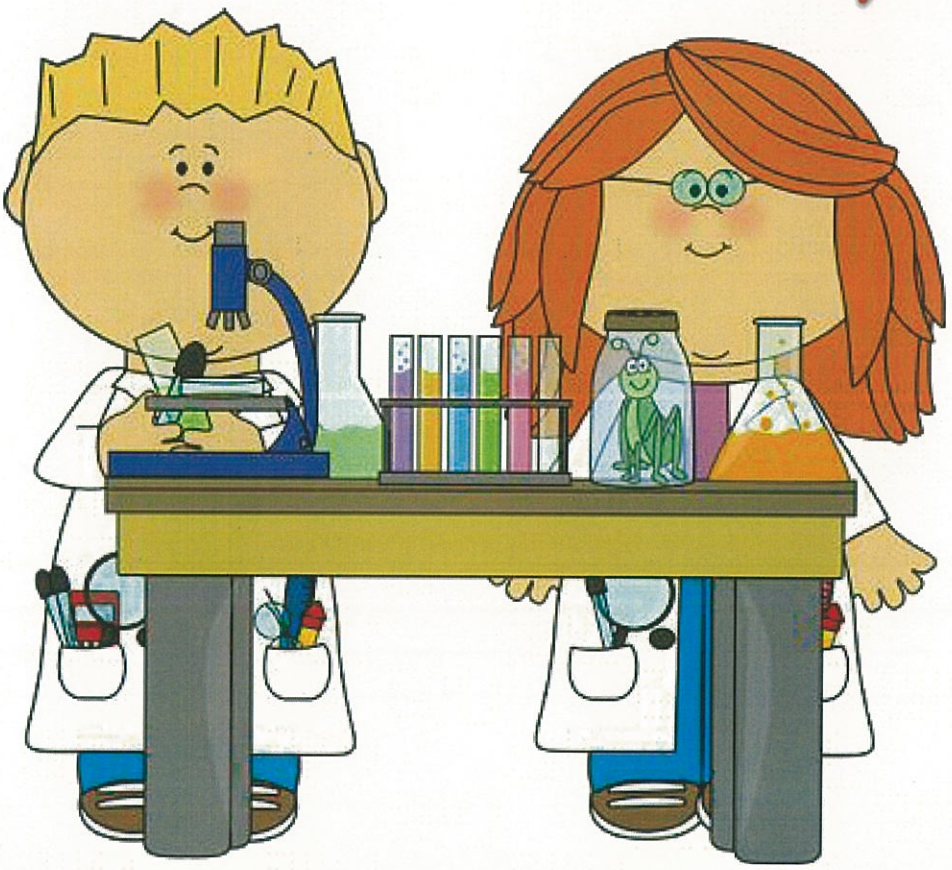
SPM BIOLOGY

EXCEL PAPER 3 MODULE

FORM 5



NAME : _____

FORM : _____

https://wickedbiology.wordpress.com

ANALYSIS OF THE 2008 – 2014 SPM PAPERS

	CHAPTER	2008	2009	2010	2011	2012	2013	2014
	FORM 4							
1.	Introduction to Biology							
2.	Cell Structure and Cell Organisation							
3.	Movement of Substances across the Plasma Membrane	1					1	
4.	Chemical Composition of the Cell		1		1			
5.	Cell Division							
6.	Nutrition		1			1	1	
7.	Respiration			1				
8.	Dynamic Ecosystem	1		1				
9.	Endangered Ecosystem							1
	FORM 5							
1.	Transport				1			
2.	Support & Locomotion							
3.	Coordination & Response					1		
4.	Reproduction							
5.	Inheritance							
6.	Variation							1
	TOTAL	2	2	2	2	2	2	2

SPM BIOLOGY (PAPER 3)

CORRECT ANSWERING TECHNIQUES

1. OVERVIEW

- Consist of 2 Questions – 1 ½ Hours
- 50 marks
- Question 1 : 33 marks , Question 2 : 17 marks
- Test on Scientific Skills
- Based on Practical / Experiments / Field Works

2. QUESTION 1 (33 MARKS)

Example of question:

Lemna minor is a species of free-floating aquatic plants from the duckweed family Lemnaceae. The plants grow mainly by vegetative reproduction: two daughter plants bud off from the adult plant.

An experiment is carried out to investigate the effect of abiotic factor such as pH on *Lemna* sp. growth. Experiment is done under controlled conditions: 12 hours a day light exposure and using the same Knop's solution.
Petri dish is filled with 20 ml Knop's solution with different pH value and 5 *Lemna* sp. each.
The Knop's solution is treated by adding acid or alkali to achieve the pH value needed.

** **Knop's solution** is a solution which contains essential nutrient for plants growth.

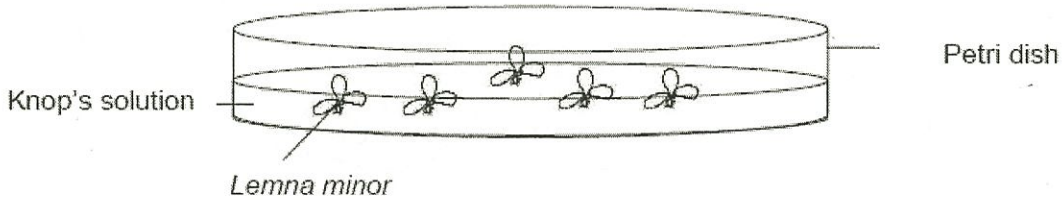
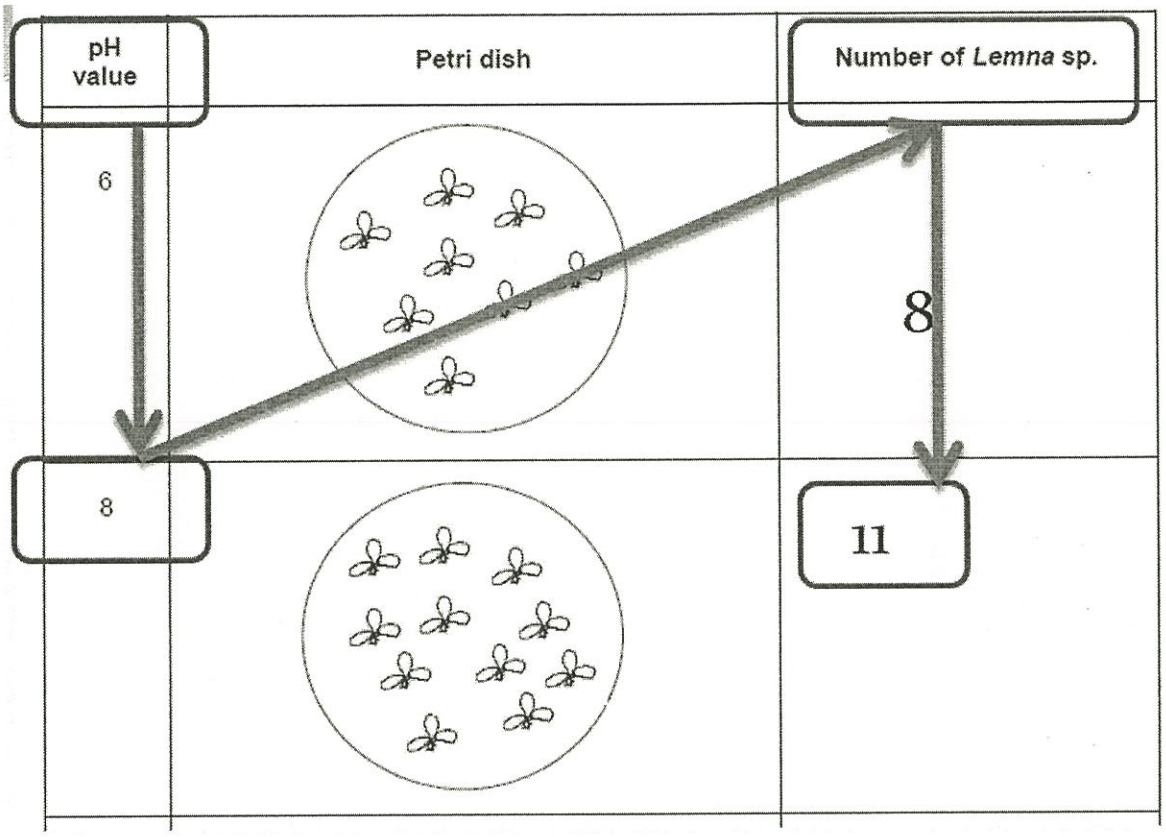


Figure 1

After 7 days, the observation is made and the result shown in Table 1.1

a. Observation

- State two **extreme** observations
- State the meaningful observations
- Consist of MANIPULATED VARIABLES and RESPONDING VARIABLES
- Observations can be in parallel / vertical form
- Preferable : Sentences which state the VALUES read from the given apparatus



Sample answer *(HORIZONTAL OBSERVATION)*

(b) (i) Based on Table 1.1, state two observations that can be made in this experiment.

Observation 1:

Manipulated Variable *Responding Variable*

At pH 12 (Knop solution), the number of Lemna sp is 1

Observation 2:

At pH 8(Knop solution), the number of Lemna sp is 11

[3 marks]

Sample answer *(VERTICAL OBSERVATION)*

(b) (i) Based on Table 1.1, state two observations that can be made in this experiment.

Observation 1:

Manipulated Variable — *Responding Variable*

At pH 12 (Knop solution), the number of Lemna sp grow is less than at pH 2/4/6/8/10

Observation 2:

At pH 8 (Knop solution), the number of Lemna sp is more than at pH 2/4/6/10/12

[3 marks

b. Making inference

- Inference 1 is for observation 1
- Inference 2 is for observation 2
- Inference is an early conclusion based on the experimental observations
- Inference may include reasons

Sample answer

(ii) State the inference for each observation made in (b) (i).

Inference for observation 1:

Strong acidic condition is not favorable for *Lemna* growth

Inference for observation 2:

Neutral / Slight alkaline condition is the best / most favorable condition for *Lemna* growth

[3 marks]

c. Measuring and using numbers

- Record the reading of the thermometer , stopwatch, measuring tools, ruler, etc. from the given diagram
- Do not forget the **UNITS**
- Up to 2 decimal points

d. Communicating data

- Table must be completed with UNITS and TITLES for the column and row
- Fill up the complete information given
- Transfer the information correctly
- If there is calculation, show the method with a complete unit / state the formula

Sample answer

pH of water	Number of *Lemna* sp
2	4
4	5
6	8
8	11
10	5
12	1

e. Interpreting data (Explain / State the Relationship)

- Construct sentence that shows relationship between variables mentioned in a question
- State the details of relationships

Sample answer

In the acidic medium the *Lemna sp*. growth is less, and increase when the medium become neutral but decrease when in alkali condition

f. Controlling variables

- State only ONE Variable for each type
- State how the variables are operated

Variables (STATE)	Method to handle the variables (MUST USE VERB)
Manipulated	**Use** / .....state the values or **different**
Responding	By **measuring / calculating** and **recording** ..... **using** ..... **State the apparatus used**
Controlled	**Use** the same ..... / **Maintain / Fix** .....**state the values**

Sample answer

Variables	Method to handle the variables
Manipulated: pH	**Add / Use** acid or alkali to the Knop solution to get **different** pH condition **Use** pH solution : pH 2, pH 4, pH 6, pH 8, pH 10, pH 12 **Change / alter** the medium condition
Responding : Number of *Lemna* sp.	**Count** and **record** the number of *Lemna sp.* plants after 7 days
Controlled Light exposure / Volume of Knop solution	**Fix** 12 hours light exposure **every day** **Maintain** the volume at **20 ml**

g. State hypothesis

- Able to state the hypothesis correctly based on the following criteria :
  - P1 : State the MV
  - P2 : State the RV
  - H : Relate P1 & P2
- The sentence that you write must show the relationship between MV and RV
- The more / the less ..... Manipulated Variables .....the more / the less ..... Responding Variables

Sample answer

h. Predicting

IF THE EXPERIMENT IS REPEATED .....PREDICT THE OBSERVATION .....

