissolve in the river / BOD decreases, more fish survived.** *Any three*	3	
(d)	Suggest three ways to reduce the impact of water pollution. **1. Treatment of sewage in the sewage treatment plant** **2. make sure that the water plant is free from pollutants** **3. enforcement of law on environmental quality control** **4. recycling of sewage effluent / garbage** **5. provide a suitable dumping area.**	3	
	TOTAL MARKS	12	

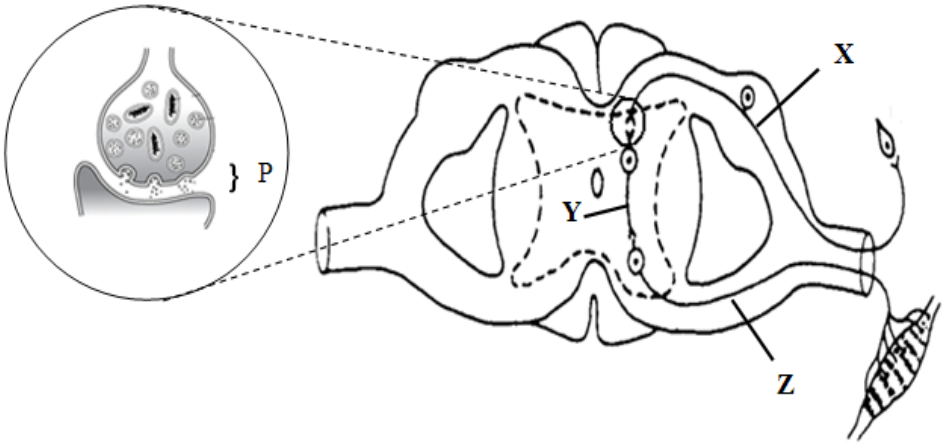
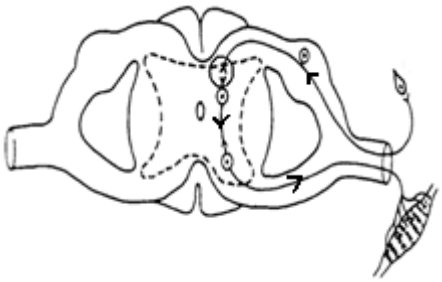
No	Questions	Marks	Student's tips
16	Diagram 16 shows the circulatory system of an organism P and the circulatory system of an organism Q  Body cells Diagram 16.1  X Body cells Diagram 16.2		
(a)	State the types of circulatory system and name one example of organism for each diagram. Diagram 16.1 Type of circulatory system: **Double (closed) circulatory system** Example or organism : **human/bird** Diagram 16.2 Type of circulatory system: **Single (closed) circulatory system** Example or organism : **Fish**	1 1	
(b)	State two differences between the hearts of both organisms. Able to state two differences between the hearts of both organisms. Sample answers: 1 : **Diagram 16.1 / human, four chambered heart** **Diagram 16.2 / fish, two chambered heart** **2 : Diagram 16.1 / human, blood enter heart twice in one circulation** **Diagram 16.2 / fish, blood enter heart once in one circulation** **(Any two)**	1	
(c)	Explain one difference between the structure of blood vessels W and X. Able to explain one difference between the structure of blood vessels W and X. Sample answers: ▪ **X has valves, W has no valves** ▪ **Blood pressure in X is low, blood pressure in W is high** **OR** ▪ **X has thin wall / large lumen, W has thick wall / small lumen** ▪ **Blood pressure in X is low, blood pressure in W is high** **(Any 1 pair)**	1 1 1	

(d)	Explain one change in the blood contents in blood vessels Y and Z. **P1: In organism P, oxygenated blood is pumped directly from the heart** **P2: Therefore, it can provide oxygen to the body tissues at a higher rate** **P3: However, in organisms Q, oxygenated blood is transported to the body tissues at a slower rate** **P4: As the oxygenated blood is from the gills not from the heart**	1 1 1 1	
(e)	Explain why the circulatory system shown in Diagram 16.1 is more efficient than the circulatory system in Diagram 16.2. **P1: Contraction of muscles require energy** **P2: Blood circulatory system transport oxygen and glucose to muscle cells** **P3: For the cells to carry out cellular respiration (to produce energy)**	1 1 1	
	TOTAL MARKS	**12**	

No	Questions	Marks	Student's tips
17	A human heart is situated in the thoracic cavity. It pumps blood which carries all the vital materials that help the body function. It contain four cambers and strong muscles. Diagram 17 shows a human heart.  Diagram 17		
(a)(i)	Name the muscle which build up the heart. **Cardiac muscle**	1	
(ii)	Explain the characteristic of the muscle which allow the heart to function efficiently . **F : (cardiac muscle) is myogenic // it contract and relaxes without (the need to) receives impulses from nervous system.** **P1 :cardiac muscle cells is interconnected** **P2 :allow electrical signals / impulses conducted rapidly (through the heart.)** **P3 :stimulate the cardiac muscle cells to contract in coordinated way.** *Any two*	1 1 1 1 (any 3)	
(iii)	Explain **one** difference of oxygen concentration in blood which flow into chamber R and chamber Q. *Any two*		

	Chamber R	Chamber Q
F	**blood in chamber R is deoxygenated blood**	**Blood in chamber Q is oxygenated blood**
P1	**Concentration of oxygen is low**	**Concentration of oxygen is high**
P2	**the blood is transported from body cells/tissue**	**the blood is transported from lungs**

b(i)	The sino-atrial node located in the right atrial wall that acts like a pacemaker. Explain the role of the pacemaker to ensure the heart pumps blood efficiently. **F : sets / control the rate at which the heart contracts.** **P1 : it generates electrical impulses** **P2 : causing the atria to contract in rhythmical pattern** **P3 : leads the ventricles to contract / push blood out to the lung / body.** *Any two*	1 1 1 Any 2	
b(ii)	Although the function of pacemaker is to ensure the heart pumps blood efficiently, the pacemaker itself is regulated by two set of nerves and hormones. Explain the statement above. **F1 : parasympathetic nerves slows down the pacemaker activity** **P1 : sympathetic nerves speed up the pacemaker activity** **P2 : both nerves connected the brain with the heart** **P3 : hormone adrenalin / epinephrine increases the heartbeat rate (during moments of fear / threat)** *Point P3 and 2 other points*	1 1 1 1 Any 2	
c	When we listen to our heartbeat through a stethoscope, we can hear a lubb-dubb sound. Explain why. **F : lubb is first sound and dub is the second sound** **P1 : lubb caused by the closing of bicuspid and tricuspid valves** **P2 : dub is caused by the closing of the semi-lunar valves** *Any two*		
	TOTAL MARKS	**9**	

<table>
<tr><th>No</th><th>Questions</th><th>Marks</th><th>Student`s Tips</th></tr>
<tr><td>18</td><td>Diagram 18 shows the cross section of the spinal cord and the reflex arc.
 
</td><td></td><td></td></tr>
<tr><td>(a)</td><td>On diagram 18 draw the arrow on X, Y and Z to show the direction of the nerves impulses on the reflex arc.
  </td><td>1</td><td></td></tr>
<tr><td>(b)(i)</td><td>Name X, Y and Z in the box provided.
<table>
<tr><td>X</td><td>Y</td><td>Z</td></tr>
<tr><td>Afferent neurone</td><td>Interneurone</td><td>Efferent neurone</td></tr>
</table></td><td>3</td><td></td></tr>
<tr><td>(ii)</td><td>State two differences between X and Z.

P1. X / Afferent neurone transmit impulses from the receptor to central nervous system but Y / efferent neurone transmit impulses from the central nervous system to the effector

P2. X / afferent neuron has the cell body is located in the middle of the neurone but in Y / efferent neurone The cell body is located at the end of the neurone

P3. X / Afferent neurone has long dendron / short axon but in Y / efferent neurone has short Dendron / long axon</td><td>2</td><td></td></tr>
</table>

(c)(i)	Diagram 18.2 shows gap P between the axon terminal and dendrite terminal of two neurones. Name gap P . **Synapse**	1	
(ii)	Name one of chemical substances which is released across P. **Acetylcholine / noradrenaline / dopamine / serotonin**	1	
(d)	A disease related to the nervous system which usually affect the elderly people is caused by lack of the chemical substances in (c) (ii)		
(i)	Name the disease. **Alzhemeir`s disease // Parkinson**	1	
(ii)	Explain your answer in (d)(i) **F : lack of acetylcholine** **P1 : brain shrinkage** **P2 : show loss of intelligence/loss of memory / mild confusion / poor concentration** **Or** **F : Lack of neurotransmitter / dopamine** **P1 : hardening of cerebral arteries** **P2 : tremors / weakness of the muscle / muscle cannot function**	3	

No	Questions	Marks	Student's tips
19	A series of experiment in Diagrams 19.1 and Diagram 19.2 were conducted to study the effect of the tip on the growth of corn coleoptiles.		

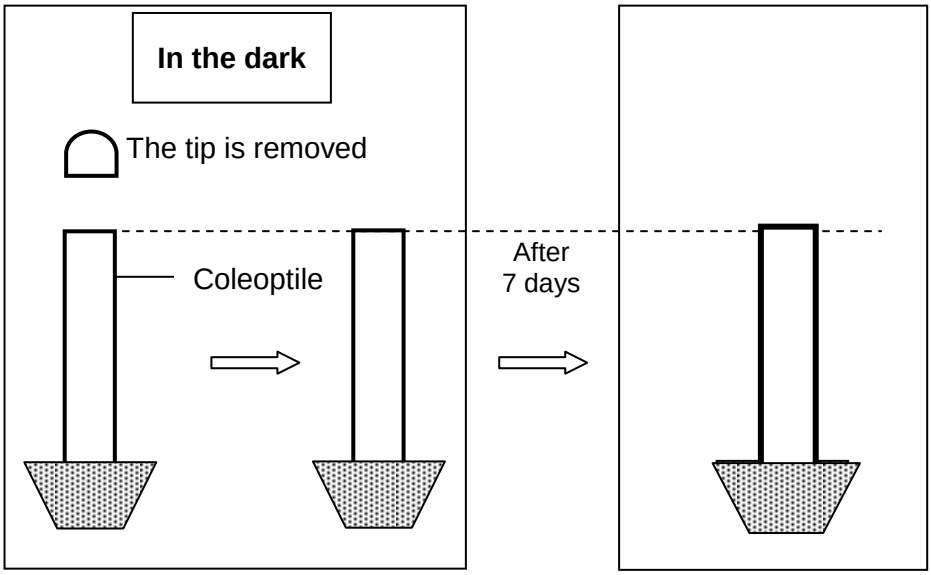


Diagram 19.1

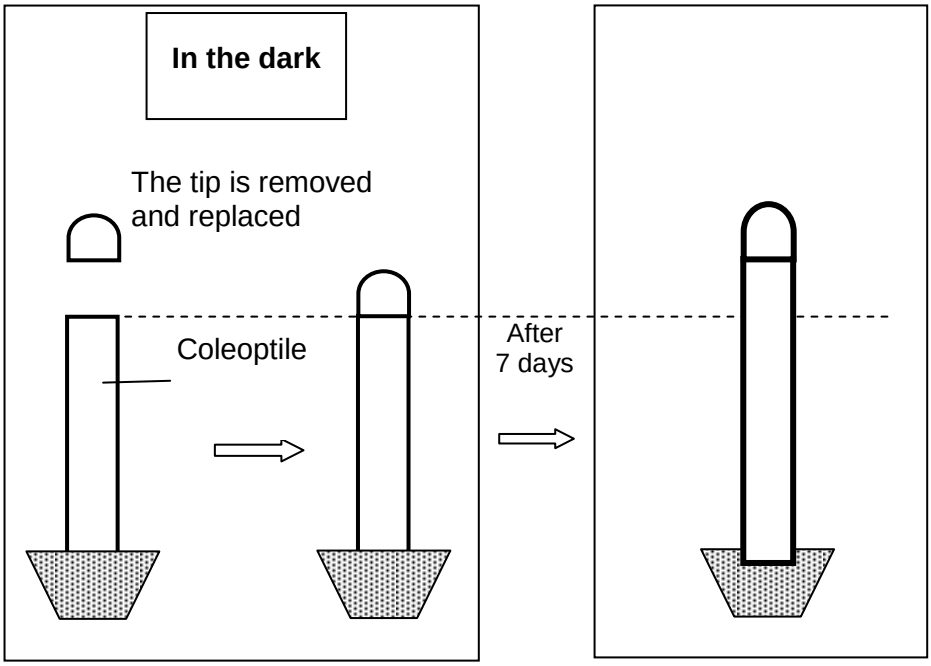
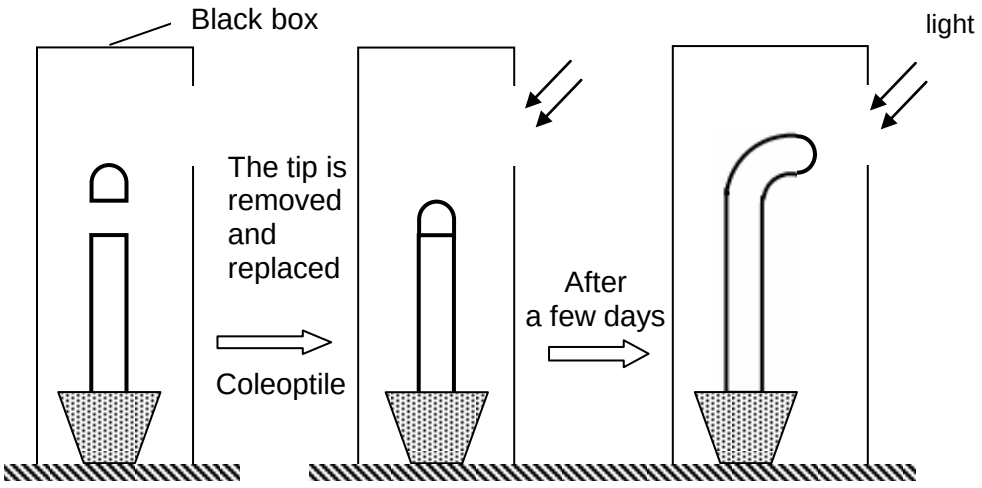
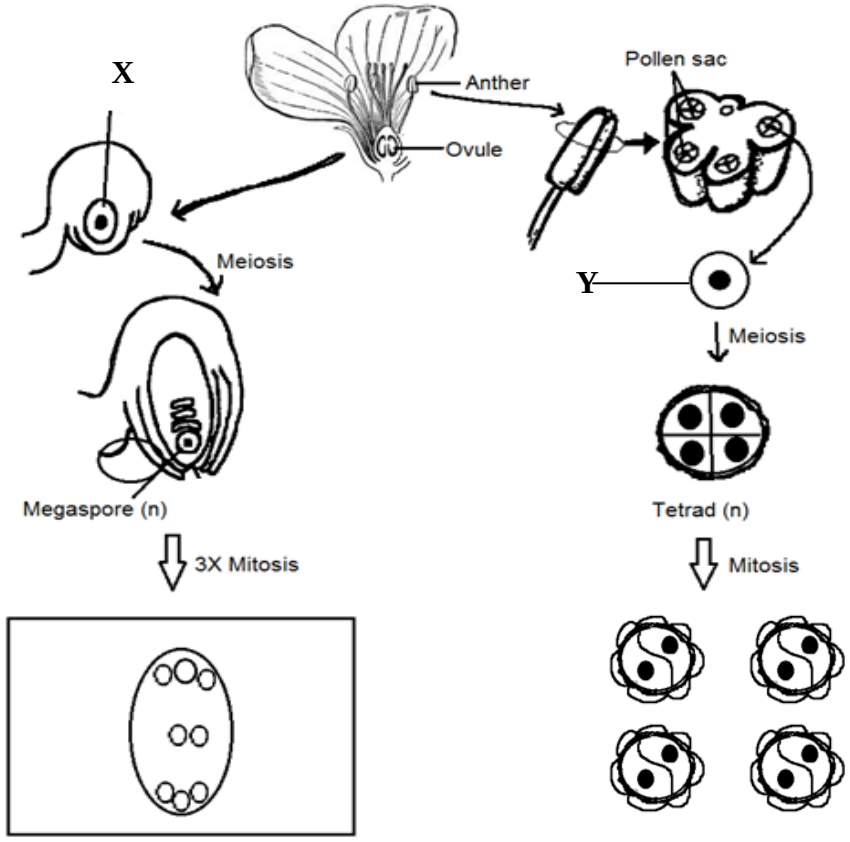
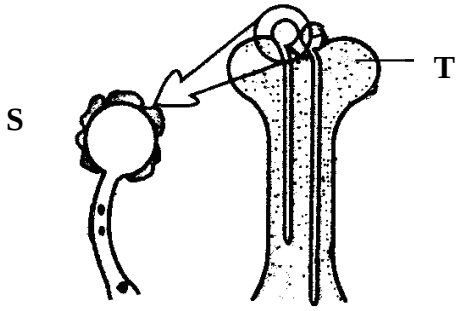


Diagram 19.2

Notes : *Diagram 1 – The coleoptile / tip should not exceed the dotted line @ shows no elongation. Diagram 2 – The coleoptile / tip must exceed the dotted line @ elongation occurs / straight upward.*

No	Questions	Marks	Student's tips
a(i)	On the Diagram 19.1 and Diagram 19.2, draw your observation in the space given. [2 marks]		
(ii)	Give the reason for the answer in (a) (i). **P1: The tip produce / contains plant hormone / auxin** **P2: Auxin diffuses / moves downward** **P3: Auxin stimulates the elongation of cells (in zone of elongation)** [2 marks] Or **P1: Without the tip / no contains plant hormone / auxin** **P2 : No the elongation of cells (in zone of elongation)** (Any 2)		
b	 Diagram 19.3 The result in Diagram 19.3 shows that the coleoptile bends towards light. Explain the result. ○ **Auxin moves away from the light side // auxin accumulates on the shaded side** ○ **Cells on the shaded side elongate more compare to light side.** ○ **Hence, the coleoptile grows (and bends) toward light.** [3 marks]		

No	Questions	Marks	Student's tips
c(i)	Name a plant hormone that can be found in the shoot tip? **Auxin / IAA**		
(ii)	What is the effect of plant hormone in c (i) on the growth of plant? **Stimulate / promote the cells elongation.** [2 marks]		
d(i)	Plant hormones are used extensively in agriculture to modify plant growth and development. What is the function of the hormone in culture tissue? **To stimulate cells division / mitosis / cell differentiation in callus** [1 mark]		
(ii)	Explain the use of hormone in parthenocarpic fruit development. ○ **Auxin is applied / sprayed to the unfertilized flowers** ○ **Ovary develops to become fruit without fertilisation** ○ **The ovary wall develops into a seedless fruit.** [2 marks]		

No	Questions	Marks	Student's tips
20	Diagram 20.1 shows the gamete formation in flowering plant.  Diagram 20.1		
(a)	Label the structure X and Y. X : **Megaspore mother cell // Embryo sac mother cell** Y : **Microspore mother cell // Pollen mother cell**	2	
(b)	Draw and label the nucleus in mature embryo sac in provided space.	2	
(c)	Reproduction in plants involves the fusion of male and female gametes. Diagram 20.2 shows the process before fertilization occur in flowering plant.  Diagram 20.2		

(c)(i)	Name the process in Diagram 20.2. **Pollination** [1 mark]		
(c)(ii)	Explain what happen to structure S when it lands on structure T. **P1: Sugar in the T/stigma stimulate the pollen grain to germinate** **P2: Pollen tube grows into style towards ovule, leaded by tube nucleus** **P3: The generatives nuclei divides by mitosis to form two male gametes** [3 marks]	3	
(d)	After the fertilization, the fruit is developing from the flower. Relate the structure of a fruit to the major flower parts. **P1: Ovule develops into a seed** **P2: Ovary develops into a fruit** [2 marks]	2	
(e)	Structure S involve in the double fertilisation. Explain the importance of double fertilisation Sample answer : **P1: To ensure flowering plant to survive // To avoid species extinction** **P2: To ensure the formation of embryo and endosperm** **P3: Embryo develops into new plant** **P4 : Endosperm provides the nutrients and energy for developing embryo**	3	
	TOTAL MARKS	**12**	

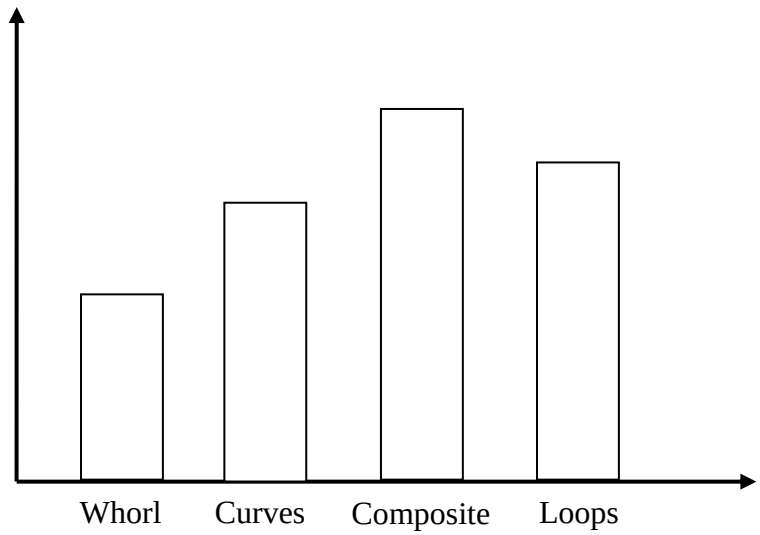
No	Questions	Marks	Student's tips
21	A group of student carries out a study of variation of fingerprints and body weight of Form 5 student at their school. The result of the study is shown in the Table 1 and Table 2.		

Types of fingerprints	Whorl 	Curves 	Composite 	Loops 
No of student	15	24	32	25

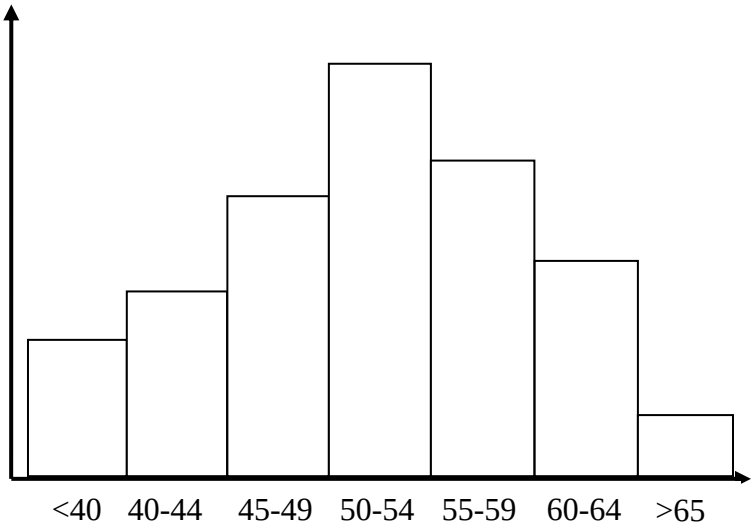
Table 1: Number of student according to types of fingerprints

Range of body weight(kg)	<40	40-44	45-49	50-54	55-59	60-64	>65
No of student	12	15	21	27	24	18	6

Table 2: Body weight distribution among students

(a)(i)	Based on Table 1 and Table 2, draw a frequency distribution histogram to show (i) The number of students against their types of fingerprints.  		

(a) (ii) (i) The number of students against their height



[4 marks]

1

(b) State **two** differences between the variation shown by the types of fingerprints and the type of their height of the students.

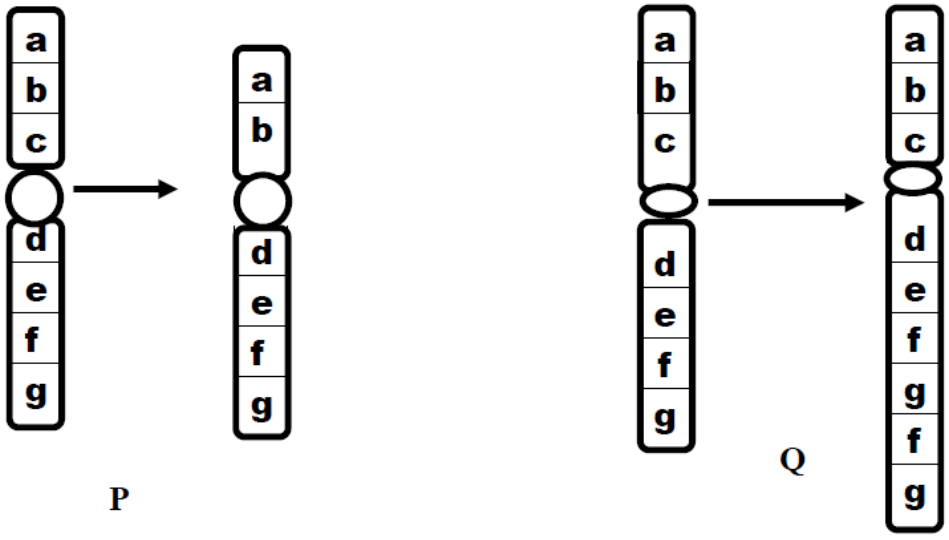
1

-

Sample answer:

Height (continuous variation)	**Type of fingerprint** (discontinuous variation)
Have no distinct categories into which individuals can be placed	**Have distinct categories into which individuals can be placed**
Have a intermediate values	**No intermediate values**
Usually control by several gene (polygenes)	**Usually controlled by one pain of genes**
Are significantly affected by environment factor	**Are largely un affected by environment factor**
Form a normal distribution	**Discrete distribution**

Any 2
[2 marks]

(c)	Explain the importance of variation. **Sample answer:** **F: species can adapt better to environment condition** **P: better adapted for survival // can transmit the advantageous genes to the offspring // camouflage from their predator** [2 marks]	1 1	
(d)	Mutation is one of the factors that cause variation. Diagram 21 shows two types of chromosomal mutation.  Diagram 21 (i) Name the processes involved in the mutation of P and Q. **Answer:** **P: Deletion** **Q: Duplication** [2 marks] (ii) Explain one bad effect cause by mutation. **Sample answer:** **P1: Mutation that occurs in a somatic cell may damage the cells** **P2: makes the cancerous cell // kill the cell** [2 marks]	2 2	

(e)	If we were to plant some cloned banana plant, it will grow into adult banana plants with some physical variation like height and number of fruits even though they have the same genotype. Explain how that variation occurs amongst the cloned banana plants. **Sample answer:** **F: Effects of environmental factors on the clone banana plant** **P1: Plant / clone received different amount of light intensity / minerals nutrient / water / fertilizer** **P2: Plant exposed to different soil type / soil pH** **P3: Plants exposed to pest or parasites** [3 marks]	1 1 1	

No	Questions	Marks	Student's tips
22	Table 1 shows three examples of variation between Individual A and Individual B.		

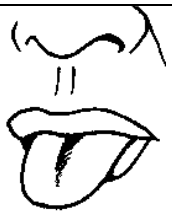
Individual A	Individual B	Continuous Variation	Discontinuous Variation
			√
			√
		√	

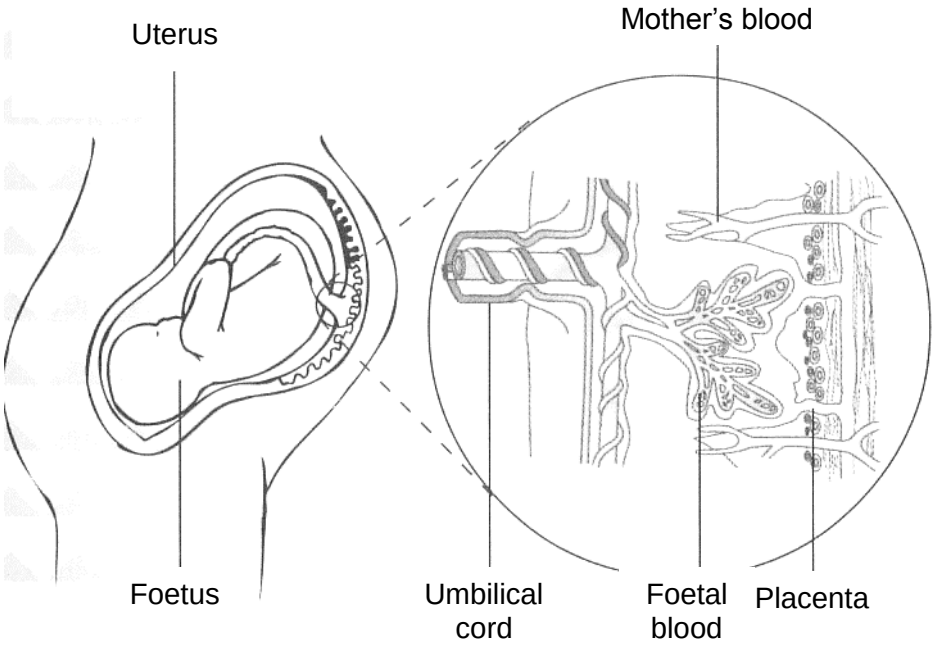
Table 1

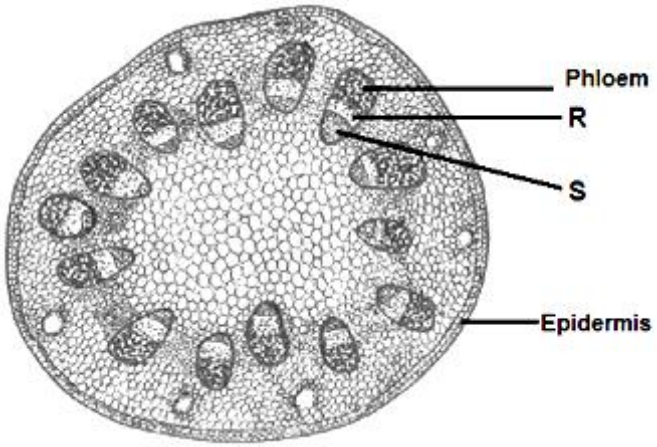
(a)	. Use a tick (√) in the correct boxes to show the type of each variation. **discontinuous variation** **discontinuous variation** **continuous variation**	3 marks	
(b)	State the meaning of variation **The differences between organism of the same species .**	1 mark	-
(c)	State two differences between continuous variation and discontinuous variation.	2 marks	

Continuous Variation	Discontinuous Variation
-Caused by genetic factor and environmental factor. **-has intermiate** **- shows gradual differences for a particular characteristics**	- **Caused by genetic factor only** - **No intermiate** - **shows distinct differences for a particular characteristics**

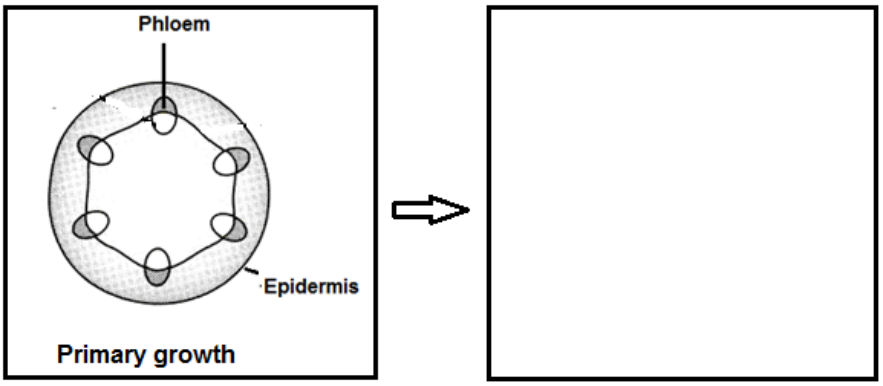
d.	Diagram show two varieties of rabbit, *Lepus alleni* and *Lepus articus* 		
d(i)	State whether the different characteristics between *Lepus alleni* and *Lepus articus* are examples of variation? **No** **Because they are not the same species**	1 1	
d(ii)	Explain two different characteristics between Lepus alleni and Lepus articus on how to help them to survive in their respective habitat *Lepus alleni* **F1 has bigger ear, to increase the ratio of TSA/V** **E1 to increase the rate of the heat loss from the body** **E2 to bring down the body temperature in the hot environment/ habitat** *Lepus articus* **F1 has smaller ear, to reduce the ratio of TSA/V** **E1 to slow down the rate of the heat loss from the body,** **E2 to maintain body temperature in the cold environment / habitat.**	 1 1 1 1	
	TOTAL MARKS	**12**	

No	Questions	Marks	Student's tips
23	Diagram 23.1 shows part of a genetic diagram about the inheritance of Rhesus factor in a family. The trait of the husband is rhesus positive, while the wife is rhesus negative. 'Rh' is the dominant gene, while 'rh' is the recessive gene. Parent : Husband Wife Phenotype : Rhesus Positive Rhesus Negetive Genotype : Rh Rh X rh rh Gamete : Rh rh Offspring Genotype : Rh rh Phenotype : Rhesus Positive Phenotypic Ratio: 100% / All Diagram 23.1		
(a)	Complete the genetic diagram. [4 marks]		
(b)	Describe the Rhesus factor in humans [2 marks] **Sample answers:** **P1 :A protein / antigen** **P2 :On the surface of red blood cells**		
(c)	Explain the inheritance of Rhesus factor by the offspring. [2 marks] Sample answers: **P1 :Inherit dominant allele / gene / Rh from father // Father's sperm with dominant allele / gene / Rh** **P2: Inherit recessive allele / gene / rh from mother // Mother's ovum with recessive allele / gene / rh**		

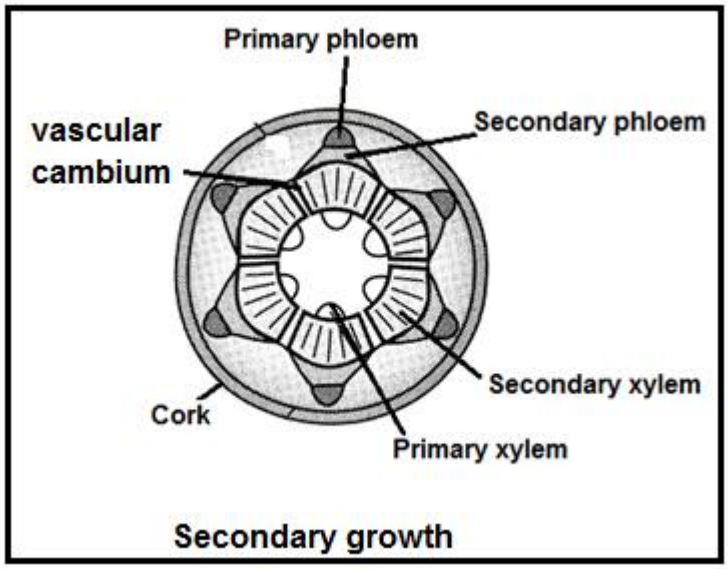
(d)	Diagram 23.2 shows the position of the foetus and the structure of placenta during the second pregnancy of the wife.  		
(d) (i)	Explain the complication faced by the foetus during the second pregnancy. **Sample answers:** **P1: Antibody (against Rhesus factor) enter foetus** **P2: Through / via the placenta** **P3: Agglutination of the (foetal) blood**		
(ii)	State one treatment the wife should undergo to avoid the complication in (d) (i). **Sample answers:** **P1 :Anti-Rhesus globulin** **P2 :Blood transfusion**		

No	Questions	Marks	Student's tips
24	Diagram 24.1 shows a cross section of a plant's stem.  Diagram 24.1		
(a)(i)	Name structure R and S. [2 marks] R : **Cambium** S : **Xylem**		
(ii)	Explain the adaptive structure of S related to its function. [2 marks] F: **Thickened with lignin/lignified// The end walls have disintegrated to leave hollow tubes** E: **provide support/strenght // transport water and minerals**		
(b)(i)	Tissue R plays important role in plant secondary growth. Explain the function of tissue R. [2 marks] F: **meristematic tissue/actively divided** P: **produces rings of secondary vascular tissues / secondary xylem and phloem**		

(ii) Draw diagram in the box given to show the secondary growth of dicot stem.



