Lembaga Peperiksaan
Malaysia

# KUPASAN MUTU JAWAPAN

## BIOLOGI 3
## 4551/3

## SPM
## 2013

KEMENTERIAN PENDIDIKAN MALAYSIA

## BENTUK KERTAS SOALAN

Kertas Biologi 4551/3 mengandungi 2 soalan.
Calon dikehendaki menjawab kedua-dua soalan tersebut.

Soalan 1 - Soalan berstruktur yang merangkumi 11 aspek kemahiran proses sains.

Soalan 2 - Soalan esei yang merangkumi 5 aspek kemahiran proses sains yang memerlukan calon merancang eksperimen.

Calon diberi masa 1 jam 30 minit untuk menjawab kedua-dua soalan tersebut.

## PRESTASI KESELURUHAN

Pada keseluruhannya, calon pada tahun ini dapat mempamerkan prestasi yang baik. Hampir semua aspek dalam kemahiran proses sains dapat dikuasai calon. Tiga aspek dalam kemahiran proses sains iaitu mentafsir graf, mendefinisi secara operasi dan merancang eksperimen tidak dijawab dengan baik dan mempengaruhi prestasi calon.

## PRESTASI MENGIKUT KUMPULAN CALON

### Kumpulan Tinggi

Calon menguasai dengan cemerlang semua aspek dalam kemahiran proses sains iaitu merekod data, membuat pemerhatian, membuat inferens, mengawal pembolehubah, menulis hipotesis, membina jadual data, memplot graf, mentafsir graf, mendefinisi secara operasi, meramal, mengelas dan merancang eksperimen. Kematangan calon dalam memberikan jawapan semakin baik.

### Kumpulan Sederhana

Dalam Soalan 1, aspek dalam kemahiran proses sains kurang dikuasai seperti menerangkan hubungan pembolehubah berdasarkan graf, menerangkan ramalan dan mendefinisi secara operasi. Bagi soalan 2 pula, calon tidak dapat menyenarai radas dan bahan dengan lengkap serta menulis prosedur eksperimen.

### Kumpulan Rendah

Jawapan tidak lengkap dan menunjukkan calon kurang menguasai hampir semua aspek kemahiran proses sains serta merancang eksperimen.

## PRESTASI TERPERINCI

1 Growth in organisms involves increasing in size, height and mass. An experiment was carried out to study the effect of nutrients concentration on the growth of plants. Maize seeds are planted in five petri dishes with moist cotton wool using different concentration of Knop's solution. Each petri dish contains two maize seeds. 5 ml of Knop's solution is added into each petri dish everyday.

Table 1.1 shows the different concentrations of Knop's solution in each petri dish.

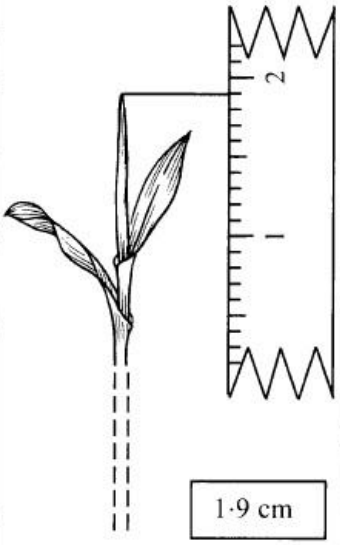
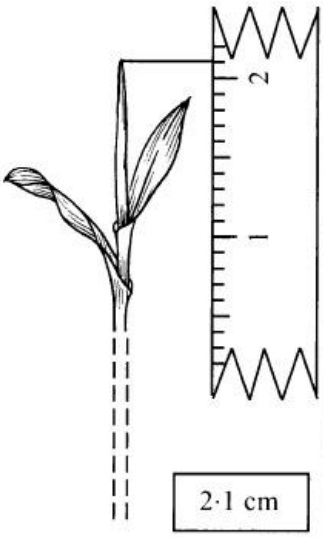
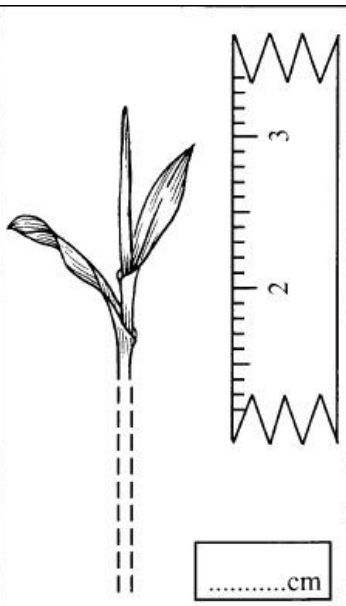
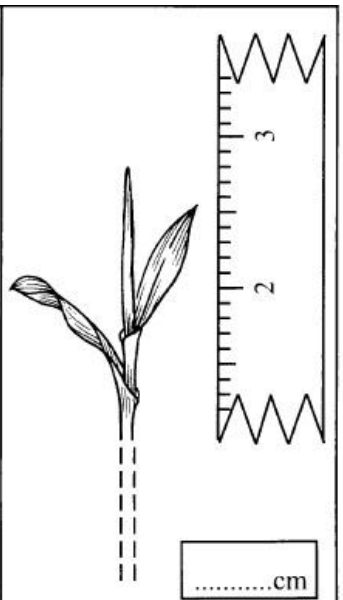
*Pertumbuhan organisma melibatkan pertambahan saiz, ketinggian dan jisim. Satu eksperimen telah dijalankan untuk mengkaji kesan kepekatan nutrien ke atas pertumbuhan pokok. Biji benih jagung ditanam di dalam lima piring petri yang mengandungi kapas lembap menggunakan larutan Knop dengan kepekatan yang berbeza. Setiap piring petri mengandungi dua biji benih jagung.* 5 ml *larutan Knop ditambah ke dalam setiap piring petri setiap hari.*