- Predict by stating whether the will be an **increase** or a **decrease**? **More**? / **Less**? / **Same**?
- May state the **values** which are suitable and suitable and will be accepted within the range
- And give the **reason** for predicting it so

Sample answer

Less / very small population of *Lemna sp*, because water is contaminated with soap/ detergent that contain alkali which is not favourable for *Lemna* to grow

i. Defining operationally

- Answer must be based on experiment not theory
- Consist of the followings :
  - WHAT IT IS : State the phrase that is going to define
  - WHAT IT DOES : Indicators (apparatus used / Responding Variables)
  - AFFECTED BY WHAT : Influenced by Manipulated Variables)

Sample answer

Abiotic factor is the pH of the medium that affect the *Lemna sp*. growth in an ecosystem

j. Classifying

- Complete the given table according to the title
- If the table is not provided, construct the table according to the classification given
- Divide rows and columns according to types / different functions

Abiotic factors	*Biotic factors*
Humidity	Decomposer
Light intensity	Parasite
Soil texture	Symbiotic organism
Topography	invertebrates

k. Correlating time and space

Able to draw the graph correctly:

- Axis : correct the title **with units, uniform scale**
- All points **plotted correctly**
- Able to join points to form smooth graph

3. **QUESTION 2 (17 MARKS)**

- **Planning / Designing** experiment
- 17 marks
- 9 aspects

a. Problem statement

- What is the effect of ..... MV .....on ..... RV .....?
- MUST BE IN QUESTION FORM
- Does / Is / What / How does .....?

b. Hypothesis

- The more .....MV ..... the more / less .....RV.....?
- If the .....
- A statement that shows relationship between the two variables : MV and RV

c. Variables

- Manipulated (MV)
- Responding (RV)
- Fixed (FV)

  * State only ONE variable for each

d. List of apparatus and materials

- List ALL functional MATERIALS and APPARATUS

e. **Experimental procedure or method**

- P1 – Preparation of materials and apparatus
- P2 – Operating Control Variables
- P3 – Operating Responding Variables
- P4 – Operating Manipulated Variables
- P5 – Precautions / Accuracy of experiment

Meaningful sentences:

1. Repeat steps 1 – 5 by using .....
2. Record result / mass / temperature in a Table

f. Presentation of data (Result)

- Prepare a Table which is complete with :
  i. Title for column and row
  ii. Correct units
  iii. No result / data is required in the table

Answer all the questions.
[50 marks]

1. An experiment was carried out to study the effect of different activities on heartbeat rates. The experiment is carried out by the same student.
Satu eksperimen telah dijalankan untuk mengkaji kesan aktiviti yang berbeza ke atas kadar denyutan jantung. Eksperimen dijalankan oleh pelajar yang sama.

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

- The student is asked to jogs on the spot for 5 minutes.
Pelajar tersebut diarahkan untuk berlari setempat selama 5 minit.

- The time taken to obtain 35 heartbeats is measured by using heartbeat monitor watch immediately after the activity as shown in Diagram 1.
Masa yang diambil untuk mendapatkan 35 denyutan jantung diukur sejurus selepas aktiviti dilakukan menggunakan jam yang mengukur denyutan jantung seperti yang ditunjukkan dalam Rajah 1.

- The experiment is repeated by the student who jogs on the spot for 10 minutes and 15 minutes.
Eksperimen diulang oleh pelajar tersebut yang berlari setempat selama10 minit dan 15 minit.

Diagram 1/*Rajah 1*

Table 1.1 shows the result of the experiment.
Jadual 1.1 menunjukkan keputusan eksperimen ini.

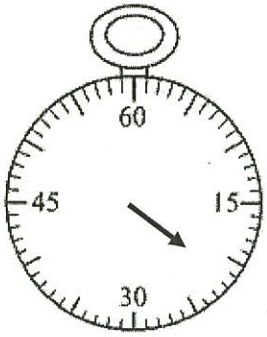
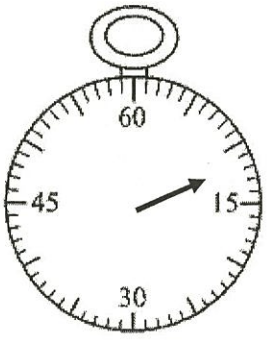
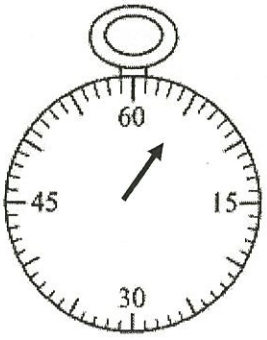
Duration of activity (min) *Tempoh aktiviti (min)*	**Time taken for 35 heartbeat (second)** *Masa yang diambil bagi 35 denyutan jantung (saat)*
 Jogging on the spot for 5 minutes	
 Jogging on the spot for 10 minutes	
 Jogging on the spot for 15 minutes	

Table 1.1/*Jadual 1.1*

For Examiner's Use

(a) Record the time taken to obtain 35 heartbeats in Table 1.1.
Rekod masa yang diambil bagi memperoleh 35 denyutan jantung dalam Jadual 1.1.

[3 marks/*3 markah*]

(b) (i) State two different observations based on Table 1.1.
Nyatakan dua pemerhatian yang berbeza berdasarkan Jadual 1.1.

Observation 1
Pemerhatian 1

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Observation 2
Pemerhatian 2

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[3 marks/*3 markah*]

(ii) State the inference from the observations in 1(b)(i).
Nyatakan inferens dari pemerhatian dalam 1(b)(i).

Inference for observation 1
Inferens terhadap pemerhatian 1

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Inference for observation 2
Inferens terhadap pemerhatian 2

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[3 marks/*3 markah*]

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

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[3 *marks*]
[3 markah]

(c) Complete Table 1.2 based on this experiment.
Lengkapkan Jadual 1.2 berdasarkan eksperimen ini.

For Examiner's Use

Variables *Pembolehubah*	Method to handle the variables *Cara mengendali pembolehubah*
Manipulated variable *Pembolehubah dimanipulasi*	....
Responding variable *Pembolehubah bergerakbalas*	....
Controlled variable *Pembolehubah dimalarkan*	....

Table 1.2/*Jadual 1.2*

[3 *marks*/*3 markah*]

For Examiner's Use

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

- Duration of activity
  Tempoh aktiviti
- Time taken to obtain 35 heartbeats
  Masa yang diambil untuk memperoleh 35 denyutan jantung
- Rate of heartbeat
  Kadar denyutan jantung

$$\text{Rate of heartbeat / } \textit{Kadar denyutan jantung} = \frac{\text{Number of heartbeat / } \textit{Bilangan denyutan jantung}}{\text{Time / } \textit{Masa}}$$

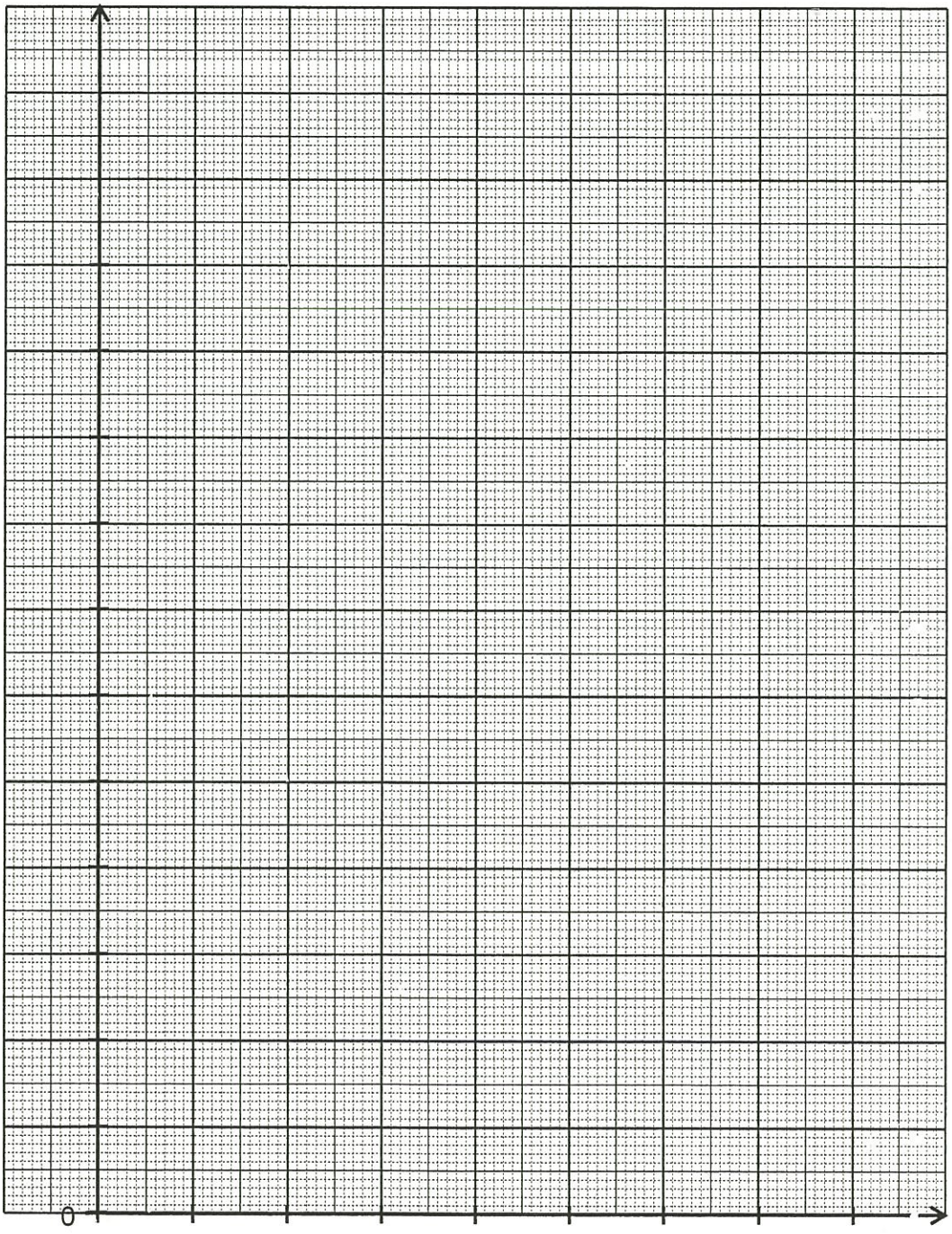
[3 marks/*3 markah*]

(e) (ii) Use the graph paper provided on page 8 to answer this question.
Using the data i(e)(i), draw a graph of rate of heartbeat against the duration of activity.
Guna kertas graf yang disediakan di halaman 8 untuk menjawab soalan ini.
Gunakan data dalam 1(e)(i), lukis satu graf kadar denyutan jantung melawan tempoh aktiviti.