Answer:

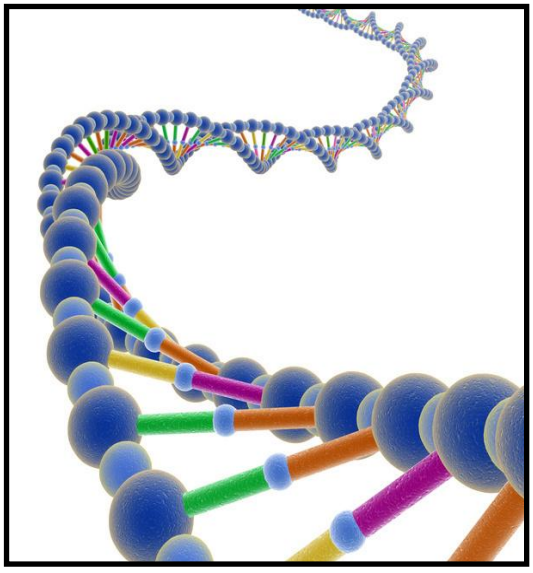


R – functional diagram /no broken lines (1 m)
L – All correct labels - (2 m)
3 –5 correct labels – (1 m)
Less than 3 correct labels (0 m)

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>(c)</td><td>Explain the benefits of the plant that undergo secondary growth as in (b)(ii) compared to plant in 24.2(i)
How does this affect their life span, survival and economic value?
Sample answer
<table>
<tr><th>Criteria</th><th>Plants with secondary growth</th></tr>
<tr><td>Life span</td><td>P1:Longer life span
P2:Bearing fruits/reproduce many time/producing many offsprings</td></tr>
<tr><td>Survival</td><td>P3: The plants are taller/bigger/wider(in size)//large diameter
P4:higher opportunity/acess for light(in tropical forest)
P5:denser/bigger/more xylems and phloems//additional strength/support to stem/root/stronger
P6:better transportation of/for water/nutrient(in plants)
P7:presence of cork tissue provides better protective layer for internal tissues</td></tr>
<tr><td>Economic value</td><td>P8: Economically cost effective/examples:materials/long lasting
P9:needs no replanting
P10:many/widely used in wood industry
P11:potential as timber</td></tr>
</table>
IP At least from each criteria
Any 4</td><td></td><td></td></tr>
<tr><td></td><td>http://cikguadura.wordpress.com/ JUMLAH</td><td>12</td><td></td></tr>
</table>

KEMENTERIAN PENDIDIKAN MALAYSIA

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN



MODUL X-A Plus / PERFECT SCORE

http://cikguadura.wordpress.com/

BIOLOGI 4551/2
(ESEI)
2013

EDISI PELAJAR

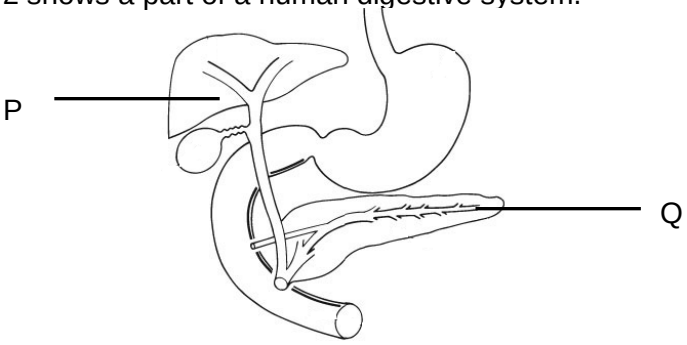
DISEDIAKAN OLEH

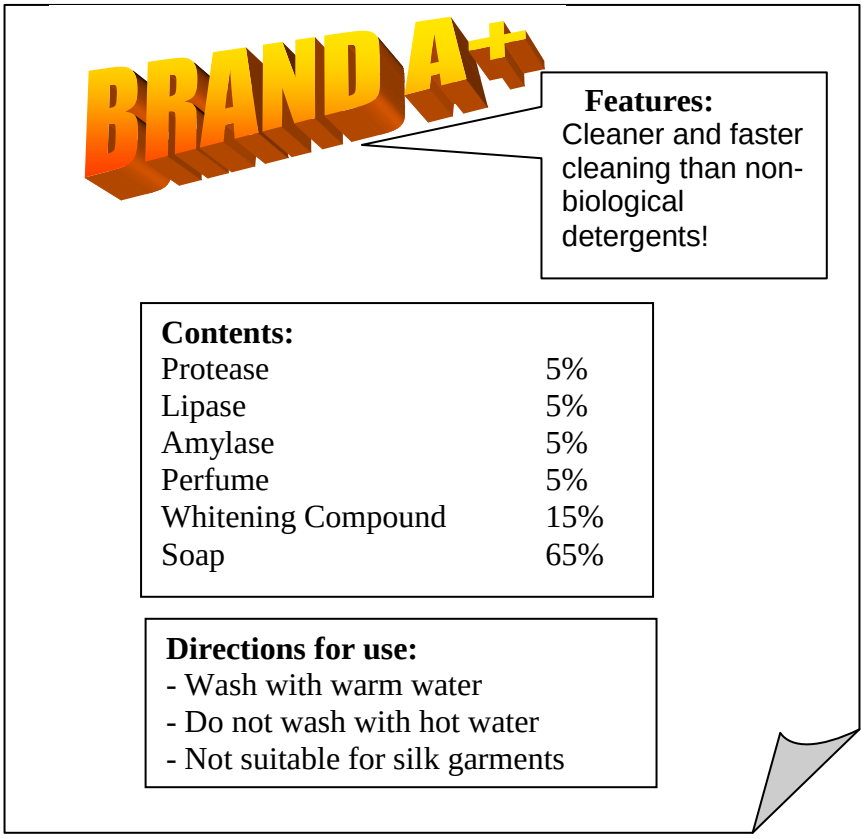
MAZINAH BT MUDA
DATIN NORIDAH BT YANGMAN
NURUL UYUN BT ABDULLAH
ROSIAPAH BT DOLLAH
MELI BIN HUSSIN
NORAINI BT SAMIN
HABSHAH BT KHATIB
ZALINA BT AHMAD
SUSANTI BT GAMIN
FATIMAHWATI BT MALEK
MOHD IZANI B SAUFI
MOHD FADHIL BIN MASRON

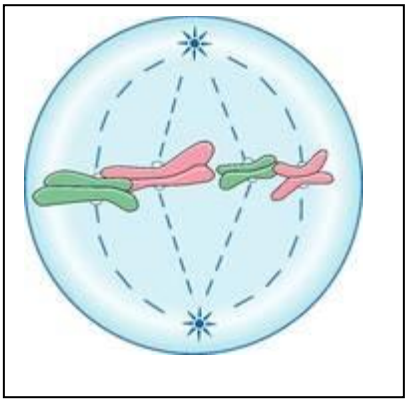
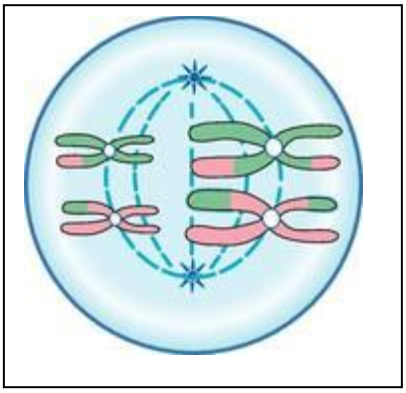
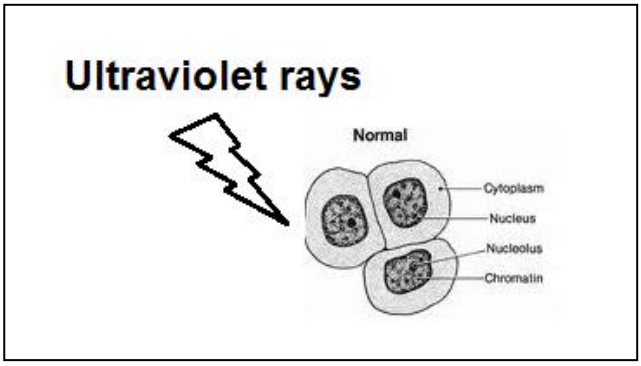
SMS TENGKU MUHAMMAD FARIS PETRA
SMS TUANKU SYED PUTRA
SMS KUALA SELANGOR
SMS SELANGOR
SMS KUALA TERENGGANU
SMS MUAR
SMS KUCHING
KOLEJ ISLAM SULTAN ALAM SHAH
SMS JOHOR
SMA PERSEKUTUAN LABU
SMS KEPALA BATAS
SMS LABUAN

Paper 2 – Section B

No	Questions	Marks	Student`s Tips
1(a)	Plasma membrane is a biological membrane that separates the interior of all cells from the outside environment. Describe the structure of plasma membrane using the fluid mosaic model. [6 marks]		
(b)	Explain how simple diffusion takes place in alveolus . [4 marks]		
(c)	By using example, explain the movement of substances across the plasma membrane by facilitated diffusion and active transport [6 marks]		
(d)	State similarities and differences between passive transport and active transport. [4 marks]		

No	Questions	Marks	Student`s Tips
2(a)	Diagram 2 shows a part of a human digestive system.  Diagram 2 Explain the role of organ P and Q in the digestion of carbohydrate, protein and lipid [10 marks]		

No	Questions	Marks	Student`s Tips
(b)	Diagram 2 shows a label from a biological detergent.  Diagram 2		
(i)	Working in a multinational consumer goods company, you are required to revise on Brand A+ biological detergent as a guideline to create a new biological detergent for the company. Explain how the biological detergent functions efficiently. Your explanation should covers on the features, the main contents and direction for use. [8 marks]		
(ii)	Suggest additional content to improvise the functions of the detergent. [2 marks]		

No	Essay Questions	Marks	Student's tips
3(a)	Diagram 3.1 shows stage P and Stage Q in a cell division process.  Stage P  Stage Q Diagram 3.1 State the similarities and differences of chromosome behavior between stage P and stage Q. [4 marks]		
(b)	Diagram 3.2 shows normal skin cells are exposed to ultraviolet (UV) rays.  Diagram 3.2 Based on diagram 3.2, explain the effect of ultraviolet (UV) rays on normal skin cells. [6 marks]		

(c)	If meiosis does not occur properly, the gametes formed will have an abnormal number of chromosomes. The zygote that is formed later would become abnormal. Explain the above passage in occurrence of Down's syndrome. [10 marks]		

No	Questions	Marks	Student`s Tips
4 (a)	Experts claim that breakfast is the most important meal of the day and placed key role in helping tackle obesity. Eating a healthy breakfast everyday gives your brain and body a boost. Eating a breakfast has a long term benefits. It can reduce obesity, high blood pressure, heart disease and diabetes. Table 1 shows a breakfast menu for an adult. **BREAKFAST MENU** Bread 2 slices Fried eggs 2 Jam 1 teaspoon Margarine 1 teaspoon Fresh milk 1 glass Banana 2 Table 1 Does the breakfast menu in Table 1 provide a balanced diet for an adult? Give your reasons. [10 marks]		

(b)	Table 2 shows the result of an analysis of meat-base fast food. **ANALYSIS OF CONTENT IN A FAST FOOD** • Excess of mineral salt • Excess of fat • Excess of protein • Insufficient fibre • Presence of food preservatives, flavouring and food colouring. Table 2 A teenager frequently consumes meat-based fast food for a long time. Describe the effects of consuming the meat-based fast food for long periods of time. [10 marks]		

No	Questions	Marks	Student's tips
5(a)	Instead of taking a balanced diet, it is also important that we practice good eating habit. In recent times, we hear of increasing cases of eating disorders among modern community. Explain the meaning of good eating habit and eating disorder. [4 marks]		
(b)	Describe following health problem related to eating habit. - Obesity - Gastritis - Anorexia nervosa [6 marks]		

(c) Diagram 5.1 shows the label on a packet of snack food.
Gordon, 17 years old teenagers take this snack as his daily diet.

Keledek Chips

Ingredients:
Keledek, vesawi oil, preservatives, sugar, salt, fats, flavouring, approved stabiliser and colouring.

Contents	**per 100 g**	**per keledek chips**
Energy	1,100 KJ	332 KJ
Fats	10.5 g	3.2 g
Unsaturated fats	6.5 g	1.8 g
Saturated fats	2.1 g	0.5 g
Sugar	1.2 g	0.6 g
Starch	15.3 g	6.5 g
Protein	2.1 g	0.8 g
Salt	0.8 g	0.2 g

Minimum weight : 350 g

Diagram 5.1

Diagram 5.2 shows the analysis of Gordon's diet and the recommended diet. (Vitamins, minerals, fibre and water are not shown)

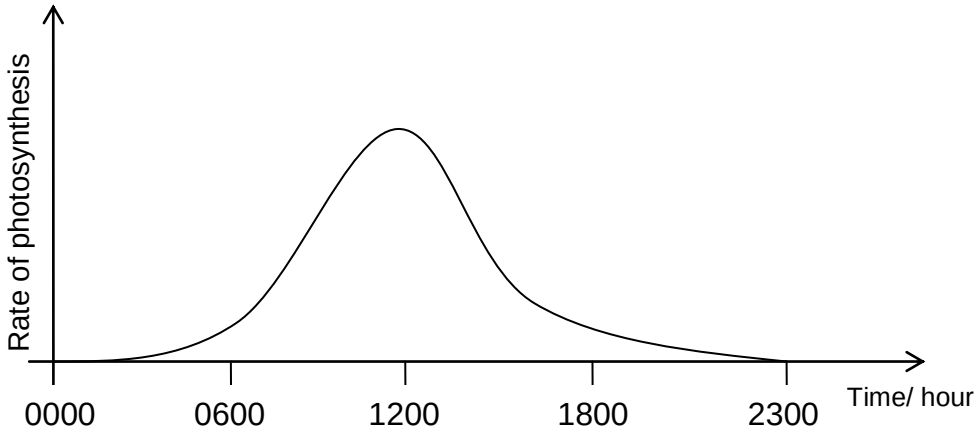
	Lipids	Carbohydrates	Proteins
Gordon's diet	25%	68%	7%
Recommended diet	14%	54%	32%

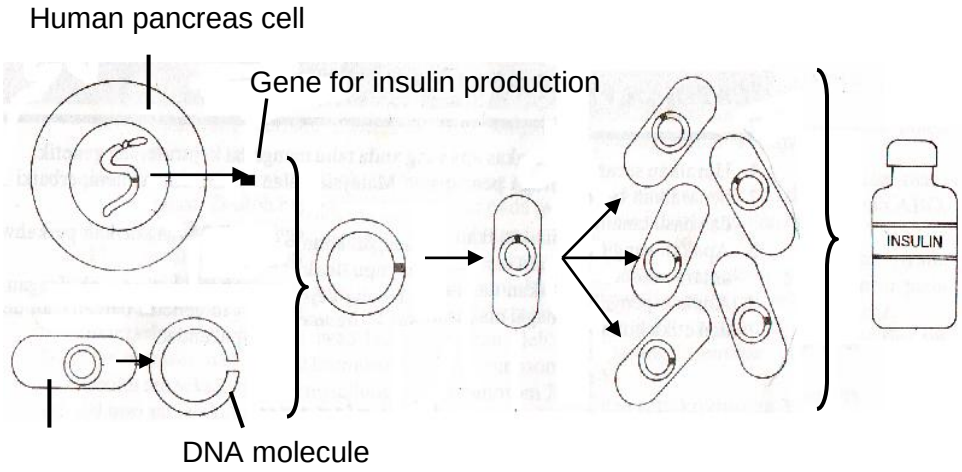
Diagram 5.2

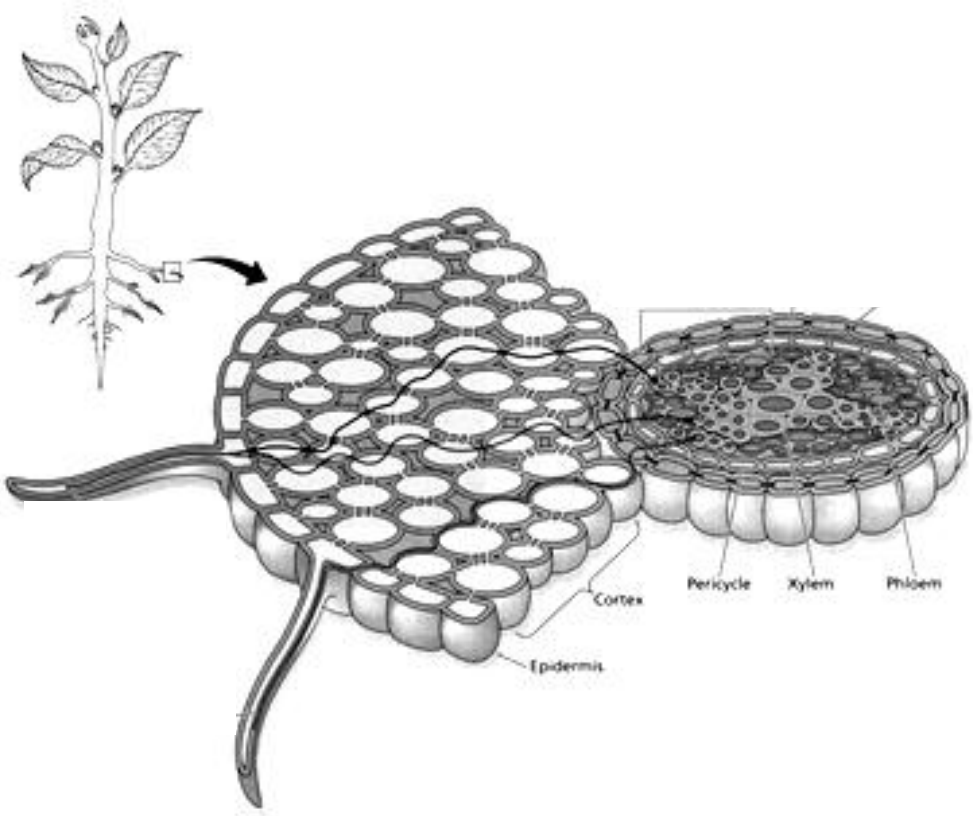
Does the Gordon eating habit is good or bad. Explain your answer.

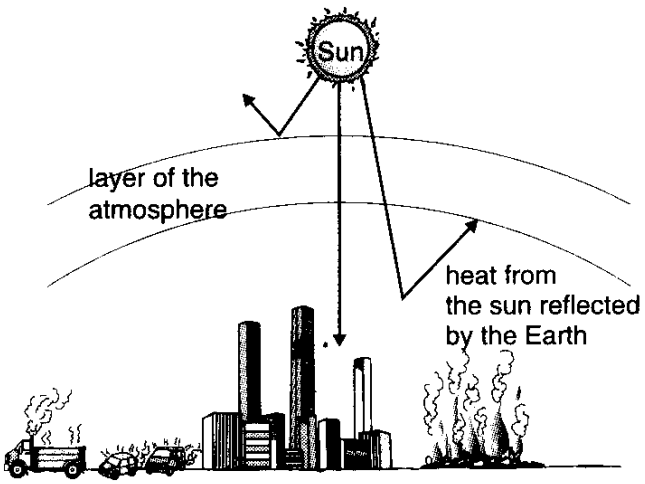
[10 marks]

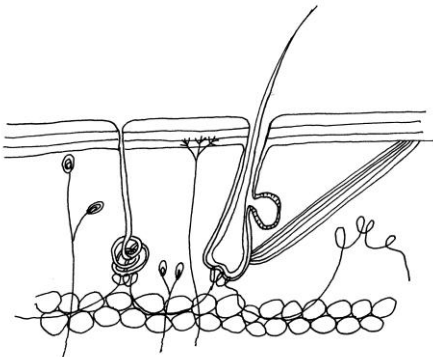
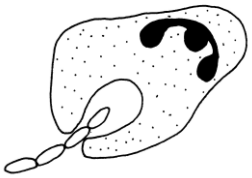
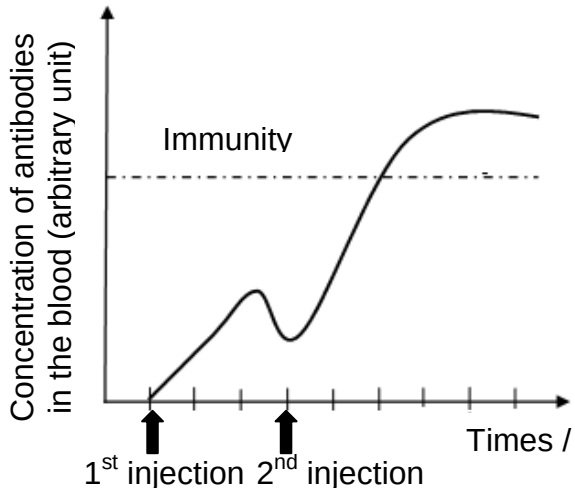
No	Questions	Marks	Student's tips
6(a)	Encik Ali is a local entrepreneur intends to process a local food item to be exported as light snacks to overseas market. He wants some guidance on food processing so that his processed snacks can appeal to the overseas consumers, and at the same time he can make profits. Describe the principles of food processing that may help Encik Ali in deciding a suitable food processing method. [10 marks]		
(b)	Diagram 6 shows various processed food on a supermarket shelf.  Diagram 6 Based on Biology knowledge, discuss good and bad of food processing on human life. [10 marks]		

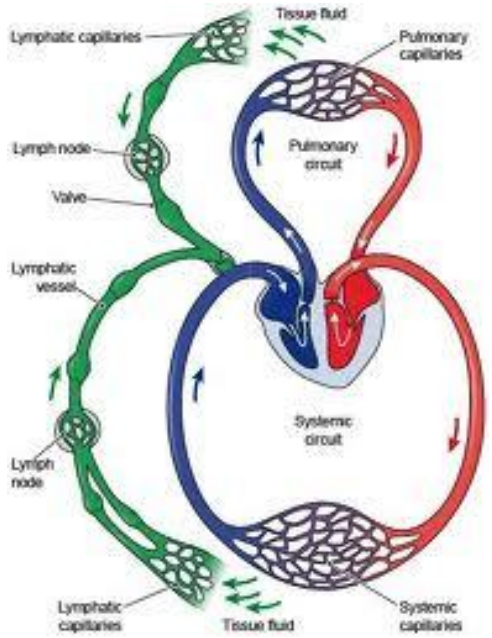
No	Questions	Marks	Student 's tips
7(a)	Photosynthesis occurs in two stages which are the light reaction and dark reaction. Describe the differences between the light reaction and dark reaction. [4 marks]		
(b)	In countries with four seasons, plants are grown in greenhouses. Based on the statement, explain why this method is carried out to ensure the production of crops throughout the year. [6 marks]		
(c)	Graph in Diagram 6 shows the changes in the rate of photosynthesis throughout the day in a tropical country.  Diagram 6 Based on the graph, explain the changes in the rate of photosynthesis in the plant throughout the day. [10 marks]		

No	Essay Questions	Marks	Student's tips
8(a)	Describe the genetic engineering in biotechnology development. [4 marks]		
(b)	Diagram 8 shows the production of insulin by biotechnology.  Diagram 8 Based on Diagram 8, explain how bacteria are used in the medical purpose. [6 marks]		
(c)	Justify the advantages and disadvantages of genetic engineering. [10 marks]		

	Questions	Marks	Student's tips
9	Diagram 9 shows the direction of water flow from the soil to the plant then to the atmosphere  Diagram 9 Based on Diagram 9 above, discuss how water molecules from the soil enter the root cells and loss during the process of transpiration. [10 marks]		

No	Questions	Marks	Student's tips
10.	Diagram 10 shows an environmental phenomenon.  Diagram 10		
(a)	Describe how the phenomenon in diagram above occurs. [10 marks]		
(b)	Suggest ways to minimize the effects of this phenomenon. [4 marks]		
(c)	Human activities have a widespread impact on the ecosystem. One of the most devastating human activities on the environment is deforestation. Describe the effect and consequences of deforestation to the ecosystem. [6 marks]		

No	Questions	Marks	Student's tips
11(a)	Diagram 11.1 shows a human skin and diagram 11.2 shows a phagocytic cell .  Diagram 11.1  Diagram 11.2 Explain how the human organ in diagram 11.1 and the cell in diagram 11.2 involve in the body defense system. [10 marks]		
(b)	Individuals P were given two injections to acquire immunity. The level of antibodies in the blood of individual P is shown in Diagram 11.3.  Diagram 11.3 Based on diagram 11.3, explain the immunity given to individual P. [10 marks]		

No	Essay Questions	Marks	Student's tips
12(a)	Diagram 12.1 shows the lymphatic system and blood circulatory system.  Diagram 12.1 • Lacteals in intestinal villi transport products of lipids • About 10% of interstitial fluid returns to the circulatory system via the lymphatic system Based on the statements, explain why the lymphatic system is considered complementary to the blood circulatory system. [10 marks]		

(b) Diagram 12.2 show stages in blood clotting mechanism**.**

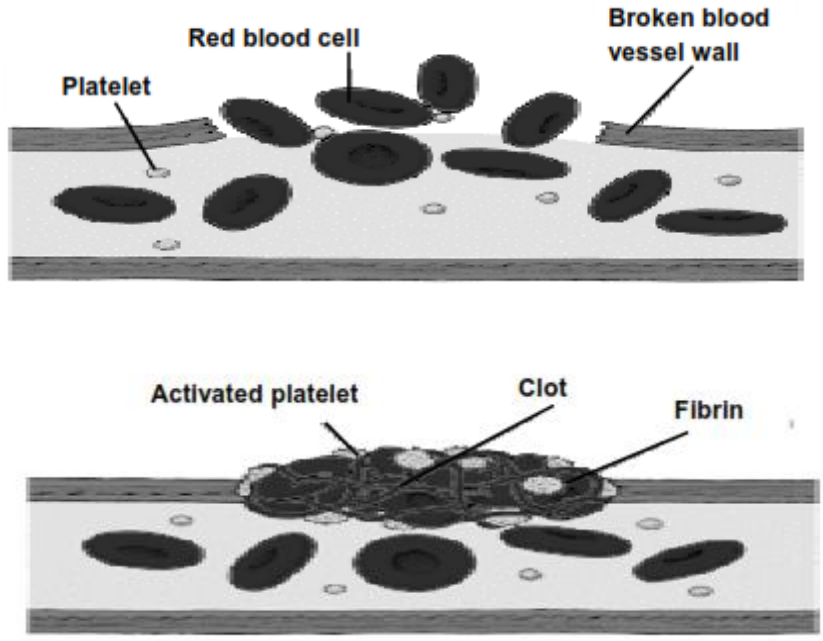
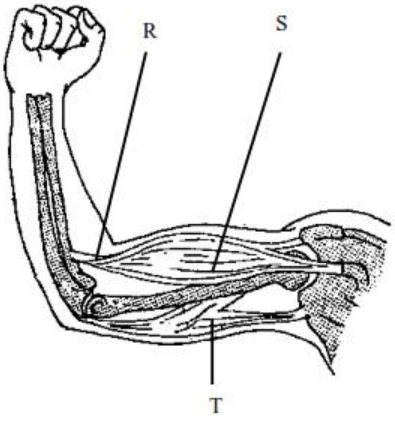
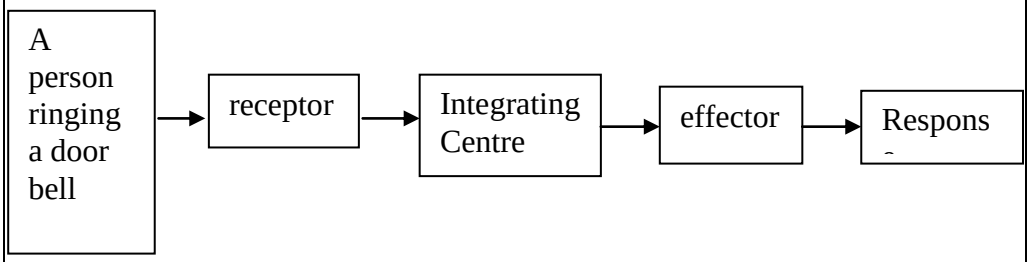


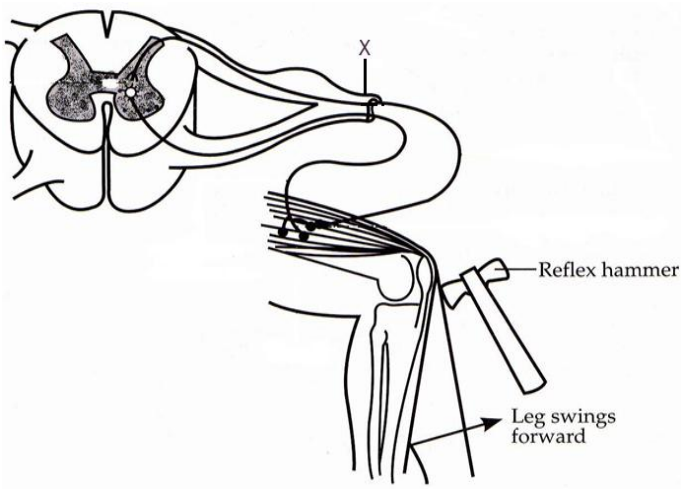
Diagram 12.2

Based on the diagram 12.2, describe how the mechanism of blood clotting help to prevent infection when a wound occurs.