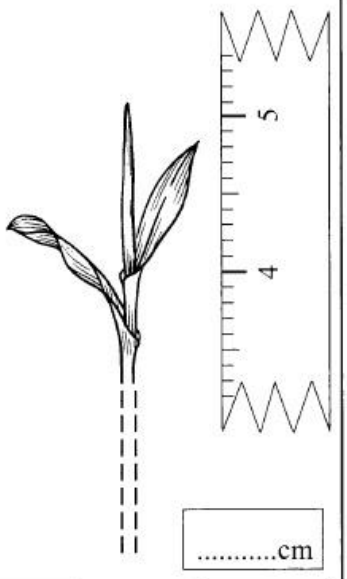
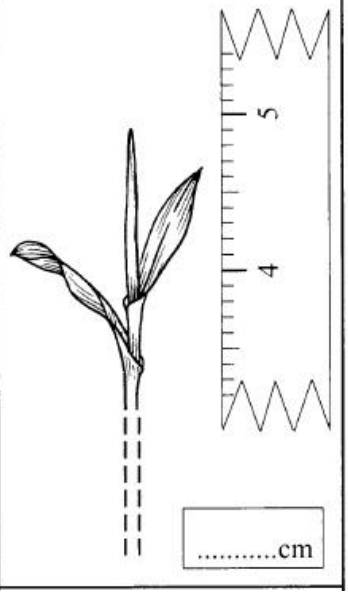
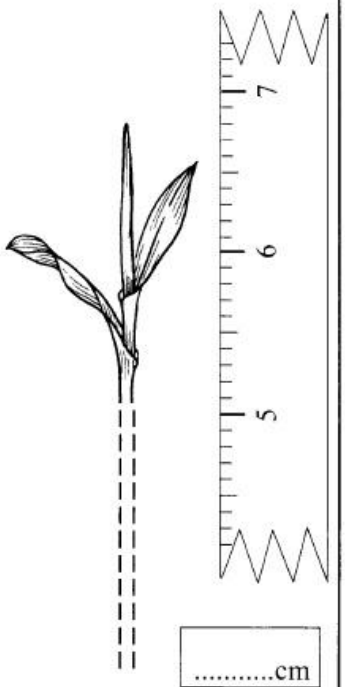
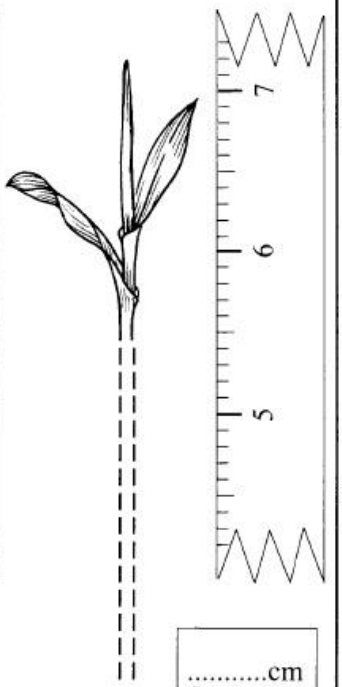
*Jadual* 1.1 *menunjukkan kepekatan larutan Knop yang berbeza dalam setiap piring petri.*

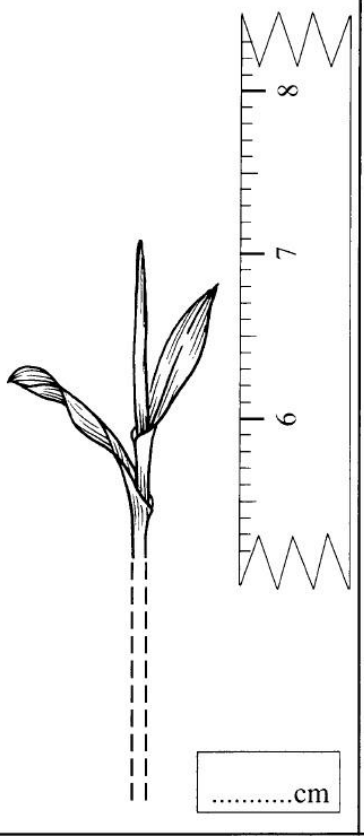
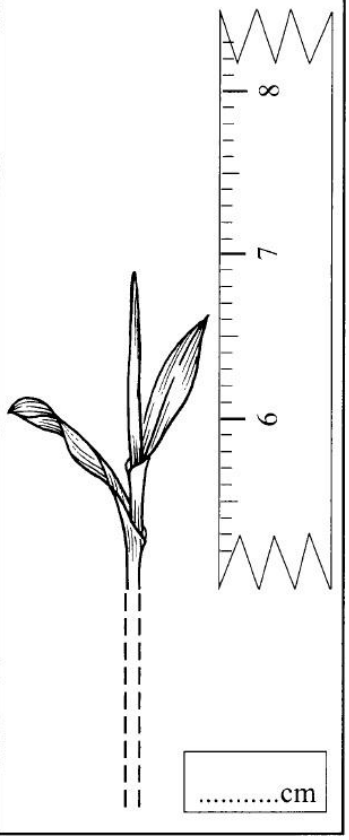
| **Petri dish** ***Piring petri*** | **Concentration of Knop's solution** ***Kepekatan larutan Knop*** (%) |
|---|---|
| A | 5·0 |
| B | 10·0 |
| C | 15·0 |
| D | 20·0 |

Table 1.2 in page **3** to **5** shows the result of this experiment after four days.

*Rajah* 1.2 *pada halaman* **3** *hingga halaman* **5** *menunjukkan keputusan eksperimen ini selepas empat hari.*

| **Petri dish** *Piring petri* | **Concentration of Knop's solution** *Kepekatan larutan Knop* (%) | **Height of maize seedling** *Ketinggian anak benih jagung* | |
|---|---|---|---|
| | | **Maize seedling 1** *Anak benih jagung* **1** | **Maize seedling 2** *Anak benih jagung* **2** |
| **A** | 5·0 |  1·9 cm |  2·1 cm |
| **B** | 10·0 |  .....cm |  .....cm |

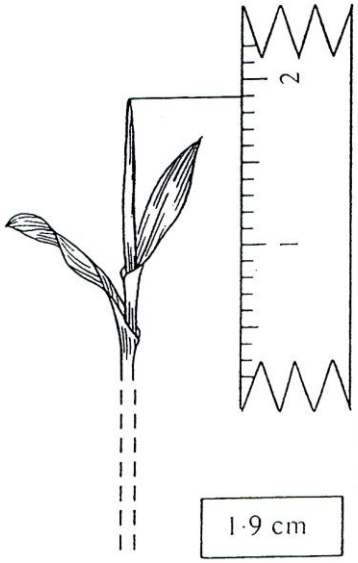
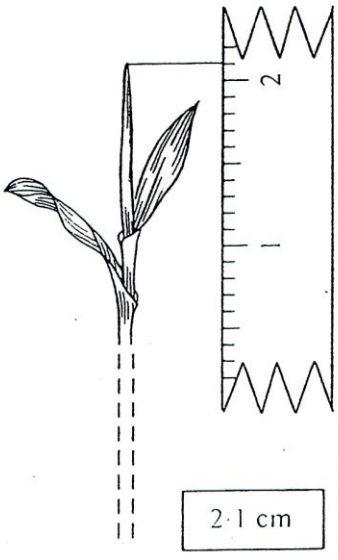
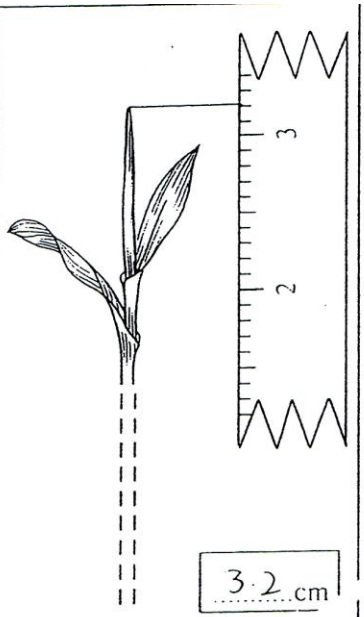
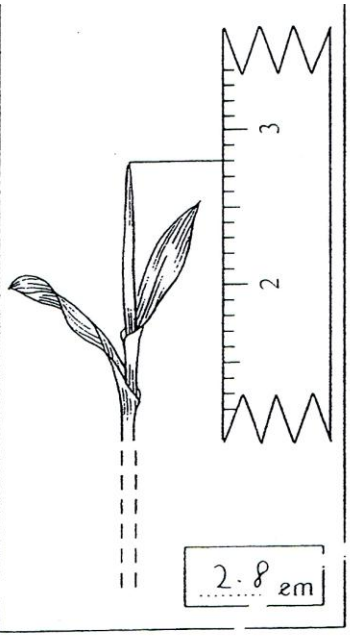
| Petri dish<br>*Piring petri* | Concentration of Knop's solution<br>*Kepekatan larutan Knop* (%) | Height of maize seedling<br>*Ketinggian anak benih jagung* | |
|---|---|---|---|
| | | Maize seedling 1<br>*Anak benih jagung 1* | Maize seedling 2<br>*Anak benih jagung 2* |
| C | 15·0 |  |  |
| D | 20·0 |  |  |