[3 marks/*3 markah*]

Graph of rate of heartbeat against duration of activity
Graf kadar denyutan jantung melawan tempoh aktiviti

Rate of heartbeat (second^{-1})
Kadar denyutan jantung (saat $^{-1}$)



Duration of activity (min)
Tempoh aktiviti (min)

(iii) Based on the graph, explain the relationship between the rate of heartbeat and the duration of activity.
Berdasarkan graf, terangkan hubungan antara kadar denyutan jantung dan tempoh aktiviti.

For Examiner's Use

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[3 marks/*3 markah*]

(f) Based on the result of the experiment, state the operational definition for heartbeat.
Berdasarkan keputusan eksperimen, nyatakan definisi secara operasi bagi denyutan jantung.

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[3 marks/*3 markah*]

(g) The student is tired after completing the activities. So, he takes a rest by sitting on a chair under a fan.
Predict the time taken for him to obtain 35 heartbeats.
Explain your answer.
Pelajar itu berasa penat selepas menyelesaikan semua aktiviti. Oleh yang demikian, dia berehat sambil duduk di atas kerusi di bawah kipas.
Ramalkan masa yang diambil untuknya memperoleh 35 denyutan jantung.
Terangkan jawapan anda.

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[3 marks/*3 markah*]

(h) The average normal heart rate in adult is about 72 heartbeats per minute. Classify the following situations according to appropriate heartbeat rate in Table 1.3.
Purata kadar denyutan jantung yang normal bagi seorang dewasa adalah 72 denyutan per minit. Kelaskan situasi berikut berdasarkan kadar denyutan jantung yang sesuai dalam Jadual 1.3.

Swimming *Berenang*	Reading magazine *Membaca majalah*
Sleeping *Tidur*	Gardening *Berkebun*
Praying *Sembahyang*	Cross country running *Berlari merentas desa*

Heartbeat rate ***Kadar denyutan jantung***	**Situation** ***Situasi***
Normal *Normal*	
Increases *Meningkat*	

Table 1.3/*Jadual 1.3*

[3 marks/*3 markah*]

Q1 Total

Answer all questions

Question 1
Soalan 1

A group of student carried out an experiment to study on the transpiration rate of a plant shoot. The factors that cause water loss from the leaves are light intensity, temperature, air movement and humidity.
Sekumpulan pelajar menjalankan eksperimen untuk mengkaji kadar transpirasi pucuk tumbuhan. Faktor-faktor yang menyebabkan kehilangan air daripada daun-daun adalah keamatan cahaya, suhu, pergerakan udara dan kelembapan udara.

Diagram 1.1 shows the apparatus set-up used in this experiment. The apparatus are prepared and kept in laboratory to study the effect of different temperature on the transpiration rate of plant shoot
Rajah 1.1 menunjukkan susunan radas yang digunakan dalam eksperimen ini. Radas disediakan dan disimpan di dalam makmal untuk mengkaji kesan suhu berlainan ke atas kadar transpirasi pucuk tumbuhan.

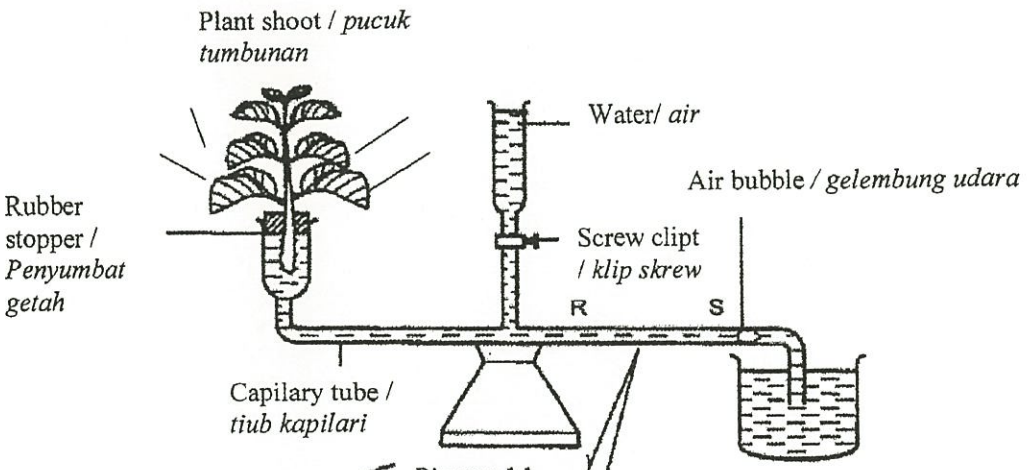


Diagram 1.1
/Rajah 1.1

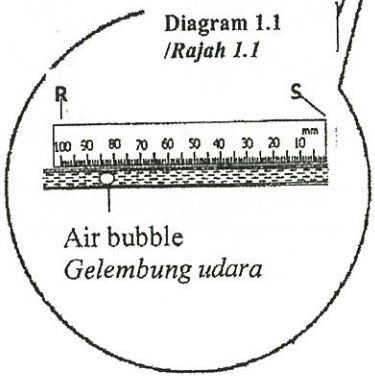
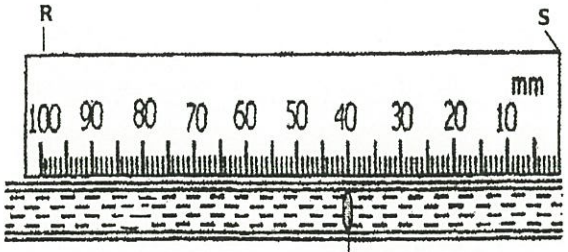
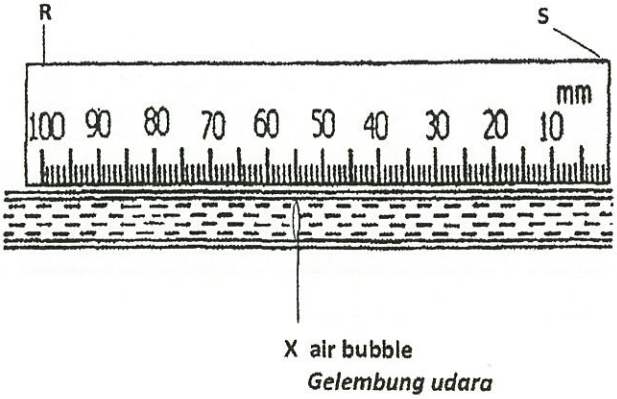


Diagram 1.2
/Rajah 1.2

Diagram 1.2 shows the position of the distance travelled by air bubble in 5 minutes. Two points, R and S are marked with 100 mm distance at the Potometer's tube.

Rajah 1.2 menunjukkan kedudukan jarak pergerakan gelembung udara. Dua titik R dan S ditanda dengan jarak 100 mm pada tiub potometer.

Table 1.3 shows the temperature and the final distance travelled by air bubble at the potometer after 5 minutes.
Jadual 1.3 menunjukkan suhu dan jarak akhir pergerakan gelembung udara pada potometer selepas 5 minit.

Temperature / *suhu* ^0C	The final distance travelled by air bubble after 5 minutes / mm *Jarak akhir pergerakan gelembung udara selepas 5 minit /mm*
20	
30	

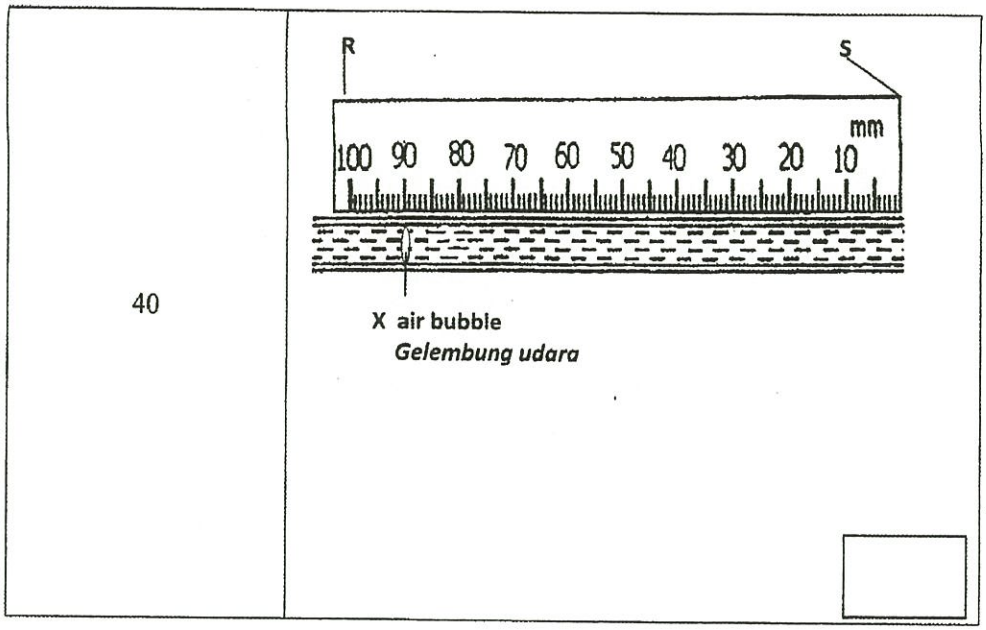


Table 1.3
Jadual 1.3

(a) Complete the Table 1.3 by recording the final distance travelled by air bubble after 5 minutes

Lengkapkan Jadual 1.3 dengan merekodkan kedudukan akhir jarak pergerakan gelembung udara selepas 5 minit.

[3 *marks*]
[3 *markah*]

For Examiner's Use

1(a)

(b)(i) Based on table 1.3 state **two** observations on this experiment.
Berdasarkan Jadual 1.3, nyatakan dua pemerhatian ke atas eksperimen ini.

Observation1/ *Pemerhatian* 1:

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.....

.....

Observation 2/ *Pemerhatian 2*:

.....

.....

.....

[3 *marks*]
[3 *markah*]

1(b)(i)

For Examiner's Use

1(b)(ii)

(ii) State the inference which corresponds to the observations in 1 (b)(i)
Nyatakan inferens yang sepadan dengan pemerhatian di 1(b)(i)

Inference from observation 1:
Inferens daripada pemerhatian 1:

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.....

Inference from observation 2:
Inferens daripada pemerhatian 2:

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.....

[3 *marks*]
[3 *markah*]

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

Variable *Pembolehubah*	Method to handle the variable *Cara mengendali pembolehubah*
Manipulated variable: *Pembolehubah dimanipulasikan:*	....
Responding variable: *Pembolehubah bergerakbalas:*	....