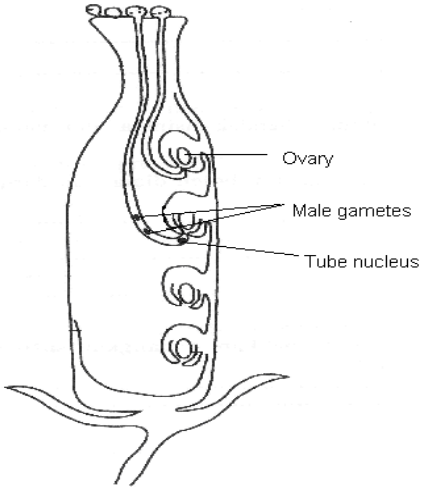
[10 marks]

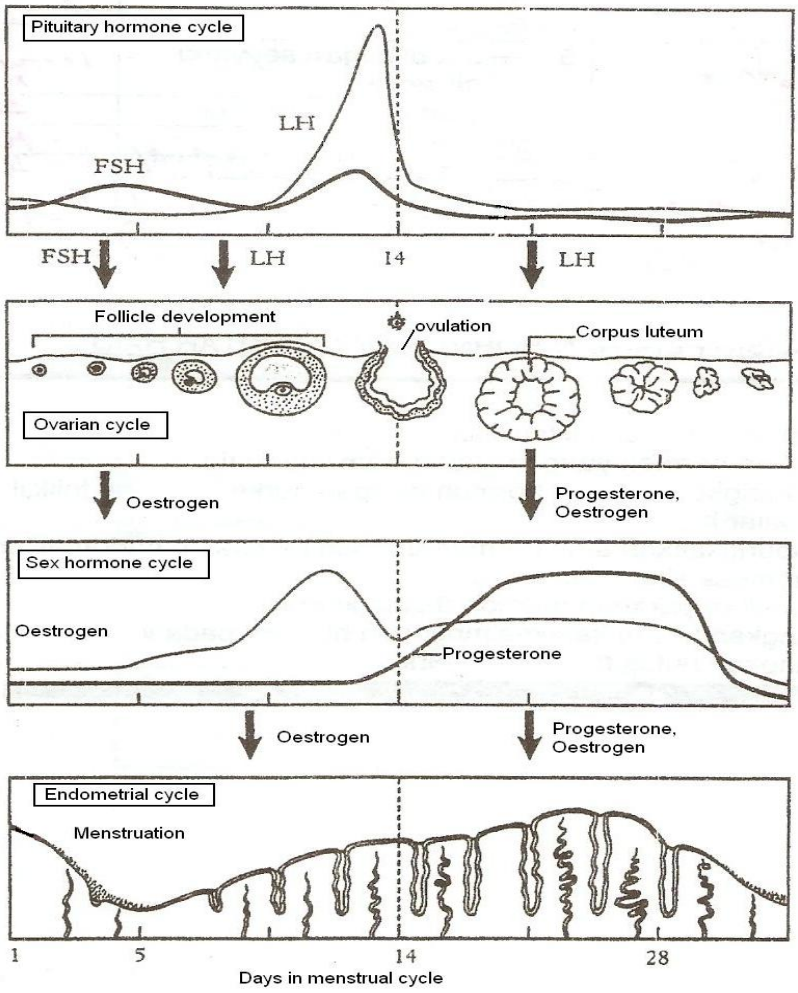
No	Essay Questions	Marks	Student's tips
13 (a)	Diagram 13 shows the action of antagonistic in bending of the fore-limb.  Diagram 13 Based on diagram, describe the function of muscles, tendons and ligaments in enabling the bending of the human fore-limb. [6 marks]		
(b)	A lady aged 50 often experiences aches and pains in her bones. She is suffering from osteoporosis. State the symptoms of osteoporosis and suggest the ways to overcome this problem. [4 marks]		
(c)	Discuss how to practice ways in maintaining a healthy musculoskeletal. [10 marks]		

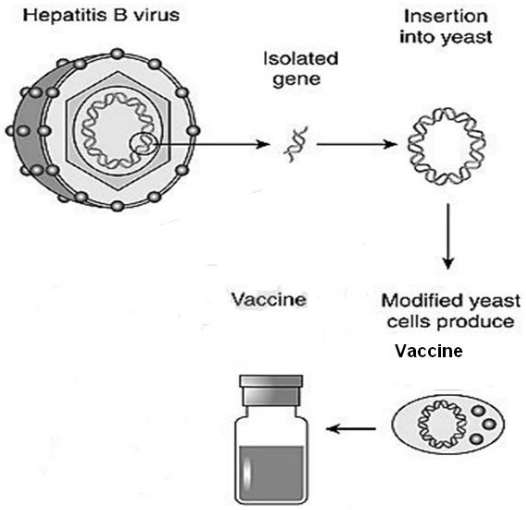
No	Essay Questions	Marks	Student's tips
14(a)	State the importance of living organisms to respond to stimuli. [4 marks]		
(b)	Diagram 14 shows the pathway of response when a man heard a visitor ringing the door bell.  Diagram 14 Based on diagram 14, explain the pathway involved in detecting and responding to the stimulus. [6 marks]		

No	Questions	Marks	Student`s Tip
15(a)	When you suddenly see too many smoke coming from your kitchen, your heart beat faster and your hands become sweaty. Based on Biology knowledge, explain the above situation. [10 marks]		
(b)	Diagram 15 shows reflex action in human.  Diagram 15		
(i)	Based on the diagram 15, draw arrows to show the nerve pathway involved in the reflex action. [1 mark]		
(ii)	Explain the reflex action shown above. [9 marks]		

No	Questions	Marks	Student's tips
16(a)	State one physical factor and one chemical factor that affecting the internal environment. Explain your answer with example. [6 marks]		
(b)	Explain the necessity to maintain an optimal internal environment. [4 marks]		

No	Essay Questions	Marks	Student's tips
17(a)	Diagram 17 shows a longitudinal section of the carpel of a flower during fertilization.  Diagram 17 Describe how the process of fertilization is carried out. [6 marks]		
(b)	Explain the similarities and differences between fertilization in a plant and mammal. [4 marks]		

No	Essay Questions	Marks	Student's tips
18(a)	Diagram 18 shows the hormones involved in the human menstrual cycle.  Diagram 18 Based on the diagram 18, explain the relationship between the hormones level with the changes in the endometrium thickness and the follicle development. [10 marks]		
(b)	A married couple has 10 children after 13 years they had lived together. They decided to limit the number of children by practicing birth control. Explain the methods in birth control that can be used for this couple. [10 marks]		

No	Essay Questions	Marks	Student's tips
19(a)	Diagram 19 shows a procedure in the production of vaccine for Hepatitis B.  Diagram 19		
(i)	Explain how Hepatitis B virus are used in production of vaccines for hepatitis B. [6 marks]		
(ii)	Based on Diagram 19, describe the meaning of genetic engineering. [4 marks]		
(b)	Discuss the good and the bad effects of genetic engineering to human and the environment. [10 marks]		

No	Question	Marks	Student's tips
20	Explain how a human is able to maintain his body temperature, even though the external temperature has dropped. [10 marks]		

No	Essay Questions	Marks	Student's tips
21	Diagram 21(a) and 21(b) shows two different characteristic among human.		

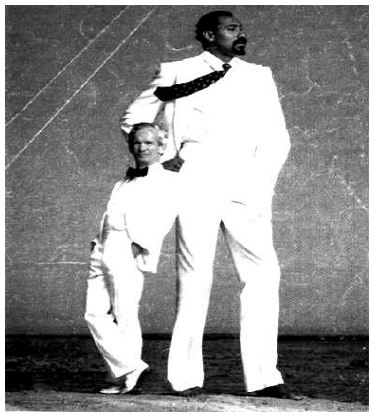


Diagram 21 (a)

Type of finger prints				
	Curves	*Right Loops*	*Whorl*	*Left Loops*

Diagram 21 (b)

(a) Based on Diagram 21(a) and in Diagram 21(b), identify the type of variation.
Explain your answers.

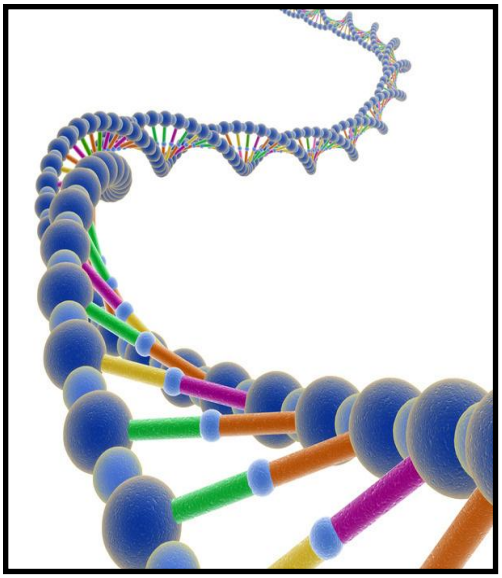
[4 marks]

(b) By using example, discuss the importance of variation in the survival of a species.

[6 marks]

KEMENTERIAN PENDIDIKAN MALAYSIA

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN



MODUL X-A Plus / PERFECT SCORE

http://cikguadura.wordpress.com/

BIOLOGI 4551/2
(ESEI)
2013

EDISI GURU

DISEDIAKAN OLEH

MAZINAH BT MUDA — **SMS TENGKU MUHAMMAD FARIS PETRA**
DATIN NORIDAH BT YANGMAN — **SMS TUANKU SYED PUTRA**
NURUL UYUN BT ABDULLAH — **SMS KUALA SELANGOR**
ROSIAPAH BT DOLLAH — **SMS SELANGOR**
MELI BIN HUSSIN — **SMS KUALA TERENGGANU**
NORAINI BT SAMIN — **SMS MUAR**
HABSHAH BT KHATIB — **SMS KUCHING**
ZALINA BT AHMAD — **KOLEJ ISLAM SULTAN ALAM SHAH**
SUSANTI BT GAMIN — **SMS JOHOR**
FATIMAHWATI BT MALEK — **SMA PERSEKUTUAN LABU**
MOHD IZANI B SAUFI — **SMS KEPALA BATAS**
MOHD FADHIL BIN MASRON — **SMS LABUAN**

Paper 2 – Section B

No	Questions	Marks	Student`s Tips
1.(a)	Plasma membrane is a biological membrane that separates the interior of all cells from the outside environment. Describe the structure of plasma membrane using the fluid mosaic model. [6 marks] **P1: Plasma membrane is composed of phospholipid <u>and</u> protein** **P2: (Various types of) proteins are dispersed throughout (and inserted into the) phospholipid bilayer.** **P3: Phospholipid bilayer is dynamic // are not rigid or static** **P4 : form a flexible structure** **P5: Phospholipid molecule has polar /hydrophilic head <u>and</u> non polar/ hydrophobic tail** **P6: Contains cholesterol which links the fatty acids together** **P7: helps to stabilized / strengthen the membrane membrane //make it more flexible** **P8: Various type of proteins // pore protein and carrier protein either partially attached or wholly embedded in the membrane.** **P9: The protein molecules (float about in the phospholipid bilayer to) form a mosaic pattern** **P10: that is always changing / mobile ('fluid' characteristic)** *Any 6*	Max 6	
(b)	Explain how simple diffusion takes place in alveolus . [4 marks] **F1: Concentration/partial pressure of oxygen in alveolus Is higher than the concentration /partial pressure of oxygen in blood capillaries .** **E1: Oxygen diffuses from alveolus to blood capillaries**	Max 4	

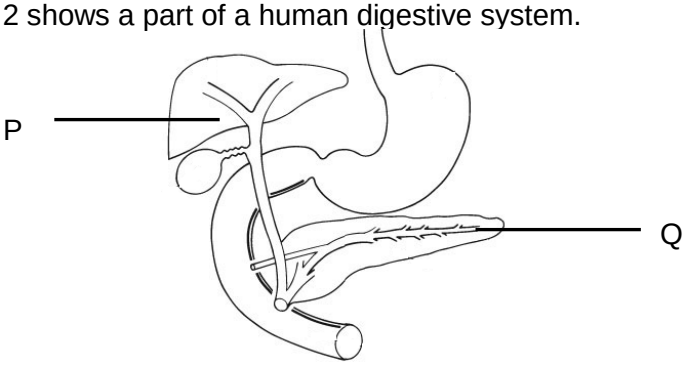
	E2 : because of the concentration gradient. **F2: Concentration/partial pressure of carbon dioxide is higher inside the blood capillaries compared to concentration/partial pressure of carbon dioxide in alveolus.** **E3: Carbon dioxide diffuses out of the blood capillaries into the alveoli** **E4 : because of the concentration gradient.** *Any 4* *(E2 , E4 = accept once)*		
(c)	By using example, explain the movement of substances across the plasma membrane by facilitated diffusion and active transport [6 marks] **<u>Facilitated diffusion (FD)</u>** **P1: Most water-soluble molecules / molecules that is not soluble in lipidseg ions/ nucleic acids/ amino acids / glucose.** **P2 : follow concentration gradient//from high concentration to low concentration of molecule/ions** **P3: combine with a specific carrier protein // bind at active site of carrier protein.** **P4: carrier protein changes shape to allow the molecules to pass through** **P5: energy is not needed/it follows the concentration gradient** **<u>Active transport (AT)</u>** **P6: example of substance : ions / glucose /amino acid** **P7 : molecules / ions move against the concentration gradient** **P8: molecule/glucose/amino acid/ ion bind at the active site** **P9: ATP / energy bind at another active site.** **P10: ATP release energy to carrier protein// ATP is spilt into ADP and P** **P11: (Then) carrier protein changes its shape to allow the molecules /ion to pass through (the plasma membrane)**	Max 6	

<table>
<tr><td></td><td>Any 6
At least 1 P from FD and 1 P from AT</td><td></td><td></td></tr>
<tr><td>(d)</td><td>State similarities and differences between passive transport and active transport.
[4 Marks]
Similarities (S):
S : Both involved the movement of substance from one region to another:
Differences(D):
<table>
<tr><th></th><th>Passive transport</th><th>Active transport</th></tr>
<tr><td>D1</td><td>The movement of substances follows the concentration gradient.</td><td>The movement of substances is against the concentration gradient.</td></tr>
<tr><td>D2</td><td>Cellular energy is not required.</td><td>Cellular energy (ATP) is required.</td></tr>
<tr><td>D3</td><td>The process continues until a dynamic equilibrium is reached.</td><td>The process results in the accumulation of / elimination of substances from the cell.</td></tr>
<tr><td>D4</td><td>Can take place in living cells or non-living physical condition</td><td>Can only take place in living cells.</td></tr>
</table>
Any 4
S and at least 1 from D.</td><td>Max 4</td><td>Tips:
If using a table, a complete sentence must be used.

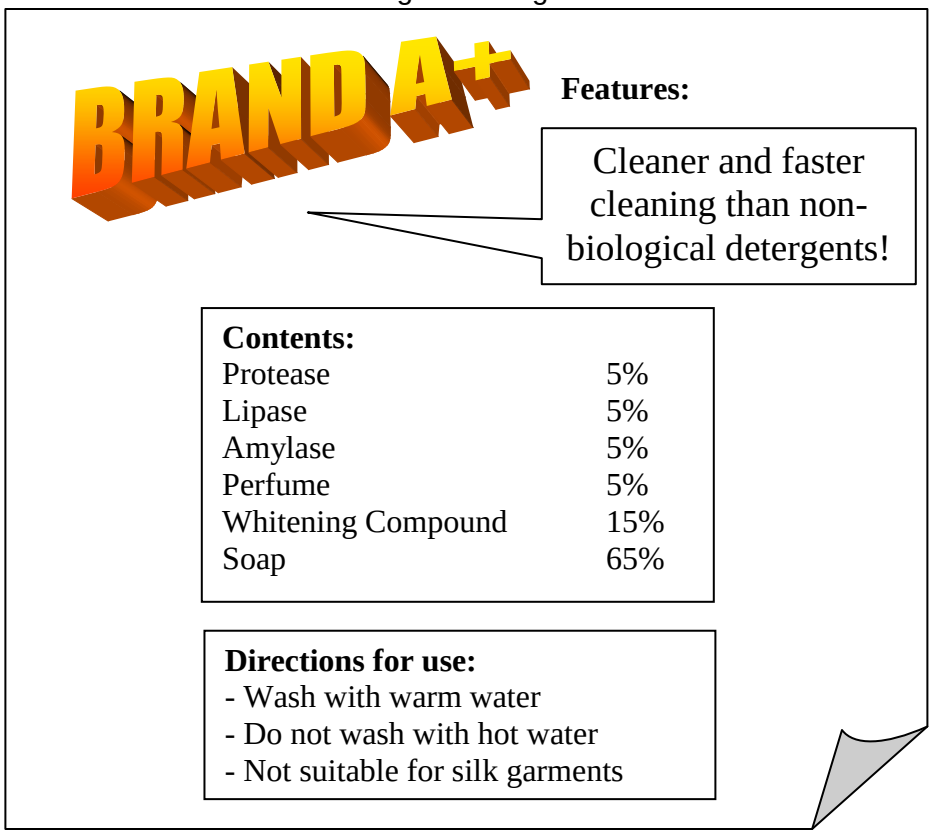
Example of not complete sentence:

“against concentration”

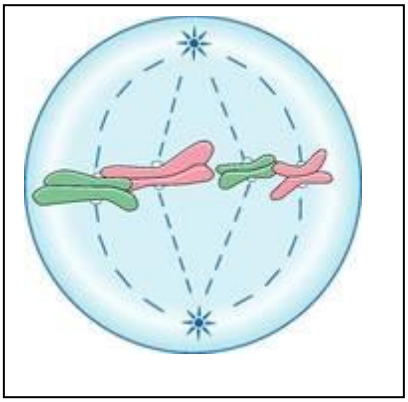
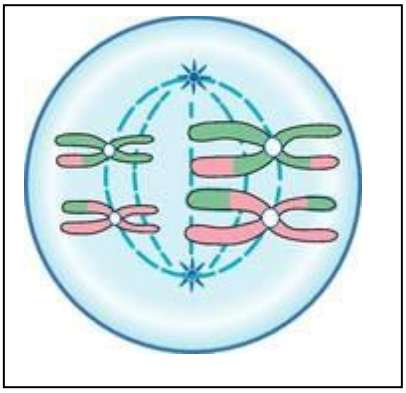
“ATP required”</td></tr>
</table>

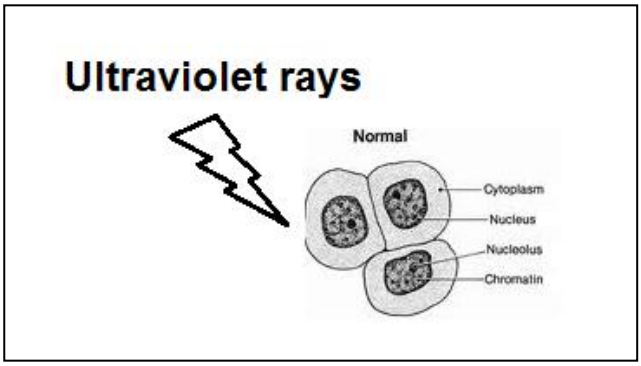
No	Essay Questions	Marks	
2(a)	Diagram 2 shows a part of a human digestive system.  Diagram 2		

	Explain the role of organ P and Q in the digestion of carbohydrate, protein and lipid [10 marks] **<u>Organ P</u>** **P1: P is a liver** **P2: which produces bile** **P3: (bile) is transported to the duodenum** **P4: to provide an alkali medium** **P5 : to emulsify lipids into tiny droplets of lipids** **P6: to increase the surface area for enzymatic action** **<u>Organ Q</u>** **P7: Q is a pancreas** **P8: secretes pancreatic juice//enzymes enzymes on digestion of starch, polypeptide and lipids** **P9: which contain(pancreatic) amylase to *hydrolize//digest//break down starch into maltose** **P10: trypsin to *hydrolize//digest//breakdown polypeptide into peptide** **P11: lipase to *hydrolize//digest//breakdown lipids into fatty acids <u>and</u> glycerol** *Any 10*	Max 10	*Reject: Convert, change

No	Essay Questions	Marks	
2(b)	Diagram 2 shows a label from a biological detergent.  Diagram 2 Working in a multinational consumer goods company, you are required to revise on Brand A+ biological detergent as a guideline to create a new biological detergent for the company.		
(b)(i)	Explain how the biological detergent functions efficiently. Your explanation should covers on the features, the main contents and direction for use. [8 Marks] **P1: Biological detergents using (active) enzymes for deeper cleansing action** **P2: Enzymes used will increase the rate of cleaning duration // faster cleaning** **P3: Protease will digest // break down// hydrolize protein.** **P4: Lipase will digest // breakdown // hydrolize lipid and oil.**	Max 8	

	P5: Amylase will digest // breakdown // hydrolizestarch stains on clothes. **P6: Removal of any suitable example of stains.** **P7: The amount of enzymes used at small quantity because / they are not used up / destroyed (but released) at the end of reaction.** **P8: The same enzyme molecule can be reuse to catalyse a large number of substrate.** **P9: An enzyme works best at an optimum temperature // any temperature range between 30°C – 40 °C.** **P10: An enzyme will be denatured/ destroyed at high temperature/ any temperature more than 40°C.** **P11: Silk is made of animal protein.** **P12: Proteins in silk will be broken down by the protease in detergent.** *Any 8*		
(b)(ii)	Suggest additional content to improvise the functions of the deteregent. [2 Marks] **P1: Additional cellulase enzyme can be added to cause clothes to be softer and looks brighter.** **P2: Cellulase will breaks down free cellulose microfibrils on clothes to soften fabrics.** **P3: Breaking down of free microfibrils also prevent from clothes looks dull due to light refraction, which gives brighter looking effects.** *Any 2*	Max 2	

No	Essay Questions	Marks	Student's tips
3(a)	Diagram 3.1 shows stage P and Stage Q in a cell division process.   Stage P Stage Q Diagram 3.1 State the similarities and differences of chromosome behavior between stage P and stage Q. [4 marks] **Answer:** **<u>Simililarities (S):</u>** **S1 – in both stages each chromosomes consist of 2 sister chromatids attached at (centromere).** **S2 – in both stages each chromosomes attached to the spindle fibre at the (centromere)** **S3 – in both stages each contromere does not divide**. **<u>Difference(D):</u>** **D1 – In stage P, chromosomes align at metaphase plate/equator while In stage Q, homologous chromosomes align at metaphase plate /equator.**	4	

(b)	Diagram 3.2 shows normal skin cells are exposed to ultraviolet (UV) rays.  Diagram 3.2 Based on diagram 3.2, explain the effect of ultraviolet (UV) rays on normal skin cells. [6 marks] **P1 - DNA molecule/gene is damaged** **P2 - the mechanism of cell cycle (will be severely) disrupted** **P3 – Cell divides by mitosis repeatedly, without control / regulation //uncontrolled mitosis** **P4 – to produce cancerous cell/cancer cell** **P5 – to form abnormal mass of cell called tumor** **P6 – lead to skin cancer**	6	
(c)	If meiosis does not occur properly, the gametes formed will have an abnormal number of chromosomes. The zygote that is formed later would become abnormal. Explain the above passage in occurrence of Down's syndrome. [10 marks]	10	

	P1 - When the chromosomes / the sister chromatids do not separate **P2- non-disjunction occurs** **P3- During anaphase I / anaphase II of meiosis** **P4- The gametes produced would have either extra / lack of chromosomes.** **P5- In Down's syndrome, 2 homologous chromosome 21 fail to separate** **P6- Causing one of gamete/ovum have extra one chromosome 21 / have two chromosome 21** **P7- When this ovum fertilized with sperm that has one chromosome 21** **P8- Will produced zygote with three chromosomes 21** **P9- The individual has trisomy chromosome 21 (instead of two chromosomes 21)** **P10- Zygote has cell with 47 chromosomes (instead of normal 46 chromosomes).**		

No	Questions	Marks	Student`s Tips
4	Experts claim that breakfast is the most important meal of the day and placed key role in helping tackle obesity. Eating a healthy breakfast everyday gives your brain and body a boost. Eating a breakfast has a long term benefits. It can reduce obesity, high blood pressure, heart disease and diabetes. Table 1 shows a breakfast menu for an adult. **BREAKFAST MENU** Bread 2 slices Fried eggs 2 Jam 1 teaspoon Margarine 1 teaspoon Fresh milk 1 glass Banana 2 Table 1		
(a)	Does the breakfast menu in Table 1 provide a balanced diet for an adult? Give your reasons. [10 marks] **F : the breakfast menu is a balanced diet for an adult** **E1 : the menu consists all the seven classes of food in the correct quantity and proportion // the menu consists of carbohydrates , lipids, protein, vitamins, mineral salts, roughage and water in the correct quantity and proportion.** **E2 : Bread / banana contains carbohydrate which will be digested into glucose** **E3 : oxidized to release energy / cell respiration** **E4 : fried eggs / fresh milk contains protein** **E5: which will be digested into amino acid** **E6 : amino acids are used in the synthesis of plasma protein / example of a plasma protein : fibrinogen / albumin / globulin // for growth / replace damage tissue / cells** **E7 : Banana contains fibre to prevent constipation**	Max 10	

E8 : Margarine / fried egg contains fat / lipid to be oxidize for Energy

E9 : fats are used as components of plasma membrane

E9 : Bread / milk / jam contains vitamins / mineral salt is used as cofactor // to regulate health.

E10 : milk contain water

E11 : to maintain body temperature / ***any function of water to human body.***

Any 10

(b) Table 2 shows the result of an analysis of meat-base fast food.

ANALYSIS OF CONTENT IN A FAST FOOD

- Excess of mineral salt
- Excess of fat
- Excess of protein
- Insufficient fibre
- Presence of food preservatives, flavouring and food colouring.

Table 2

A teenager frequently consumes meat-based fast food for a long time. Describe the effects of consuming the meat-based fast food for long periods of time.

[10 marks]

Effect (E)	**Description (of long term effect)**
Excess of salt in food increases the blood osmotic pressure	**Causes salt poisoning // formation of stones in the kidney / urinary tracts // arteriosclerosis // hypertension.**
Excess of oil / fat / lipids increases cholesterol content in blood	**Causes coronary thrombosis / cardiovascular diseases / narrowing of blood arteries // obesity**
Excess of protein prolongs digestion / not used by the body	**Deamination increases and produces toxic amounts of nitrogenous waste products / urea / uric acid // kidney failure / gout**

Max 10

	Food preservatives / colouring / additives contain harmful chemicals	**Chemicals can be carcinogenic / cause cancer .**		
	Insufficient roughage / fibre in food	**Cause constipation / faeces hard and small / evacuation of faeces causes pain // intestinal diseases.**		

No	Questions	Marks	Student's tips
5	Instead of taking a balanced diet, it is also important that we practice good eating habit. In recent times, we hear of increasing cases of eating disorders among modern community.		
(a)	Explain the meaning of Good Eating Habit and Eating Disorder [4 marks] **<u>Good eating habit (G)</u>** **P1: taking food in correct quantity at the correct time** **P2: refrain from overeating / eating too little** **P3: normal person should take in three meals a day; breakfast// lunch // dinner //any explanation** **<u>Eating disorder (E)</u>** **P1: taking improper quantity of food, food classes and time // do not follow the food pyramid** **P2: overeating / eating too little food in one meal** **P3: taking excessive fatty food / rich in sugar/ (any explanation)** *Any 4* *At least 1 P from G and at least 1 P from E*	Max 4	
(b)	Describe following health problem related to eating habit - Obesity - Gastritis - Anorexia nervosa [6 marks]	Max 6	

	<u>Obesity</u> **P1: excessive (storage of) energy in the form of fat** **P2: causes a lack of balanced between intake and energy expenditure/ used** **P3: taking excessive fatty food and high sugar content** **P4: lead to cardiovascular disease/ hypertension / diabetes mellitus** **<u>Gastritis</u>** **P5: epithelial lining of stomach become inflamed** **P6: causes improper eating time / empty stomach during eating time** **P7: acidic gastric juice acting on the epithelial lining of stomach** **P8: mucus / protective layer in the stomach disrupted** **<u>Anorexia nervosa</u>** **P9: experience an intense fear of gaining weight** **P10: intentionally deprive them self of food to achieve severe loss in body weight** **P11: lose both fat / muscle that they become extremely lossweight** **P12: lead to organ failure / heart, endocrine system or reproductive system fail** *Any 6* *(At least 1 P from P1-P4, P5-P8 and P9-P12)*		

(c) Diagram 5.1 shows the label on a packet of snack food. Gordon, 17 years old teenagers take this snack as his daily diet.

Keledek Chips

Ingredients:
Keledek, vesawi oil, preservatives, sugar, salt, fats, flavouring, approved stabiliser and colouring.

Contents	**per 100 g**	**per keledek chips**
Energy	1,100 KJ	332 KJ
Fats	10.5 g	3.2 g
Unsaturated fats	6.5 g	1.8 g
Saturated fats	2.1 g	0.5 g
Sugar	1.2 g	0.6 g
Starch	15.3 g	6.5 g
Protein	2.1 g	0.8 g
Salt	0.8 g	0.2 g

Minimum weight : 350 g

Diagram 5.1

Diagram 5.2 shows the analysis of Gordon's diet and the recommended diet. (Vitamins, minerals, fibre and water are not shown)

	Lipids	Carbohydrates	Proteins
Gordon's diet	25%	68%	7%
Recommended diet	14%	54%	32%

Diagram 5.2

Does the Gordon eating habit is good or bad. Explain your answer.

[10 Marks]

Max 10

F:Gordon's diet is bad// not a balance diet.

P1: Keledek chips is not good for daily diet

P2: high content of lipid

E1: lead to obesity / cardiovascular disease / hypertension

P3: high content of carbohydrate / 14% carbohydrate contents more than recommended

	E2: lead to obesity / diabetes mellitus / cardiovascular disease **P4: lack of protein content / 25% protein content less than recommended** **E4: lead low body defence / muscle lose / disruption of the function organ (liver/kidney failure) /kwashiorkor / marasmus / stuntegrowth.** **P5: (others choice) low fibre** **E5: cause constipation** **P6: low vitamin** **E6: any examples of Vitamin deficiency disease.** **P7: high salt** **E7: cause hypertension** *Any 10*		

6	Encik Ali is a local entrepreneur intends to process a local food item to be exported as light snacks to overseas market. He wants some guidance on food processing so that his processed snacks can appeal to the overseas consumers, and at the same time he can make profits. Describe the principles of food processing that may help Encik Ali in deciding a suitable food processing method [10 marks] **P1 : list of food process method : preservation / pasteurisation / canning / fermentation / drying (*at least 2 methods*)** **The processing must be able to :** **P2 : can withstand long periods of transportation / storage.** **P3 : more attractive / more palatable** **P4 : keep the food for a longer duration // ensure the lifespan of the food is extended.**	Max 10	

	P5 : so, it can be stored for future use // continuous supply for the population **P6 : ensure the food is preserved in its original form** **P7 : maintain the original taste of the food** **P8 : preserve the nutrient content of the food** **P9 : adding extra nutrient / vitamin / mineral / probiotics / beneficial microbe** **P10 : to increase its commercial value** **P11 : improve the taste / appearance / texture of the processed food** **P12 : Enhance the freshness of the food** **P13 : The food additives must not be a health risk** *Any 10*		

(b) Diagram 6 shows various processed food on a supermarket shelf.

Diagram 6

Based on Biology knowledge, discuss good and bad of food processing on human life.

[10 marks]

Max 10

Good (G)	Explanation (P)
G1 : to preserve food / long shelf live	**P1: Avoid wastage of food / prevent food spoilage/can be stored (for future use)**
G2 : to increase its commercial value / uses of food additives	**P2: improve the taste / appearance / texture of food/to preserve the freshness**
G3 : to diversify the uses of food substances	**P3: to increase the variety of product//any example**
G4 : Kill microorganism that spoil food / caused disease / tuberculosis / any explanation	**P4 : To prevent food poisoning / disease**

Bad(B)	Explanation(P)
B1 : uses food additive	**P5 : give long term side effect/examples//reduce the nutrient/vitamin in the food.**
B2 : uses of food colouring / yellow dye/tetrazine	**P6 : causes allergy reaction / cancer**
B3 : too much sugar	**P7 : increases the risk of diabetes**
B4 : too much salt // Sodium nitrate	**P8 :increase the risk of high blood pressure // causes nausea / athma (to certain people)**
B5: Change original taste / flavor / texture / nutrient lost	**P9 : Less freshness**
B6 : Oily food may be oxidized	**P10 : Food becomes rancid / smells / tastes different / harmful to the body.**

Any 10
At least one point from G and B

7 (a) Photosynthesis occurs in two stages which are the light reaction and dark reaction.
Describe the differences between the light reaction and dark reaction.

[4 *marks*] Max4

Light reaction	Dark reaction
D1. Occurs in granum	**Occurs in stroma**
D2. Requires light	**Does not require light**
D3. Involves photolysis of water	**Involves reduction/fixation of carbon dioxide**
D4. Materials required is water/ chlorophyll	**Materials required is carbon dioxide /hydrogen atoms/ ATP**
D5. Produces oxygen and water	**Produces glucose**

(b)

In countries with four seasons, plants are grown in greenhouses.

Based on the statement, explain why this method is carried out to ensure the production of crops throughout the year.

[6 *marks*]

F: In temperate countries light intensity / temperature changes throughout the year.

P1: In winter , temperature is very low

P2: In autumn, the plants shed their leaves // Light intensity/ temperature is low

P3: Rate of photosynthesis is very low

P4: In spring and summer, the light intensity/temperature are optimum for photosynthesis.

P5: So the rate of photosynthesis is maximum / highest.

P6: In the greenhouse, light intensity/concentration of carbon dioxide / temperature are maintained at optimum level (for photosynthesis) throughout the year.

P7: So the rate of photosynthesis is maintained at maximum level throughout the year (regardless of changes in light intensity or temperature).

P8: The plants are able to increase yields / increase the crops production throughout the years.

(c) Graph in Diagram 6 shows the changes in the rate of photosynthesis throughout the day in a tropical country.

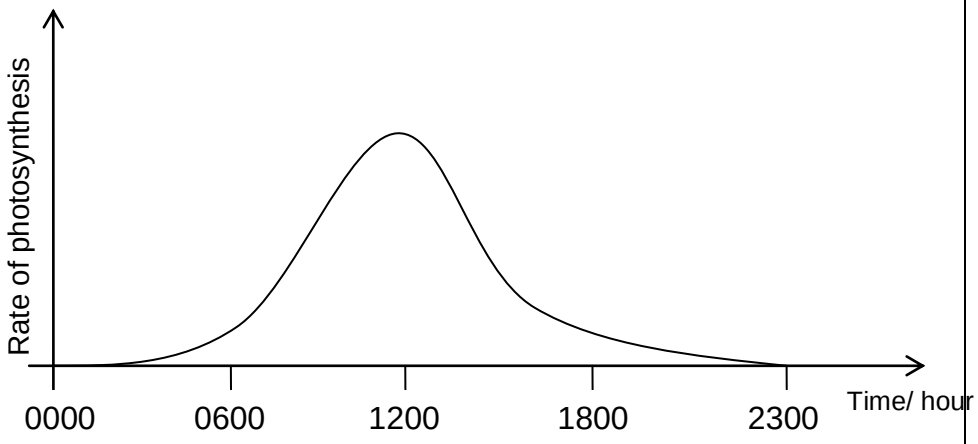


Diagram 6

Based on the graph, explain the changes in the rate of photosynthesis in the plant throughout the day.

[10 *marks*] Max 10

F1: From 0000 to 0600, the rate of photosynthesis is very low

P1: The light intensity / temperature is (very) low

P2: (At low temperature,) photosynthetic enzymes are inactive.

F2: From 0600 to 1200 , the rate of photosynthesis increase (rapidly)

P3: Light intensity / Temperature also increases
P4: Enzyme for photosynthesis become more active.