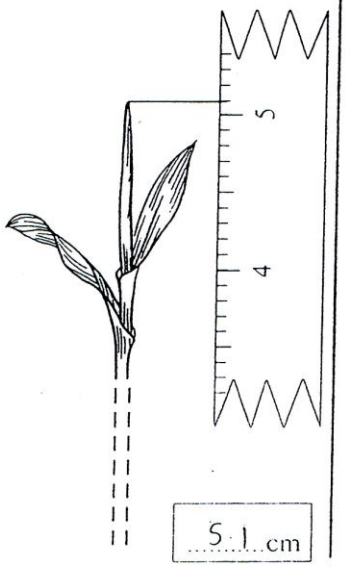
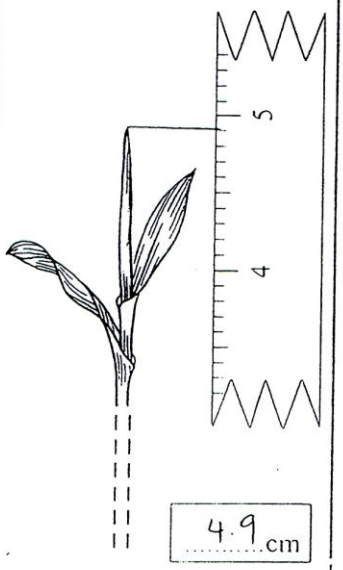
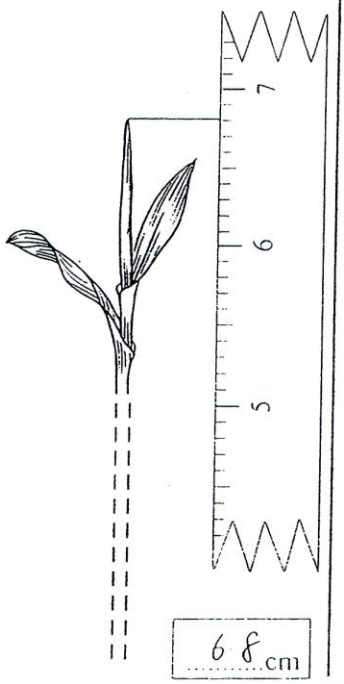
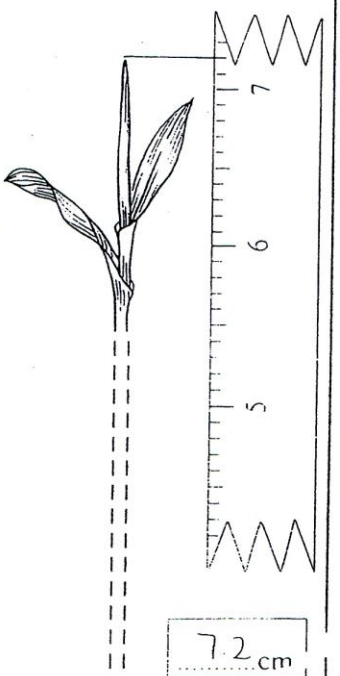
| Petri dish *Piring petri* | Concentration of Knop's solution *Kepekatan larutan Knop* (%) | Height of maize seedling *Ketinggian anak benih jagung* | |
|---|---|---|---|
| | | Maize seedling 1 *Anak benih jagung* 1 | Maize seedling 2 *Anak benih jagung* 2 |
| E | 25·0 |   |   |

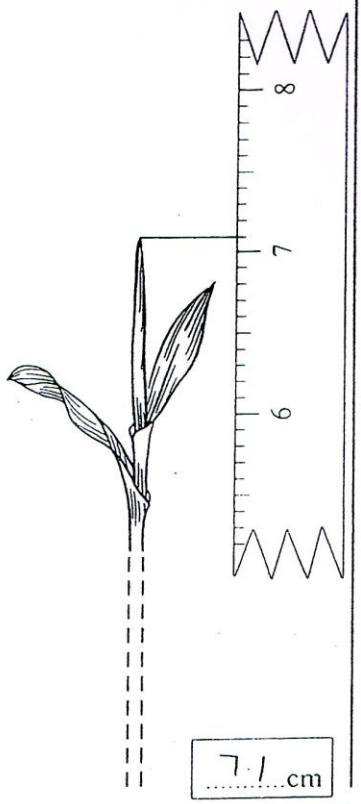
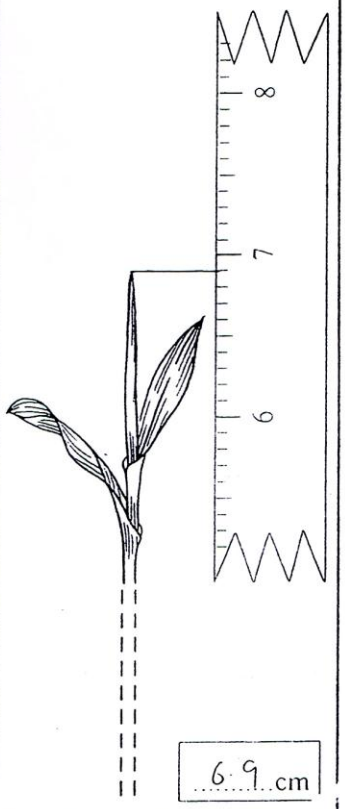
Soalan 1(a) - Merekod data

(*a*) Record the height of each maize seedlings in the boxes provided in Table 1.2.