For Examiner's Use

Constant variable: *Pembolehubah dimalarkan:*	.....
.....	.....
.....	.....
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1(c)

Table 2
Jadual 2

[3 *marks*]
[3 *markah*]

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

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1(d)

[3 *marks*]
[3 *markah*]

(e)(i) Based on the Table 1.2, construct a table and record the results of this experiment which includes the following aspects:

Berdasarkan Jadual 1.2, bina satu jadual dan rekodkan keputusan eksperimen ini dimana termasuk aspek-aspek berikut:

- Temperature
  Suhu
- The final distance travelled by air bubble
  Jarak akhir pergerakan gelembung udara
- Rate of transpiration
  Kadar transpirasi

  Use the formula:
  [Rate of transpiration = $\frac{\text{final distance travelled by air bubble}}{\text{Time}}$]

  Gunakan formula:
  [Kadar transpirasi = $\frac{\text{Jarak akhir pergerakan gelembung gas}}{\text{Masa}}$]

For Examiner's Use

1(e)(i)

[3 *marks*]
[3 *markah*]

(e)(ii) Use the graph paper provided on page 11 to answer this question.
Using the data in 1(e)(i), draw a graph on rate of transpiration against the temperature.
Guna kertas graf yang disediakan di halaman 11 untuk menjawab soalan ini. Menggunakan data di 1(e)(i), lukis graf ke atas kadar transpirasi melawan suhu.

1(e)(ii)

[3 *marks*]
[3 *markah*]

(f) Based on the graph in 1(e)(ii), explain the relationship between the rate of transpiration and temperature.
Berdasarkan graf di 1(e)(ii). Terangkan hubungan di antara kadar transpirasi dengan suhu.

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1(f)

[3 *marks*]
[3 *markah*]

(g) This experiment is repeated by using the same set of apparatus but a transparent polythene beg was used to cover the plant shoot with anhydrous sodium chloride. Predict the final distance travelled by air bubble at temperature of 40^0C. Explain your prediction.

Eksperimen ini diulangi dengan menggunakan susunan radas yang sama tetapi menggunakan beg politena yang lutsinar untuk menutup pucuk tumbuhan bersama natrium klorida kontang.
Ramalkan jarak akhir pergerakan gelembung udara pada suhu 40^0C.

Terangkan ramalan anda.

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[3 *marks*]
[3 *markah*]

For Examiner's Use

1(g)

(h) Based on this experiment , deduce operationally for transpiration.
Berdasarkan eksperimen ini, definisi secara operasi bagi transpirasi.

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.....

[3 *marks*]
[3 *markah*]

1(h)

(i) These students found that, the rate of transpiration depends on the factors of transpiration. They list out several factors that affect the rate of transpiration as follows:
Pelajar-pelajar ini mendapati bahawa kadar transpirasi bergantung kepada faktor transpirasi. Mereka telah menyenaraikan beberapa faktor yang mempengaruhi kadar transpirasi seperti berikut :

For Examiner's Use

Light intensity, number of leaves, place for stoma, air movement
keamatan cahaya, bilangan daun, kedudukan stoma, tiupan angin,

wax cuticle, size of leaf, air humidity, curld leaf
kutikel berlilin, saiz daun, kelembapan udara, daun bergulung

Categorised the above factors based on the morphological factor or environmental factor.
Kategorikan faktor-faktor di atas berdasarkan sama ada faktor morfologi atau faktor persekitaran.

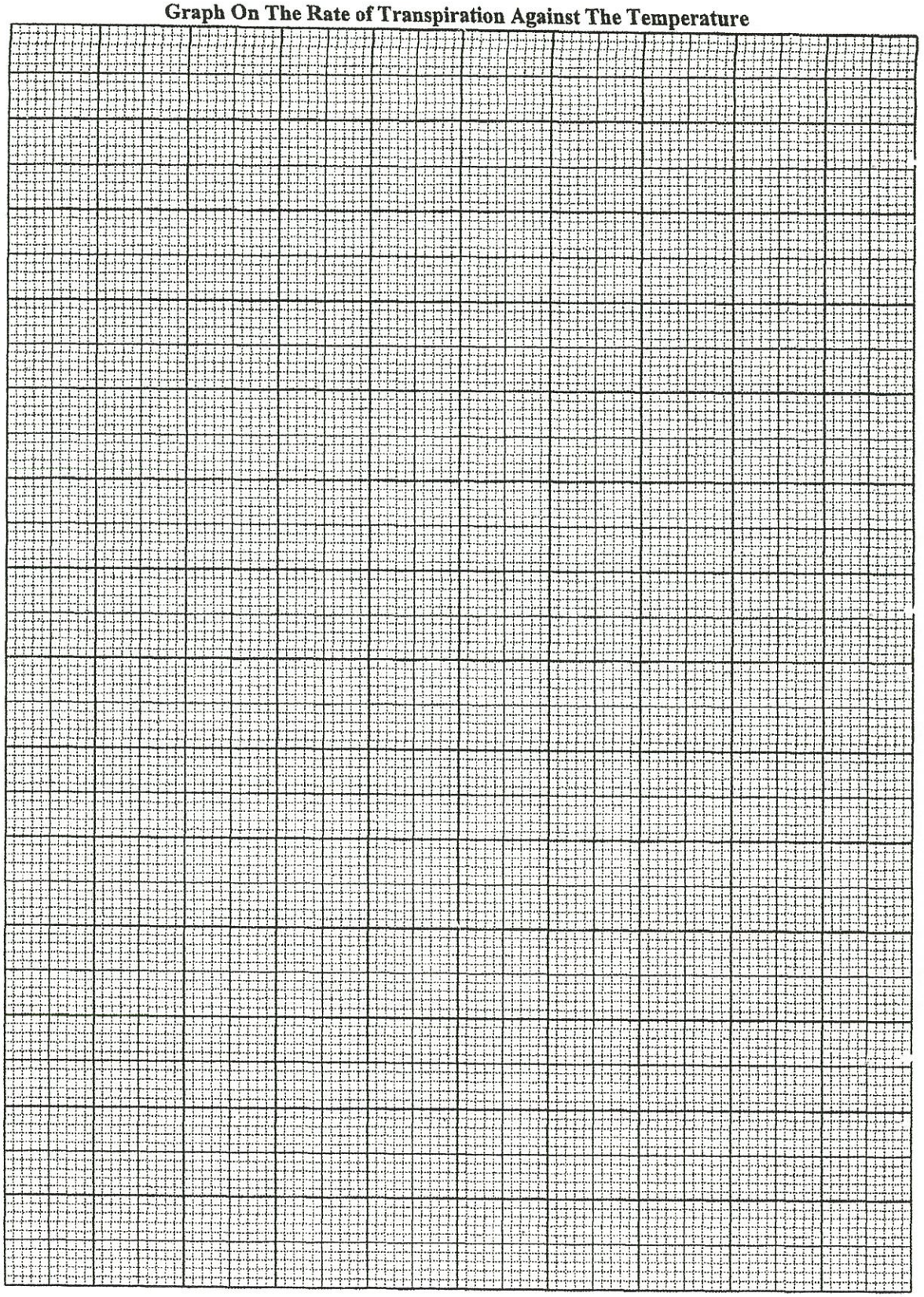
Morphological Factor *Faktor morfologi*	Environmental Factor *Faktor persekitaran*

1(i)

Table 3
Jadual 3

[3 *marks*]
[3 *markah*]

Graph On The Rate of Transpiration Against The Temperature



2.

Information: Besides producing a cooling effect in plants, water loss through transpiration also plays a main role in the absorption and transport of water and mineral ions from the roots to the different parts of the plants. The rate of transpiration however, is affected by environmental factors such as light intensity, air movement, relative humidity and surrounding temperature.

***Maklumat**: Selain daripada menghasilkan kesan penyejukan terhadap tumbuhan, kehilangan air melalui proses transpirasi juga memainkan peranan utama dalam penyerapan dan pengangkutan air dan ion-ion mineral dari akar ke bahagian-bahagian berlainan dalam tumbuhan berkenaan. Walaubagaimanapun, kadar transpirasi dipengaruhi oleh faktor-faktor persekitaran seperti keamatan cahaya, pergerakan udara, kelembapan relatif dan suhu persekitaran.*

Situation : A group of Biology students is assigned to investigate how the relative humidity in the surrounding affects the rate of transpiration in plants.

***Situasi:** Sekumpulan pelajar Biologi ditugaskan untuk menyiasat bagaimana kelembapan relatif dalam persekitaran mempengaruhi kadar transpirasi di dalam tumbuhan.*

Based on the information and situation above, design a laboratory experiment to study the effect of relative humidity on the rate of transpiration in plants. The planning of the experiment must include the following aspects:

Berdasarkan maklumat dan situasi di atas, rancangkan satu eksperimen untuk mengkaji kesan kelembapan relatif ke atas kadar transpirasi. Perancangan eksperimen perlu merangkumi aspek berikut:

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

(17 marks)

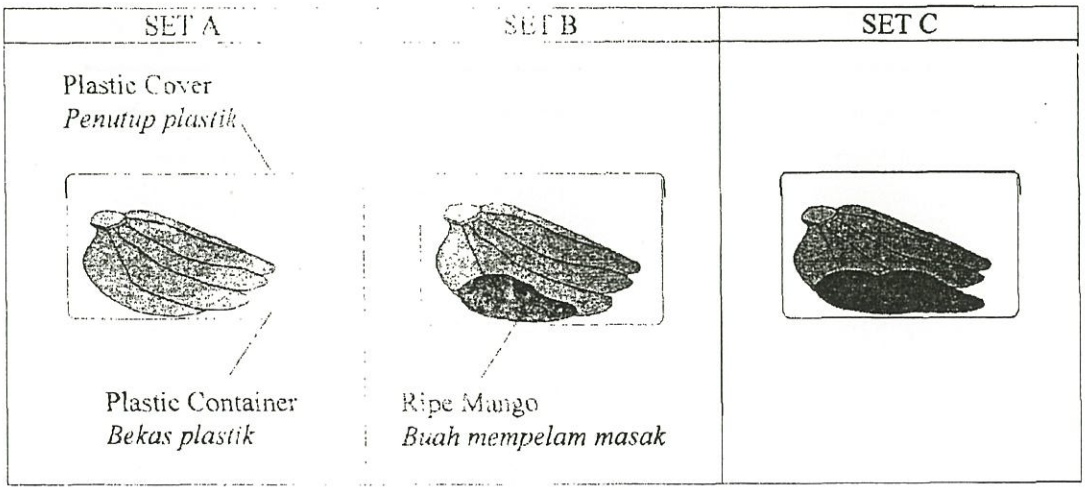
(17 markah)

1. Using ripe fruits to induce the ripening of other fruits is a common method which is widely used by farmers in agriculture.
A group of students carried out an experiment to investigate how the ripe mangoes able to induce the ripening process of a bunch of unripe bananas.

Dengan menggunakan buah yang masak untuk merangsang pemasakan buah yang lain merupakan satu kaedah umum yang digunakan secara meluas oleh pekebun dalam bidang pertanian.
Sekumpulan pelajar telah menjalankan satu eksperimen bagi menyiasat bagaimana buah mempelam yang masak dapat merangsang proses pemasakan satu sikat buah pisang yang belum masak.