P5: Stomata open wider to allow absorption of more carbon dioxide

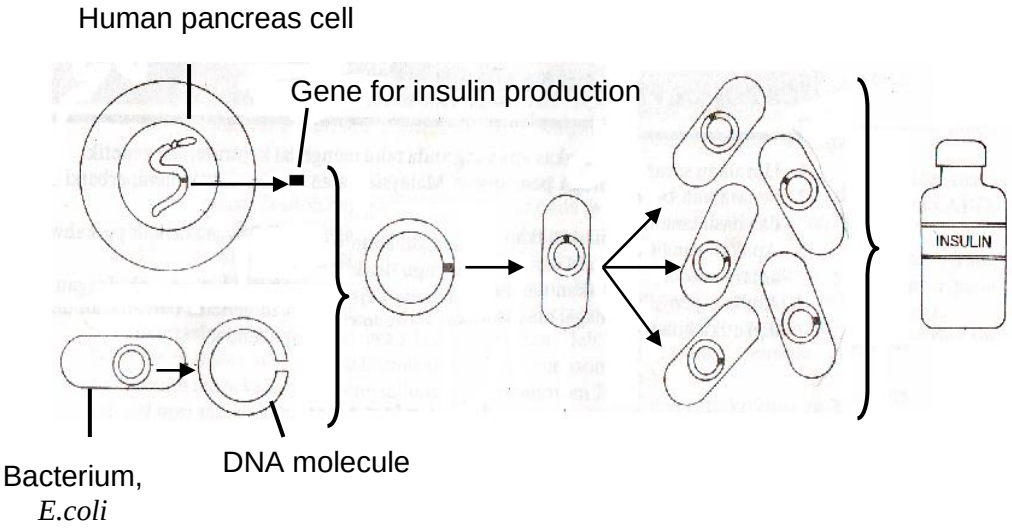
F3: The rate of photosynthesis is maximum / the highest at 1200

P6: The light intensity maximum / temperature is optimum (for photosynthesis)./ stomata open fully

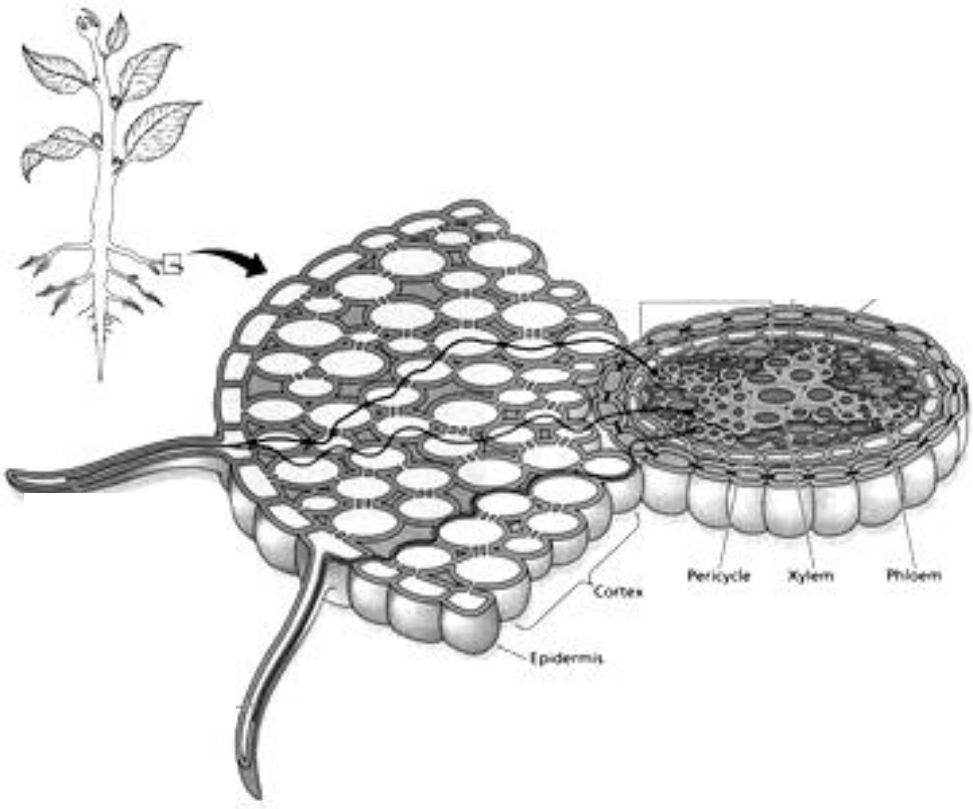
P7: Enzymes are the most active.

	F4: From 1200 to 1800, the rate of photosynthesis decreases **P8: Light intensity / temperature decreases** **P9: Photosynthetic enzyme are less active** **P10: Stomatal openings/pores become smaller** **P11 : Less carbon dioxide is absorbed** **F5: From 1800 to 2300 , the rate of photosynthesis become very low / stopped / ceased** **P12 : Light intensity very low / temperature is very low/ no light** **P13: Photosynthetic enzymes are not active** **P14: Stomata closed** **P15: Very little / no carbon dioxide is absorbed** *Any 10*		

No	Essay Questions	Marks	Student's tips
8(a)	Describe the genetic engineering in biotechnology development. [*4 marks*] **Meaning :** **P1 : Genetic engineering is the gene manipulation / alteration of genetic materials of an organism** **P2 : to create new combinations of genes.** ***Process :*** **P3: It involves the transfer/insertion of a gene / genes (on the DNA molecule)** **P4: from a living organism (the DNA molecule of) another organism.** **Importance:** **P5: produce organism with desired characteristics / any explanation**	Max 4	

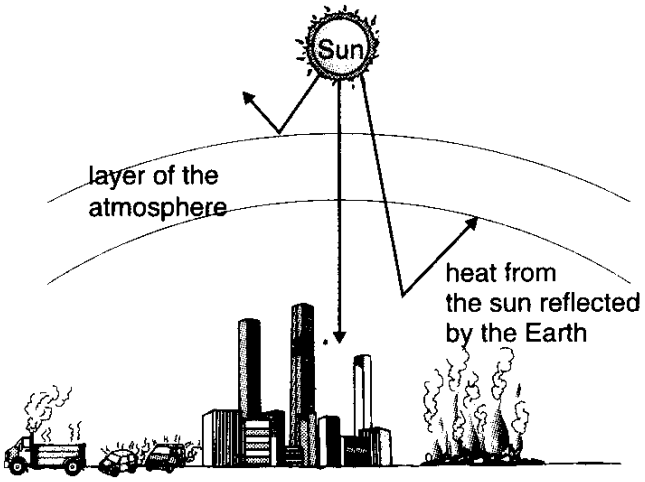
(b)	Diagram 8 shows the production of insulin by biotechnology.  Diagram 8 Based on Diagram 8, explain how bacteria are used in the medical purpose. [6 marks] **P1: Medical purpose – insulin production is used for curing diabetic patient.** **P2: The gene / DNA molecule which involved in insulin production is isolated from human pancreas cell.** **P3: Gene / DNA molecule is then inserted into the DNA molecule / plasmid of a bacterium // *E. coli*** **P4: The bacterium contains a recombinant DNA with human insulin gene** **P5: The bacterium is then cultured in a suitable condition / nutrient medium** **P6: The bacterium (is now) capable to produce the human insulin** **P7: in a large scale (cheaper).** **P8: The insulin is purified and used to treat (diabetic patient)** *Any 6*	Max 6 marks	

(c)	Justify the advantages and disadvantages of genetic engineering. [10 marks] **<u>Advantages of genetic engineering</u>** **P1: Enables the mass production (of various types of products through the development of new strains of crops and livestock).** **P2 : Ensures that food sources / Genetically Modified Food (GMF) (are readily available) at cheaper cost** **P3 : Enables the mass production of medical / pharmaceutical products** **P4: to solve environmental problems such as oil spills by using genetically engineered bacteria.** **P5: Can diagnose / treat the genetic diseases at the early stage // any explanation.** **P6 : To speed up the process of selective breeding in animal / plant** **P7 : Useful in gene therapy** **<u>Disadvantages of genetic engineering</u>** **P8: (The introduction of foreign genes in microorganisms) leads to the creation of (harmful) pathogens.** **P9: (New species of crops that are produced) can cause the original species to become extinct.** **P10:Transgenic crops / new species can colonise/ displace the natural plant population** **P11: The side effects of eating food from genetically modified organism are still uncertain// any explanation.** *Any 10* *At least 1 P from advantages and 1 P from disadvantages*	Max 10	

	Questions	Marks	Student's tips
9	Diagram 9 shows the direction of water flow from the soil to the plant then to the atmosphere  **Diagram 9**		
	Based on Diagram 9 above, discuss how water molecules from the soil enter the root cells and loss during the process of transpiration. [10 marks] **<u>Root pressure</u>** **P1: There is a concentration gradient between soil water and epidermalcell // soil water is hypotonic to the epidermal cell** **P2: so water diffuse into the cell of root hairs / epidermal cells** **P3: by osmosis**	Max 10	

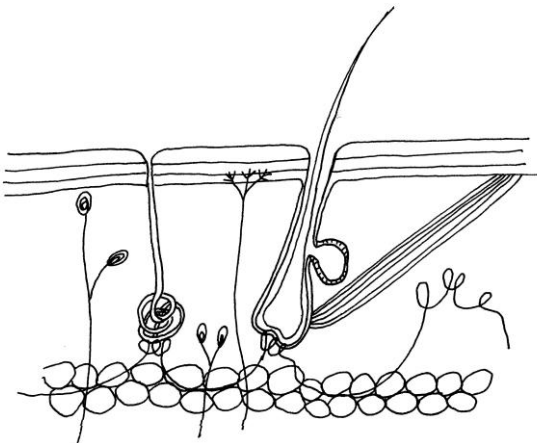
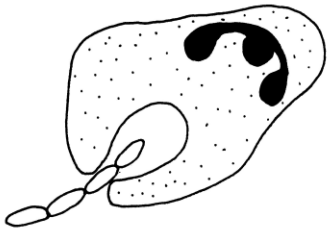
	P4: this will cause the osmotic pressure of the epidermal cell decrease / hypotonic (compare) to the adjacent cells **P5: so water diffuse again to the adjacent cells** **P6: by osmosis** **P7: to cause continuously movement of water inward** **P8 : (Meanwhile), mineral ions are actively pumped / accumulated in xylem vessel** **P9: This condition creates a force to push the water into xylem vessel //root pressure created.** **P10: So water diffuses from cortex to the xylem vessel (of the middle of root.)** **P11: The concentration gradient of water across the cortex and endodermis create a pushing force, water then move to xylem** **<u>Capillary Action</u>** **P12: This is combination forces of cohesion and adhesion forces** **P13: Cohesion force is the attraction among the water molecule along the xylem xylem vessel** **P14: Adhesive force is the attraction of water molecule with the wall of the xylem cells.** **P15: Thus the capillary action enable the upwards movement of**		

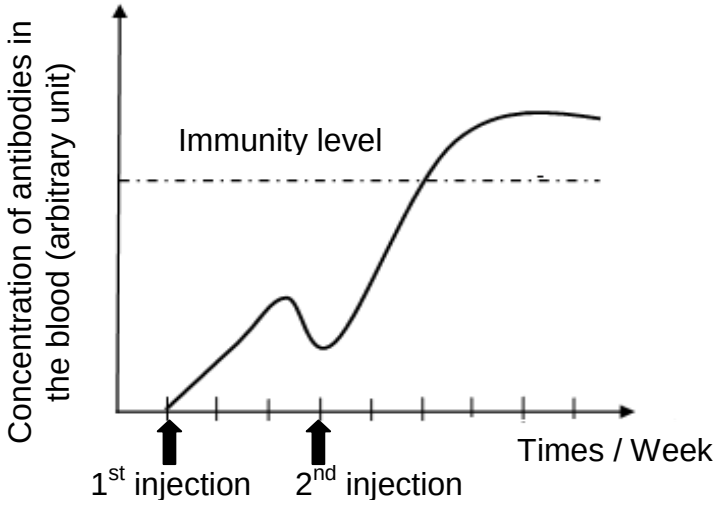
	wateralong the xylem **<u>Transpirational pull</u>** **P16: During transpiration, water loss to the atmosphere and thuscreate the transpiration pull**. *Any 10* *P3 and P6 accept once*		

No	Questions	Marks	Student's tips
10.	Diagram 10 shows an environmental phenomenon.  **Diagram 10**		
(a)	Describe how the phenomenon in diagram above occurs. [10 marks] **P1: The phenomenon is Green house effect** **P2: Carbon dioxide /chlorofluorocarbons (CFCs)/ methane/ nitrous oxide / water vapour make up the greenhouse gases.** **P3: Greenhouse gases / CO_2 produced by burning of fossil**	Max 10	

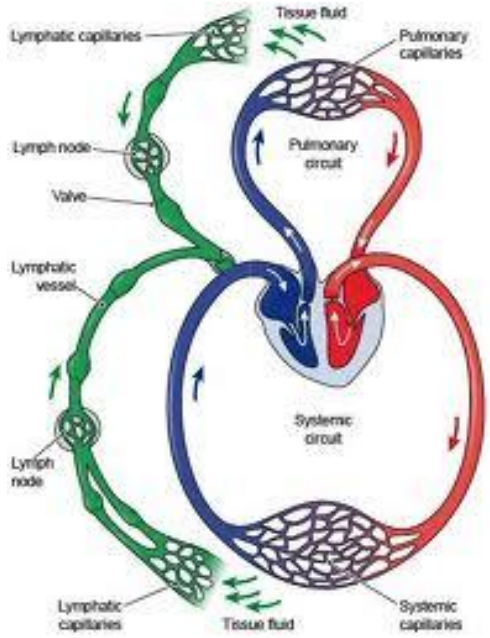
	P4: deforestation activity increase concentration of CO_2 // Lack of tree decrease absorption of CO_2 . **P5: A layer of green house gases / CO_2 is formed** **P6: When the sunlight enter the Earth's atmosphere .** **P7: (Most of) the radiation is absorbed by the Earth.** **P8: Some radiation is radiated back into space.** **P9: Green house gases trap / absorb the (radiated) heat** **P10. Causes earth temperature increase // warm the atmosphere// Global warming** *Any 10*		
(b)	Suggest ways to minimize the effects of this phenomenon. [4 marks] **P1: Reduce burning of fossil fuels** **P2: encourage car pool / prevent open burning /any suitable example** **P3: Use alternative energy source //electricity // use hybrid car** **P4: Slow down/reduce deforestation for farming / development// prevent open burning // use incinerator** **P5: Replant trees which have been cut down // campaign for green earth // any explanation suitable.** *Any 4*	4m	
(c)	Human activities have a widespread impact on the ecosystem. One of the most devastating human activities on the environment is deforestation. Describe theeffect and consequences of deforestation to the ecosystem. [6marks] **P1: No roots system to hold the soil** **P2: causes soil erosion/ landslide** **P3: (During raining), sedimentation is run off into the river.** **P4: causes flash flood**	Max 6	

	P5: Habitat of animal/ fauna destruction **P6: causes extinction of flora / fauna** **P7 : increase concentration of CO_2 in atmosphere** **P8 : cause Green House Effect phenomenon // global warming** *Any 6*		

No	Questions	Marks	Student's tips
11.	Diagram 11.1 shows a human skin and diagram 11.2 shows a phagocytic cell .  **Diagram 11.1**  **Diagram 11.2**	**10 marks**	
(a)	Explain how the human organ in diagram 11.1 and the cell in diagram 11.2 involve in the body defense system. [10 marks] **<u>Human skin (diagram 11.1)</u>** **P1: The outer layer is tough / impermeable to bacteria / viruses /pathogen** **P2: the continual shedding of dead skin cells** **P3 : makes it difficult for bacteria to grow on the skin**		

	P4: sebaceous gland produced sebum /oil **P5 : (sebum produced) forms a protective layer over the skin** **P6: The sweat secreted contains lysozyme / enzyme** **P7: capable of breaking down (the cell walls of certain) bacteria** **P8: Skin has slightly acidic at pH 5.5 / prevents bacterial growth.** **<u>Phagocytic cell (diagram 11.2)</u>** **P9 : The cell performs phagocytosis** **P10: (When the cell encounters any pathogen) it engulfs the pathogen** **P11: The pathogen is drawn inside the cell (to form phagosome)** **P12 : Lysosome released lysozyme to digest the pathogen** **P13 : The cell releases the digested pathogen out of it** *Any 10* *(At least 1P from P1-P8,* *At least 1P from P9-P13)*		
(b)	Individuals P were given two injections to acquire immunity. The level of antibodies in the blood of individual P is shown in Diagram 11.3  Diagram 11.3		

	Based on diagram 11.3, explain the immunity given to individual P. [10 marks] **P1: Individual P is given artificially acquired active immunity** **P2: which is an injection of vaccine** **P3: a preparation of weakened / dead / non-virulentforms of pathogen (that is not harmful)** **P4: The injected vaccine stimulates the lymphocytes** **P5: to produce antibodies** **P6: The first injection results in the production of a low concentration of antibodies / low level of immunity** **P7: Not enough to protect the person against the disease.** **P8: The second injection increases theantibody production to a level of immunity** **P9: so that he can be protected against the disease.** **P10: The second injection is known as booster dose**	10 marks	

No	Essay Questions	Marks	Student's tips
12	Diagram 12.1 shows the lymphatic system and blood circulatory system.  Diagram 12.1 • **Lacteals in intestinal villi transport products of lipids** • **About 10% of interstitial fluid returns to the circulatory system via the lymphatic system**		
(a)	**Based on the statements, explain why the lymphatic system is considered complementary to the blood circulatory system.** **P1: fatty acids and glycerol is absorbed /diffuse/transported into lacteal** **P2: the lacteals fuse to form larger lymphatic vessels.** **P3: and enter the lymphatic system.** **P4: (Lymph carrying products of lipid digestion) eventually drains into the thoracic duct**	10 marks	

	P5: (the thoracic duct merges) into the left subclavian vein **P6: thus the lymphatic system complements the circulatory system in transporting the product of digestion.** **P7: (90%) tissue fluid/interstitial fluid returned to the blood circulatory system.** **P8: the remaining /10% flows into (the blunt-ended) lymph vessel/ capillaries.** **P9: these lymph capillaries drain into a larger lymph vessels** **P10: which eventually drain back into the blood circulatory system** **P11: via the thoracic duct / the right lymphatic duct** **P12: thus, the lymphatic system is complementary to the blood circulatory system** **P13: in ensuring that the volume of the blood in the blood vessels is kept constant.** *Any 10* *P6,P12 – accept once*		

(b) Diagram 12.2 show stages in blood clotting mechanism.

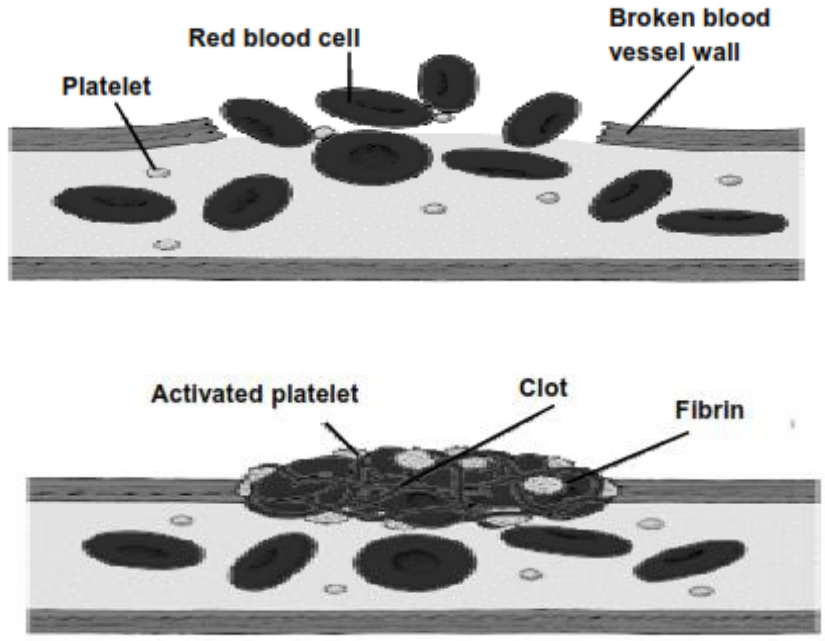


Diagram 12.2

Based on the diagram 12.2, describe how the mechanism of blood clotting helps to prevent infection when a wound occurs.

[10 marks]

10 marks

P1: wall of the blood vessel is broken/ damage/injured

P2: the connective tissue in the vessel wall is exposed to air

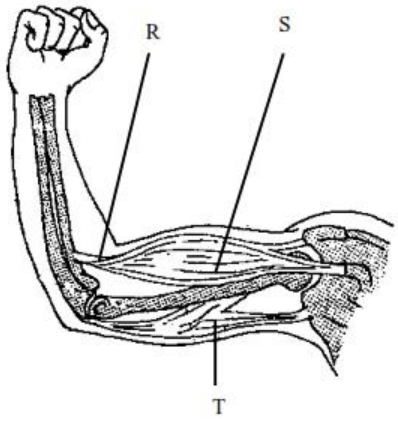
P3: platelets stick/ clump together (to the collagen fibers in the connective tissue.)

P4: (then aggregation of platelets) forms plug

P5: the clumped platelet / damaged cells /clotting factors in the plasma.

P6: produce thromboplastins /thrombokinase

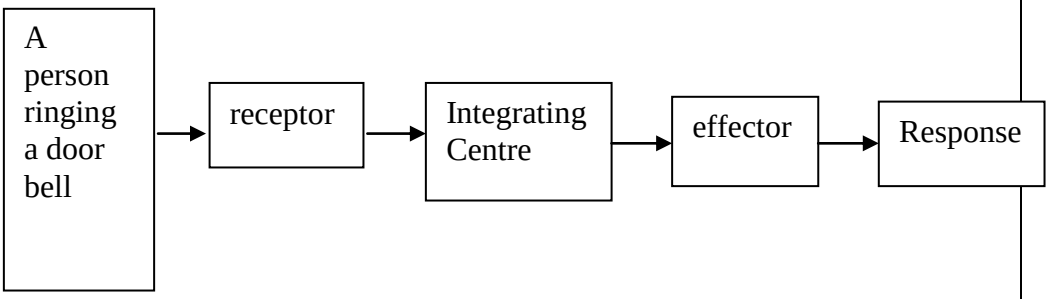
	P7: thromboplastins / thrombokinase in the presence of calcium ions and vitamin K **P8: convert prothrombin (inactive plasma protein) into thrombin (active plasma protein)** **P9: thrombin convert /catalyses (the conversion of soluble) fibrinogen to (insoluble) fibrin** **P10: fibrin (form a network that mesh over the wound) trapping red blood cells** **P11: (and)sealing the wound** **P12: a blood clot prevent excess blood loss** **P13: prevent bacteria/pathogen/microbe from entering the cell through wound** **P14 : prevent infection of disease** *Any 10*		

No	Essay Questions	Marks	Student's tips
13 (a)	Diagram 13 shows the action of antagonistic in bending of the fore-limb.  Diagram 13		

	Based on diagram, describe the function of muscles, tendons and ligaments in enabling the bending of the human fore-limb. [6 marks] **P1: Biceps muscle /S is attached to the radius/ bone by tendons /R** **P2: When biceps muscle /S contracts** **P3: A pulling force is produced** **P4: and is transmitted to the tendon / R** **P5: Tendon /R pulls the radius upwards** **P6: Ligaments hold the humerus to the radius-ulna at the elbow joint** **P7: Give support / strength to the bones (when they are being pulled upwards)** **P8: At the same time the triseps muscle / T relaxes** **P9: Triceps muscle/ T is connected to the ulna by tendons / R** **P10 : When triceps muscle / T contracts** **P11: Tendons / R pull the ulna downwards** **P12: At the same time the biseps muscle / S relaxed** ***Any 6***	Max 6	
(b)	A lady aged 50 often experiences aches and pains in her bones. She is suffering from osteoporosis. State the symptoms of osteoporosis and suggest the ways to overcome this problem. [4 marks] **Symptoms:** **P1: fractures of the vertebrae / wrists / hips** **P2: loss of height over time** **P3: stooped posture** **To prevent osteoporosis:**	Max 4	

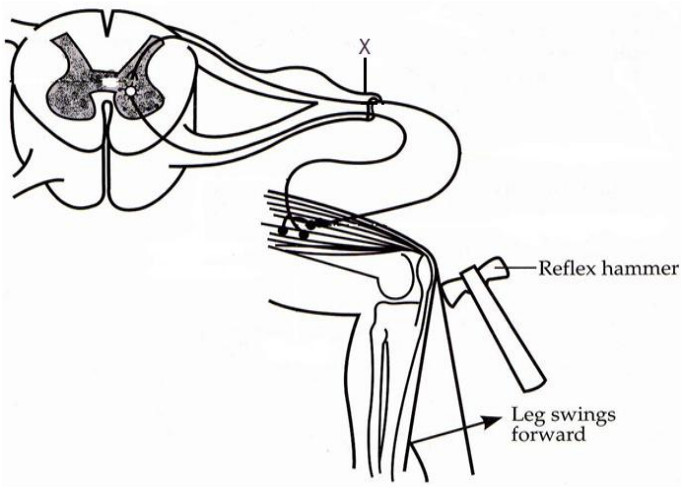
	P1: adequate intake of calcium / phosphorus (and vitamin D.) // drink milk **P2: do regular exercise** **P3: takes balance diet** *Any 4*		
(c)	Discuss how to practice ways in maintaining a healthy musculoskeletal [10 marks] **F1: Having a balanced diet for every meal.** **E1:Take a diet rich in proteins /vitamins (A,C and D)** **E2: (together with) minerals /calcium /phosphate / iron for the strong bones .** **E3:Drinking fluoridated water will also harden the bones .** **F2: Adopt a good posture while standing /sitting /walking / while performing certain tasks** **E4 : to ensure that our body is always well supported.** **E5: This is important because a bad posture will put undue pressure on our muscles / spine // any explanation** **E6: this will affect the functions/ disrupt internal organs / lungs /heart / stomach.** **F3- Wear proper attire for daily activities.** **E7 : Wear loose / comfortable clothes at all times.** **E8: Tight clothes will restrict our movement .** **E9: A woman wearing high heel shoes will cause the spine to curve .** **F4: Taking appropriate precautions during vigorous activities.**	Max 10	

	F5 : Practice correct / safe techniques when exercising **E10: to prevent serious injuries to the musculoskeletal system.** *Any 10*		

No	Essay Questions	Marks	Student's tips
14(a)	State the importance of living organisms to respond to stimuli. [4 marks] **P1 : enable the organism to adjust to environmental changes.** **P2: enable to protect the organisms from harm and** **P3: to ensure their survival.** **P4: to regulate the equilibrium of the internal environtment.**	Max 4	
14(b)	Diagram 14 shows the pathway of response when a man heard a visitor ringing the door bell.  Diagram 14 Based on diagram 14, explain the pathway involved in detecting and responding to the stimulus. [6 Marks] **P1** **The receptor in the sensory organs/ear detects the stimulus.** **P2** **The receptor trigger/generate a nerve impulse in the afferent/sensory neuron**	Max 6	

		P3	**The afferent/sensory neuron transfer/ transmit theimpulse to the integrating centre in the brain.**		
		P4	**The brain interprets the information / send out nerve impulse**		
		P5	**The impulse received by the efferent/motor neuron**		
		P6	**Efferent /motor neuron transfer/transmit the impulse to the effector.**		
		P7	**The effector is the skeletal muscle (in the leg)**		
		P8	**Skeletal muscle(in the leg) will contract**		
		P9	**the man will walk to open the door**		
			Any 6		

No	Questions	Marks	Student`s Tip
15(a)	When you suddenly see too many smoke coming from your kitchen , your heart beat faster and your hands become sweaty. Based on Biology knowledge, explain the above situation. [10 marks] **P1 : the situation known as `fight or flight` situation** **P2 : involved nervous system and endocrine system** **P3 : the hypothalamus sends / transmitt nerve impulse** **P4: to neurons in adrenal gland** **P5 : (which is in turn) stimulate the adrenal gland to secrete adrenaline / noradrenaline**	Max 10	

	P6 : (increase heart beat) and breathing rate **P7 : increase blood pressure** **P8 : increase blood glucose level** **P9 : to increase metabolic activity** **P10 : (the heart need to contract more) to pump a larger amount of oxygen** **P11 : and glucose** **P12 : to brain / skeleton muscle** **P13 : (because the brain must be highly alert) to mobilize the body into immediate action** **P14 : the skeleton muscle becomes more energizer (to fight off / flee immediately)** *Any 10*		
(b)	Diagram 15 shows reflex action in human.  Diagram 15		
(i)	Based on the diagram 15, draw arrows to show the nerve pathway involved in the reflex action [1 mark]		

(ii)	****(Arrows from) muscle ⟶ dorsal root (at afferent neuron) ⟶ spinal cord (at afferent neuron) ⟶ muscle** Explain the reflex action shown above. [9 marks] **F : interneurone is not involved // involved afferent neurone and efferent neurone only** **P1 : When the part below / tendon of the knee cap is struck/hit by a reflex hammer** **P2 : the stretch receptor in the muscle is stimulated.** **P3 : This generates /trigger nerve impulses along the afferent neurone** **P4 : towards the spinal cord** **P5 : via the dorsal root** **P6 : do not involved brain** **P7 : (In the spinal cord) the nerve impulses are transmitted/ transfer from the afferent neurone to efferent neurone** **P8 : The efferent neurone transmit/transfer the nerve impulses from the spinal cord to the effector /muscle tissue** **P9 : <u>quadriceps</u> muscle contracts** **P10 : jerking the leg forward // knee jerk action** *Any 9*	Max 9	

<table>
<tr><th>No</th><th>Questions</th><th>Marks</th><th>Student's tips</th></tr>
<tr><td>16(a)</td><td>State one physical factor and one chemical factor that affecting the internal environment.
Explain your answer with example.
[6 marks]

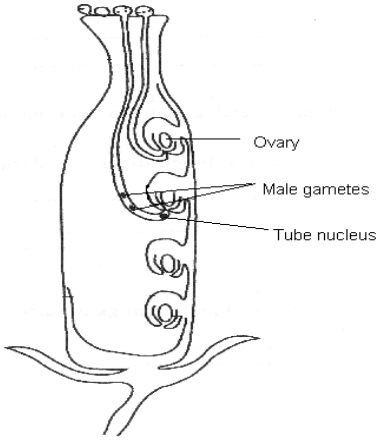
<table>
<tr><th></th><th>Physical factors</th><th>Explanation /example</th></tr>
<tr><td>P1 :</td><td>Temperature</td><td>E1: Enzyme active at 37°C /optimum temperature
E2 : Enzyme denatured at temperature more than 40°C
E3 : enzyme inactive at low temperature</td></tr>
<tr><td>P2 :</td><td>Blood pressure</td><td>E1 : Normal blood pressure is 120/80 mmHg

E2 : Exchange of nutrient / waste product between cell and internal environment efficient
E3 : high blood pressure will cause stroke/ cardiovascular disease
E4 : low blood pressure will cause dizziness/lack of oxygen supply to cell / brain.</td></tr>
<tr><td>P3:</td><td>Osmotic pressure</td><td>E1 : to keep cytoplasm of the cell is isotonic to the interstitial fluid & blood plasma

E2 : low osmotic pressure will cause body cell shrink

E3: high osmotic pressure will cause body cell burst</td></tr>
</table>
</td><td>Max 6</td><td></td></tr>
</table>

	<table><tr><th></th><th>Chemical factors</th><th>Explanation /example</th></tr><tr><td>**P4:**</td><td>**Salt**</td><td>**E1: to keep maintain the osmotic pressure** **E2 : to prevent hypertension**</td></tr><tr><td>**P5:**</td><td>**Sugar**</td><td>**E1 : to keep maintain blood sugar level** **E2 :to prevent diabetes mellitus**</td></tr><tr><td>**P6:**</td><td>**pH value**</td><td>**E1: to keep maintain blood pH at about neutralpH** **E2: to maintain chemical reaction / physiological process at maximum**</td></tr></table> *Any 6* *(At least 1 point from physical factor* *At least 1 point from chemical factors)*		
(b)	Explain the necessity to maintain an optimal internal environment. [4 marks] **P1: to maintain the rate of nutrients / waste product exchange** **E1: supply the cells with nutrients at optimum requirement** **E2: get rid the waste product that harmful to the cells // eliminate waste product** **P2: to maintain the body metabolism** **E3: control the physical & chemical factor so that metabolic process at optimum level** **E4: synthesis of ATP is at maximum level for muscle contraction /any example** *Any 4*	Max 4	

No	Essay Questions	Marks	Student's tips
17.	Diagram 17 shows a longitudinal section of the carpel of a flower during fertilization.  Diagram 17	Max 6 marks	Explain Give fact and explanation
(a)	Describe how the process of fertilization is carried out. [6 marks] **P1 : When the pollen tube reaches the embryo sac, it penetrates (the wall of) the embryo sac.** **P2 : tube nucleus degenerates.** **P3 : One male gamete / nucleus fuses/fertilize with the two polar nuclei** **P4 : to form a triploid /3n nucleus.** **P5 : Another male gamete / nucleus fuses/ fertilize with the egg cell** **P6 : to form a diploid / 2n zygote.** **P7 – Double fertilization take place.** *Any 6*		
(b)	Explain the similarities and differences between fertilization in a plant and mammal. [4 marks]	Max 4 marks	

Similarities between plant and animal fertilization:

S1 : Both fertilization involves the fusion of a male gamete and a female gamete

E1 : to form the diploid zygote

S2 : Both male gamete releases enzymes to break down tissues surrounding the female gamete

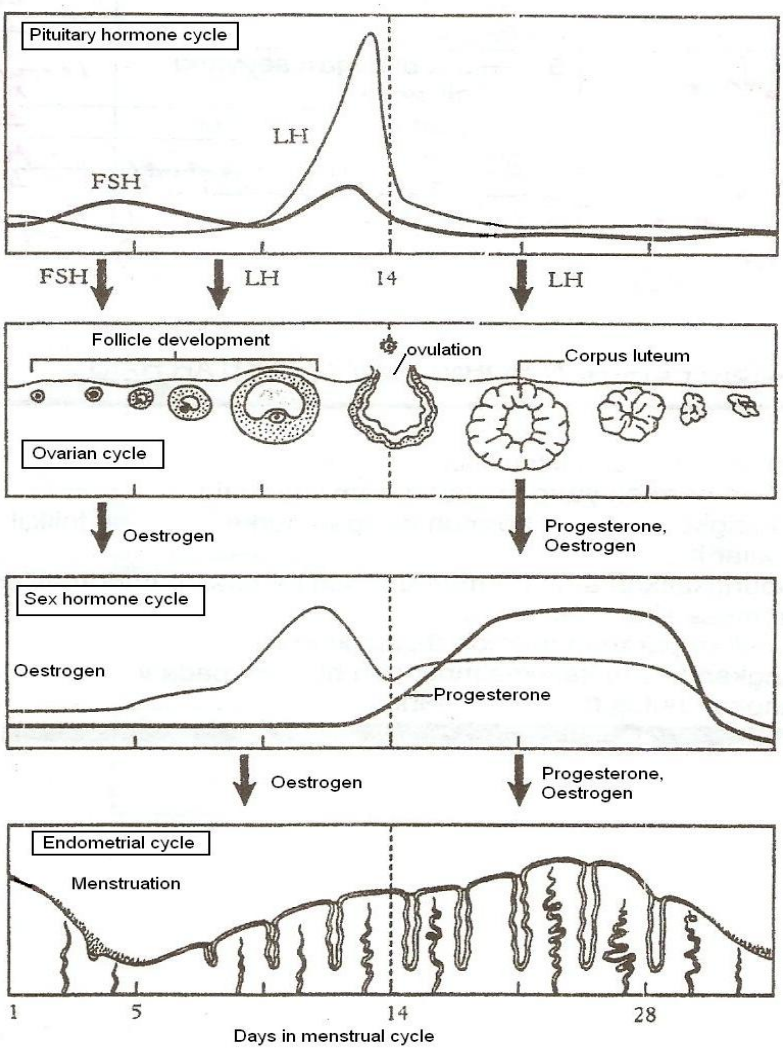
E2 : the male gamete travels along a tube to the female gamete

Differences between plant and mammal fertilization

	Plant fertilization	**Mammal fertilization**
D1	**Involves 2 male gametes .**	**Involves 1 male gamete only.**
E1	**One male gamete fuses with the egg cell (to form the diploid zygote).** **The other male gamete fuses with 2 polar nuclei (to form triploid zygote.)**	**One male gamete fuses with one egg cell (to form the diploid zygote.)**
E2	**Produce one diploid zygote and one triploid zygote**	**Produce only one diploid zygote**
D2	**Male gamete is delivered to the egg cell / female reproductive organ by the pollen tube.**	**Sperms are delivered through fallopian tube (directly) to the ovum**
E3	**Male gamete move (along the pollen tube to reach the egg cell/polar nuclei)**	**Male gamete swim (toward ovum)**

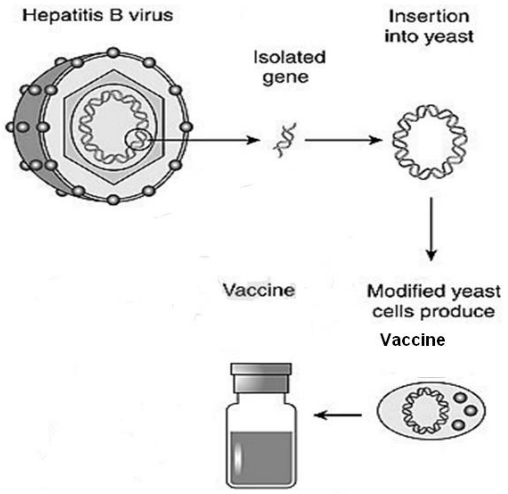
Any 4
(At least 1point from similarity
At least 1point from difference)

Tips:
If using a table, a complete sentence must be used.