*Rekod ketinggian bagi setiap anak benih jagung dalam petak yang disediakan dalam Jadual* 1.2.

| Petri dish<br>*Piring petri* | Concentration of Knop's solution<br>*Kepekatan larutan Knop*<br>(%) | Height of maize seedling<br>*Ketinggian anak benih jagung* | |
|---|---|---|---|
| | | Maize seedling 1<br>*Anak benih jagung* 1 | Maize seedling 2<br>*Anak benih jagung* 2 |
| A | 5·0 |  |  |
| B | 10·0 |  |  |

| Petri dish *Piring petri* | Concentration of Knop's solution *Kepekatan larutan Knop* (%) | Height of maize seedling *Ketinggian anak benih jagung* | |
|---|---|---|---|
| | | Maize seedling 1 *Anak benih jagung 1* | Maize seedling 2 *Anak benih jagung 2* |
| C | 15·0 |  5·1 cm |  4·9 cm |
| D | 20·0 |  6·8 cm |  7·2 cm |

| Petri dish *Piring petri* | Concentration of Knop's solution *Kepekatan larutan Knop* (%) | Height of maize seedling *Ketinggian anak benih jagung* | |
|---|---|---|---|
| | | Maize seedling 1 *Anak benih jagung* 1 | Maize seedling 2 *Anak benih jagung* 2 |
| E | 25·0 |   |   |

Kebanyakan calon dapat merekod bacaan ketinggian anak benih jagung dengan tepat.

Soalan 1(b) (i) - Menyatakan pemerhatian

(*b*) (i) Based on Table 1.2, state **two** observations made on the height of the maize seedlings in any petri dish.

*Berdasarkan Jadual* 1.2, *nyatakan* **dua** *pemerhatian yang dibuat terhadap ketinggian anak benih jagung dalam mana-mana piring petri.*

Observation 1:

*Pemerhatian* 1:

.....

.....

Observation 2:

*Pemerhatian* 2:

.....

.....

Soalan 1(b)(ii) - Menyatakan inferens berdasarkan pemerhatian

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

*Nyatakan inferens daripada pemerhatian di* **1**(*b*)(i).

Inference from observation 1:

*Inferens daripada pemerhatian* 1:

.....

.....

Inference from observation 2:

*Inferens daripada pemerhatian* 2:

.....

.....

In 5% knop solution, the height of maize seedling 1 and 2 is 1.9cm and 2.1cm

Observation 2:

*Pemerhatian* 2:

In 25% knop solution, the height of maize seedling 1 and 2 is 7.1cm and 6.9cm

Inference from observation 1:

*Inferens daripada pemerhatian* 1:

In 5% knop solution, the nutrient is less so the growth rate is less

Inference from observation 2:

*Inferens daripada pemerhatian* 2:

In 25% knop solution, the nutrient is high so the growth rate is higher

Pemerhatian secara tegak *(Vertical observation*)

Pemerhatian ketinggian anak benih jagung dalam piring petri dapat dinyatakan dengan tepat.
Inferens dapat dinyatakan dengan tepat berdasarkan ke atas pemerhatian.

Observation 1:

*Pemerhatian* 1:

petri dish D had the tallest maize plant

Observation 2:

*Pemerhatian* 2:

Petri dish A had the shortest maize plant

Inference from observation 1:

*Inferens daripada pemerhatian* 1:

Because its concentration of nutrient is the Optimum

Inference from observation 2:

*Inferens daripada pemerhatian* 2:

Because it has a low concentration of the knop's solution

Pemerhatian secara mendatar (*Horizontal observation*)

Pemerhatian dapat dinyatakan dengan betul tetapi memberikan inferens kurang tepat iaitu sama ada tidak menerangkan kesan kepekatan nutrien atau tidak mengkaitkan ketinggian dengan pertumbuhan anak benih jagung.

Observation 1:

*Pemerhatian* 1:

in petri dish D, seedling 1 is shorter than seedling 2.

Observation 2:

*Pemerhatian* 2:

In petri dish D, seedling 2 is taller than seedling 1.

Pemerhatian lemah kerana berulang.

Inference from observation 1:

*Inferens daripada pemerhatian* 1:

Seedling 1 is shorter than seedling 2 because it gets less nutrients than seedling 2.

Inference from observation 2:

*Inferens daripada pemerhatian* 2:

Seedling 2 is taller than seedling 1 because it gets more nutrients than seedling 2.

Inferens salah.

Soalan 1(c) - Mengawal Pembolehubah

(c) Complete Table 1.3 based on this experiment.
*Lengkapkan Jadual 1.3 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* | |
| ..... | ..... |
| ..... | ..... |
| ..... | ..... |

| Variable<br>*Pembolehubah* | Method to handle the variable<br>*Cara mengendali pembolehubah* |
|---|---|
| Manipulated variable<br>*Pembolehubah dimanipulasikan*<br>The concentration of Knop's solution. | Use different concentration of Knop's solution in each petri dish. |
| Responding variable<br>*Pembolehubah bergerak balas*<br>The height of maize seedlings. | Measure and record the height of maize seedlings using a metre ruler. |
| Constant variable<br>*Pembolehubah dimalarkan*<br>Type of maize seedlings used. | Fix the type of maize seedlings used. |

Calon dapat menyatakan ketiga-tiga pembolehubah iaitu dimanipulasikan, bergerak balas, dimalarkan dan cara mengendalikan pembolehubah dengan tepat.

| Variable<br>*Pembolehubah* | Method to handle the variable<br>*Cara mengendali pembolehubah* |
|---|---|
| Manipulated variable<br>*Pembolehubah dimanipulasikan*<br>Concentration of knop's solution | Use different concentration of knop's solution for the various petri dish like 5.0%, 10%, 15%, 20%, 25%. |
| Responding variable<br>*Pembolehubah bergerak balas*<br>Height of maize seedlings | Measure the height of maize seedlings using a ruler |
| Constant variable<br>*Pembolehubah dimalarkan*<br>Volume of knop's solution | Fix the amount of knop's solution used to be 5ml |

| Variable<br>*Pembolehubah* | Method to handle the variable<br>*Cara mengendali pembolehubah* |
|---|---|
| Manipulated variable<br>*Pembolehubah dimanipulasikan*<br>Concentration of Knop's solution. | Change the concentration of Knop's solution in every petri dish.<br>For example, 5.0%, 10.0%, 15.0%. |
| Responding variable<br>*Pembolehubah bergerak balas*<br>The height of the maize seedlings. | The height of maize seedlings is measured and recorded. |
| Constant variable<br>*Pembolehubah dimalarkan*<br>Volume of Knop's solution | Add the same volume of Knop's solution for all the petri dishes. |

Jawapan tidak lengkap kerana tidak menulis "**merekod**" atau tidak menyatakan "**menggunakan pembaris***"* bagi pembolehubah bergerak balas.

Soalan 1(d) - Menyatakan Hipotesis

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

.....

.....

.....

(*d*) State the hypothesis for this experiment.
*Nyatakan hipotesis bagi eksperimen ini.*
The higher the concentration of Knop's solution, the taller the height of maize seedlings until the optimum concentration is reached.

(*d*) State the hypothesis for this experiment.
*Nyatakan hipotesis bagi eksperimen ini.*
The more the concentration of nutrients, the more the growth of plant. Until an optimum concentration of nutrients growth rate remains constant.

Hipotesis dapat dinyatakan dengan tepat iaitu dapat menunjukkan hubungan antara pembolehubah dimanipulasikan dengan pembolehubah bergerak balas.