In the investigation, three sets of experiment have been set up.
Set A used a plastic container 30 cm x 30 cm x 20 cm, placed a bunch of unripe bananas in it and closed the container with a cover.
Set B used a plastic container 30 cm x 30 cm x 20 cm, placed a bunch of unripe bananas and one ripe mango in it and closed the container with a cover.
Set C used a plastic container 30 cm x 30 cm x 20 cm, placed a bunch of unripe bananas and two ripe mangoes in it and closed the container with a cover.
All the tree bunches of bananas were taken from the same tree at the same day.
All the plastic container of Set A, B and C are kept at room temperature in the laboratory.
The results of the experiment is shown in Table 1.

Dalam penyiasatan ini, tiga set eksperimen disediakan.
Set A menggunakan satu bekas plastic 30 cm x 30 cm x 20 cm, masukkan satu sikat pisang yang belum masak dan menutupnya dengan penutup.
Set B menggunakan satu bekas plastic 30 cm x 30 cm x 20 cm, masukkan satu sikat pisang yang belum masak bersama dengan satu biji mempelam masak dan menutupnya dengan penutup.
Set C menggunakan satu bekas plastic 30 cm x 30 cm x 20 cm, masukkan satu sikat pisang yang belum masak bersama dengan dua biji mempelam masak dan menutupnya dengan penutup.
Ketiga-tiga sikat pisang diambil dari pokok yang sama dan pada hari yang sama.
Kesemua bekas plastik Set A, B dan C disimpan pada suhu bilik di dalam makmal sains.
Keputusan eksperimen ditunjukkan dalam Rajah 1.



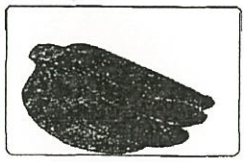
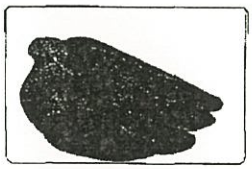
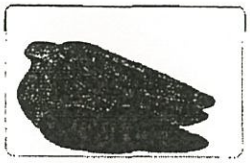
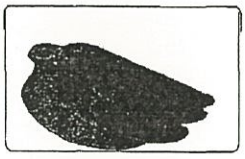
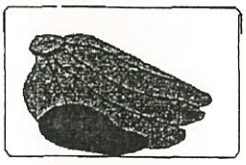
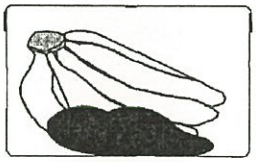
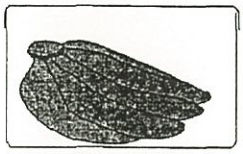
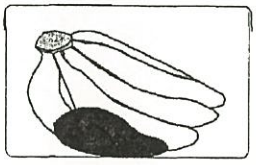
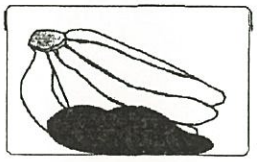
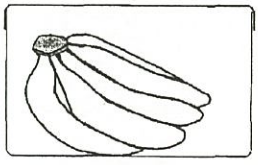
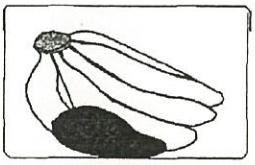
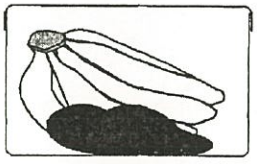
Date / Tarikh	Set A	Set B	Set C
Nov 15	 Green / *Hijau*	 Green / *Hijau*	 Green / *Hijau*
Nov 16	 Green / *Hijau*	 Yellowish green *Hijau kekuningan*	 Yellow *Kuning*
Nov 17	 Yellowish Green *Hijau kekuningan*	 Yellow *Kuning*	 Yellow *Kuning*
Nov 18	 Yellow *Kuning*	 Yellow *Kuning*	 Yellow *Kuning*
	.....	.....	.....
	Time Taken for the bananas to turn yellow / day *Masa yang diambil untuk pisang menjadi kuning / hari*		

TABLE 1
JADUAL 1

(a) Record the time taken for the bananas to turn yellow in Table 1.
Catatkan masa yang diambil untuk pisang menjadi kuning dalam Jadual 1.

[3 marks / *markah*]

(b) (i) State two different observations on the relationship between the number of mangoes and the time taken for the unripe bananas to turn yellow from Table 1.
Nyatakan dua pemerhatian yang berbeza ke atas perhubungan antara bilangan buah mempelam dengan masa yang diambil untuk pisang yang tidak masak bertukar menjadi kuning daripada Jadual 1..

Observation 1 / *Pemerhatian 1 :*

.....

.....

.....

Observation 2 / *Pemerhatian 2 :*

.....

.....

.....

[3 marks / *markah*]

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

Inference 1 / *Inferens 1 :*

.....

.....

.....

Inference 2 / *Inferens 2 :*

.....

.....

.....

[3 marks / *markah*]

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

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

Table 2 / *Jadual 2*

[3 marks / *markah*]

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

.....

.....

.....

[3 marks / *markah*]

(e) (i) Construct a table and record all the data collected in this experiment.
Bina satu jadual dan rekodkan semua data yang dikumpul dalam eksperimen ini.

Your table should have the following aspects :
Jadual anda hendaklah mengandungi aspek-aspek berikut:

- Set of the experiment
  Set eksperimen
- Number of mangoes in the plastic container.
  Bilangan buah mempelam dalam bekas plastik..
- Time taken for the unripe bananas to turn yellow.
  Masa yang diambil oleh pisang yang tidak masak bertukar menjadi kuning.

[3 marks / *markah*]

(ii) Use the data in 1(e)(i) and on a piece of graph paper, plot a graph to show the relationship between the number of mangoes in the plastic container and the time taken for the unripe bananas to turn yellow.

Gunakan data dalam 1(e)(i) dan di atas kertas graf yang disediakan, plotkan graf bagi menunjukkan perhubungan antara bilangan biji buah mempelam dalam bekas plastik dengan masa yang diambil bagi pisang yang tak masak bertukar menjadi kuning..

[3 marks / *markah*]

(f) Based on the graphs in 1(e)(ii), explain the relationship between the number of mangoes in the plastic container and the time taken for unripe bananas to turn yellow.

Berdasarkan graf di 1(e)(ii), terangkan hubungan antara bilangan biji buah mempelam dalam bekas Plastik dengan masa yang diambil bagi pisang yang tak masak bertukar menjadi kuning..

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[3 marks / *markah*]

(g) Based on the results of this experiment, what can be deduced about the ripening process of the bananas?

Berdasarkan keputusan eksperimen ini, apa yang dapat dirumuskan tentang proses pemasakan pisang?

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[3 marks / *markah*]

(h) A group of students repeat the above experiment by not closing the plastic container with the cover, based on the results of this experiment, predict the changes of the time taken for the unripe bananas to turn yellow in Set C.

Explain your prediction.

Sekumpulan pelajar mengulangi eksperimen di atas dengan tidak menutup bekas plastik dengan penutup, berdasarkan keputusan eksperimen ini, ramalkan perubahan masa yang akan diambil bagi pisang tidak masak bertukar menjadi kuning dalam Set C

Terangkan ramalan anda.

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.....

[3 marks / *markah*]

(i) Plant hormones are widely used in agriculture.
Classify the following plant hormones in how they were used in agriculture.

Hormon digunakan secara meluas dalam bidang pertanian.
Kelaskan hormon-hormon tumbuhan berikut dalam bagaimana ia digunakan di bidang pertanian.

Cytokinin, Auxin, Gibberellins *Cytokinin, Auxin, Gibberellins*

Plant Hormones *Hormon tumbuhan*	Used for *Digunakan untuk*
	Used to produce seedless fruits *Digunakan untuk menghasilkan buah tanpa biji.*
	Used to promote the growth of main stem *Digunakan untuk merangsang pertumbuhan batang tumbuhan*
	Used in storage of green vegetable. *Digunakan dalam penyimpanan sayuran hijau.*

TABLE 3
JADUAL 3

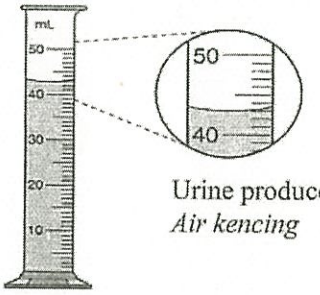
[3 marks / *markah*]

Question 1
Soalan 1

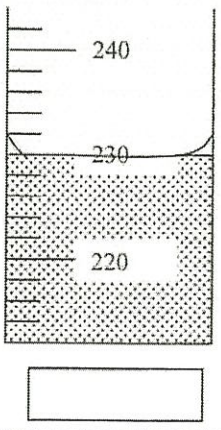
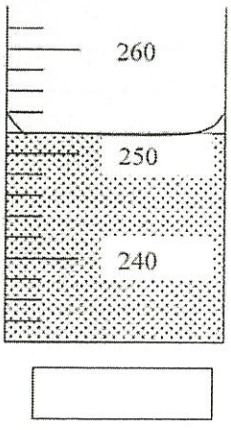
Three groups of same age students were carried out an experiment to investigate how different volumes of water intake on the volume of urine produced. Each group consists of two students. Both students were given same volumes of mineral water to drink and the volumes of urine produced were collected and recorded after half an hour. The results are shown in Table 1. The experiment was repeated two times.

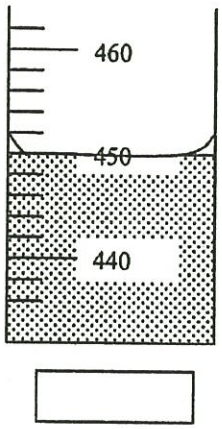
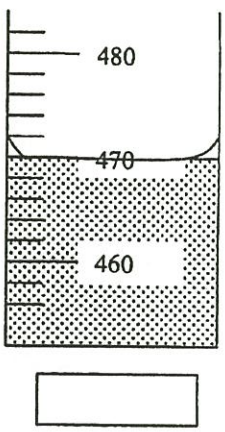
Tiga kumpulan pelajar yang sama umur telah menjalankan suatu eksperimen untuk menyiasat bagaimana perbezaan isipadu pengambilan air terhadap isipadu air kencing yang dihasilkan. Setiap kumpulan terdiri daripada dua orang pelajar. Kedua-dua pelajar telah diberikan isi padu air mineral yang sama untuk diminum dan isi padu air kencing yang dihasilkan dikumpulkan dan direkodkan selepas setengah jam. Keputusan ditunjukkan di dalam Jadual 1. Eksperimen telah diulangi sebanyak dua kali.