No	Essay Questions	Marks	Student's tips
18(a)	Diagram 18 shows the hormones involved in the human menstrual cycle.  Diagram 18 Based on the diagram 18, explain the relationship between the hormones level with the changes in the endometrium thickness and the follicle development. [10 marks]	Max 10 marks	

	P1 : FSH & LH are produced by the pituitary gland **P2 : Oestrogen&Progesteron are produced by ovary** **P3 : FSH causes Graafian follicles in ovary to develop** **P4 : stimulate ovary tissues / follicle cells to produce oestrogen** **P5 : Day 0-5/7 th , the low FSH / oestrogen level causes the breakdown of endometrium of uterus** **P6 : discharge of blood and tissues (through the vagina).** **P7 : Oestrogen stimulate the growth of follicles** **P8 : Promote the rebuilding / repair endometrium wall (after menstruation).** **P9 : Stimulate pituitary gland to produce LH // Inhibits the production of FSH** **P10 : LH Causes ovulation (on day 14 th)** **P11 : Stimulates corpus luteum (in ovary) to produce <u>progesterone</u>** **P12 : Endometrium is prepared for the implantation.** **P13 : Progesterone strengthens the endometrium wall // remain/maintain the thickness of the endometrium wall** **P14 : inhibits the secretion of the FSH / LH stop the follicle development / ovulation** *Any 10*		
(b)	A married couple has 10 children after 13 years they had lived together. They decided to limit the number of children by practicing birth control. Explain the methods in birth control that can be used for this couple. [*10 marks*]	Max 10 marks	

	Female **F1 Tubal ligation** **P1 both Fallopian tubes are tied / cut** **P2 sperms cannot fertilize the ovum** **F2 Contraseptive pills** **P1 pill contains oestrogen and progesterone** **P2 prevent follicle development / ovulation** **F3 Intrauterine device (IUD)** **P1 IUD is fitted in the uterus** **P2 prevent implantation of zygote** **F4 Presence of Mucus** **P1 Fertile period // produce mucus** **P2 avoid sexual intercource** **F5 Diaphragm** **P1 cover the cervix** **P2 prevent sperms from entering the uterus.** **Male** **F1 Vasectomy** **P1 Vas deferens / sperm ducts are tied / cut** **P2 sperms cannot be transferred out.** **F2 Condom** **P1 is placed over erected penis** **P2 Prevent sperm from entering the vagina** **F3 Withdrawal method** **P1 Penis is withdrawn from the vagina before ejaculation** **P2 Prevent sperm from entering the vagina** **F4 Rhythm methods** **P1 avoid sexual intercourse during fertile period (that is 3 days before and 3 days after ovulation)** *Any 10* *(At least 1F/1P from female* *At least 1F/1P from male)*		

No	Question	Marks	Student's tips
19	Diagram 19 shows a procedure in the production of vaccine for Hepatitis B.  Diagram 19		
(a)(i)	Explain how Hepatitis B virus are used in production of vaccines for hepatitis B [6 marks] **P1: The gene (which involved in vaccine production) is isolated from Hepatitis B virus.** **P2: (The gene is) then inserted into the DNA of yeast** **P3: yeast contains a recombinant DNA with virus gene** **P4: (The yeast is) then cultured in a suitable condition / nutrient medium** **P5: (The yeast is now) capable to produce the vaccine in a large quantity.** **P6: The vaccine is purified / used to treat hepatitis B patient**	6 Marks	

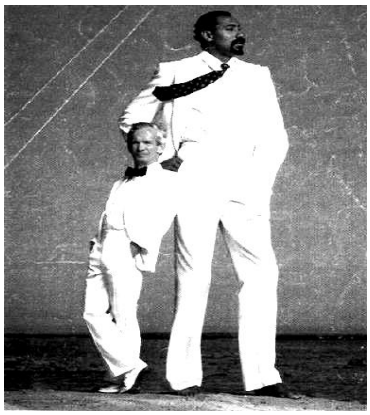
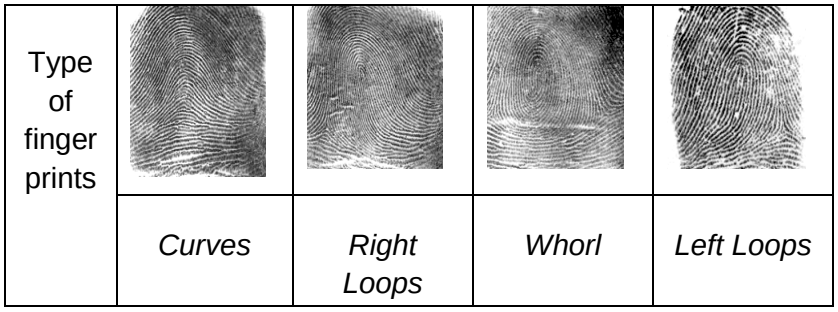
(a)(ii)	Based on Diagram 19, describe the meaning of genetic engineering. [4 marks] **P1: It involves techniques used to <u>alter characteristics</u> of an organism/ yeast** **P2:by introducing target genes from another organism/Hepatitis B virus into its DNA/ yeast DNA** **P3: This modified DNAis known as recombinant DNA** **P4: The organism with the recombinant DNA is known as a genetically modified organism (GMO)/ yeast**	4 marks	
(b)	Discuss the good and the bad effects of genetic engineering to human and the environment. [10 marks] **<u>Good effect of genetics to mankind and the environment</u>** **<u>F1: selective breeding</u>** **G1:used in agriculture to produce offspring that possess desirable characteristics of both parents** **G2: Example: selection of suitable oil palm plants to produce a Hybridplant with desirable characteristic** **<u>F2: genetic engineering</u>** **G3: involves techniques used to <u>alter characteristics</u> of an organism by introducing target genes from another organism into its DNA** **G4: produce disease resistant/ pest resistant plants** **G5: Less pesticides are used// less pollution to the environment// better health for consumers.** **G6 : increase yield of crops//better livelihood for farmers// help to solve problems of insufficient food.** **G7 : create crops with better nutrition value // tomatoes with higher vitamin A content //help to solve problems of malnutrition.**		

	G8: create crops with longer shelf lives // less food wastage **G9 : genetically modified livestock /produce meat with less fat / more milk.** **G10: Enables the mass production of medical / pharmaceutical products// genetically modified bacteria produce insulin for treatment of diabetes mellitus// Genetically modified yeast to produce vaccine for hepatitis for prevention of hepatitis diseases.** **G11: Gene therapy for treatment of genetic disorders/ diseases / muscular dystrophy/ rheumatoid arthritis/ sickle cell anemia** **G12: solve environmental problems / oil spills by using genetically engineered bacteria.** **<u>F3: DNA fingerprinting</u>** **G13: used to identification purpose in solving criminal cases // paternity disputes// detect human genetics diseases // confirm the genotypes to animals / plants in agriculture** **<u>F4: Human genome project</u>** **G14: Determine the sequence of all the base pairs found in the DNA of the human genome** **G15: Make maps showing the exact locations of genes for major sections of human chromosomes** **G17: Produce linkage maps where inherited traits/ genetic diseases can be tracked over generations** **<u>Bad effect of genetic engineering on human and environment</u>** **F1: Pest resistant genes may be transferred to weeds** **B1: difficult to control growth of weeds.** **F2: Some transgenic crops may have animal genes**		

	B2 : this may not be acceptable to certain groups for religious reasons // any explanation **F3: Genetically modified foods may be harmful to health** **B3: may activate human genes to cause cancer.** **F4: Transgenic organisms may affect the survival of other organismsin the ecosystem.** **B4: may cause the imbalance of nature / ecosystem** **F5: Gene therapy used for the treatment of genetic disorder has its limitations.** **B5 : may not be acceptable because of religious / moral values.** **B6 : very costly because require high technology / expertise** *Any 10* *At least 1 from good effect* *At least 1 from bad effect*		

No	Question	Marks	Student's tips
20	Explain how a human is able to maintain his body temperature, even though the external temperature has dropped. [10 marks] **When the external temperature dropped;** **F1: The hair erector muscle (in the skin) contract** **P1: to raise the hair.** **P2: A layer of air will be trapped by the hairs** **P3: act as an insulator** **P4: to prevent the loss of heat from the body.** **F2: Vasoconstriction occur / blood capillaries in the dermis of the skin constrict.** **P5: Less blood flow near to the surface of the skin** **P6: less heat loss from the skin (by emission)** **F3: The adrenal gland is stimulated to secrete adrenaline.** **P7: (Adrenaline) increase the rate of conversion of glycogen to glucose** **P8: the body's metabolism rate increase** **P9: to produce / generate more heat.** **F4: The thyroid gland is stimulated to secrete thyroxine** **P10: to increase the metabolic rate / production of heat is increase (so the body temperature rises)** **F5: Skeletal muscles contract and relax repeatedly**	Max 10	

	P11: causing the body to shiver. **P12: Shivering generates heat to raise the body's temperature.** **F6: No sweat is produced by the sweat gland** **P13: No heat lose through the evaporation of sweat** *Any 10*		

No	Essay Questions	Marks	Student's tips
21	Diagram 21(a) and 21(b) shows two different characteristic among human beings  Diagram 21 (a)  Diagram 21 (b)		
(a)	Based on Diagram 21 (a) and in Diagram 21 (b), identify the type of variation. Explain your answers. [4 marks] **F1: (Characteristic for)Diagram 20(a) (height) shows continuous variation** **P1: (reason) no distinct differences between individuals** **P2: with intermediates / can be measure/quantitative//the plotted graph shows normal distribution** **F2: Diagram 20(b) (type of fingerprints)shows Discontinuous Variation**	Max 4	

	P4: (reason) the differences between individuals are obvious/distinct **P5: without intermediates/qualitative // the plotted graph shows discrete distribution** *Any 4*		
(b)	By using example, discuss the importance of variation in the survival of a species. **P1 - Variation within a species causes some individuals to adapt better to environmental conditions** **P2 - Example : Colour in snails (which is discontinuous variation) enables the snails to survive in different habitat.** **P3 - The variety of colour and banding depending on the alleles present.** **P4 - Different phenotypes are selected in different habitat to camouflage them from their predators.** **P5 – Examples yellow snails better adapted to the sun and high temperature environment.** **P6 - So yellow snails will survive and transmit the advantages genes to their offspring.** **P7 - Over the times, there will be changes in the individual of a particular species, with the better adapted ones increasing in population; resulting in a new species.** **P8 - This is called " survival of the fittest" / natural selection** *Any 6*		

KEMENTERIAN PENDIDIKAN MALAYSIA

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN

MODUL X-A Plus / PERFECT SCORE

http://cikguadura.wordpress.com/

BIOLOGI 4551/3 (SOALAN 1) 2013

EDISI GURU

DISEDIAKAN OLEH

MAZINAH BT MUDA
DATIN NORIDAH BT YANGMAN
NURUL UYUN BT ABDULLAH
ROSIAPAH BT DOLLAH
MELI BIN HUSSIN
NORAINI BT SAMIN
HABSHAH BT KHATIB
ZALINA BT AHMAD
SUSANTI BT GAMIN
FATIMAHWATI BT MALEK
MOHD IZANI B SAUFI
MOHD FADHIL BIN MASRON

SMS TENGKU MUHAMMAD FARIS PETRA
SMS TUANKU SYED PUTRA
SMS KUALA SELANGOR
SMS SELANGOR
SMS KUALA TERENGGANU
SMS MUAR
SMS KUCHING
KOLEJ ISLAM SULTAN ALAM SHAH
SMS JOHOR
SMA PERSEKUTUAN LABU
SMS KEPALA BATAS
SMS LABUAN

BIOLOGY 3 (4551/3)
http://cikguadura.wordpress.com/
LIST OF QUESTIONS

QUESTION 1 (STRUCTURED ITEM)

NO	TOPIC	CHAPTER	FORM	√ / ×
1	The effect of pH on enzyme activity	4	4	
2	Amount of Vitamin C in fruit juices	6	4	
3	The effect of carbon dioxide concentration on the rate of photosynthesis	6	4	
4	The effect of running on the rate of heartbeat	7	4	
5	The effect of temperature on anaerobic respiration	8	4	
6	The effect of TSA/V ratio on the rate of diffusion	10	5	
7	The effect of temperature on the rate of transpiration	10	5	
8	The effect of concentration of drinking water on the volume of urine	12	5	

QUESTION 2 (DESIGN EXPERIMENT)

NO	TOPIC	CHAPTER	FORM	√ / ×
1	The effect of concentration of sucrose solution on the percentage change in mass of mustard green	3	4	
2	The effect of albumen concentration on the activity of pepsin	4	4	
3	The effect of nitrogen deficiency on the growth of maize	6	4	
4	The effect of intraspecific competition on the growth of paddy plant	8	4	
5	The population size of rats in a food factory and in a paddy field	8	4	
6	The level of water pollution in three villages	9	4	
7	The level of air pollution caused by solid pollutant in different places	9	4	
8	Effect of environmental factor (type of soil) on variation (height) in hibiscus plant	15	5	

QUESTION 1
CHAPTER 4- CHEMICAL COMPOSITION OF THE CELL

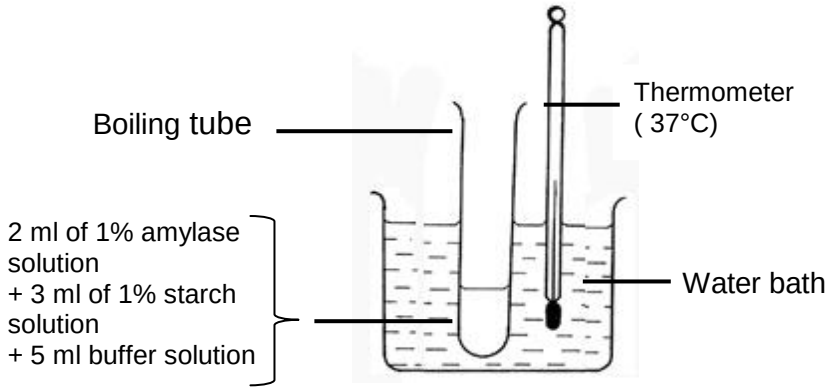
No	Question	Mark	Tips
1	An experiment was carried out to investigate the effect of pH values on the rate of reaction of amylase enzyme. Several buffer solutions with different pH values were prepared. The following steps were carried out. Step 1 2 ml of 1% amylase solution was placed into a boiling tube containing 5 ml of buffer solution of pH 5. Step 2 2 drops of iodine solution was placed into each groove on a white tile. Step 3 3 ml of 1% of starch solution was added into the boiling tube and the stopwatch is started immediately. Step 4 Every 2 minutes, a drop of the mixture from the boiling tube was dropped into a new groove of iodine solution on the white tile by using a clean dropper. Step 5 The time taken for the iodine solution to remain yellow is recorded. Step 6 Steps 1 to 5 are repeated using buffer solutions of pH 6, 7, 8 and 9. Diagram 1 shows the materials and apparatus used in this experiment for different pH values of buffer solutions.  Diagram 1		

Diagram 2 shows the observation for the experiment using buffer solution of pH 5 after 28 minutes.

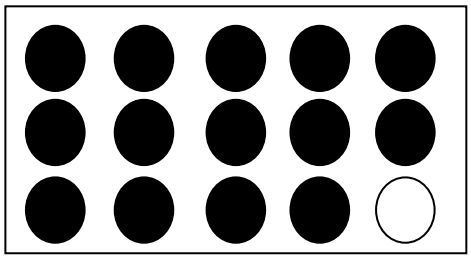


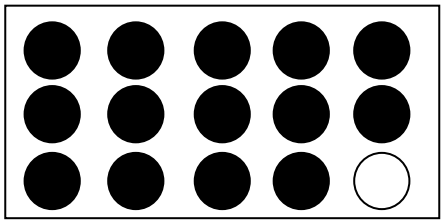
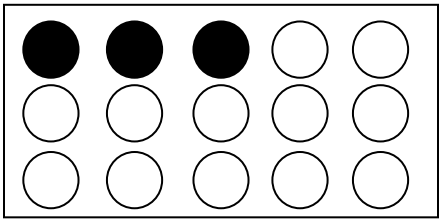
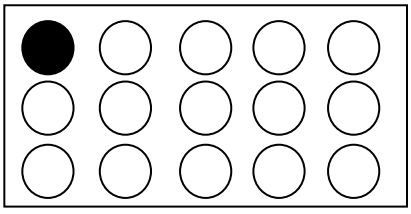
Diagram 2

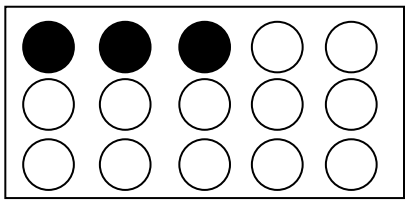
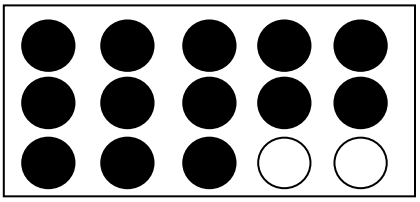
(a) In Table 1, list all the materials and apparatus labeled in Diagram 1. **3**

Material	**Apparatus**
1. (1%) amylase solution *2. (1%) starch solution* *3. Buffer solution*	*1. Boiling tube* *2. Thermometer* *3. Water bath*

Table 1

(b) Record the time taken for iodine solution to remain yellow in Table 2. **3**

pH of buffer solution	Observation	Time taken for iodine solution to remain yellow (min)
5		28
6		*6*
7		*2*

	8		*6*	
	9		*26*	

Answer:

pH of buffer solution	Time taken for iodine solution to remain yellow (min)
5	*28*
6	*6*
7	*2*
8	*6*
9	*26*

(c)(i) State two different observations made from Table 2. **3**

Criteria:
P1 : Manipulated variable (pH value)
P2 : Responding variable (Time taken for iodine solution to remain yellow)
P3 : Reading / comparison

Sample answer :
1. The time taken for iodine solution to remain yellow for pH solution 5 / 6 / 7 / 8 / 9 is 28 min / 6 min / 2 min / 6 min / 26 min.

2. The time taken for iodine solution to remain yellow for pH solution 5 / 9 is longer than pH solution 6 / 7 / 8 //

3. For pH 5, the number of groove blue black is 14 // For pH 5 the number of white groove is 1

(ii) State the inferences from the observations in 1(c)(i). **3**

Criteria:(Any two)
P1: medium and suitable / not suitable
P2 : Rate of amylase reaction /hydrolysis of starch / amylase activity
P3 : more collision / affinity/ charges at active sites // more enzyme-substrate formed // more products formed

Sample answer:
1. (pH 5/pH 6 is) acidic / (pH 8 /pH 9 is) alkaline is not suitable / not optimum so rate of amylase reaction is low

2. (pH 7 is) neutral is suitable / optimum so hydrolysis of starch is the fastest

3. (At pH 7) the rate of hydrolysis of starch is higher than (at pH 5 / pH 6 / pH 8 / pH 9) because it is a neutral medium.

(d) Complete Table 3 based on this experiment. **3**
Criteria:
All six correct variables and method to handle variables.
Sample answers:

Variable	Method to handle the variable
Manipulated variable : *buffer solution / pH*	*Use different pH of buffer solution at pH 5, 6, 7, 8 and 9*
Responding variable : *1. Time taken for iodine solution to remain yellow. //* *2. Rate of hydrolysis / activity of starch by amylase // enzyme reaction*	*1. (Measure and) record the time taken by using the stopwatch* *2. Calculate the rate of hydrolysis of starch using formula:* *Rate of reaction =* $\frac{1}{Time}$
Constant variable: *1. Concentration of the starch / amylase* *2. Volume of starch (solution)* *3. Temperature*	*1. Fixed the concentration of starch / amylase at 1%* *2. Fixed the volume of starch at 3 ml* *3. Fixed the temperature of water bath at 37^{o}C*

(e) State the hypothesis for this experiment. **3**

Accept: *Wrong conclusion as a hypothesis (refer sample answer 1)*

Criteria:
P1 : Manipulated variable - pH value)
P2 : Responding variable - Time taken for iodine solution to remain yellow // Rate of hydrolysis of starch // rate of enzyme reaction // activity of enzyme
P3 : Relationship (optimum // highest //fastest//maximum)

Sample answer:
1. *The higher the pH value, the longer the time taken / the higher the rate of hydrolysis of starch.*

2. The optimum pH for (complete) hydrolysis of starch by amylase is pH 7

3. Amylase hydrolyses starch (completely) fastest at pH 7 (compared to other pH values)

4. Rate of hydrolysis of starch is fastest / highest / maximum at pH 7

(f)(i) Construct a table and record all the data collected in this experiment. Your table should have the following titles. **3**

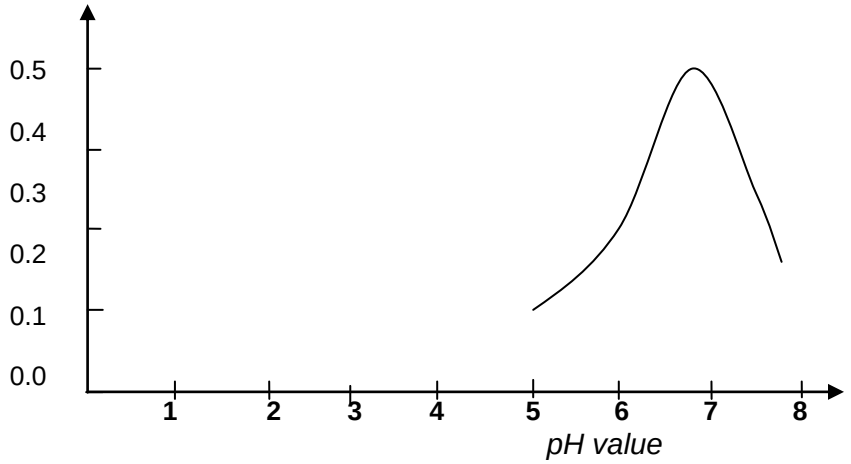
- pH
- Time taken for iodine solution to remain yellow
- Rate of amylase reaction :

$$\text{Rate of reaction} = \frac{1}{\text{Time taken for iodine solution to remain yellow (min)}}$$

Criteria:
T : Titles with correct units
D : Record all the data correctly
C : Calculate the rate of amylase reaction correctly

Answer:

pH	*Time taken for iodine solution to remain yellow (min)*	*Rate of amylase reaction (1/min)*
5	*28*	*0.04 / 0.036*
6	*6*	*0.17 / 0.167*
7	*2*	*0.50 / 0.500*
8	*6*	*0.17 / 0.167*
9	*26*	*0.04 / 0.038*

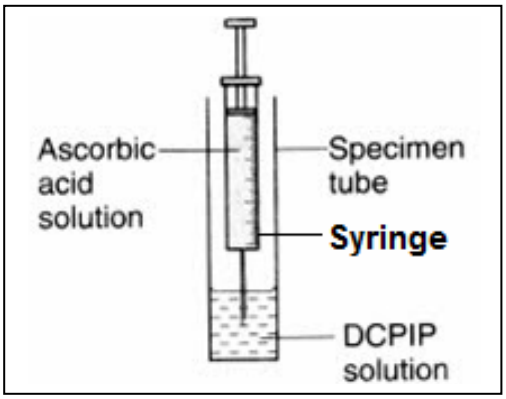
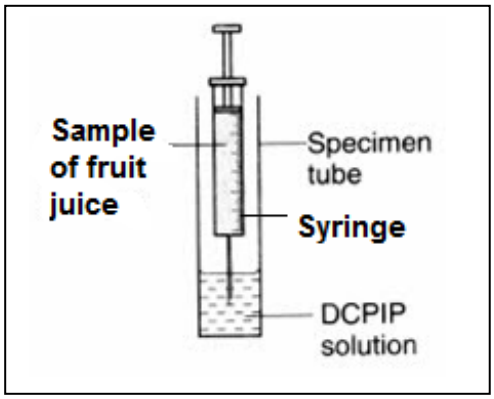
(ii)	Use the graph paper provided to answer this question. Using the data in 1(f)(i), draw a graph of the rate of reaction of amylase against the pH values of the mixture solution. **Criteria:** **P: Axes** **Uniform scales on both horizontal and vertical axis** **T:Points** **All points plotted correctly** **B:Curve** **Able to join all the points to form a smooth curve** **Sample answer:** *Rate of reaction of amylase , min^{-1}*  	**3**	
(g)	Based on the graph in 1(f)(ii), explain the relationship between the rate of amylase reaction and the pH values of the mixture solution. **Criteria**: **R1 : Relationship of rate of amylase reaction and the pH value** **R2 : How pH affect the reaction amylase** **R3 : Hydrolysis of starch** **Sample answer :** 1. *At pH 7, the rate of reaction of amylase is maximum because pH 7 is optimum and the hydrolysis of starch is the fastest.* 2. *When the pH value is higher / lower than pH 7 the rate of amylase activity is low / slower / decreases because the pH is not suitable and the hydrolysis of starch is slow.* **3.** *pH 7 is neutral, pH lower than 7 is acidic and pH higher than 7 is alkaline. Enzyme amylase is active at pH neutral, less active at other pH values.The hydrolysis of starch is the fastest at pH 7.*	**3**	

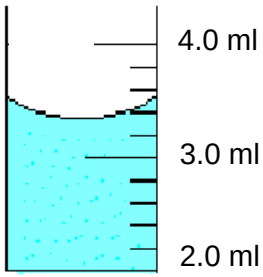
(h)	State the operational definition for the rate of reaction of amylase based on this experiment. **Criteria** : **D1 : Formula of rate of reaction of amylase = 1/ time** **D2 : (Time taken for) iodine solution to remain yellow / cannot detected by iodine** **D3 : Hydrolysis of starch is influenced by the pH value** **Sample answer :** *Rate of reaction of amylase is one over the time taken for iodine solution to remain yellow / complete hydrolysis of starch.The hydrolysis of starch is influenced by the pH values.*	**3**	
(i)	This experiment is repeated using buffer solution at pH 7 in water bath at 20°C. Predict the outcome of this experiment. Explain your prediction. **Criteria:** **P1 : Prediction - The time taken increases / longer / more than 2 minutes / given even values (4 min / 6 min / etc)** **P2 : Temperature low / cold condition / not suitable / not optimum** **P3 : The activity of enzyme / amylase slow / inactive // the rate of amylase activity is low.** **// The hydrolysis of starch is low // the chance of collision between enzyme and starch is less // less starch is hydrolysed // less starch product produced** **Sample answer :** *The time taken will increase // value more than 2 minutes because the activity of amylase become slow / inactive / the rate of amylase activity is low. Less starch is hydrolysed.*	**3**	
	TOTAL MARKS	**33**	

QUESTION 2

http://cikguadura.wordpress.com/

CHAPTER 6- NUTRITION

No	Question	Marks	Tips
2.	Vitamin C is an ascorbic acid that is essential for human nutrition. This experiment is to determine the amount of vitamin C in several samples of fruit juices. Diagram 1.1 and 1.2 shows the set-up of apparatus used in the experiment. The amount of vitamin C in several samples of fruit juices were determined by carrying out the following steps: A specimen tube is filled with 1 ml of 0.1% DCPIP solution. A syringe is filled with 5 ml of 0.1 % ascorbic acid. The syringe needle is placed below the level of DCPIP solution and the ascorbic acid is released drop by drop into the DCPIP solution in a specimen tube. The volume of ascorbic acid used to decolourise the DCPIP solution using syringe is recorded . (refer Diagram 1.1) The experiment is repeated by using several type of fruit juices to replace the 0.1 % ascorbic acid. (refer Diagram 1.2) The volume of pineapple juice, orange juice, and lime juice that decolourised the DCPIP solution were recorded in Table 1.  Diagram 1.1  Diagram 1.2 Diagram 2 shows the Volume 0.1% ascorbic acid (standard solution) to decolourise 1 ml of 0.1% DCPIP solution.		



Volume of 0.1% ascorbic acid (standard solution) to decolourise 1 ml of 0.1% DCPIP solution : 1.6 ml

Diagram 2

Table 1 shows the volume of several fruit juices required to decolourise 1 ml of 0.1% DCPIP solution.

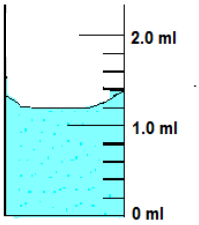
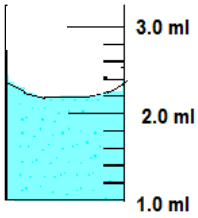
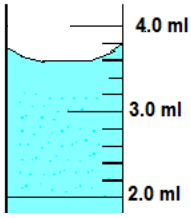
Type of fruit juices	Volume of fruit juices required to decolourise 1 ml of 0.1% DCPIP solution (ml)
Pineapple	 3.8
Orange	 2.8
Lime	 1.4

Table 1

<table>
<tr><td>(a)</td><td>Record the volume of fruit juices required to decolourise 1 ml 0.1% DCPIP solution in the space provided in Table 1.</td><td>3</td><td></td></tr>
<tr><td>(b)(i)</td><td>State two different observations made from table 1.

Criteria:
C1: Type of fruit juice
C2: Volume of fruit juice used to decolourise 1ml 0.1% DCPIP solution

Sample answers:
1. When the type of fruit juice is lime/orange/pineapple, the volume of fruit juices required to decolourise 1 ml of 0.1% DCPIP solution is 3.8/2.8/1.4 ml.
2. The volume of fruit juices required to decolourise 1 ml of 0.1% DCPIP solution in pineapple juice is higher than lime orange.</td><td>3</td><td></td></tr>
<tr><td>(b)(ii)</td><td>State inferences from the observation in 1(b)(i).

Criteria:
C1: Amount / concentration of Vitamin C
C2: Ascorbic acid

Sample answers:
1. (Lime/pineapple/orange juice) contains asid ascorbic. The amount / concentration of vitamin C in (lime/pineapple/orange) is high/low.
2. As the ascorbic is higher in lime than in pineapple / orange, the concentration of Vitamin C in lime is higher than in pineapple / orange.</td><td>3</td><td></td></tr>
<tr><td>(c)</td><td>Based on the experiment, complete Table 2.