(*d*) State the hypothesis for this experiment.
*Nyatakan hipotesis bagi eksperimen ini.*
Height of maize seedling depends on the concentration of Knop's solution given

Hubungan antara pembolehubah dimanipulasikan dan pembolehubah bergerak balas tidak dinyatakan dengan jelas.

Soalan 1(e)(i) - Membina Jadual untuk merekod data

Soalan 1 (e) (ii) - Melukis graf
Soalan 1 (f) - Menyatakan dan menerangkan hubungan dalam graf

(*e*) (i) Construct a table and record all the data collected from Table 1.2.

Your table should have the following titles:

*Bina satu jadual dan rekodkan semua data yang dikumpul dari Jadual* 1.2.

*Jadual anda hendaklah mengandungi tajuk-tajuk berikut*:

- Concentration of Knop's solution
  *Kepekatan larutan Knop*
- Height of maize seedling 1 and maize seedling 2
  *Ketinggian anak benih jagung* 1 *dan ketinggian anak benih jagung* 2
- Average height of the maize seedlings
  *Purata ketinggian anak benih jagung*
- Growth rate of maize seedling
  *Kadar pertumbuhan anak benih jagung*

$$\left[\text{Growth rate} = \frac{\text{Average height}}{\text{Days}}\right]$$

$$\left[\textit{Kadar pertumbuhan} = \frac{\textit{Purata ketinggian}}{\textit{Hari}}\right]$$

(ii) Use the graph paper provided on page 9 to answer this question.

Using the data in **1**(*e*)(i), draw a graph of growth rate of maize seedlings against the concentration of Knop's solution.

*Guna kertas graf yang disediakan di halaman* 9 *untuk menjawab soalan ini.*

*Menggunakan data di* **1**(*e*)(i), *lukis graf kadar pertumbuhan anak benih jagung melawan kepekatan larutan Knop.*

(*f*) Based on the graph in **1**(*e*)(ii), state the relationship between the concentration of Knop's solution and the growth rate of maize seedlings.

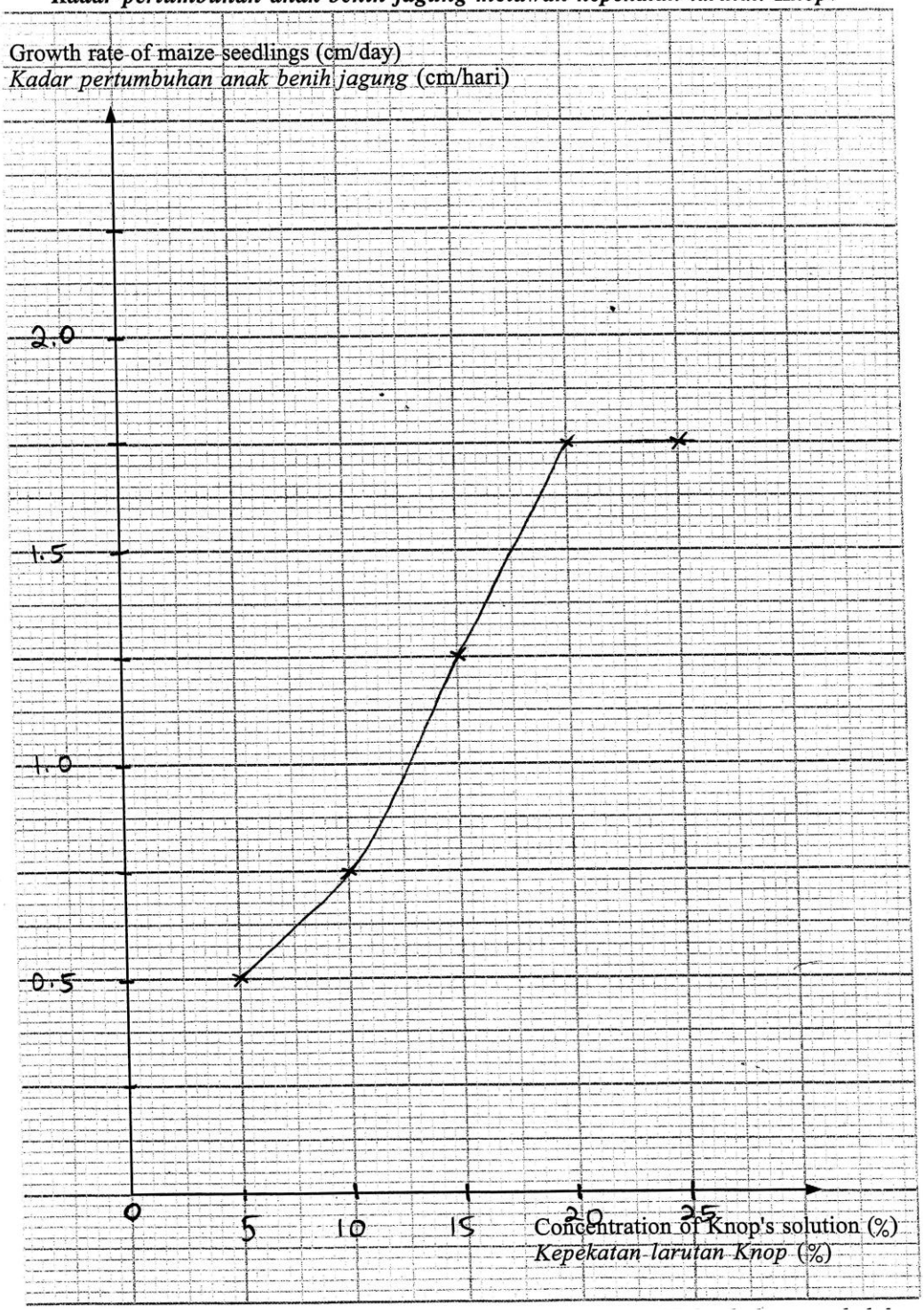
Explain your answer.

*Berdasarkan graf di* **1**(*e*)(ii), *nyatakan hubungan antara kepekatan larutan Knop dengan kadar pertumbuhan anak benih jagung.*

*Terangkan jawapan anda.*

| Concentration of Knop's solution | Height of maize seedling 1 | Height of maize seedling 2 | Average height of maize seedling | Growth rate of maize seedling |
|---|---|---|---|---|
| 5.0% | 1.9cm | 2.1cm | 2cm | 0.50 cm/day |
| 10.0% | 3.2cm | 2.8cm | 3cm | 0.75cm/day |
| 15.0% | 6.1cm | 4.9cm | 5cm | 1.25cm/day |
| 20.0% | 6.8cm | 7.2cm | 7cm | 1.75cm/day |
| 25.0% | 7.1cm | 6.9cm | 7cm | 1.75cm/day |

**Growth rate of maize seedlings against concentration of Knop's solution.**
***Kadar pertumbuhan anak benih jagung melawan kepekatan larutan Knop.***