Mineral water
Air mineral



Urine produced
Air kencing

Group of student *Kumpulan pelajar*	Volume of water taken (ml) *Isipadu air yang diambil (ml)*	Volume of urine produced by two different student of same age (ml) *Isipadu air kencing yang dihasilkan oleh dua orang pelajar yang berbeza yang sama umur (ml)*	
		First student *Pelajar pertama*	Second student *Pelajar kedua*
A	500ml		

B	1000ml		

Untuk Kegunaan Pemeriksa

(a) Record the volume of urine that have been collected in the measuring cylinder into Table 1
Rekod isipadu air kencing yang dikumpulkan di dalam selinder penyukat ke dalam Jadual 1
[3 marks/*3 markah*]

1 (a)

(b) (i) Based on the results in Table 1, state **two** observations that can be made from this experiment.
Berdasarkan keputusan di dalam Jadual 1, nyatakan dua pemerhatian yang dapat dibuat daripada eksperimen ini

Observation 1/*pemerhatian 1*:

.....

.....

.....

Observation 2/*pemerhatian 2*:

.....

.....

.....

[3 marks/*3 markah*]

1 (b)(i)

(ii) State the inference from the observations in (b) (i).
Nyatakan inferens berdasarkan pemerhatian di (b) (i)

Inference from observation 1/*inferen dari pemerhatian 1*:

.....

.....

.....

Inference from observation 2/*inferen dari pemerhatian 2*:

.....

.....

.....

[3 marks/*3 markah*]

1 (b)(ii)

(c) Complete table 2 based on the experiment.
Berdasarkan eksperimen, lengkapkan jadual 2 di bawah

Variable ***Pembolehubah***	**Particulars to be implemented** ***Cara mengendalikan pembolehubah***
Manipulated/ *manipulasi:*	....
Responding / *bergerakbalas:*	....
Controlled/ *dimalarkan*	....

Table 2/ *Jadual 2*

[3 marks/*3 markah*]

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

.....

.....

.....

[3 marks/*3 markah*]

1 (d)

(e) Construct a table and record all your data collected in the experiment which include the following aspects :
Bina satu jadual untuk merekodkan semua keputusan eksperimen meliputi aspek berikut :

- Student/*Pelajar*
- Volume of water intake/*Isipadu air yang di ambil*
- Volume of urine produced/ *Isipadu air kencing yang dihasilkan*
- Average of urine produced/ *Purata air kencing dihasilkan*

[3 marks/*3 markah*]

1 (e)

(f) Use the graph paper provided on page 9 to answer this question. Using the data in 1 (e), draw a bar chart to show the relationship between the average of volume of urine produced againsts volume of water intake.
Dengan menggunakan kertas graf yang dibekalkan pada muka surat 9 untuk menjawab soalan ini. Dengan menggunakan data di dalam 1 (e), lukis carta bar untuk menunjukkan hubungan purata isipadu air kencing yang terhasil melawan isipadu air yang diambil.

[3 marks/*3 markah*]

1 (f)

(g) Based on bar chart, explain the relationship between the volume of water intake and the average of volume of urine produced?
Berdasarkan carta bar, terangkan hubungan antara isi padu air yang diminum dengan purata isi padu air kencing yang dihasilkan.

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.....

1 (g)

[3 marks/*3 markah*]

(h) If both students from group A were asked to stay in a room with 10 °C temperature during the experiment, predict the volume of urine produced. Explain your prediction.
Jika kedua-dua pelajar daripada kumpulan A diarahkan untuk berada di dalam bilik yang bersuhu 10 °C semasa eksperimen dijalankan, ramalkan isi padu air kencing yang dihasilkan. Terangkan ramalan anda.

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.....

1 (h)

[3 marks/*3 markah*]

(i) Based on this experiment, what can you deduce about osmoregulation?
Berdasarkan eksperimen ini, apakah yang dapat anda rumuskan tentang pengomoskawalaturan?

.....

.....

.....

.....

1 (i)

[3 marks/*3 markah*]

(j) The following list is part of the apparatus and material used in this experiment.
Senarai berikut adalah sebahagian daripada radas dan bahan yang digunakan dalam eksperimen ini

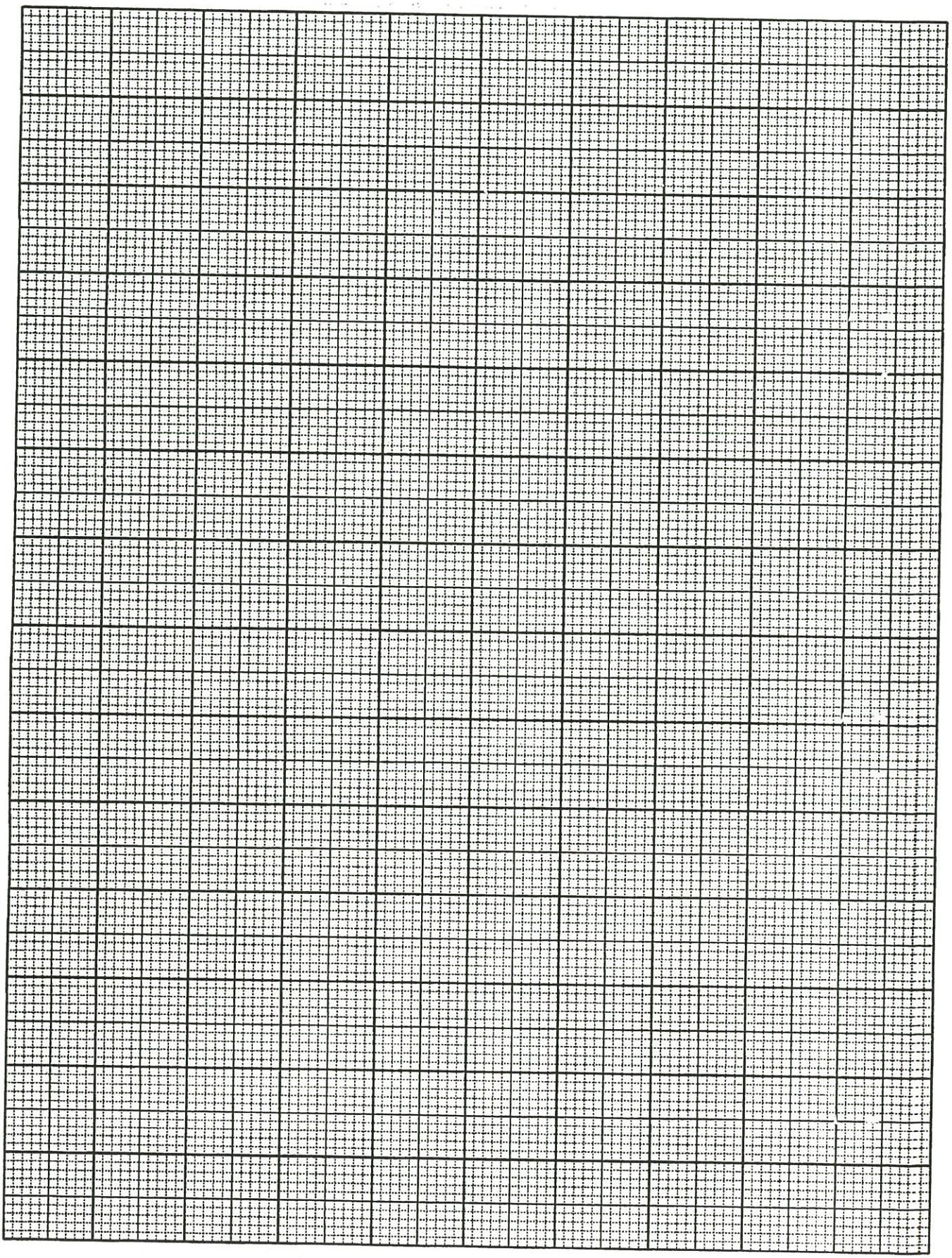
Measuring cylinder *Selinder penyukat*	Stopwatch *Jam randik*	Mineral water *Air mineral*	Mineral bottle *Botol mineral*	Student *Pelajar*	Urine *Air Kencing*

Complete Table 3 by matching each variable with the apparatus and material used in this experiment
Lengkapkan Jadual 3 dengan memadankan setiap pembolehubah dengan radas dan bahan yang digunakan dalam eksperimen ini.

Variable *Pembolehubah*	Apparatus *Radas*	Material *Bahan*
Manipulated *Manipulasi*		
Responding *Bergerak balas*		
Controlled *Dimalarkan*		

[3 marks/*3 markah*]

1 (j)



2 Pertumbuhan adalah satu proses yang melibatkan penambahan bilangan sel, saiz dan fungsi-fungsi organ dalam badan organisma. Pertumbuhan boleh diukur menggunakan parameter jisim segar, jisim kering atau ketinggian organisma.

Growth is a process which involves an increase in the number of cells, size and the function of organs in the organism's body. The growth can be measured by using the parameter of fresh mass, dry mass or height of organisms.

Berdasarkan maklumat di atas, rancang satu eksperimen di dalam makmal untuk mengkaji pertumbuhan pokok jagung dalam tempoh masa empat minggu. Perancangan eksperimen anda hendaklah meliputi aspek-aspek berikut:

Based on the information above, plan a laboratory experiment to study the growth of maize plant in four weeks. The planning of your experiment must include the following aspects:

- Pernyataan masalah / *Problem statements*
- Hipotesis / *Hypothesis*
- Pemboleh ubah / *Variables*
- Senarai radas dan bahan / *List of apparatus and materials*
- Prosedur eksperimen / *Experimental procedure*
- Persembahan data / *Presentation of data*

(17 markah)
(17 marks)

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

Question 1
***Soalan* 1**

A group of students carried out an experiment to study discontinuous variation and the inheritance of traits in plants. Diagram 1.1 shows 2 types of seeds in a fruit of a plant. The students determine the ratio between the number of round seeds and wrinkled seeds in 10 fruits of a legume plant.

Sekumpulan pelajar menjalankan satu eksperimen mengkaji variasi tak selanjar dan pewarisan trait pada tumbuhan. Rajah 1.1 *menunjukkan* 2 *jenis biji di dalam satu buah. Pelajar menentukan nisbah bagi bilangan biji bulat dan biji berkedut di dalam* 10 *buah daripada satu pokok kacang.*

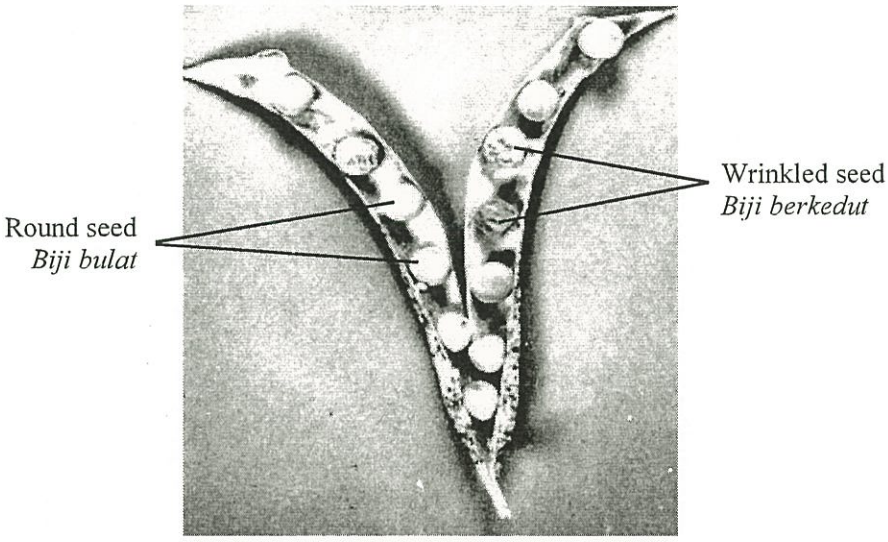


Diagram 1.1
Rajah 1.1

Diagram 1.2 shows the legume seeds taken out from 10 legume fruits.