Criteria:
All six correct variables and method to handle variables.
Sample answers:

<table>
<tr><th>Variable</th><th>Method to handle the variable</th></tr>
<tr><td>Manipulated variable:

1. Type of fruit juices</td><td>1. Use different type of fruit juices // Use lime juice,orange juice and pineapple juice // Change lime juice to orange juice and pineapple juice</td></tr>
<tr><td>Responding variable:

1. Volume of fruit juices required to decolourise 1 ml 0.1% DCPIP solution //</td><td>1. Measure and <u>record</u> volume of fruit juices required to decolourise 1 ml 0.1% DCPIP solution using a <u>syringe</u>.</td></tr>
</table>
</td><td></td><td>Try to avoid ‘amount’ as parameter</td></tr>
</table>

	2. Amount / Concentration / percentage of vitamin C	*2. Calculate (and record) the concentration of Vitamin C using formula :* *Concentration of Vitamin C:* *= volume of 0.1% ascorbic acid / Volume of fruit juices juices required to decolourise 1 ml 0.1% DCPIP solution* *Percentage of Vitamin C:* *= Volume of 0.1% ascorbic acid x 0.1 / Volume of fruit juices juices required to decolourise 1 ml 0.1% DCPIP solution*
Constant variable: *1. Volume/concentration of DCPIP solution*		*1. Fix the volume/concentration of DCPIP solution at 1 ml / 0.1%.*

Table 2

(d)	State the hypothesis for this experiment. **Criteria:** **C1: Fruit juices (Lime,orange,pineapple)** **C2: Volume of fruit juice to decolourise 1ml DCPIP solution** **C3: Relation (higher / lower)** **Sample answer:** *1. Volume of fruit juices required to decolourise 1 ml 0.1% DCPIP solution in orange juice is higher than pineapple juice and lime juice.* *2. The percentage of vitamin C in lime is higher than pineapple juice and orange juice*	3	
(e) (i)	Construct a table and record all data collected from this experiment. Your table should have the following titles: • Type of fruit juices. • Volume of fruit juices required to decolourise 1 ml 0.1% DCPIP solution • Percentage of vitamin C Percentage of vitamin C = volume of 0.1% ascorbic acid X 0.1 % / volume of fruit juice decolourised 1ml DCPIP solution	**3**	

Criteria:
T: Titles with correct units
D: Data of type of fruit juice volume of fruit juices required to decolourise 1 ml 0.1% DCPIP solution
C: Correct calculation of percentage of Vitamin C

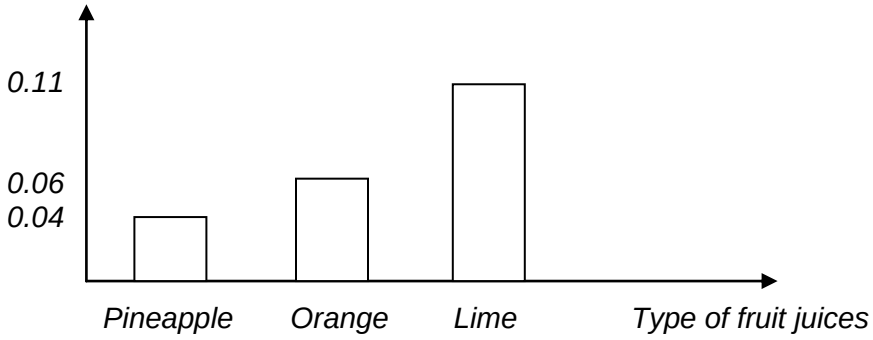
Answer:

Type of fruit juices.	*Volume of fruit juices required to decolourise 1 ml 0.1% DCPIP solution (ml)*	*Percentage of vitamin C (%)*
Pineapple	*3.8*	*0.04*
Orange	*2.8*	*0.06*
Lime	*1.4*	*0.11*

(e)(ii) *Using the data from 1 (e)(i) draw a bar chart to show the relationship between the percentage of vitamin C in and the fruit juices.* **3**

Criteria:
P: Correct title and unit for both axes Y and X plus uniform scales
T: Correct height of each bar
B: Separate bar with the same width

Sample answer:



(f) Based on the data in 1(e)(i) and graph in 1(e)(ii), explain the relationship between the percentage of vitamin C in and the fruit juices. **3**

Criteria:
P1: Correct relationship
P2: More / less acid ascorbic
P3: More / less volume of fruit juice to decolourise DCPIP solution

Sample answer:
The percentage of vitamin C in lime is higher than pineapple juice and orange juice.Because lime juice contains more ascorbic acid so less volume of juice is used to decolourise the DCPIP solution.

(g) The experiment is repeated using orange juice that has been exposed to the air for 5 hours . Predict the outcome of this experiment.
Explain your prediction. **3**

Criteria:
P1: Correct prediction (volume of orange juice more than 2.8 ml)
P2 : Vitamin C in orange juice has been oxidised
P3 : More volume of fruit juice is required to decolourise / reduce the DCPIP solution // Less vitamin C / ascorbic acid

Sample answer:
The volume of orange juice required to decolourise 1 ml 0.1% DCPIP solution is more than 2.8 ml because the Vitamin C in the orange juice has been oxidised. More volume of fruit juice required to decolourise / reduce the DCPIP solution.

(h) Based on this experiment, state the operational definition for vitamin C. **3**
Criteria:
P1 : Ascorbic acid in fruit juices / lime juice / orange juice / pineapple juice
P2 : Decolourise DCPIP solution
P3: Percentage / concentration of Vitamin C is affected by the type of fruit juices

Sample answer:
Vitamin C is ascorbic acid in lime juice which decolourises the DCPIP solution.The amount / concentration vitamin C is affected by the type of fruit juices.

(i) Table 2 shows several types of fruit juices with their respective concentration of Viatmin C. **3**

Type of fruit juice	Concentration of Vitamin C (mg/100g)
Mango	28
Banana	9
Guava	183
Lemon	46
Apple	6

Table 2

Arrange the fruits juices in Table 2 according to the volume of the juice needed to decolourise 1ml of DCPIP solution.

Apple,Banana,Mango,Lemon,Guava

Highest → Lowest

Concentration of Vitamin

TOTAL MARKS **33**

QUESTION 3

CHAPTER 6- NUTRITION

No	Question	Marks	Tips
3	A group of students carried out an experiment to study the effect of concentration of carbon dioxide on the rate of photosynthesis. Diagram 1 shows the apparatus set-up to collect the gas released when an aquatic plant, *Hydrilla sp* is exposed to light from the lamp. The apparatus is placed at a distance of 20 cm from the light source. The *Hydrilla* sp is immersed in 0.2%, 0.4%,0.6% and 0.8% concentration of sodium hydrogen carbonate solution respectively.The number of gas bubbles released in five minute is counted and recorded. The temperature of the water is maintained at 28^0 C throughout the experiment.		

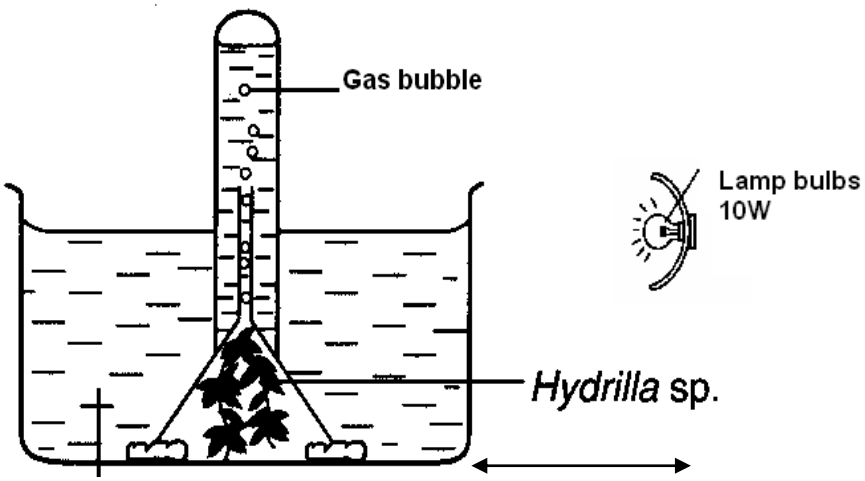


Diagram 1

Table 1.1 shows the results of this experiment.

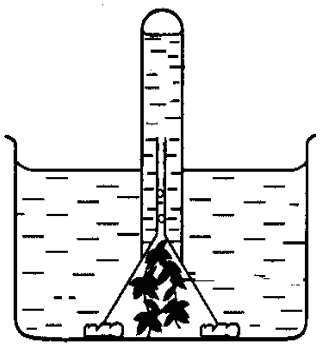
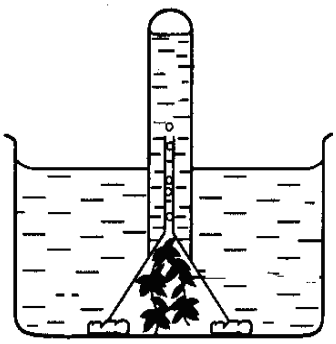
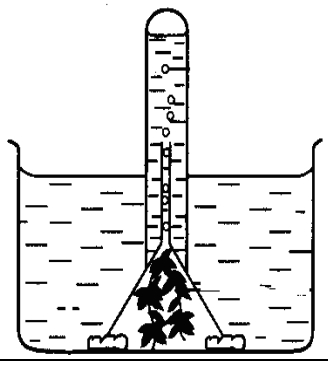
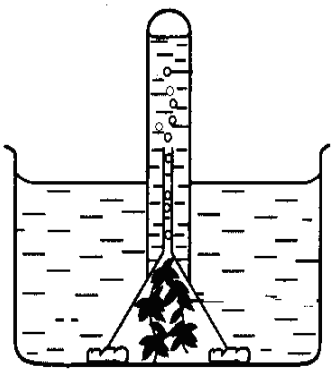
Concentration of sodium hydrogen carbonate (%)	Number of gas bubbles released in five minutes
0.2	 *2*
0.4	 *5*
0.6	 *8*
0.8	 *10*

Table 1.1

<table>
<tr><td>(a)(i)</td><td>Based on Table 1.1 state two different observations.

Criteria:
P1: Concentration of sodium hydrogen carbonate
P2: Number of gas bubbles

1. At concentration of 0.2% sodium hydrogen carbonate, the number of gas bubbles released is 2.
2. At concentration of 0.8% sodium hydrogen carbonate, the number of gas bubbles released is 10 .
3. At concentration of 0.2% sodium hydrogen carbonate, the number of gas bubbles released is less than in 0.4%/0.6%/0.8% of sodium hydrogen carbonate.</td><td>3</td><td></td></tr>
<tr><td>(ii)</td><td>State the inference which corresponds to the observation in 1(a)(i).

Criteria:
C1: Concentration of carbon dioxide
C2: Rate of photosynthesis // more /less photosynthesis
C3: More/less oxygen released

Sample answers:

1. Concentration of carbon dioxide is low, the rate of photosynthesis decrease /less photosynthesis/less carbon dioxide released
2. Concentration of carbon dioxide is more, the oxygen released is more/photosynthesis is more</td><td>3</td><td></td></tr>
<tr><td>(b)</td><td>Record the number of gas bubbles in the space provided in table 1.1
(Refer Table 1.1)</td><td>3</td><td></td></tr>
<tr><td>(c)</td><td>Complete Table 1.2 based on this experiment that was carried out.

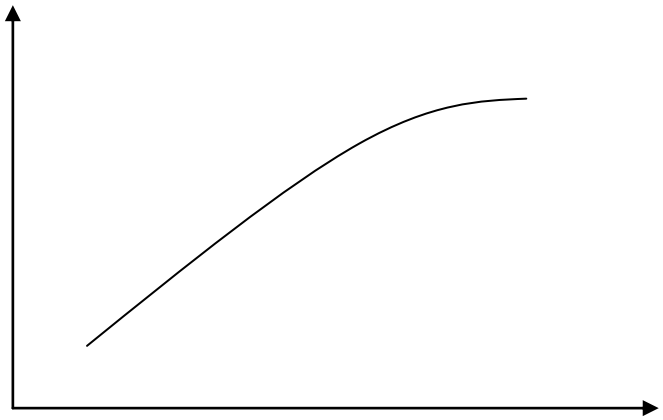
<table><tr><th>Variable</th><th>Method to handle the variable</th></tr><tr><td>Manipulated variable
Concentration of sodium hydrogen carbonate// concentration of carbon dioxide</td><td>Use different concentration of sodium hydrogen carbonate // Use 0.2%,0.4%,0.6% and 0.8% of sodium hydrogen carbonate</td></tr><tr><td>Responding variable
1. The number of gas bubble released in five minutes</td><td>Count and <u>record</u> the number of gas bubble by using <u>stopwatch</u>.</td></tr></table></td><td>3</td><td></td></tr>
</table>

2. The rate of photosynthesis	*<u>Calculate</u> the rate of photosynthesis by using formula : <u>number of bubble</u> 5 minutes*
Fixed variable *Temperature of the water// distance of the lamp// light intensity*	*<u>Fix</u> water temperature at <u>28^{0}C</u>// Fix the distance of lamp at 20cm// Fixed the 10 W lamp bulb*

Table 1.2

(d)	State the hypothesis for this experiment. **Criteria:** **P1: Concentration of sodium hydrogen carbonate / carbon dioxide** **P2: Number of gas bubbles released in five minutes / Rate of photosynthesis** **P3: Relationship** **Sample answers:** *As the concentration of sodium hydrogen carbonate increases, the number of gas bubble released in five minutes increases.*	**3**	
(e)(i)	Based on table 1.1 construct a table and record the results of the experiment which includes the following aspects: o Concentration of sodium hydrogen carbonate o Number of gas bubbles released in five minutes o Rate of photosynthesis , (number minute^{-1}) **Criteria:** **T: Correct titles with units** **D: Correct data of concentration of sodium hydrogen carbonate and number of gas bubbles in five minutes** **C: Correct calculation of rate of photosynthesis** **Answer:**	**3**	

Concentration of sodium hydrogen carbonate(%)	*Number of gas bubbles released in five minutes*	*Rate of photosynthesis (number/minute)*
0.2	*2*	*0.4*
0.4	*5*	*1.0*
0.6	*8*	*1.6*
0.8	*10*	*2.0*

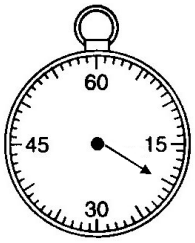
e(ii)	On the graph paper provided, draw the graph of the rate of photosynthesis against the concentration of sodium hydrogen carbonate solution. **Criteria:** **P: Titles with correct units and uniform scales for both axes** **T: Correct plotting of points.** **B: Smooth and correct curve (extrapolation not more than 3 small boxes)** **Sample answer:** *Concentration of sodium hydrogen carbonate solution, %*  *Rate of photosynthesis , number / minute*	**3**	
e(iii)	Explain the relationship between the rate of photosynthesis and the concentration of sodium hydrogen carbonate solution based on the graph in 1(e)(ii). **Criteria:** **R1: Relationship** **R2: Concentration of carbon dioxide increases** **R3 : More oxygen produced** **Sample answers:** *The higher the concentration of sodium hydrogen carbonate, the higher the rate of photosynthesis. More carbon dioxide presents. More oxygen produced.*	**3**	
(f)	If the experiment is repeated by increasing the intensity of light, predict the rate of photosynthesis when the concentration of sodium hydrogen carbonate solution used is 0.8% **Criteria:** **P1: Correct prediction - the rate of photosynthesis more than 2.0 / minute** **P2: More light energy trapped (by chloroplast)** **P3: More oxygen // carbon dioxide is limiting factor**	**3**	

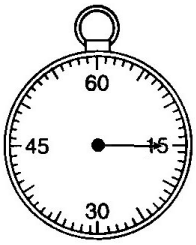
	Sample answers: *The rate of photosynthesis will increase more then 2.0 unit/minute because the light intensity has increased and the concentration of carbon dioxide is the limiting factor.*		
(g)	Based on the results of the experiment define what photosynthesis is. **Criteria:** **P1: Process in aquatic plant / Hydrilla sp in sodium hydrogen carbonate solution** **P2: Releases gas bubbles** **P3: Affected by concentration of carbon dioxide / sodium hydrogen carbonate solution** **Sample answer:** *Photosynthesis is a process occurs in aquatic plant/ Hydrilla sp in sodium hydrogen carbonate solution that releases gas bubbles.Photosynthesis is affected by (different) concentration of sodium hydrogen carbonate / carbon dioxide.*	**3**	
(h)	Another student conducts a similar experiment but uses the following apparatus and materials : 0.3% sodium hydrogen carbonate solution water bath lamp stopwatch aquatic plant thermometer Classify the list above as material and apparatus: Materials: *0.3% sodium hydrogen carbonate solution*, *aquatic plant* Apparatus: *Water bath*, *Lamp*, *Stopwatch*, *thermometer*	**3**	

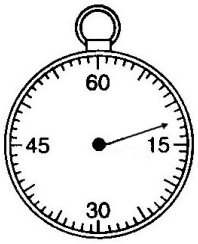
QUESTION 4

CHAPTER 7- RESPIRATION

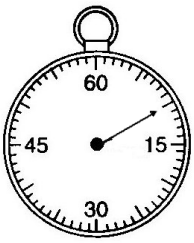
<table>
<tr><th>No</th><th>Questions</th><th>Marks</th><th>Tips</th></tr>
<tr><td>4</td><td>A group of students carried out an experiment to investigate the effect of running on the rate of heartbeat. A school athlete was asked to run around the school field once. Immediately after the student had finished running, the time for making 30 heart beats was taken .
The whole experiment was repeated by the same athlete running around the school field 2 times, 3 times and 4 times at the same speed. The results are shown in the Table 1.1

<table>
<tr><th>Number of rounds ran</th><th>The time taken for making 30 heartbeats (s)</th></tr>
<tr><td>One</td><td> 

20</td></tr>
<tr><td>Two</td><td> 

15</td></tr>
<tr><td>Three</td><td> 

12</td></tr>
</table></td><td></td><td></td></tr>
</table>

	Four  *10* Table 1.1		
(a)	Record the time taken for making 30 heartbeats by the athlete in the spaces provided in Table 1.1.	**3**	
(b)(i)	State two different observations made from Table 1.1 **Criteria:** **P1: Manipulated Variable – Number of round ran** **P2: Responding Variable – Time taken for making 30 heartbeats** **Sample answer:** *1. The time taken for making 30 heartbeats after running one round is 20 seconds.* *2. The time taken for making 30 heartbeats after running four rounds is 10 seconds.* *3. The time taken for making 30 heartbeats after running one round is longer than after running four rounds*	**3**	
(b)(ii)	State inferences from the observation in 1(b)(i). **Criteria:** **P1: Less / More vigorous activity // Less / more amount of oxygen required by muscle cells** **P2: Low / high rate of heartbeat** **Sample answer:** *1. The rate of heartbeats is high because the activity is more vigorous.* *2. The rate of heartbeat is lower as muscle cells needs a small amount of oxygen .* *3. The rate of heartbeat is lower and the activity is less vigorous when running for one round compared to running for four rounds.*	**3**	
(c)	Based on the experiment, complete Table 1.2. **Criteria**: **All six correct variables and method to handle variables.** **Sample answers:**	**3**	

	<table><tr><th>Variable</th><th>Method to handle the variable</th></tr><tr><td><u>Manipulated variable</u> *The number of round/times (the boy runs round the school field)*</td><td>*The boy runs different number of rounds in the school field(1 round/time, 2 rounds, 3 rounds and 4 rounds)*</td></tr><tr><td><u>Responding variable</u> *The time taken for making 30 heart beat*</td><td><u>Record</u> *the time taken for making 30 heartbeat by using a <u>stop watch.</u>*</td></tr><tr><td><u>Controlled variable</u> *speed for running each round / The number of heart beat / The subject (the student)*</td><td>*fix the speed of running / fix the number of heartbeat at 30 / the same student is used throughout the experiment.*</td></tr></table>		
(d)	State the hypothesis for this experiment. **Able to state the correct hypothesis based on criteria:** **P1 = manipulated variable** **P2 = responding variable** **R = relationship** **Sample answers:** 1. *The more the number of times /rounds the athlete runs (round the school field), the shorter the time taken for making 30 heartbeats.* 2. *The more the number of times /rounds the athlete runs (round the school field), the faster the rate of heartbeats.*	**3**	
(e)(i)	Construct a table and record all data collected from this experiment. Your table should have the following titles: • The number of round ran • The time taken for making 30 heartbeats • The rate of heartbeat in a minute **Criteria:** **T: Correct titles with units** **D: Correct data of number of round ran and time taken for making 30 heartbeats** **C: Correct calculation of rate of hearbeat**	**3**	

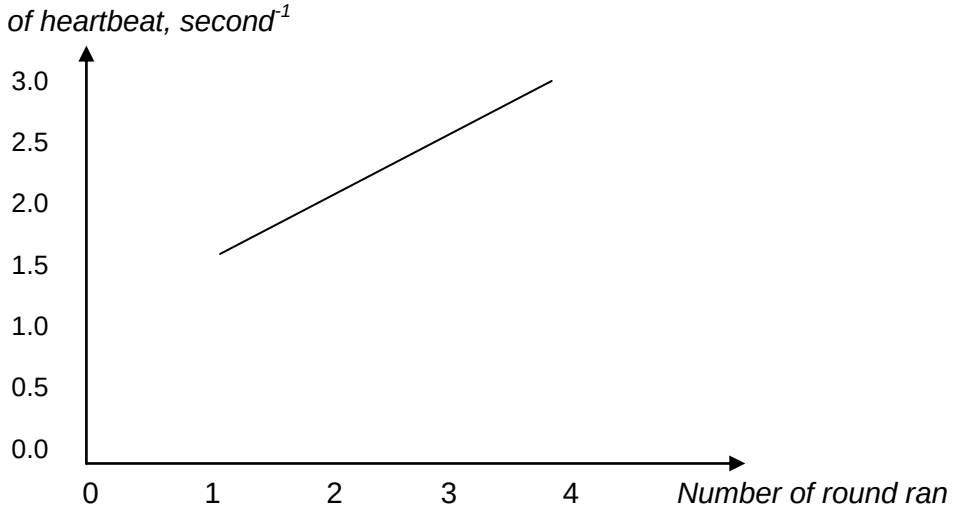
Answer:

The number of round ran	***Time taken for making 30 heartbeat, second***	***Rate of hearbeat (second^{-1})***
1	*20*	*1.5*
2	*15*	*2.0*
3	*12*	*2.5*
4	*10*	*3.0*

(e)(ii) Using the data from 1 (e)(i) draw a graph to show the rate of heartbeats against the number of round ran **3**

Criteria:
P: Titles with correct units and uniform scales for both axes
T: Correct plotting of points.
B: Smooth and correct curve (extrapolation not more than 3 small boxes)

Sample answer:



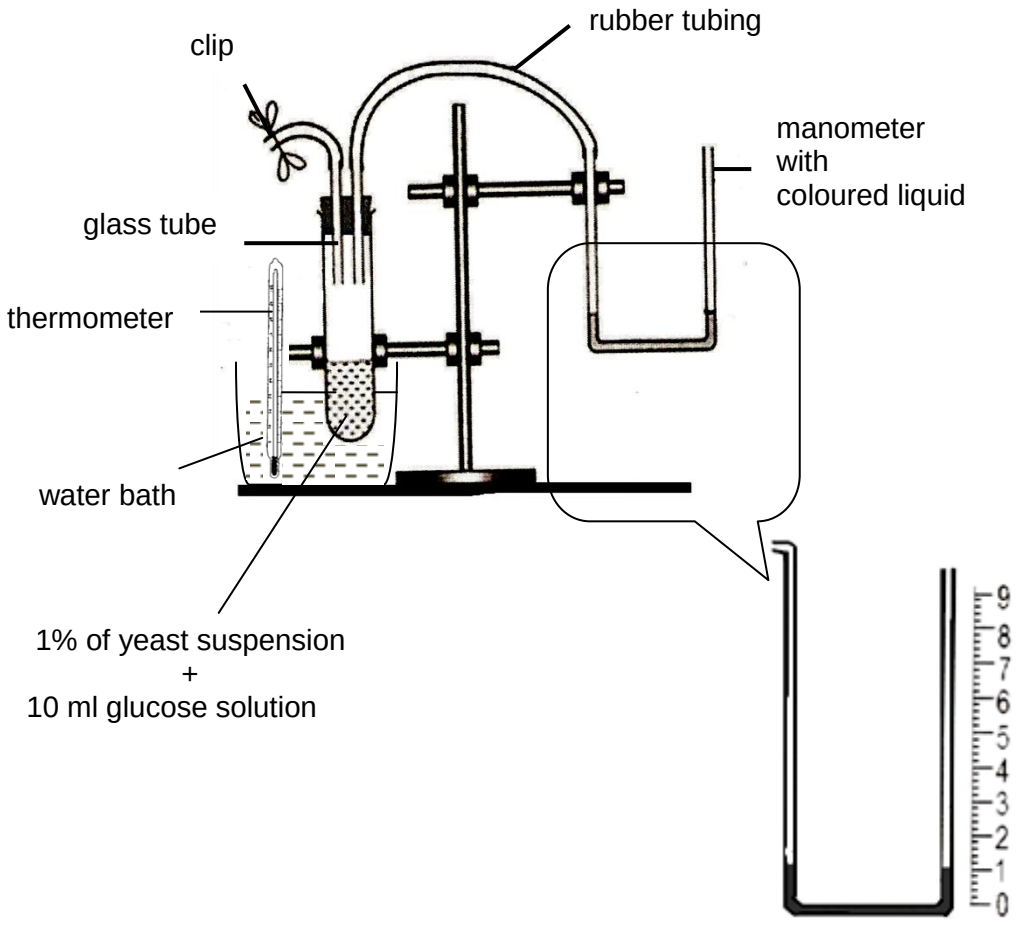
(f) Based on the graph in (1) (e) (ii), explain the relationship between the number of round ran and the rate of heartbeat **3**

Criteria:
P1:Relationship (When the number of round ran increases , the rate of heartbeat increases)
P2- to pump more blood (into circulation) / transport more oxygen / glucose
P3- for cellular respiration

	Sample answer: *As the number of round ran increases, the rate of heartbeat increase to pump more blood for cellular respiration.*		
(g)	As the student is running, he is chased by a fierce dog. Predict the rate of his heartbeat . Explain your prediction. **Criteria:** **P1**: **The rate of heart beat will increase / more than 1.5 / 2.0 / 2.5 /3.0 second^{-1}** **P2: Adrenal glands secrete more adrenaline** **P3: More glucose and oxygen transported to muscles / cellular respiration increase/ more energy is produced** **Sample answer:** *The rate of his heartbeat will increase/more than 3.0 second^{-1} because adrenal glands secrete more adrenalin. More glucose / oxygen are supplied to the muscles / cellular respiration increase/ more energy is produced.*	**3**	
(h)	From this experiment, what can you deduce about the rate of the heartbeat. **Criteria:** **P1 : number of heartbeat in one second** **P2 : athlete runs around the school field (at the same speed)** **P3 : affected by the number of round ran** **Example:** *The rate of heartbeat is the number heart beat in one second when an athlete runs round the school field (at constant speed). The rate of heartbeat is affected by the number of round ran.*	**3**	
(i)	The following list are some daily activities of a housewife. Jogging Swimming Cooking Sewing Reading Classify the activities into low heartbeat rate and high heartbeat rate. **Answer:** **Low heartbeat rate**: *Cooking, Sewing, Reading* **High heartbeat rate**: *Jogging, Swimming*	**3**	
	TOTAL MARKS	**33**	

QUESTION 5

CHAPTER 7- RESPIRATION

No	Questions	Marks	Tips
5	A group of students carried out an experiment to study the effect of temperature on the respiration of yeast . Diagram 5.1 shows the apparatus set up for this experiment and the initial height of coloured liquid in the manometer. The experiment was repeated using different temperature of the water bath.  Diagram 5.1 Table 5.1 shows the results of the experiment after 10 minutes.		

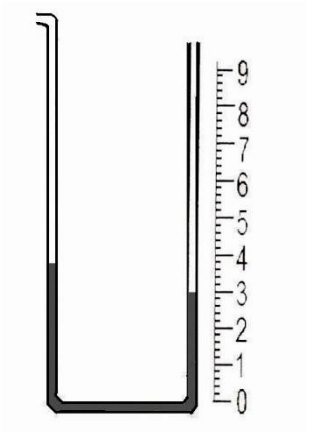
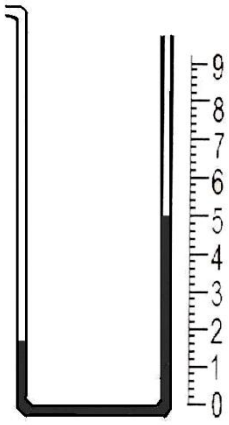
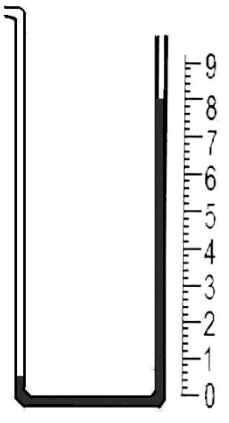
Temperature , °C	Final height of coloured liquid in the manometer (cm)
15	 *3.0*
25	 *5.0*
37	 *8.0*

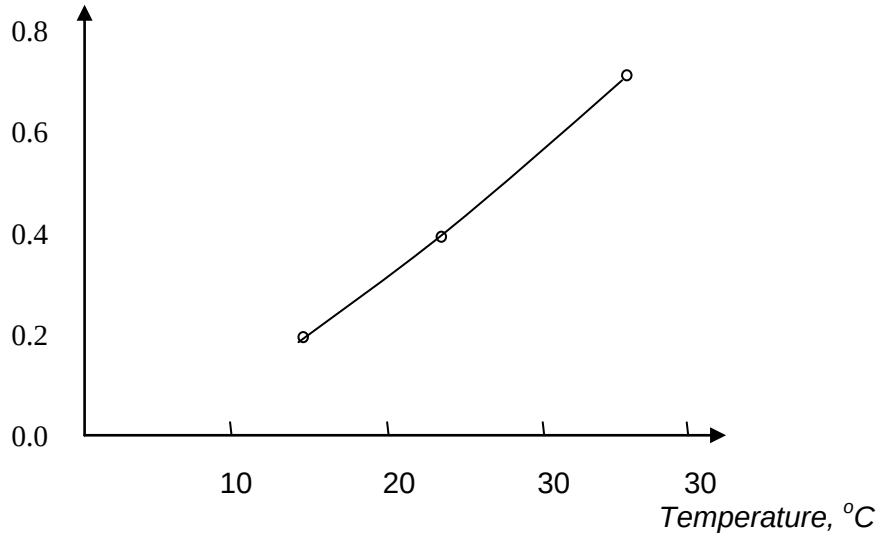
Table 5.1

(a)(i)	Based on Table 5.1, state **two** observations . **Criteria:** **P1: Temperature** **P2: Final height of coloured liquid** **P3: Value with unit** **Sample answer:** *1. At 15^{o}C ,the final height of coloured liquid is 3 cm* *2. At 37^{o}C ,the final height of coloured liquid is 8 cm*	3	
(a)(ii)	State the inference which corresponds to the observation in **1**(a)(i). **Criteria:** **P1: Temperature high / low** **P2: Enzyme / zymase inactive / active** **P3: Rate of respiration in yeast // amount of carbon dioxide** **Answer:** *1. At low temperature, rate of respiration in yeast is less because enzyme is inactive* *2. At optimum temperature,rate of respiration in yeast is the highest/maximum because enzyme zymase is very active.*	**3**	
(b)	Record the final height of the coloured liquid in Table 5.1. **Criteria :** **All three correct reading of final height of coloured liquid.**	**3**	
(c)	Complete Table 5.2 based on the experiment.	**3**	

Variables	**Method to handle the variable**
Manipulated variable *Temperature*	*Change / Use different temperature of the water bath // Use 15^{o}C /25^{o}C /37^{o}C*
Responding variable *1. Final height of coloured liquid*	*Measure and <u>record</u> the height of coloured liquid by using a <u>metre rule</u>*
2. Change in height of coloured liquid	*<u>// Calculate</u> the change in height of coloured liquid by using <u>formulae</u> : Final height – initial height*

	3.The rate of yeast activity/ respiration	*Calculate (the rate of) yeast activity by using formulae:* = *the height of coloured liquid / time taken*	
	Controlled variable **Concentration of yeast suspension / volume of glucose/ /time taken**	**Fix the concentration of yeast suspension at 1% /volume of glucose at 10ml / time taken for 10 minutes**	
	Table 5.2		
(d)	State the hypothesis for this experiment. **Criteria:** **P1:Temperature** **P2:Final height / Change in height of coloured liquid / yeast activity / rate of respiration** **P3:Relationship** Sample answer: *The higher/ lower the temperature, the higher / lower the rate of respiration of yeast.*	**3**	
(e)(i)	Based on Table 5.1, construct a table and record the results of the experiment which includes the following aspects: • Temperature • Change in height of coloured liquid • Rate of respiration in yeast [change in height of coloured liquid / time] **Criteria:** **T: Title with correct units** **D: Correct all three data of temperature and change in height of coloured liquid.** **C: Correct calculation of rate of respiration in yeast** **Answer:**	**3**	

Temperature, ^{o}C	**Change in height of coloured liquid /cm**	**Rate of respiration in yeast / cmmin^{-1}**
15	*2*	*0.2*
25	*4*	*0.4*
37	*7*	*0.7*

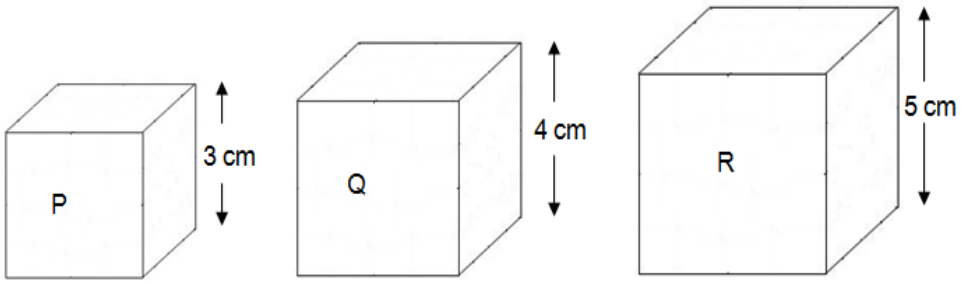
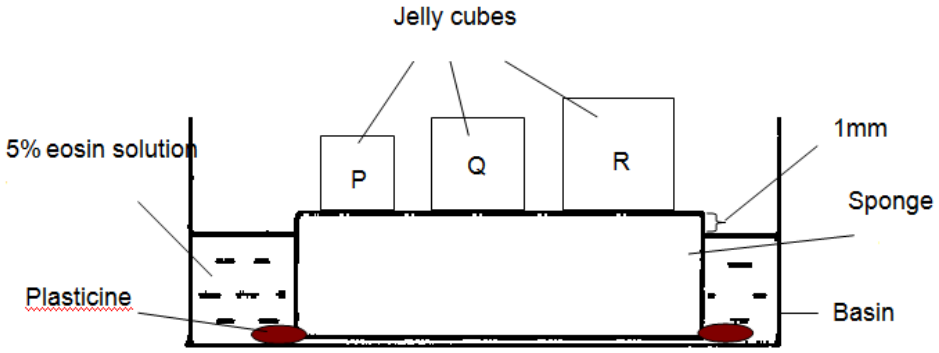
(e)(ii)	Based on the table in e(i), draw a graph of the rate of the activity of yeast against temperature. Criteria: **Axes (P) – Correct titles on both axes and uniform scales,** **Points(T)- all points correctly plotted** **Shape(B)- all points are connected smoothly** **Sample answer:** *Rate of yeast activity , cm/min*  	**3**	
(e)(iii)	Explain the relationship between the rate of yeast activity and temperature based on the graph in 1(e)(ii). **Criteria:** **R1: Relationship** **R2: Enzyme /zymase more active** **R3: More carbon dioxide released** Sample answers: *When the temperature increases/decreases, the rate of yeast activity increases/decreases because enzyme / zymase become more active. More carbon dioxide released*	3	
(f)	Based on the experiment, define respiration operationally . **Criteria:** **P1: Process carried out by yeast in glucose solution** **P2 : Causing the change in height of coloured liquid in manometer// final height of coloured liquid in manometer** **P3 : Affected by temperature**	3	

	Sample answer: *Respiration is a process carried out by yeast in glucose solution that causes the change in the height of coloured liquid in the manometer. It is affected by temperature.*		
(g)	The experiment is repeated by adding 1 ml of 0.1 mol dm^{-3} of sodium hydroxide solution into the boiling tube in the water bath of 37 °C**.** The experiment is left for 10 minutes. Predict the height of the coloured liquid after 10 minutes. Explain your prediction. **Criteria**: **P1: Correct prediction in height of the coloured liquid (less than 8.0 cm / value)** **P2: Alkaline medium is not suitable / favourable** **P3: Yeast less active // Rate of respiration decreases// Less carbon dioxide released** **Sample answer**: *The height of coloured liquid is less than 8.0 cm because the medium is alkaline which is not suitable for yeast activity. The rate of respiration decreases.*	3	
(h)	The following list is part of the apparatus and material used in this experiment. yeast , metre rule, coloured liquid, electronic balance, glucose solution, measuring cylinder , water bath , manometer Complete Table 5.3 by matching each variable with the apparatus and material used in the experiment. Table 5.3	3	
	TOTAL MARKS	**33**	

Variables	Apparatus	Material
Manipulated	**Water bath**	**-**
Responding	**metre rule,manometer**	**coloured liquid**
Controlled	**electronic balance**	**yeast , glucose solution**

QUESTION 6

CHAPTER 1- TRANSPORT

No	Questions	Marks	Tips
6	A group of students carried out an experiment to investigate the relationship between the total surface area to volume ratio and the rate of coloured water diffusion . Three jelly cubes were prepared, with sides of 3 cm, 4 cm and 5 cm respectively as shown in Diagram 1. The cubes are labeled as P, Q and R.  Diagram 1 A piece of sponge approximately 50 mm thick is placed on the floor of a basin. A little plasticines used to fasten the sponge onto the floor of the basin. 5% eosin solution is poured into the basin until 1mm away from the top of the sponge. The whole sponge is wet with the solution. The jelly cubes are then placed slowly on the sponge, as shown in Diagram 2. The solution is added constantly to maintain its height of 1mm away from the sponge top.  Diagram 2 After 20 minutes, the cubes are taken out carefully and wiped with filter paper. They are cut vertically into two halves. The lower part of the cubes were coloured red. The height of the coloured portion is measured. The results are recorded in Table 1.1.		