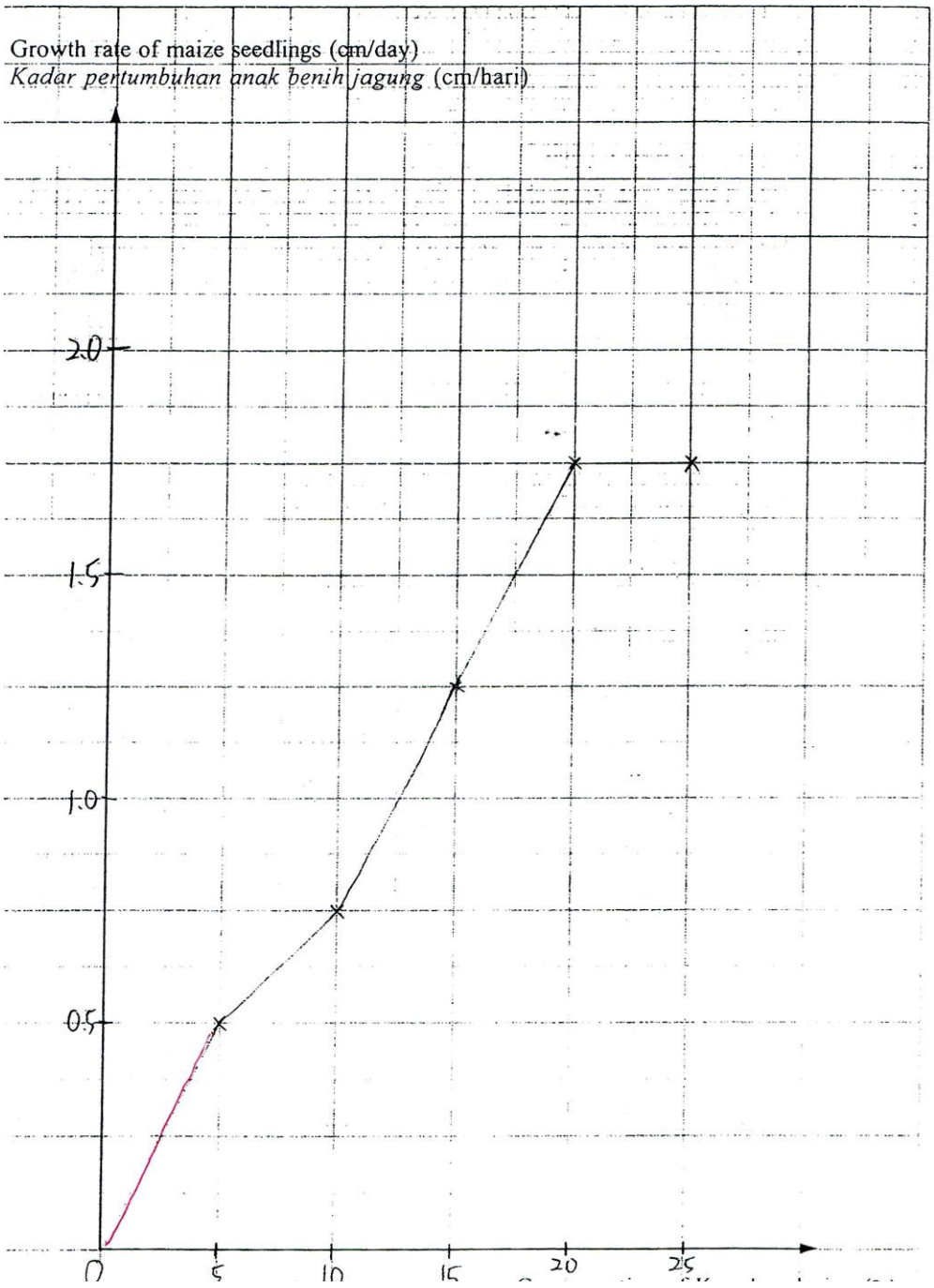
The growth rate of maize seedlings increase until it has reach 20.0% concentration, it become constant. This is because the nutrients in 20.0% Knop's solution is enough to let the plant grow

Calon dapat membina jadual dengan mengikut kehendak soalan untuk merekod data eksperimen bersama dengan unit betul serta dapat mengira peratusan kadar pertumbuhan anak benih jagung dengan betul.

Graf dilukis adalah memenuhi kriteria, iaitu menulis skala paksi yang seragam, memindah titik dengan betul dan melukis garisan graf melalui semua titik.

Kebanyakan calon dapat menyatakan hubungan antara kepekatan larutan Knop dan kadar pertumbuhan anak benih jagung dengan betul.

| Concentration of Knop's solution% | Height of maize seedlings/cm | | Average height of the maize seedlings | Growth rate of maize seedling |
|---|---|---|---|---|
| | 1 | 2 | | |
| 5% | 1.9cm | 2.1cm | 2cm | 0.5 |
| 10% | 3.2cm | 2.8cm | 3cm | 0.75 |
| 15% | 5.1cm | 4.9cm | 5cm | 1.25 |
| 20% | 6.8cm | 7.2cm | 7cm | 1.75 |
| 25% | 7.1cm | 6.9cm | 7cm | 1.75 |


Growth rate of maize seedlings (cm/day)
Kadar pertumbuhan anak benih jagung (cm/hari)
2.0
1.5
1.0
0.5
0
5
10
15
20
25

The higher the concentration of Knop's solution, the higher the growth rate of maize seedling until an optimum point of concentration is reached. The concentration of Knop's solution is linearly proportional to the growth rate of maize seedlings until an optimum point is reached.

Jadual data tiada mempunyai unit bagi kadar pertumbuhan anak benih jagung.
Terdapat juga calon melukis garisan graf yang **melebihi** titik ditandakan.
Kebanyakan calon dapat menyatakan hubungan antara kepekatan larutan Knop dan kadar pertumbuhan anak benih jagung dengan betul **tetapi gagal menerangkan hubungan.**

The concentration of Knop's solution increases, the growth rate of maize seedlings increases, until a maximum value, the growth rate becomes constant.

As the concentration of knop's solution increase, the height of maize seedlings become higher, As the concentration of knop's solution reach 25.0%. it become a limiting factor and the height of maize seedlings become constant.

Tidak dapat menerangkan hubungan antara kepekatan larutan Knop dan kadar pertumbuhan anak benih jagung dengan betul.

Soalan 1(g) - Menyatakan definisi secara operasi

(g) Based on the result of this experiment, state the operational definition for growth.

*Berdasarkan keputusan eksperimen ini, nyatakan definisi secara operasi untuk pertumbuhan.*

Growth is the process where the height of the maize seedlings increase and is affected by the concentration of knop's solution.

Growth is the rise in height of maize seedling in four days and the growth is affected by the concentration of Knop's solution used.

Kemahiran mendefinisi secara operasi untuk "pertumbuhan" anak benih jagung dapat dikuasai dengan baik.

Growth is the average height of maize seedling after four days. The height of the seedling depends on the concentration of Knop's solution given to the seedling. The average height is obtained by measuring the height of two maize seedlings and taking the average.