Rajah 1.2 *menunjukkan biji-biji kacang yang dikeluarkan daripada* 10 *buah kacang.*

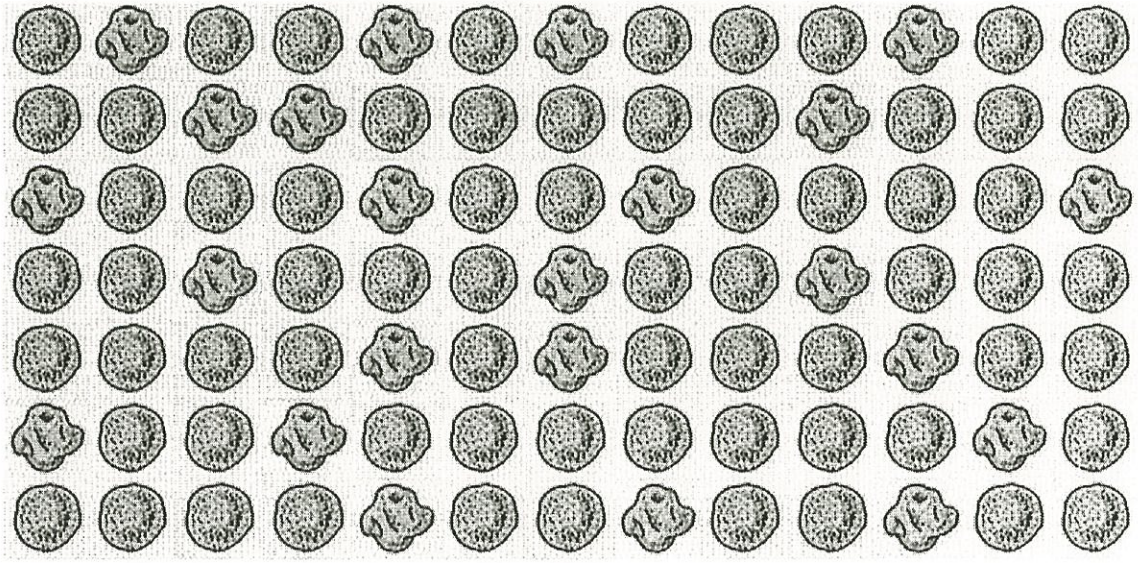


Diagram 1.2
Rajah 1.2

For Examiner's Use

(a) Complete Table 1.3 by stating the number of round seeds and wrinkled seeds as shown in Diagram 1.2.

Lengkapkan Jadual 1.3 *dengan menyatakan bilangan biji bulat dan biji berkedut seperti yang ditunjukkan dalam Rajah* 1.2.

[3 marks]
[3 *markah*]

Character / *Ciri* : Type of seed *Jenis biji*	Trait / *Trait*	
	 Round seed *Biji bulat*	 Wrinkled seed *Biji berkedut*
Number of Seed *Bilangan biji*		
Total Number of Seed *Jumlah Bilangan Biji*		

Table 1.3
Jadual 1.3

(b) (i) Based on Table 1.3, state two observations.
Berdasarkan Jadual 1.3, *nyatakan dua pemerhatian.*

Observation 1
Pemerhatian 1:

.....

.....

Observation 2
Pemerhatian 2:

.....

.....

[3 marks]
[3 *markah*]

(ii) State the inference for each observation made in (b) (i).
Nyatakan inferens bagi setiap pemerhatian yang dibuat dalam (b) (i).

Inference for observation 1
Inferens bagi pemerhatian 1:

.....

.....

Inference for observation 2
Inferens bagi pemerhatian 2:

.....

.....

[3 marks]
[3 markah]

For Examiner's Use

(c) Complete Table 1.4 based on the experiment.
Lengkapkan Jadual 1.4 *berdasarkan eksperimen ini.*

[3 marks]
[3 *markah*]

Variables *Pembolehubah*	Operating the variables *Mengoperasi pembolehubah*
Manipulated variable *Pembolehubah dimanipulasikan*	How to alter the manipulated variable *Bagaimana mengubah pembolehubah yang dimanipulasikan* ....
Responding variable *Pembolehubah bergerak balas*	How to determine the responding variable *Bagaimana menentukan pembolehubah bergerak balas* ....
Controlled variable *Pembolehubah dimalarkan*	How to maintain the controlled variable *Bagaimana menetapkan pembolehubah dimalarkan* ....

Table 1.4
Jadual 1.4

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

.....

.....

.....

[3 marks]
[3 *markah*]

For Examiner's Use

(e) (i) Based Table 1.3, construct a table and record the results of the experiment which include the following aspects:

Berdasarkan Rajah 1.1 *dan Jadual* 1.2, *bina satu jadual dan rekod keputusan eksperimen ini yang meliputi aspek-aspek berikut:*

- Type of seed
  Jenis biji
- Number of seeds
  Bilangan biji
- Ratio of seeds
  Nisbah biji

[3 marks]
[3 *markah*]

(ii) Draw a bar graph of the number of seeds against the type of seed on the graph paper provided in page 7.
Lukiskan satu graf bar bilangan biji melawan jenis biji di atas kertas graf yang disediakan di halaman 7.

[3 marks]
[3 *markah*]

(iii) Based on the bar graph drawn in (e) (ii), state the ratio of the two types of seeds. Explain your answer.
Berdasarkan graf bar yang dilukis dalam (e) (ii), *nyatakan nisbah bagi kedua-dua jenis biji.*
Terangkan jawapan anda.

.....

.....

.....

[3 marks]
[3 *markah*]

For Examiner's Use

(f) Based on the experiment, state the operational definition of discontinuous variation.
Berdasarkan eksperimen ini, nyatakan definisi secara operasi variasi tak selanjar.

.....

.....

.....

[3 marks]
[3 *markah*]

(g) The experiment is repeated by using 100 legume fruits that contained 900 seeds.
Predict the number of round seeds and wrinkled seeds.
Explain your answer.

Eksperimen ini diulang dengan menggunakan 100 *buah kacang yang mengandungi 900 biji.*
Ramalkan bilangan biji bulat dan biji berkedut.
Terangkan jawapan anda.

.....

.....

.....

[3 marks]
[3 *markah*]

(h) The following list is are some characters shown in human.
Senarai berikut adalah beberapa ciri pada manusia.

Height *Ketinggian*	Ability to roll tongue *Kebolehan menggulung lidah*	Blood group *Kumpulan darah*
Attachment of earlobe *Lekapan cuping telinga*	Intelligence *Kepintaran otak*	Body weight *Berat badan*

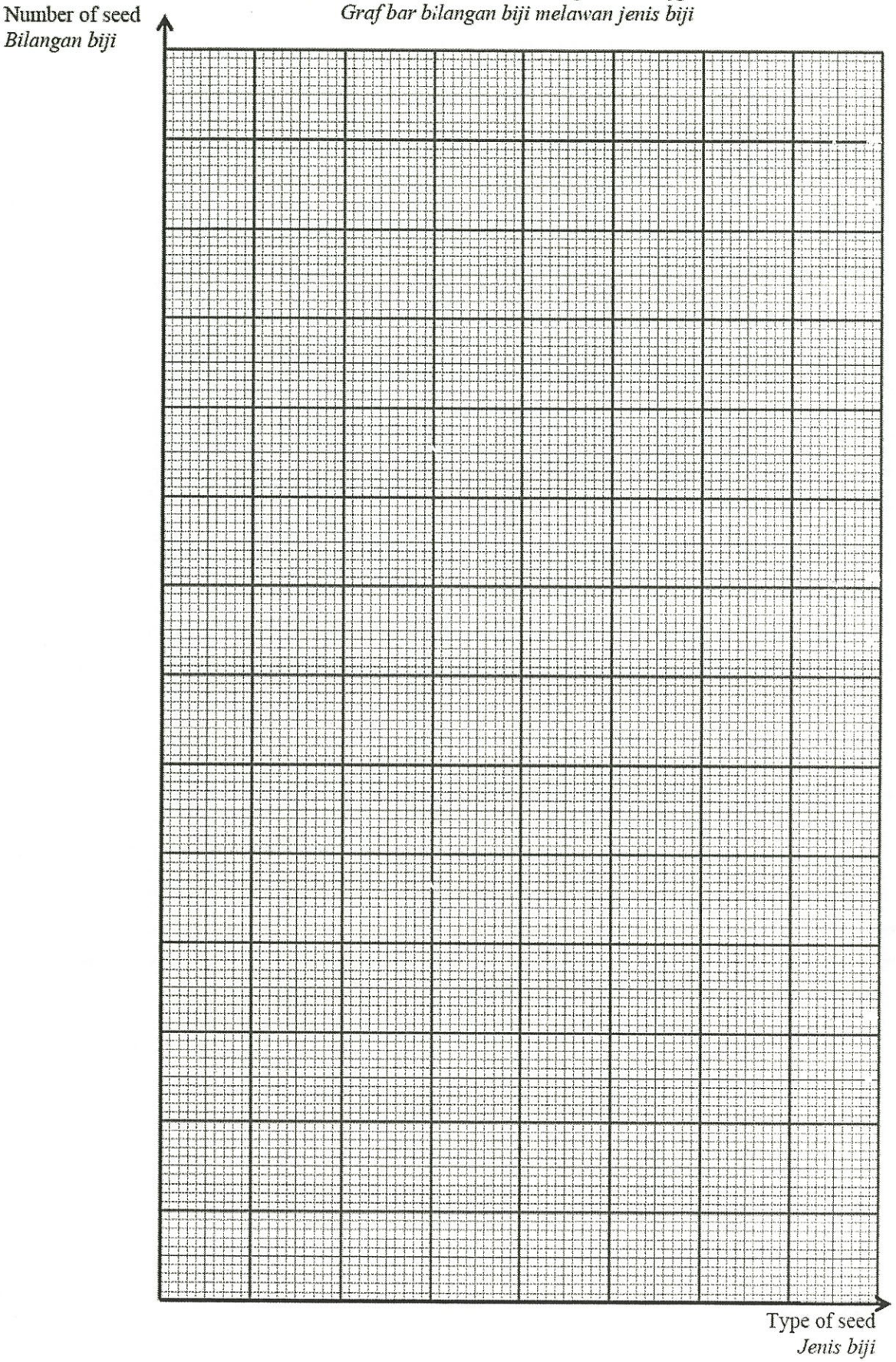
Classify each character to the correct type of variation.
Kelaskan setiap ciri berdasarkan jenis variasi yang betul.