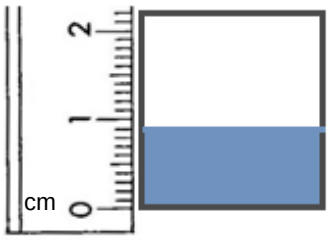
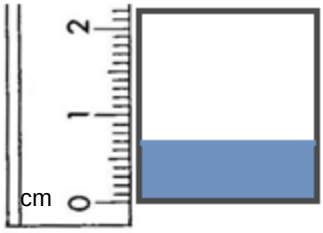
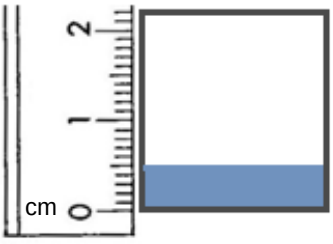
Cube	The length of the side (cm)	The cut halves of the cubes	The height of the red coloured portion (cm)
P	*3*		***0.9***
Q	*4*		***0.7***
R	*5*		***0.5***

Table 1.1

a	Record the the height of red coloured portion of the jelly P, Q and R in spaces in Table 1.1.	**3**	
b(i)	Based on the results in Table 1.1, state two observations for the experiment. **Criteria:** **P1: side of the cube** **P2: the (final) height of the red-coloured portion (of the jelly)** **Sample answer:** **1.** *When the side of the cube is 3cm / 4 cm / 5cm, the (final) height of the red-coloured portion (of the jelly) is 0.9cm /0.7cm /0.5 cm*	**3**	

<table>
<tr><td></td><td>2. The (final) height of the red-coloured portion of cube P is higher than in cube Q /R.</td><td></td><td></td></tr>
<tr><td>b(ii)</td><td>State the inference which corresponds to the observation in 1(a)(i).
Criteria:
P1 : total surface area to volume ratio
P2 : (rate of (coloured)) water / eosin diffusion
Samp;e answer:
1. Total surface area to volume ratio of cube P is big / high, so (the rate of) eosin / coloured water diffuse into the jelly is fast .
2. Cube R’s surface area to volume ratio is small / low, so the rate of water diffuse into the jelly is slow
3. Total surface area to volume ratio of cube P is bigger (than Q / R) and so the rate of water diffusion is higher (than cube Q / R) // Vice-versa.</td><td>3</td><td></td></tr>
<tr><td>c)</td><td>Complete Table 1.2 based on this experiment
Sample answer:
<table>
<tr><th>Variable</th><th>Method to handle the variable</th></tr>
<tr><td><u>Manipulated variable</u>
The length of the cube’s sides. / size of cube // TSA/V</td><td>By using different length for the sides of the cubes (that is, 3cm, 4cm and 5cm)</td></tr>
<tr><td><u>Responding variable</u>
The (final) height of the coloured portion of cubes after 20 minutes // The rate of coloured water diffusion</td><td>Measure and <u>record</u> the final height of the red-coloured portion of the jelly cubes using a ruler //
<u>Calculate</u> the rate of coloured water diffusion using the <u>formula</u>: height of the red-coloured portion divided by time taken</td></tr>
<tr><td><u>Controlled variable</u>
The type of jelly // concentration of the eosin solution // time taken</td><td>Use the same type of jelly // Fix the concentration of eosin used at 5% / time taken at 20 minutes.</td></tr>
</table>
Table 1.2</td><td>3</td><td></td></tr>
</table>

d) State the hypothesis for this experiment. — 3

Criteria:

P1: Manipulated Variable - length of the sides of the cube

P2: Responding Variable - rate of water diffusion / height of red-coloured portion of jelly (after 20 minutes)

P3: Relationship

Sample answer:

The longer the length of the sides of the cube, the lower the rate of water diffusion / height of red-coloured portion of jelly (after 20 minutes) .

e(i) Construct a table and record the data collected in this experiment which include the following aspects: — **3**

- Length of the side of cubes
- The total surface area per volume ratio (cm^{-1})
- The height of the red-coloured portion of the cubes
- The rate of water diffusion, calculated using formula:

$$\text{The rate of water diffusion} = \frac{\text{The height of the red coloured portion}}{\text{Time taken.}}$$

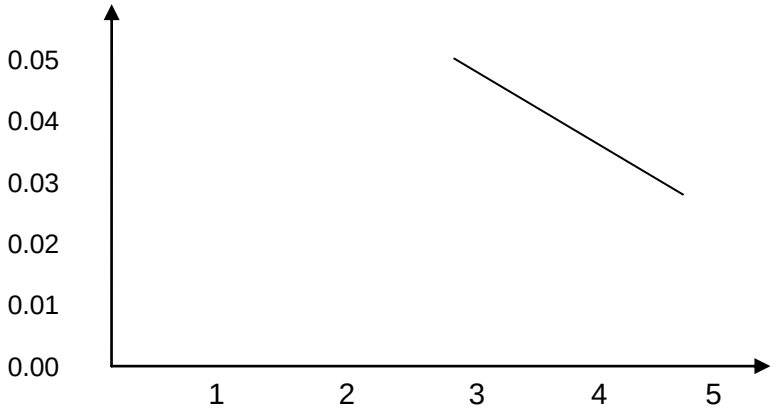
Criteria:

T: Title with correct units
D: Correct data
C: Correct calculation of rate of water diffusion

Sample answer:

Length of sides of cube (cm)	*Total surface area per volume ratio (cm^{-1})*	*Height of the red-coloured portion of the cubes (cm)*	*Rate of water diffusion (cm/min)*
3	***2.0***	***0.9***	***0.05 / 0.045***
4	***1.5***	***0.7***	***0.04 / 0.035***
5	***1.2***	***0.5***	***0.03 / 0.025***

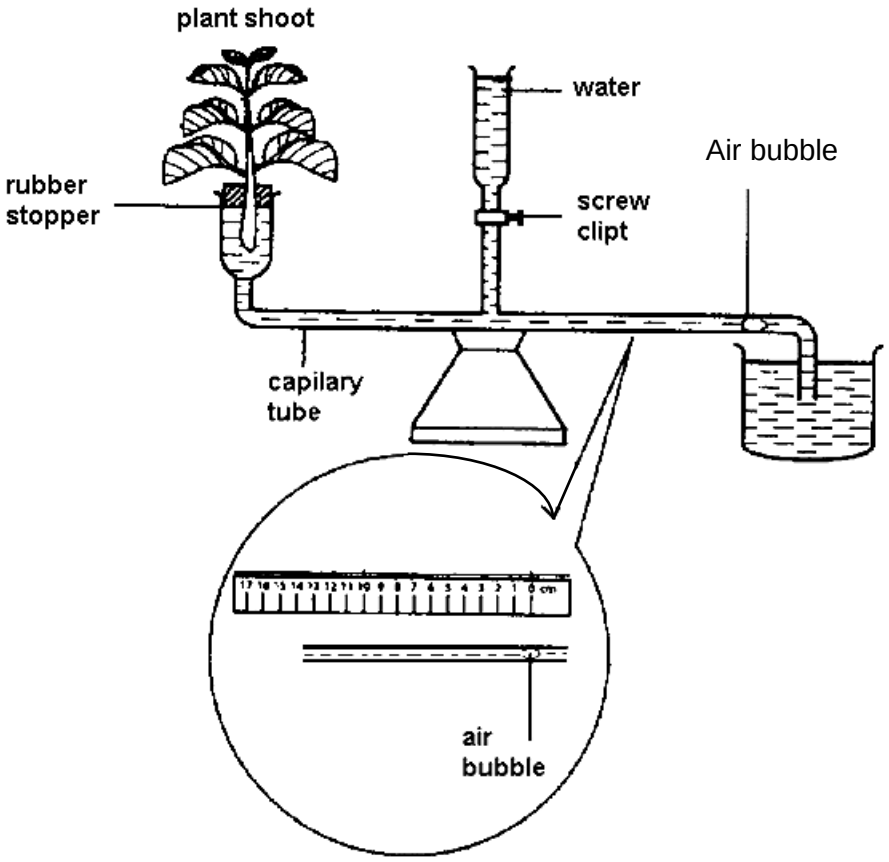
e(ii) Using the data in (1) (e) (i), draw the graph of the rate of water diffusion against the length of the sides of the cubes. — **3**

	Criteria : **P1: Correct label of axes , units and uniform scales** **P2: All points plotted correctly** **P3: Correct shape of graph** **Sample answer:** *Rate of water diffusion, cm/min*  *Length of sides of cubes , cm*		
f)	Based on the graph in 1(e)(ii), explain the relationship between the rate of water diffusion and length of sides of cube. **Criteria:** **P1: Relationship** **P2: TSA/V increase** **P3: more coloured water enters by diffusion** **Sample answer:** *When the length of sides of cube increases, the rate of water diffusion increases because as the total surface area per volume increases more coloured water diffuse into the jelly cubes.*	**3**	
g)	Based on this experiment, deduce the meaning of diffusion operationally. **Criteria :** **P1: process of coloured water enters the jelly cubes** **P2: immersed / placed in eosin solution** **P3: affected by the length of side of cubes/surface area/ TSA/V**	**3**	

	Sample answer: *Diffusion is a process of coloured water enters the jelly cubes when the cubes are immersed / placed in eosin solution. The rate of diffusion depends on the length of side of cubes/surface area/ TSA/V*		
h)	Predict the rate of water diffusion if the side of jelly cube R is perforated with a few holes. **Criteria:** **P1: Prediction – Higher than 0.03cm/mim** **P2: Bigger total surface area** **P3: Height of red-coloured portion higher than 5cm** *The rate of water diffusion will be higher than 0.03cm/min. This is because the cube's total surface area per volume ratio will be bigger than 1.5cm^{-1} causes the height of red-coloured portion of the jelly cube will be higher than 5cm.*	**3**	
i)	The following list are apparatus and material which are used in the experiment. Plasticine sponge eosin solution Jelly cubes basin filter paper Classify the apparatus and material according to their function in Table 3. **Sample answer:** Material / Apparatus *Eosine solution*, *Jelly cubes*, *Filter paper* / *Plasticine*, *Sponge*, *basin* Table 3	**3**	

QUESTION 7 :

CHAPTER 10- TRANSPORT

No	Questions	Marks	Student's tips
8	A group of students carried out an experiment to study the effect of temperature on the rate of transpiration in a plant. Diagram 1 shows the set-up of apparatus used in the experiment and the position of air bubble at the beginning of experiment.  Diagram 1 The apparatus are prepared and kept in laboratory with difference temperature. The experiment was repeated in different temperature. Table 1.1 shows the reading of temperature and position of air bubble after 5 minutes.		

No	Questions	Marks	Student's tips

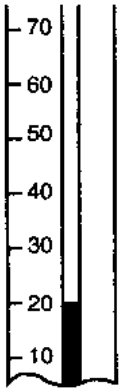
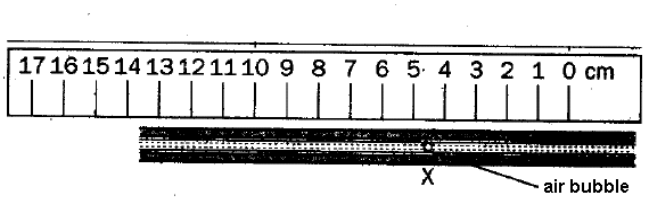
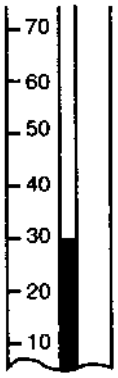
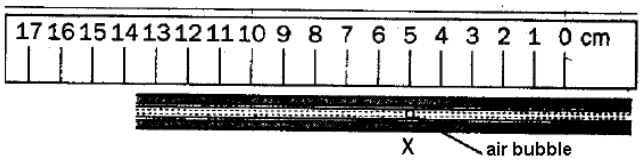
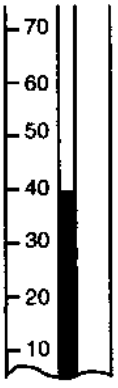
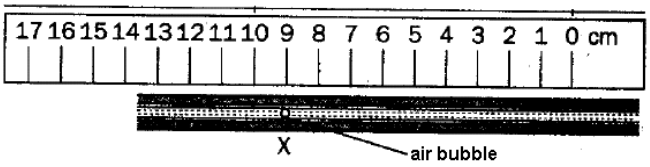
Temperature, ^{o}C	Position of air bubble (X) after 5 minutes , cm
 *20^{o}C*	 *4.5*
 *30^{o}C*	 *5.0*
 *40^{o}C*	 *9.0*

Table 1.1

No	Questions	Marks	Student's tips
a)(i)	Based on table 1.1 state **two** observations **Criteria.** **P1 – Manipulated variable :Temperature** **P2 – Responding variable :Position of air bubble after five minutes** **P3 – RV Reading / RV Value / comparison after 5 minutes** **Sample Answer:** **1**. *At the temperature 20^oC /30^oC / 40^oC the position of air bubble is 4.5 cm/ 5.0 cm / 9.0 cm* *2. At temperature 40^oC the position of air bubble is farther than at 30^oC*	**3**	
a)(ii)	State the inference which corresponds to the observations in 1 (a)(i) **Criteria:** **P1: Temperature low/high** **P2: Kinetic energy of water (molecule)** **P3: Rate of transpiration low / high // Increase/decrease evaporation of water** ***Sample answer:*** *1. At high temperature, kinetic energy of water molecule increases / high , which increase the rate of transpiration.* *2. The higher the temperature, the higher the kinetic energy of water, the higher the rate of transpiration .*	**3**	
(b)	Complete the Table 1.1 by recording the temperature and the position of air bubble after five minutes. **(Refer Table 1.1)**	**3**	

c(i) Based on the experiment, complete Table 1.2

Variable	Method to handle the variable
Manipulated variable : Temperature	***Use*** *different temperature //* ***Use*** *$20^oC, 30^oC, 40^oC$*
Responding variable : *Position of air bubble // Distance of air bubbles movement // Rate of transpiration*	*Measure and* ***record*** *the distance of air bubbles movement/ position of air bubble* ***using a ruler.*** ***// Calculate*** *the rate of transpiration by using* ***formula :*** $= \frac{\textbf{Position of air bubble}}{\textbf{time}}$
Constant variable: *Type of plant //* *// Number of leaves in plant/shoot* *// Air humidity* *// Light Intensity*	***Use the same*** *type of plant/ number of leaves in plant /air humidity / light intensity that is hibiscus shoot / six leaves / in the lab*

Table 1.2

3

c(ii) The following list is part of the apparatus and material used in this experiment.

Thermometer, stop watch, ruler, capillary tube, plant, water

Complete Table 1.3 by matching each variable with the apparatus and material used in this experiment.

Sample answer:

Variable	Apparatus	Material
Manipulated	*Thermometer*	-
Responding	*ruler*	*water*
Controlled	*Capillary tube, stopwatch*	*plant*

Table 1.3

3

<table>
<tr>
<td>d)</td>
<td>State the hypothesis for this experiment.

Criteria:
P1 – Temperature.
P2 – Position of air bubble//Distance of air bubbles movement//The rate of transpiration
R - Relationship

Sample answer :

1. The rate of transpiration is higher when the temperature increase
2. The distance of air bubbles movement is longer when the temperature is higher</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>e)(i)</td>
<td>Based on Table 1.1, construct a table and record the results of this experiment which includes the following aspect:

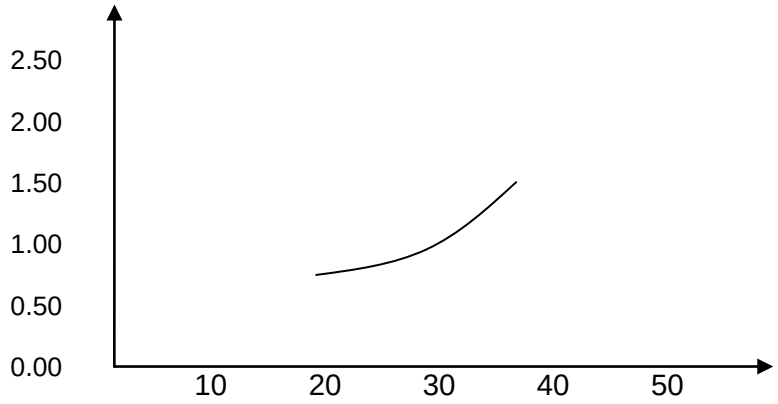
• Temperature (^{o}C)
• The distance of air bubble after five minutes (cm)
• Rate of transpiration [distance of air bubble / 5 minutes]

Criteria:
T: Title with correct units
D: Correct all three data of temperature and distance of air bubble
C: Correct calculation of rate of transpiration

<table>
<tr><th>Temperature (^{0}C)</th><th>Distance of air bubble after 5 minutes, (cm)</th><th>Rate of transpiration (cm/min)</th></tr>
<tr><td>20</td><td>4.5</td><td>0.9</td></tr>
<tr><td>30</td><td>5.0</td><td>1.0</td></tr>
<tr><td>40</td><td>9.0</td><td>1.8</td></tr>
</table>
</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>e)(ii)</td>
<td>On the graph paper provided, draw the graph of rate of transpiration against the temperature.

Criteria:

Axes (P) – Correct titles on both axes and uniform scales,
Points(T)- all points correctly plotted
Shape(B)- all points are connected smoothly</td>
<td>3</td>
<td></td>
</tr>
</table>

	Sample answer *Rate of transpiration, cm/min*  		
f)	Based on the graph in e)(ii), state the relationship between the rate of transpiration and the temperature. Explain your answer. ***Criteria:*** ***P1: Relationship*** ***P2: Kinetic energy of water molecule*** ***P3: Evaporation of water molecules*** ***Sample answer :*** *When the temperature increase, the rate of transpiration increase because more kinetic energy gained by water molecules so evaporation of water molecule increase.*	**3**	
g)	Based on the experiment, deduce transpiration operationally. **Criteria:** **P1: Loss of water vapour from leaves** **P2: Position / distance of air bubble** **P3: Affected by temperature** **Sample answer:** *Transpiration is the loss of water vapour from the leaves shown by the distance of air bubbles movement (in capillary tube / photometer) which is affected by the temperature.*	**3**	
h)	In another experiment, the apparatus is located under the hot sun. Predict the observation and explain the results of the experiment.	**3**	

	Criteria: **P1 – the distance of air bubble.** **P2 – the transpiration rate** **P3 – higher temperature // higher light intensity.** **Sample answer:** *The distance of the air bubble is further/more than 9 cm because the tanspiration rate is higher due to a higher temperature / higher light intensity*		
	TOTAL MARKS	**33**	

QUESTION 8

CHAPTER 3- COORDINATION AND RESPONSE

One of the main roles of kidney in human is to carry out osmoregulation process during the formation of urine.A group of students carry out an experiment to study osmoregulation in human by relating the effect of concentrations of drinking water on the volume of urine output.

The night before the experiment, three students were not allowed to drink water after 11.00 pm. In the morning of the experiment at 7.30 am, each student drank 500 ml drinking water These students were asked to rest for an hour in a classroom at room temperature. At 8.30 am the students urinate to empty their urinary bladder.

Table 1.1 shows the volume of urine collected from each student at 8.30 am.

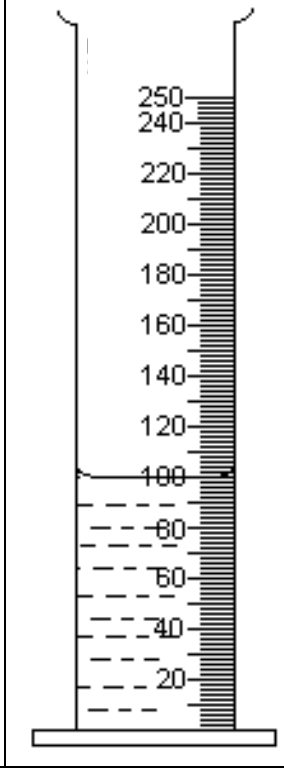
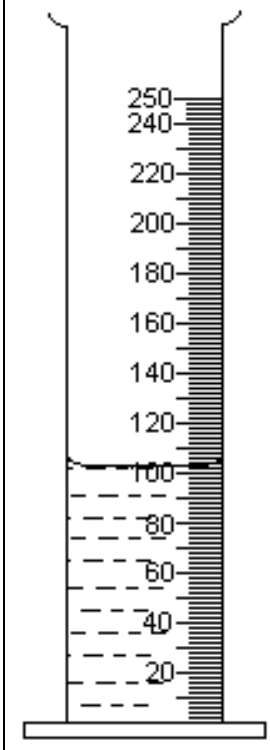
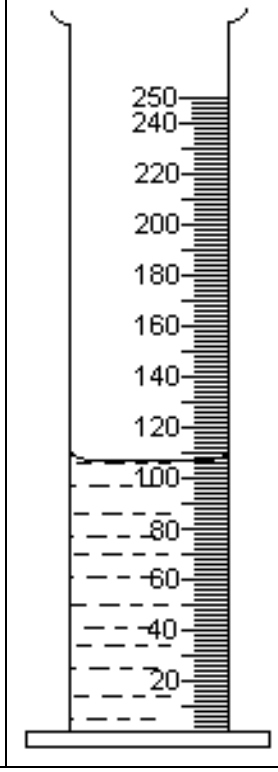
Student	A	B	C
Urine collected at 8.30 am			

Table 1.1

Immediately ,the students were given three different types of drinking water which they drank as quickly as possible as shown inTable 1.2 .

Student	Type of drinking water
A	500 ml 0.5% sodium chloride solution
B	500 ml of 1.0 % sodium chloride solution.
C	500 ml of 1.5 % sodium chloride solution.

Table 1.2

Urine samples of each student were taken and measured after an hour (9.30 am) as shown in Table 1.3

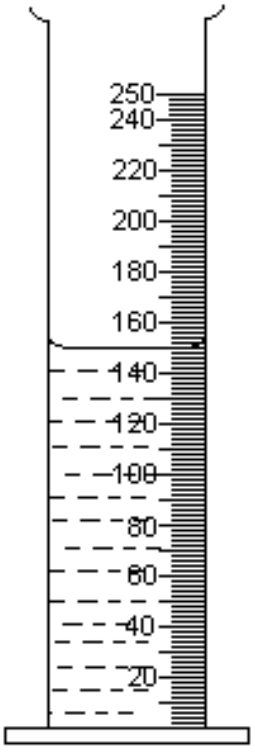
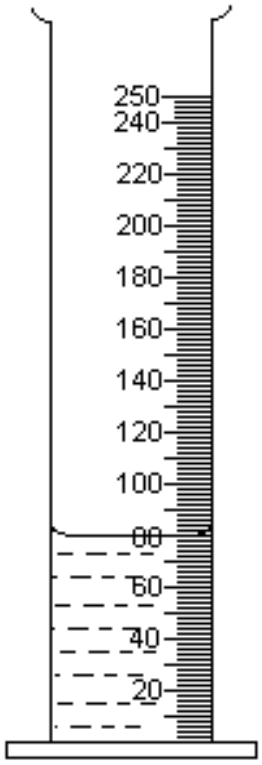
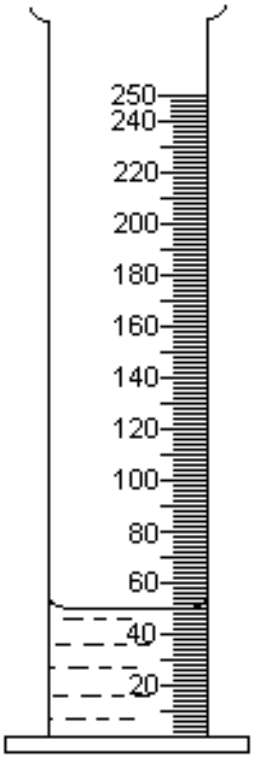
Student	A	B	C
Type of drinking water	0.5% sodium chloride solution	1.0 % sodium chloride solution	1.5 % sodium chloride solution
			
Volume of urine collected at 9.30 am, ml	*150.0*	*80.0*	*50.0* .....

Table 1.3

No	Question	Marks	Tips
(a)(i)	Based on Table 1.3 state **two different** observations . ***Criteria.*** **P1 – type of drinking water** **P2 – volume of urine collected** **Sample answers:** **1**. *The volume of urine collected from the student who drank 0.5% sodium chloride solution is 150 ml.* *2. The volume of urine collected from the student who drank 1.0 % sodium chloride solution is 80 ml.* *3. The volume of urine collected from the student who drank 1.5 % sodium chloride solution is smaller than the volume of urine collected from the student who drank 0.5% sodium chloride solution.*	**3**	
(a)(ii)	State the inference which corresponds to the observations in 1 (a)(i) ***Criteria:*** ***P1: Amount of water reabsorbed (from kidneys)*** ***P2: Hypotonic / Hypertonic solution (to the body cells) // Less / more concentrated solution*** ***P3 : (Blood) osmotic pressure*** ***Sample answers:*** *1. Less amount of water reabsorbed because the drinking water is hypotonic to the body cells .* *2. More water reabsorbed from the kidneys because the drinking water is hypertonic to the body cells.* *3. More water reabsorbed in student C compared to student A because 1.5 % sodium chloride solution is more concentrated compared to 0.5% sodium chloride solution*	**3**	
(b)	Complete Table 1.3 by recording the volume of urine collected by each student. ***(Refer Table 1.3)***	**3**	

(c)(i) Complete the Table 1.4 based on the experiment . 3

All six correct variables and method to handle the variables.

Sample answers:

Variables	Method to handle the variable
Manipulated variable *Concentration of sodium chloride solution*	*Use different concentration of sodium chloride solution // Use 0.5% / 1.0 %/ 1.5% of sodium chloride solution*
Responding variable *Volume of urine collected*	*Measured and record the the volume of urine collected by using measuring cylinder*
Controlled variable *Volume of drinking water* *Time interval*	*All students drank 500 ml of drinking water* *Fix the time interval for 1 hour*

Table 1.4

(c)(ii) The following list is part of the apparatus and material used in this experiment. **3**

Stopwatch, sodium chloride solution, beaker, measuring cylinder, mineral water, urine

Complete Table 1.5 by matching each variable with the apparatus and material used in this experiment.

Variables	Apparatus	Materials
Manipulated	**Measuring cylinder**	**Sodium chloride solution**
Responding	**Measuring cylinder, Beaker**	**urine**
Controlled	**Measuring cylinder Stop watch**	**Type of drinking water**

Table 1.5

d) State the hypothesis for this experiment. **3**

Criteria:
P1: manipulated variable – concentration of sodium chloride.
P2: responding variable – volume of urine collected.
R : relationship between P1 and P2.

Sample answer:

The higher the concentration of sodium chloride, the lower the volume urine collected

(e)(i) Base on the Table 1.3, construct the table and record the results of this experiment which includes the following aspects: **3**

- Percentage of sodium chloride solution.
- Volume of drinking water
- Volume of urine collected
- Water reabsorbed in kidney.