Growth is the proses of getting taller in height of plant which is affected by the concentration of Knop's solution if concentration of Knop's solution increases, the height of plant increases too.

Growth is the height of maize seedlings, after four days when they are planted in petri dishes with moist cotton wool using different concentration of Knop's solution.

By using 20.0% Knop's solution as the culture solution for the plant

Gagal dalam menyatakan definisi secara operasi yang lengkap atau betul.

Soalan 1(h) - Meramal hasil eksperimen.

(*h*) Another group of students carried out the same experiment by using 50% concentration of Knop's solution. Predict the outcome of this experiment.

Explain your prediction.

*Sekumpulan murid yang lain menjalankan eksperimen yang sama dengan menggunakan kepekatan larutan Knop 50%. Ramalkan hasil eksperimen ini.*

*Terangkan ramalan anda.*

The plant will wilt and its height is 1.5 cm, that is less than 1.9 cm. This is because the solution is hypertonic to the plant, water diffuses out from the plant. Plasmolysis occurs because the concentration of the solution is higher than the plant.

Dapat meramal hasil eksperimen dan memberi penerangan yang lengkap.

Growth rate remains at 1.75 cm/day. This is because a concentration of Knop's solution that is higher than 20% results in an unchanged growth rate which is 1.75 cm/day.

The maize seedlings will emit. 50% of Knop's solution is hypertonic to the cell sap of maize seedlings. Water diffuse out of the root by osmosis.

The growth rate of the maize seedling will be 1.75 cm/day because other environmental factor has become the limiting factor

The growth rate would be the same. This is because that is the maximum growth rate

Meramalkan hasil eksperimen tetapi tidak disokong melalui penerangan yang lengkap.

Soalan 1(h) - Mengelas

(*i*) The following list are the variables used in this experiment to study the growth rate in plants.

Classify the following variables into manipulated variables and responding variables in Table 1.4.

*Senarai berikut ialah pembolehubah-pembolehubah yang digunakan dalam eksperimen ini untuk mengkaji kadar pertumbuhan pokok.*

*Kelaskan pembolehubah berikut kepada pembolehubah dimanipulasikan dan pembolehubah bergerak balas dalam Jadual* 1.4.

| | | |
|---|---|---|
| Dry mass<br>*Jisim kering* | Concentration of nutrient<br>*Kepekatan nutrien* | Light intensity<br>*Keamatan cahaya* |
| Amount of water<br>*Jumlah air* | Wet mass<br>*Jisim basah* | Height<br>*Ketinggian* |

| **Manipulated variable**<br>***Pembolehubah dimanipulasikan*** | **Responding variable**<br>***Pembolehubah bergerak balas*** |
|---|---|
| | |

| **Manipulated variable**<br>***Pembolehubah dimanipulasikan*** | **Responding variable**<br>***Pembolehubah bergerak balas*** |
|---|---|
| Concentration of nutrient<br>Light Intensity<br>Amount of water | Dry Mass<br>Wet Mass<br>Height |

Mengelas merupakan satu kemahiran yang mudah.

| Manipulated variable<br>*Pembolehubah dimanipulasikan* | Responding variable<br>*Pembolehubah bergerak balas* |
|---|---|
| Amount of water<br>Light intensity<br>Dry mass<br>Concentration of nutrient | Height<br>Wet mass |

| Manipulated variable<br>*Pembolehubah dimanipulasikan* | Responding variable<br>*Pembolehubah bergerak balas* |
|---|---|
| Concentration of nutrient | Height |

Calon salah anggap jisim kering sebagai pembolehubah dimanipulasikan atau tidak jawab dengan lengkap.

**Soalan 2** - Merancang satu eksperimen

2 Starch and protein contained in food are large molecules. Large molecules cannot be absorbed by the villi of the small intestine. Glucose and amino acids are small molecules which can diffuse into the villi.

Based on the information above, plan a laboratory experiment to show that small molecules are able to diffuse across a semipermeable membrane but large molecules cannot.

The planning of your experiment must include the following aspects:

*Kanji dan protein yang terkandung dalam makanan merupakan molekul besar. Molekul besar tidak boleh diserap oleh vilus usus kecil. Glukosa dan asid amino adalah molekul kecil yang boleh meresap ke dalam vilus.*

*Berdasarkan maklumat di atas, rancang satu eksperimen dalam makmal untuk menunjukkan bahawa molekul kecil boleh meresap merentasi membran separa telap tetapi molekul besar tidak boleh.*

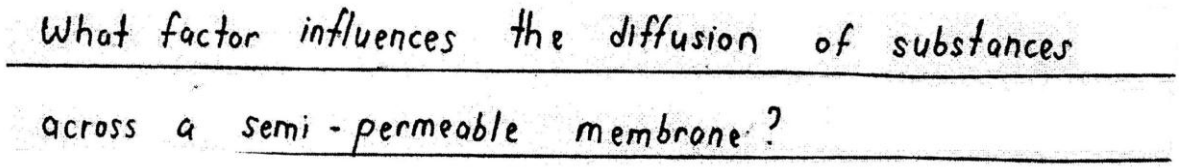
*Perancangan eksperimen anda hendaklah meliputi aspek-aspek berikut:*

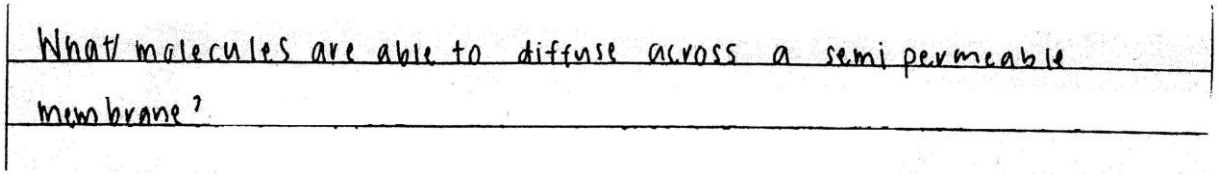
- Problem statement
  *Pernyataan masalah*
- Hypothesis
  *Hipotesis*
- Variables
  *Pembolehubah*
- List of apparatus and materials
  *Senarai radas dan bahan*
- Procedure of experiment
  *Prosedur eksperimen*
- Presentation of data
  *Persembahan data*

<u>Aspek menulis penyataan masalah</u>

What is the effect of size of molecule on the diffusion of the molecule across a semipermeable membrane (visking tubing)?