Continuous Variation *Variasi Selanjar*	Discontinuous Variation *Variasi tak Selanjar*

[3 marks]
[3 *markah*]

33

Bar graph of the number of seeds against the type of seed
Graf bar bilangan biji melawan jenis biji



Question 1
Soalan 1

Variation is differences between organism of the same species. Variation in plant can be shown by the different size/mass of fruits, length of leaves or colour of flower. These variation can be affected by light intensity, amount of water, amout of minerals or pH of soil.
Variasi adalah perbezaan di antara organisma daripada spesies yang sama. Variasi dalam tumbuhan boleh ditunjukkan oleh perbezaan saiz/jisim buah, panjang daun atau warna bunga. Variasi ini boleh dipengaruhi oleh keamatan cahaya, jumlah air, jumlah mineral atau pH tanah.

One experiment was carried out to investigate the effect of light intensity onto growth of tomato plants which contain the same genetic. The tomato plants were planted in two glass house with same other basic needs.
Satu eksperimen telah dijalankan untuk mengkaji kesan keamatan cahaya ke atas pertumbuhan pokok-pokok tomato yang mempunyai genetik yang sama. Pokok tomato tersebut telah ditanamkan di dalam dua rumah kaca dengan keperluan asas lain yang sama.

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

1. 10 tomato plants were planted in glass house A.
   10 pokok tomato telah ditanamkan di dalam rumah kaca A.

2. While the other 10 tomato plants were planted in glass house B.
   Manakala 10 pokok lagi telah ditanamkan di dalam rumah kaca B.

3. Basic needs such as water and minerals were fixed for both glass house A and B.
   Keperluan asas seperti air serta garam mineral telah ditetapkan bagi kedua-dua rumah kaca A dan B.

4. For the factor of light intensity, tomato plants in glass house A were exposed to light about 12 hours daily while in glass house B, tomato plants were exposed to the light about 6 hours.
   Bagi faktor keamatan cahaya, pokok-pokok tomato rumah kaca A telah didedahkan kepada cahaya selama 12 jam sehari manakala pokok-pokok tomato rumah kaca B telah didedahkan selama 6 jam.

5. After 4 months, the tomato fruits which were planted in both glass houses shown differences in size and mass.
   Selepas 4 bulan, buah tomato yang ditanamkan didalam kedua-dua rumah kaca didapati menunjukkan saiz serta jisim yang berbeza.

6. Table 1 shows the result obtained from the experiment.
Jadual 1 menunjukkan keputusan yang diperolehi dari eksperimen :

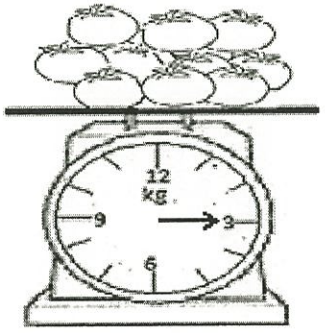
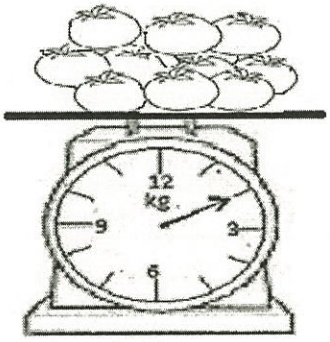
Glass house *Rumah Kaca*	Duration of tomato plant exposed to the light intensity daily (hour) *Tempoh masa keamatan cahaya didedahkan kepada pokok tomato setiap hari (jam)*	Mass of 10 tomatoes *Jisim 10 biji tomato* (kg)	Average mass of each tomato *Purata Jisim bagi sebiji tomato* (kg)
A	12		
B	6		

Table 1/ *Jadual 1*

(a) Record the mass of 10 tomatoes and calculate the average reading in Table 1.
Rekodkan jisim 10 biji tomato dan hitungkan purata bacaan dalam Jadual 1.
[3 *marks/markah*]

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

Observation 1:
Pemerhatian 1:

.....

.....

.....

Observation 2:
Pemerhatian 2:

.....

.....

.....

[3 *marks/markah*]

1(b)(i)

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

Inference from observation 1:
Inferens daripada pemerhatian 1:

.....

.....

.....

Inference from observation 2:
Inferens daripada pemerhatian 2:

.....

.....

.....

[3 *marks/markah*]

1(b)(ii)

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

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

Table 2
Jadual 2

[3 *marks/markah*]

1(c)

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

.....

.....

.....

[3 *marks/markah*]

1(d)

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

- Glass house
  Rumah kaca
- Duration of tomato plant exposed to the light intensity daily.
  Tempoh masa keamatan cahaya didedahkan kepada pokok tomato setiap hari
- Mass of 10 tomatoes
  Jisim 10 biji tomato
- Growth rate of tomato
  Kadar pertumbuhan tomato

Use the formulae:

$$\text{Growth rate of tomato} = \frac{\text{Mass of 10 tomatoes}}{\text{Time taken for planting}}$$

Gunakan formula:

$$\textit{Kadar pertumbuhan tomato} = \frac{\textit{Jisim 10 biji tomato}}{\textit{Masa diambil untuk menanam}}$$

1(e)(i)

[3 *marks/markah*]

(e)(ii) Use the graph paper provided on page 8 to answer this question.
By using the data in 1(e)(i), draw a bar chart on the growth rate of tomato against duration of tomato plant exposed to the light intensity daily.

Guna kertas graf yang disediakan di halaman 8 untuk menjawab soalan ini.
Menggunakan data di 1(e)(i) , lukis carta bar kadar pertumbuhan tomato melawan tempoh masa keamatan cahaya didedahkan kepada pokok tomato setiap hari

[3 *marks/markah*]

1(e)(ii)

(e)(iii) Based on the bar chart in 1(e)(ii), explain the relationship between the growth rate of tomato against duration of tomato plant exposed to the light intensity daily.
Berdasarkan carta bar dalam 1(e)(ii), terangkan hubungan di antara kadar pertumbuhan tomato melawan tempoh masa keamatan cahaya didedahkan kepada pokok tomato setiap hari

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.....

.....

.....

[3 *marks/markah*]

1(e)(iii)

(f) This experiment is repeated by exposing the tomato plant to the light intensity for 4 hours daily.
Predict the mass of 10 tomatoes that will be provided.
Explain your prediction.
Eksperimen ini diulangi dengan mendedahkan pokok tomato kepada keamatan cahaya selama 4 jam sehari.
Ramalkan jisim 10 tomato yang akan diperolehi.
Terangkan ramalan anda.

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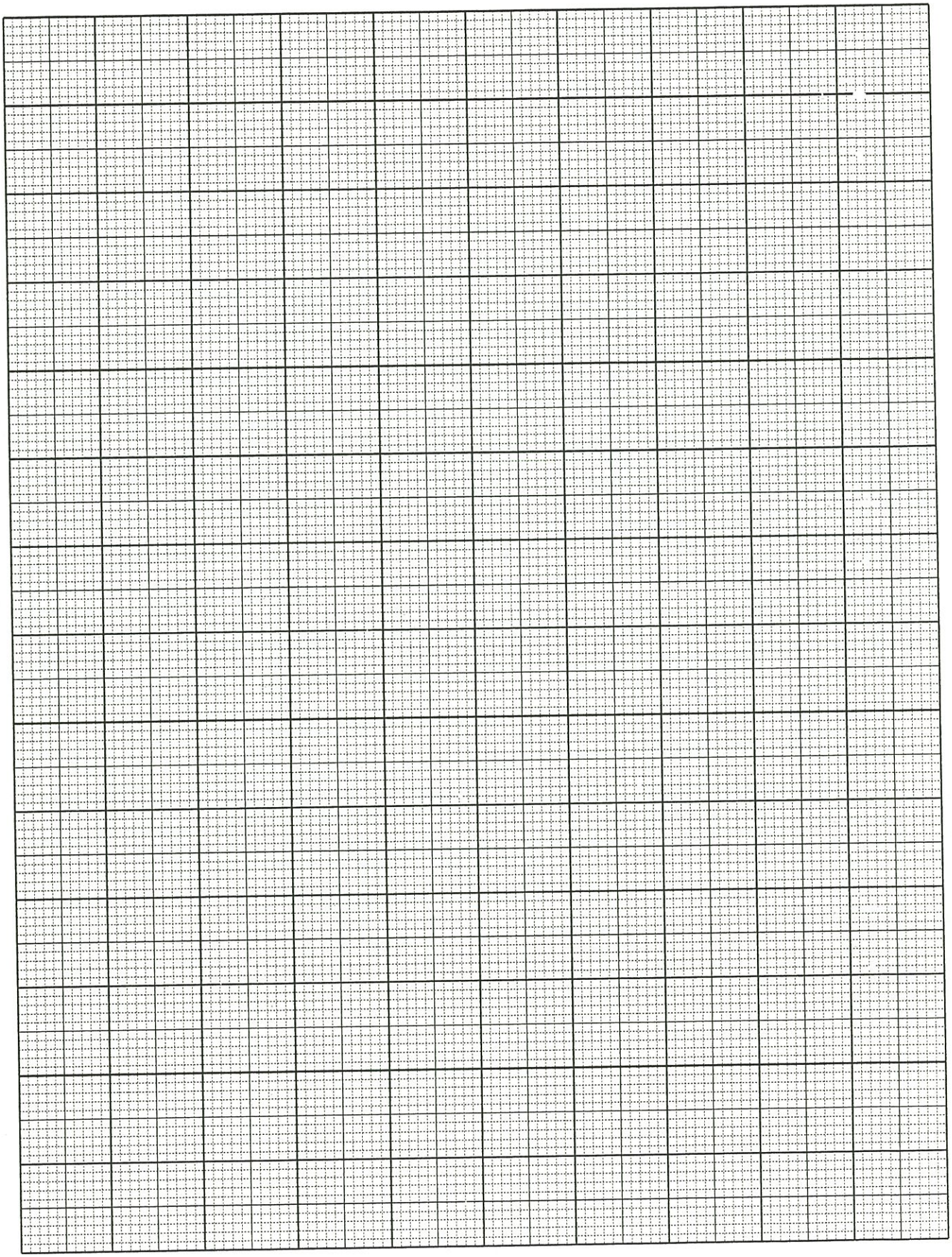
.....

.....

[3 *marks/markah*]

1(f)



(g) Based on the result of this experiment, state the operational definition for continuos variation
Berdasarkan keputusan eksperimen ini, nyatakan definisi secara operasi untuk variasi selanjar

.....

.....

.....

.....

[3 *marks/markah*]

1(g)

(h) The following list is part of the apparatus and material used in this experiment.
Senarai berikut adalah sebahagian daripada radas dan bahan yang digunakan dalam eksperimen ini

Light bulb	Calendar	Tomatoes Fertiliser	Compression balance	Tomato Plant
Mentol	*Kalendar*	*Baja Tomato*	*Neraca mampatan*	*Pokok tomato*

Complete Table 3 by matching each variable with the apparatus and material used in this experiment
Lengkapkan Jadual 3 dengan memadankan setiap pembolehubah dengan radas dan bahan yang digunakan dalam eksperimen ini.

1 (h)

Variable *Pembolehubah*	Apparatus *Radas*	Material *Bahan*
Manipulated *Manipulasi*		
Responding *Bergerak balas*		
Controlled *Dimalarkan*		

Table 3/ *Jadual 3*

[3 *marks/markah*]