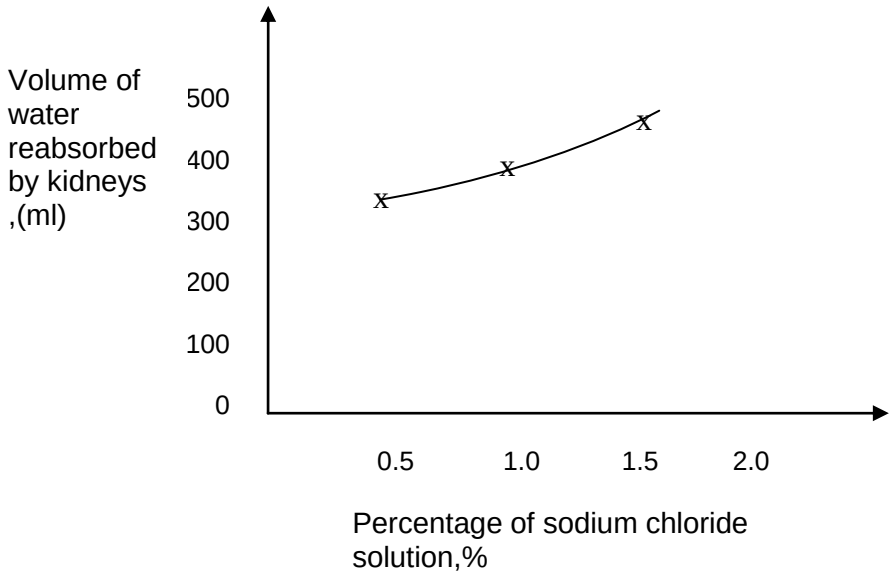
Criteria:
T: Title with correct units
D: Correct data
C: Correct calculation

Sample answer:

Percentage of sodium chloride solution (%)	**Volume of drinking water (ml)**	**Volume of urine collected (ml)**	**Water reabsorbed by kidney (ml)**
0.5	*500*	*150*	*350*
1.0	*500*	*80*	*420*
1.5	*500*	*50*	*450*

(e)(ii) On the graph paper, draw the graph of water reabsorbed by kidneys against the percentage of sodium chloride solution. **3**

Criteria:
Axes (P) – Correct titles on both axes and uniform scales,
Points(T)- all points correctly plotted
Shape(B)- all points are connected smoothly

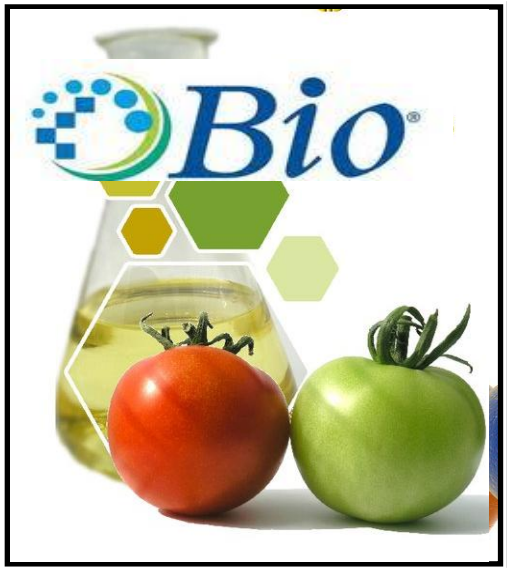
	Sample answer:  		
(e)(iii)	Explain the relationship between the water reabsorbed and percentage of sodium chloride solution in drinking water based on the graph in 1(e)(ii). Criteria: **P1: Relationship** **P2: Concentration of solution increases // More hypertonic to body cells** **P3: Increase in blood osmotic pressure** **Sample answer:** *As the percentage of sodium chloride solution increases, the volume of water reabsorbed by kidneys increase. The solution is more concentrated and the blood osmotic pressure increases.*	**3**	
(f)	Based on this experiment, deduce osmoregulation. ***Criteria*** **D1 – urine production in human / students** **D2 – volume of urine collected after drinking sodium chloride solution** **D3 – affected by the concentration of sodium chloride solution** **Sample answer:** *Osmoregulation is a process of urine production which is shown by the volume of urine collected after drinking sodium chloride solution. Osmoregulation is affected by concentration of sodium chloride solution.*		

No	Question	Marks	Tips
(g)	In another experiment , student C drank 500 ml of 1.5 % sodium chloride solution and rest in the air condition room for an hour. Predict the volume of urine collected after one hour and explain your prediction. **Criteria:** **P1 – volume of urine collected less than 50 ml / any value less than 50 ml** **P2 – Low temperature** **P3 – Less sweating // Less water loss** **Sample answer** *Volume of urine is less than 50 ml because of low temperature.* *This will cause less sweating and less water loss.*		
	TOTAL MARKS	**33**	

MODUL TAMAT

KEMENTERIAN PENDIDIKAN MALAYSIA

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH
DAN SEKOLAH KECEMERLANGAN



MODUL X-A Plus / PERFECT SCORE

http://cikguadura.wordpress.com/

BIOLOGI 4551/3 (SOALAN 2) 2013

EDISI GURU

DISEDIAKAN OLEH

MAZINAH BT MUDA
DATIN NORIDAH BT YANGMAN
NURUL UYUN BT ABDULLAH
ROSIAPAH BT DOLLAH
MELI BIN HUSSIN
NORAINI BT SAMIN
HABSHAH BT KHATIB
ZALINA BT AHMAD
SUSANTI BT GAMIN
FATIMAHWATI BT MALEK
MOHD IZANI B SAUFI
MOHD FADHIL BIN MASRON

SMS TENGKU MUHAMMAD FARIS PETRA
SMS TUANKU SYED PUTRA
SMS KUALA SELANGOR
SMS SELANGOR
SMS KUALA TERENGGANU
SMS MUAR
SMS KUCHING
KOLEJ ISLAM SULTAN ALAM SHAH
SMS JOHOR
SMA PERSEKUTUAN LABU
SMS KEPALA BATAS
SMS LABUAN

Paper 3 – Question 2

No	Questions	Marks	Student's tips
1	The quadrate sampling technique is primarily used in estimating the size of plant population which then also apply to estimate the population size of immobile organism. Lichen is green alga that grows on the bark of the tree. Alga grows in low light intensity. Use the quadrate sampling technique to estimate the population size of the lichen on the bark of mango tree in your school area which exposed at different light intensity. The planning of your experiment must include the following aspects: • Problem statement • Hypothesis • Variables • List of apparatus and materials • Experimental procedure • Presentation of data		Chapter 8
	Problem statement : Able to state the problem statement of the experiment correctly that included criteria: • Manipulated variable • Responding variable • Relation in question form and question mark (?) **<u>Sample Answer</u>** **1. Does the light intensity affect the size of lichen population?** **2. Does the population size of the lichen on the bark of mango tree facing the east / the sun is higher than facing the north /away from the sun ?**	3	

	Hypothesis Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship of the variables • **Sample Answer** **The population size of the lichen on the bark of mango tree in school area facing the sun/high light intensity/ facing the east is larger than the area that facing away from the sun/low light/ facing the north.**	3	
	Variables: Able to identify **all** the three variables correctly **Sample Answer** **Manipulated: light intensity/area facing the east and the north.** **Responding: size of lichen population** **Fixed : type of species/the size of the grid**	3	
	Material and Apparatus: Able to state material and apparatus: Compulsory to use in : MV, RV and FV **Apparatus : grid transparency paper (size 10cm x 10cm), permanent marker pen** **Materials : Alga, mango tree**	3	

	Procedures: Able to write **five** procedures P1. P2, P3, P4 and P5 correctly. **P1 :** Steps to set up the apparatus (at least three P1) **P2 :** Steps to handle the fixed variable (one P2) **P3 :** Steps to handle the manipulated variable (one P3) **P4 :** Steps to record the responding variable (one P4) **P5 :** Precautionary steps / steps taken to get average results / readings (one P5) **Sample Answer** **1. Select the mango tree with lichen grow on the tree bark facing the sun/facing the east. (P1)** **2. Place the transparency with grid size 10cm x 10cm (P2) at the selected bark. (P1) Leave the grids on the bark for two weeks.(P2)** **3. After two weeks measure the size of lichen population on the tree bark facing the sun/facing the east by counting the number of the squares on the grid covered more than half by the lichen (P3)** **4. Measure the size of lichen population for the area facing away from the sun/facing the north by using the grid.(P4)** **5. Repeat step 1- 4 to get an average reading.(P5)** **6. Calculate the percentage coverage of the lichen using formula(P3);** **Percentage coverage = total area covered by lichen (cm^2) X 100%** **number of quadrat X quadrat area** **7. Record all data in the table. (P1)**	3	

Results:

Able to draw a complete table to record the relevant data based on the 2 criteria:

- Location of the grid
- Population size /percentage coverage

Sample Answer

Location of the grid	**the tree bark facing the sun/facing the east**	**the tree bark facing away from the sun/facing the north**
Total area covered by lichen (cm^2)		
Percentage coverage (%)		

2

TOTAL MARKS **17**

No	Questions http://cikguadura.wordpress.com/	Marks	Student's tips
2	Macronutrients (Calcium, Magnesium, Phosphorus, Potassium) are involved in the synthesis of chemical substances essential for healthy growth of plants. Two German botanists, Julius Sachs and Wihelm Knop, grew plants in culture solutions to determine the role of macronutrients in plant growth. They discovered Knop's solution as shown in the table below;		

No.	Macronutrient compound	Amount
1	Calcium Nitrate, $Ca(NO_3)_2$	0.8 g
2	Potassium nitrate KNO_3	0.2 g
3	Potassium dihydrogen phosphate, KH_2PO_4	0.2 g
4	Magnesium sulphate, $MgPO_4$	0.2 g
5	Ferum (III) phosphate $FePO_3$	TRACE
6	Distilled water.	100 cm^3

The absence of one or more of macronutrients in the Knop's solution can lead to mineral deficiency in plants. The symptoms of mineral deficiency depend on the functions of the mineral in the plant.

Design an experiment to investigate the effect of nitrogen deficiency on the growth of maize seedlings.

The planning of your experiment must include the following aspects:

- Problem statement
- Hypothesis
- Variables
- List of apparatus and materials

	• Experimental procedure • Presentation of data		
	Problem statement : Able to state the problem statement of the experiment correctly that included criteria: • Manipulated variable • Responding variable • Relation in question form and question mark (?) **Sample Answer** **1. What is the effect of nitrogen deficiency on the growth of maize seedlings?** **2. Does the amount of nitrogen in the knop's solution affect the growth of maize seedlings?**	3	
	Hypothesis Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship of the variables **Sample Answer** 1.**The growth of of maize seedlings is higher in the knop's solution with higher amount of nitrogen.** **2.The higher the amount of nitrogen the knop's solution the higher the growth of of maize seedlings**	3	

	Variables: Able to identify **all** the three variables correctly **Sample Answer** **Manipulated: Type of solution (Presence or absence of nitrogen in the solution)** **Responding: the growth of maize seedlings / size of plant** **Fixed : type of maize/the volume of knop's solution**	3	
	Material and Apparatus: Able to state material and apparatus: Compulsory to use in : MV, RV and FV **Apparatus :** **1.conical flask** **2. rubber stopper with hole,** **3. delivery tube,** **4. connected to the air pump,** **4.knife** **5.glass tube** **6. ruler** **Materials :** **1.maize seedlings** **2.Knop's solution (0.8 g Calcium nitrate,0.2g potassium nitrate,0.2g Potassium dihydrogen phosphate,0.2g Magnesium sulphate,trace amount of ferum (III) phosphate.1000ml distilled water)** **3. Knop's solution with out nitrogen (0.8 g calcium chloride,0.2g**	3	

	potassium chloride,0.2g potassium dihydrogen phosphate,0.2g magnesium sulphate, trace amount of ferum (III) phosphate.1000ml distilled water) **4.cotton wool** **5.black paper**		
	Procedures: Able to write **five** procedures P1. P2, P3, P4 and P5 correctly. **P1 :** Steps to set up the apparatus (at least three P1) **P2 :** Steps to handle the fixed variable (one P2) **P3 :** Steps to handle the manipulated variable (one P3) **P4 :** Steps to record the responding variable (one P4) **P5 :** Precautionary steps / steps taken to get average results / readings (one P5) **Sample Answer** **1. Cover the 2 conical flask with black paper.(P1)** **2. Fill the boiling tube as following;(P1)** **a. Complete Knop's solution** **b. Knop's solution without nitrogen.(P4)** **3. Place a maize seedlings into each conical flask which supported by cotton wool. (P1)** **4. Leave the set under the light source for 5 days.(P2)** **5. The solution in the conical flask is replaced every week.(P5)** **6. After 20 days, measure and record the height of maize seedlings by using a ruler.(P3)** **7. Record all data in the table. (P1)**	3	

	Results: Able to draw a complete table to record the relevant data based on the 2 criteria: **Sample Answer** Type of solution | **The height of maize seedlings (cm)** **Complete Knop's solution** | **Knop's solution without nitrogen** |	2	
	TOTAL MARKS	**17**	

No	Questions	Marks	Student's tips
3	The diffusion of molecules through the plasma membrane is based on the size of molecules. If the solution concentration is diluted, water molecules will diffuse in through this semi-permeable membrane until equilibrium is achieved. If the solution is concentrated , water molecules will diffused out through the semi-permeable membrane by osmosis. Based on the above information , plan a laboratory experiment to study the effect of different concentration of sucrose solution on the percentage change in mass of Mustard green stem. The planning of your experiment must include the following aspects: • Problem statement • Hypothesis • Variables • List of apparatus and materials • Experimental procedure • Presentation of data		Chapter 3
	Problem statement : Able to state the problem statement of the experiment correctly that included criteria: • Manipulated variable • Responding variable • Relation in question form and question mark (?)	3	

	Sample Answer 1. **What is the effect of different concentration of sucrose solution on the percentage change in mass of Mustard green stem?** 2. **How does the concentration of sucrose solution affect the percentage change in mass of Mustard green stem?**		
	Hypothesis Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship of the variables **Sample Answer** **The higher the concentration of sucrose solution, the lower the percentage change in mass of Mustard green stem.**	3	
	Variables: Able to identify **all** the three variables correctly **Sample Answer** **Manipulated: different concentration of sucrose solution** **Responding: Percentage change in mass of Mustard green stem** **Fixed : Type of mustard green stem, volume of sucrose solution**	3	
	Material and Apparatus:	3	

	Able to state material and apparatus: Compulsory to use in : MV, RV and FV **Sample Answer** ***Materials :*** **Mustard green stem, sucrose solution (distilled water, 2%, 6%. 10%, 15% and 20%), tissue paper** ***Apparatus :*** **pen knife, cutting board, petri dishes, ruler, marker pen, measuring cylinder, weighing machine/ balance, stopwatch**		
	Procedures: Able to write **five** procedures P1. P2, P3, P4 and P5 correctly. **P1 :** Steps to set up the apparatus (at least three P1) **P2 :** Steps to handle the fixed variable (one P2) **P3 :** Steps to handle the manipulated variable (one P3) **P4 :** Steps to record the responding variable (one P4) **P5 :** Precautionary steps / steps taken to get average results / readings (one P5) **Sample Answer** **1. The stem of Mustard green is cut longitudinally into 6 strips (P2) at initial length of 4 cm using a pen knife.(P1)** **2. Each strips are dried with tissue paper and weight using a balance.(P5)** **3. Initial mass of strips are recorded using a weighing balance / electronic balance.(P3)**	3	

	4. Six petri dishes were labelled as P, Q, R, S ,T and U (P1) **5. Each petri dish P, Q, R, S, T and U are filled with 20 ml distilled water, 20 ml 2%sucrose solution, 20 ml 6% sucrose solution, 20 ml 10% sucrose solution, 20ml 15% sucrose solution and 20ml 20% sucrose solution respectively.(P4)** **6. Each Mustard green strip is placed into the petri dish and stopwatch is started.(P1)** **7. After 30 minutes,(P2) the strips were removed, dried with tissue paper (P5) and weighed again by using a weighing balance / electronic. The final mass of strips are recorded by using weighing balance / electronic balance. .(P3)** **8. Calculate the percentage change in mass of Mustard green strip by using the formula:** $\frac{\text{Final mass - Initial mass}}{\text{Initial mass}} \times 100\%$ **(P3)** **9. All results are recorded in a Table.(P1)**		
	Results: Able to draw a complete table to record the relevant data base on the 3 criteria: • Concentration of sucrose solution • Mass of Mustard green stem • Percentage change in Mass of Mustard green stem **Sample Answer**	2	

Petri dish	Concentration of sucrose solution (%)	Mass of Mustard green stem (g)			Percentage change in Mass of Mustard green stem (%)
		Initial	Final	Difference	
P	Distilled water				
Q	2				
R	6				
S	10				
T	15				
U	20				

TOTAL MARKS **17**

No	Questions	Marks	Student's tips
4	Plants compete to obtain the common abiotic factors such as sunlight, water, minerals , spaces and others to survive and grow well. As a result, the stronger species will win in the competition or become dominance against the other species. Based on the above statement, plan a laboratory experiment to study the intraspecific competition between paddy plants. The planning of your experiment must include the following aspects: • Problem statement • Hypothesis • Variables • List of apparatus and materials • Experimental procedure • Presentation of data		Chapter 8
	Problem statement : Able to state the problem statement of the experiment correctly that included criteria: • Manipulated variable • Responding variable • Relation in question form and question mark (?)	3	

	Sample Answer 1. **How does the distance between the paddy seedlings affect the dry mass?** 2. **What is the dry mass of paddy seedlings grown at different distance ?** 3. **Is there any effect on the growth of paddy seedlings if they are grown at different distance ?**		
	Hypothesis Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship of the variables **Sample Answer** **The farther the distance between the paddy seedlings the higher the growth/dry mass/ any suitable parameters.**	3	
	Variables: Able to identify **all** the three variables correctly **Sample Answer** **Manipulated variable : The distance between the seedlings** **Responding variable : Dry mass / any suitable parameters** **Constant variable : Type and amount of soil / volume of water / same amount of sunlight /Type of plant.**	3	
	Material and Apparatus:	3	

	Able to state material and apparatus: Compulsory to use in : MV, RV and FV **Sample Answer** **Material : paddy seeds,soil,distilled water,** **Apparatus :four seedling plots / boxes ,signboard paint/ labelled card, brush,ruler,oven,spade,waterycan,,weighing machine/ beam balance / newton balance.**		
	Procedures: Able to write **five** procedures P1. P2, P3, P4 and P5 correctly. **P1 :** Steps to set up the apparatus (at least three P1) **P2 :** Steps to handle the fixed variable (one P2) **P3 :** Steps to handle the manipulated variable (one P3) **P4 :** Steps to record the responding variable (one P4) **P5 :** Precautionary steps / steps taken to get average results / readings (one P5) **Sample Answer** **1. Four boxes are labelled as A,B,C and D .The size of each box is 2m x 2m.(P1)** **2. 100 paddy seeds were sowed at the distance of 3cm,5cm,7cm and 10cm between each seeds in box A,B,C and D respectively. (P4/P1)** **3. The seeds in box A,B,C and D is watered daily and left to germinate and grow. (P1)** **4. After 30 days, 5 paddy plants are picked at random and removed from box A,B,C and D.(P2 /P1)** **5. The paddy plants are washed to remove the soil from the roots.(P5) The plants are then dried in an oven at 100^0C – 104^0C. The dry mass of paddy plant is measured by using an electronic balance until there is no more change in mass (P3)** **6. All the results/ average dry mass are tabulated in a table.(P1)**	3	

Results:

2

Able to draw a complete table to record the relevant data base on the 3 criteria:

- Plot / box
- Average dry mass of plants

Sample Answer

The distance between the seedlings (cm)	Average dry mass of Paddy plant (g)
3	
5	
7	
10	

TOTAL MARKS **17**

No	Questions	Marks	Student's tips
5	A group of students want to carry out a project to study the population size of rats in a food factory and a paddy field. Design an experiment that can be carried out in the field to estimate the population size of the rats. The planning of your experiment must include the following aspects: • Problem statement • Hypothesis • Variables • List of apparatus and materials • Experimental procedure • Presentation of data		
	Problem statement : Able to state the problem statement of the experiment correctly that included criteria: • Manipulated variable • Responding variable • Relation in question form and question mark (?) **Sample Answer** **1.Does the area affect the population size of rats ?** **2.What is the population size of rats in food factory and paddy field?**	3	

	Hypothesis Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship of the variables **<u>Sample Answer</u>** **The population size of rats is higher in a paddy field than in a food factory**	3	
	Variables: Able to identify **all** the three variables correctly **<u>Sample Answer</u>** **Manipulated: area/food factory and paddy field** **Responding: the population size of rats** **Fixed : the size of the area , type of rats**	3	
	Material and Apparatus: Able to state material and apparatus: Compulsory to use in : MV, RV and FV **Apparatus : Mouse trap , Indian ink/a permanent marker pen ,** **Materials : Rats**	3	

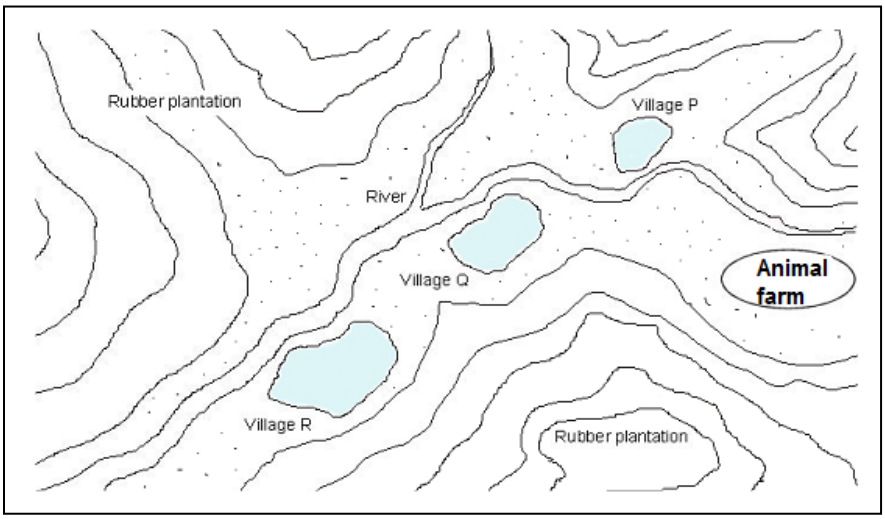
	Procedures: Able to write **five** procedures P1. P2, P3, P4 and P5 correctly. **P1 :** Steps to set up the apparatus (at least three P1) **P2 :** Steps to handle the fixed variable (one P2) **P3 :** Steps to handle the manipulated variable (one P3) **P4 :** Steps to record the responding variable (one P4) **P5 :** Precautionary steps / steps taken to get average results / readings (one P5) **Sample Answer** **1. Rats are captured at random from the food factory and a paddy field (P1/P4)** **2. The captured rats are marked by using Indian ink.(P1)** **3. The rats are released and allowed to mix freely with the other rats(P1)** **4. After three week(P2), rats are recaptured at random.(P5) The number of marked rats recaptured is recorded.(P3)** **5. The population size of the rats in the food factory and a paddy field is estimated using the following formula(P3),** **Population size = Number of rats in the first capture X Number of rats in the second capture / Number of marked rats I in the second capture** **6. All results are tabulated in a table.(P1)**	3	
	Results: Able to draw a complete table to record the relevant data based on the 5 criteria:	2	

- The places
- The number of rats in the first capture
- The number of rats in the second capture

Sample Answer

Location	The number of rats in the first capture	The number of rats in the second capture	The number of rats marked in the second capture	The population size
Food factory				
Paddy field				

TOTAL MARKS **17**

No	Questions	Marks	Student's tips
6	Three villages which residents made the above complaints are marked village P, village Q and village R. There is an animal farm at the up stream of the river. The distance between the villages and the factory are 10km, 15km and 20km respectively. Diagram 6.1 shows the location of the villages. Three samples of water are collected from the village P,Q and R.  Diagram 6.1 Design a laboratory experiment to study the level of water pollution collected from the three villages. The planning of your experiment must include the following aspects: • Problem statement • Hypothesis • Variables • List of apparatus and materials		

	• Experimental procedure • Presentation of data		
	Problem statement : Able to state the problem statement of the experiment correctly that included criteria: • Manipulated variable • Responding variable • Relation in question form and question mark (?) **Sample Answer** **1. What is the level of water pollution in different water samples?** **2. Do different water samples affect the time taken for methylene blue to decolourise?**	3	
	Hypothesis Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship of the variables **Sample Answer** **The time taken for the methylene blue solution to decolourise in river P is faster than river Q and R.**	3	
	Variables: Able to identify **all** the three variables correctly	3	

	Sample Answer **Manipulated: the sample of water from different rivers** **Responding: time taken for methylene blue to decolourise/level of water polution** **Fixed : volume of water sample //volume of methylene blue //concentration of methylene blue**		
	Material and Apparatus: Able to state material and apparatus: Compulsory to use in : MV, RV and FV **Apparatus : reagent bottle with stopper**, **beaker, syringe, stopwatch** **Materials : Water sample(at least 4 type), methylene blue solution(0.1%)**	3	
	Procedures: Able to write **five** procedures P1. P2, P3, P4 and P5 correctly. **P1 :** Steps to set up the apparatus (at least three P1) **P2 :** Steps to handle the fixed variable (one P2) **P3 :** Steps to handle the manipulated variable (one P3) **P4 :** Steps to record the responding variable (one P4) **P5 :** Precautionary steps / steps taken to get average results / readings (one P5)	3	

	Sample Answer 1. **Water samples are collected from village P,Q and R.(P1/P4)** 2. **Three reagent bottles are labelled as A,B, and C (P1)** 3. **Each reagent bottle is filled with the following water sample. (P4)** **A-water from village P** **B-water from village Q** **C-water from village R** 4. **1ml of methylene blue solution is added (P2) by using a syringe (P1) to the base of each water sample (P5)** 5. **Each reagent bottle is then closed quickly with a stopper (P5).** 6. **The reagent bottle cannot be shaken. (P5)** 7. **Each reagent bottle is kept in a dark place(cupboard) (P1) and the the stopwatch is started. (P1)** 8. **The bottles are examined from time to time. (P1)** 9. **The time taken for methylene blue to decolourise is measure by using a stopwatch (P3) and the data is recorded in a table (P1)**		
	Results: Able to draw a complete table to record the relevant data based on the 3 criteria: • Source of water • Time taken to decolourise methylene blue solution • Level of water pollution	2	

Sample Answer

Source of water	Time taken to decolourise methylene blue solution (hours)	Level of water pollution
Village P		
Village Q		
Village R		

TOTAL MARKS **17**

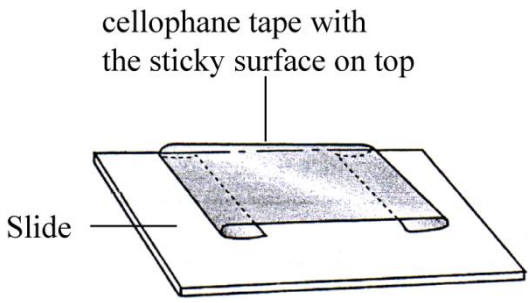
No	Questions http://cikguadura.wordpress.com/	Marks	Student's tips
7	Pollutants such as soot, lead, carbon monoxide, hydrocarbon, smog and haze enter the air from various sources. Based on the above information, design an experiment to study the level of air pollution caused by solid pollutants from different places. The planning of your experiment must include the following aspects: • Problem statement • Hypothesis • Variables • List of apparatus and materials • Experimental procedure • Presentation of data		Chapter 9
	Problem statement : Able to state the problem statement of the experiment correctly that included criteria: • Manipulated variable • Responding variable • Relation in question form and question mark (?)	3	

	Sample Answer **Problem statement:** 1. **What is the level of air pollution cause by solid pollutants in different places.?** **2 Do the different places affect the level of air pollution cause by solid pollutants?** **3. Which place has the highest level air pollution caused by amount of solid pollutants?**		
	Hypothesis Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship of the variables • **Sample Answer** **1. The Amount / quantity of solid pollutants/level of air pollution is the highest at the school gate near to the car park compare to other places.**	3	
	Variables: Able to identify **all** the three variables correctly **Sample Answer** **Manipulated variable:** Different places **Responding variable:** Amount / quantity of solid pollutants **Controlled variable :** Cellophane tape size // time expose.	3	

	Material and Apparatus: Able to state material and apparatus: Compulsory to use in : MV, RV and FV **Sample Answer** **Apparatus : Four clean Glass slide ,Scissor, transparency grid 10cm x 10 cm, light microscope.** **Materials : Cellophane tape**	3	
	Procedures: Able to write **five** procedures P1. P2, P3, P4 and P5 correctly. **P1 :** Steps to set up the apparatus (at least three P1) **P2 :** Steps to handle the fixed variable (one P2) **P3 :** Steps to handle the manipulated variable (one P3) **P4 :** Steps to record the responding variable (one P4) **P5 :** Precautionary steps / steps taken to get average results / readings (one P5)	3	

Sample Answer

1. **Four clean glass slides each with a cellophane tape were prepared as shown in the diagram.(P1)**



2. **Make sure the length of the cellophane tape is equal for sets.(P2)**
3. **Label the four slides as P, Q, R and S(P1). Place each of them in the following places.(P4)**
   - **P : covered petri dish and put on the table in the laboratory**
   - **Q : tied to the school gate near to the car park**
   - **R : beside the laboratory window**
   - **S : in an air-conditioned room**
4. **Your hand must be clean during carry out the experiment and does not touch the sticky surface on the cellophane (P5)**
5. **After a week(P2), collect the slides and Place the transparency with grid size 10cm x 10cm (P2) on them. Count the number of the squares on the grid contained more than half of the solid pollutans.**

8. **Calculate the percentage coverage of the solid pollutans by using formula(P3);**

$$\text{Percentage coverage} = \frac{\text{total area containing solid pollutans (cm}^2\text{)}}{\text{number of quadrat X quadrat area}} \times 100\%$$

Results:

Able to draw a complete table to record the relevant data base on the 3 criteria:

- **Location of the grid**
- **Total area covered by solid pollutants**
- **Percentage coverage**

Sample Answer

Location of the slaids	P	Q	R	S
Total area covered by solid pollutants (cm^2)				
Percentage coverage by solid pollutants (%)				

2

TOTAL MARKS **17**

No	Questions	Marks	Student's tips
8	Variation within a species causes some individuals to adapt better to environmental conditions and changes. These individuals are better adapted for survival than others. They will survive and transmit the advantageous genes to their offspring. The better adapted ones increasing in population. Based on the above information, design an experiment to show how variation of the snails *Cepaea nemoralis* which exist in a variety of colours able to survive in different environmental condition. Note :  * Yellow-shelled snails better adapted to the sun and high temperature. • Brown-shelled snails survived best at an apparently cool site and worst at an exposed one The planning of your experiment must include the following aspects: • Problem statement • Hypothesis • Variables • List of apparatus and materials • Experimental procedure • Presentation of data		

	Problem statement : Able to state the problem statement of the experiment correctly that included criteria: • Manipulated variable • Responding variable • Relation in question form and question mark (?) **Sample Answer** **1. Does the light intensity affect the population /number of Yellow-shelled and brown-shelled snails survived?** **2. Does Yellow-shelled snails survive better in high/low light intensity compare to Brown-shelled snails?.** **3. Which type of snails (Yellow-shelled snails or Brown-shelled snails) can survive more in high/low light intensity ?**	3	
	Hypothesis Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship of the variables **Sample Answer** **Population of yellow-shelled snails survive better in high light intensity environmental condition compare to Brown-shelled snails .**	3	

	Variables: Able to identify **all** the three variables correctly **Sample Answer** **Manipulated variable: light intensity / environmental condition** **Responding variable: Population /Number of Yellow-shelled and brown-shelled snails survived** **Controlled variable : cage size/amount of food.**	3	
	Material and Apparatus: Able to state material and apparatus: Compulsory to use in : MV, RV and FV **Sample Answer** **Apparatus : experimental population cage , lamp, thermometer** **Materials : Yellow-shelled snails, Brown-shelled snails**	3	
	Procedures: Able to write **five** procedures P1. P2, P3, P4 and P5 correctly. **P1 :** Steps to set up the apparatus (at least three P1) **P2 :** Steps to handle the fixed variable (one P2) **P3 :** Steps to handle the manipulated variable (one P3) **P4 :** Steps to record the responding variable (one P4) **P5 :** Precautionary steps / steps taken to get average results / readings (one P5)	3	

Sample Answer

1. **Prepare two experimental population cage with the size of 1m x 1m then label as P and Q.(P1)**
2. **Both cage P and Q are provided with food and suitable pH and humidity .(P1)**
3. **50 Yellow-shelled snails and 50 Brown-shelled snails are put into each experimental population cage P and Q.(P1)**
4. **Exposed experimental population cage P to light from the lamp.(P1)**
5. **Keep experimental population cage Q away from light (in the dark room) and make sure the condition is cool.(P4)**
6. **Supply same amount of food and humidity for both experimental population cage for two weeks (P2)**
7. **After two weeks count and record the number of Yellow-shelled snails and Brown-shelled snails from both experimental population cage P and Q.(P3)**
8. **Repeat step 1-7 to get an average reading.(P5)**
9. **All results are recorded in a Table.(P1)**

Results: 2

Able to draw a complete table to record the relevant data base on the 3 criteria:

- Environmental condition
- Number of Yellow-shelled snails / unit
- Number of Brown-shelled snails / unit

Sample Answer

Environmental Condition/ light intensity	Number of Yellow-shelled snails / unit		Number of Brown-shelled snails / unit	
	At the begining	After two weeks	At the begining	After two weeks
High light intensity	50		50	
Low light intensity	50		50	

TOTAL MARKS **17**

No	Questions	Marks	Student's tips
9	Enzyme is an organic substances which can be found in all living cells. Enzyme's activity is influenced by several factors such as temperature, pH, substrate concentration and enzyme concentration. Based on the above information, design a laboratory experiment to investigate the effects of albumen concentration on the activity of pepsin. The planning of your experiment must include the following aspects: • Problem statement • Hypothesis • Variables • List of apparatus and materials • Experimental procedure • Presentation of data		Chapter 4
	Problem statement : Able to state the problem statement of the experiment correctly that included criteria: • Manipulated variable • Responding variable • Relation in question form and question mark (?)	3	

	Sample Answer 1. **How does the albumen concentration affect the time taken for the albumen suspention to becomes clear.** 2. **What is the effect of (different) albumen concentration on the rate of (pepsin) enzyme reaction ?** 3. **Can/Will/Does the (different) albumen concentration affect the rate of (pepsin) enzyme reaction?**		
	Hypothesis Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship of the variables • **Sample Answer** The higher **the concentration of albumin** , the higher **the rate of enzyme pepsin reaction**.	3	
	Variables: Able to identify **all** the three variables correctly **Sample Answer** **Manipulated:** albumen concentration. **Responding:** The rate of enzyme reaction // The time taken for the albumen change from cloudy to clear **Fixed :** The concentration of the pepsin / The volume of the pepsin solution / The volume albumen suspension**/**temperature/pH.	3	

	Material and Apparatus: Able to state material and apparatus: Compulsory to use in : MV, RV and FV **Sample Answer** **Materials: different concentration albumen suspension(1%,2%, 3% and 4% albumen suspension), 1% pepsin solution, 0.1M hydrochloric acid,** **Apparatus:pipette / measuring cylinder, test tubes, water bath (beaker,bunsen burner & thermometer), stop-watch, dropper**	3	
	Procedures: Able to write **five** procedures P1. P2, P3, P4 and P5 correctly. **P1 :** Steps to set up the apparatus (at least three P1) **P2 :** Steps to handle the fixed variable (one P2) **P3 :** Steps to handle the manipulated variable (one P3) **P4 :** Steps to record the responding variable (one P4) **P5 :** Precautionary steps / steps taken to get average results / readings (one P5) **Sample Answer** **1. 5ml (P2) of 1% (P2) albumen suspension is transferred / poured (P1) into a test-tube using a measuring cylinder (P1). The test-tube is labeled P.** **2. 1ml of (0.1M) hydrochloric acid is poured into the same test-tube (P1) using a measuring cylinder.** **3. 1ml of 1% pepsin is poured into the same test-tube (P1) using a measuring cylinder. The mixture is shake well (P1).** **4. The test-tube is placed in a water bath (P1) containing 300ml of water at 37°C. The stop-watch is started.** **5. The time taken for mixture to turn clear is measured by using a stopwatch(P3) and recorded in a table (P1).**	3	

6. **Steps 1 to 5 are repeated, by replacing the 1% albumen suspension with <u>2%, 3% and 4% albumen suspension (P4)</u> respectively.**
7. **<u>Steps 1 to 6 are repeated three times to get an average result (P5)</u>.**
8. **All the data are recorded in a table.(P1).**

Results: 2

Able to draw a complete table to record the relevant data base on the 3 criteria:

- Concentration of albumen / substrate solution
- Time taken for the mixture to turn colourless
- The rate of enzyme reaction

<u>Sample Answer</u>

Concentration of albumen / substrate solution (%)	Time taken for the mixture to turn clear (min)				The rate of enzyme reaction (min^{-1})
	1	2	3	Average	
1					
2					
3					
4					

TOTAL MARKS **17**