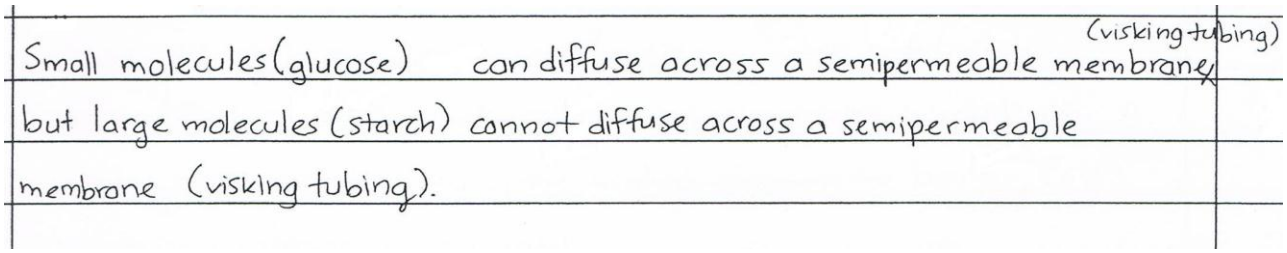
Pernyataan masalah dapat dinyatakan dengan betul. Mereka dapat menghubungkait pembolehubah dimanipulasikan dengan pembolehubah bergerak balas dalam bentuk soalan.



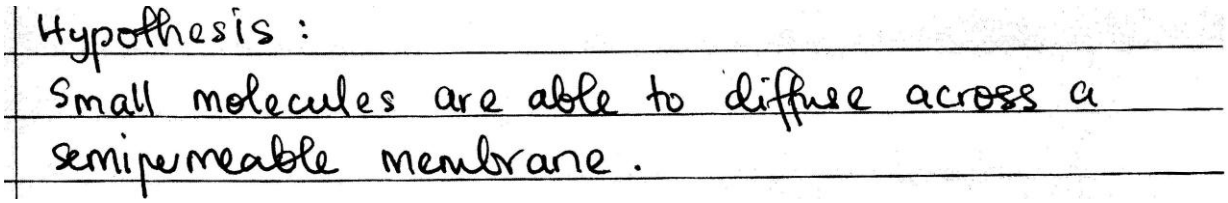




Jawapan calon kekurangan satu pembolehubah dalam pernyataan masalah.

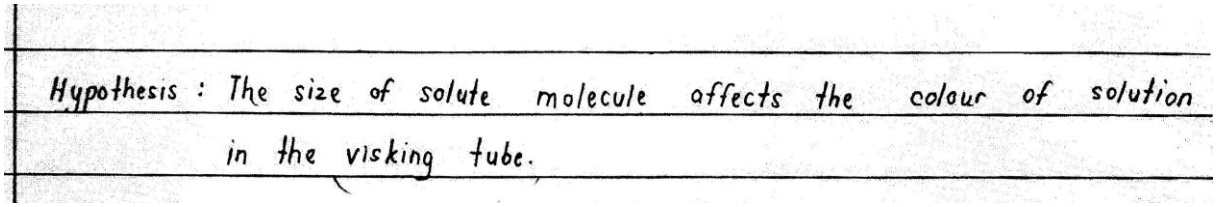
<u>Aspek menyatakan hipotesis</u>




Hipotesis dapat dinyatakan dengan betul.
Mereka dapat menunjukkan satu hubungan yang betul antara pembolehubah dimanipulasikan dengan pembolehubah bergerak balas.

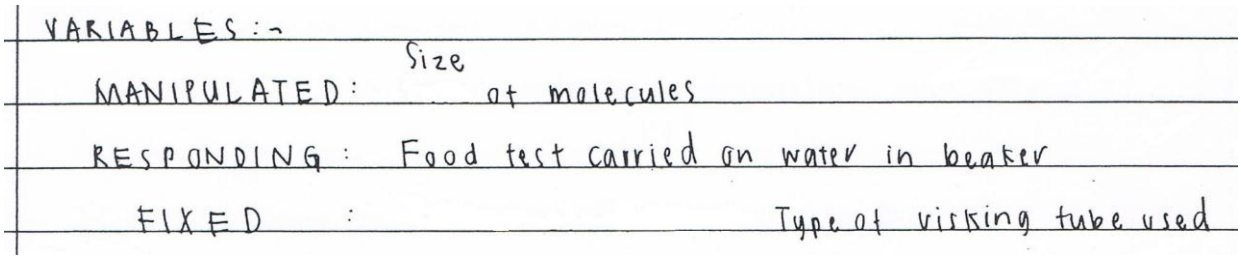


Kekurangan satu pembolehubah atau pembolehubah tidak jelas.

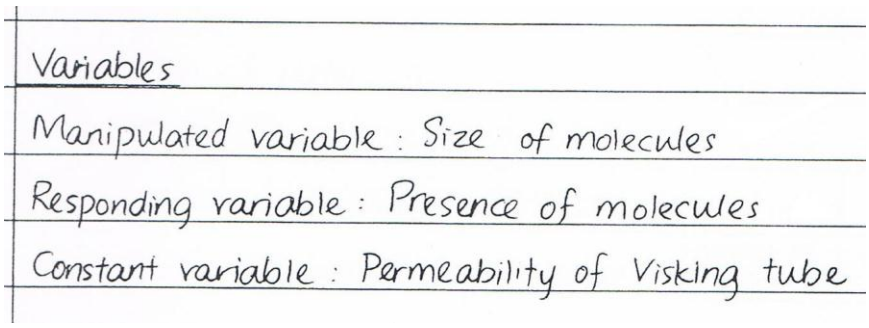



Hipotesis tidak menunjukkan hubungan yang jelas antara pembolehubah dimanipulasikan dengan pembolehubah bergerak balas.

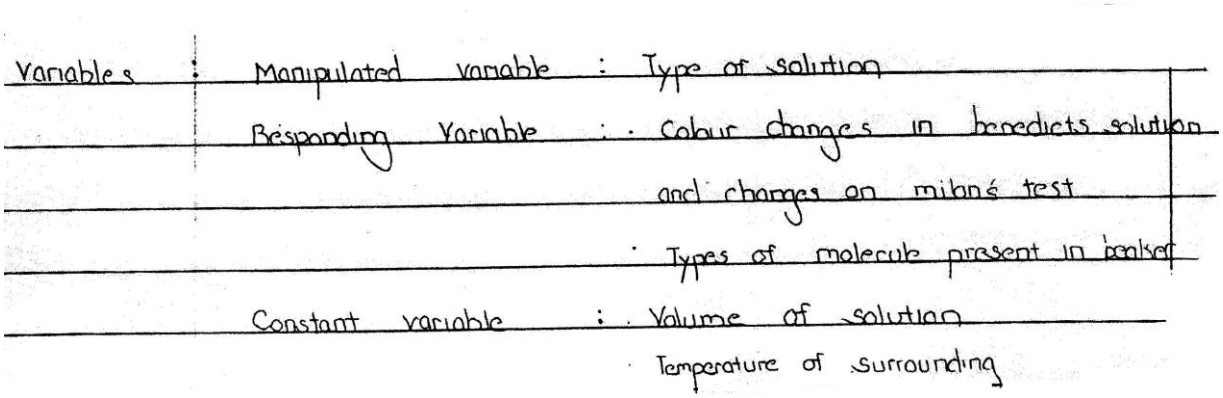
<u>Aspek mengenalpasti pembolehubah</u>




Dapat mengenalpasti ketiga-tiga pembolehubah dengan betul iaitu pembolehubah dimanipulasikan, bergerak balas dan dimalarkan.

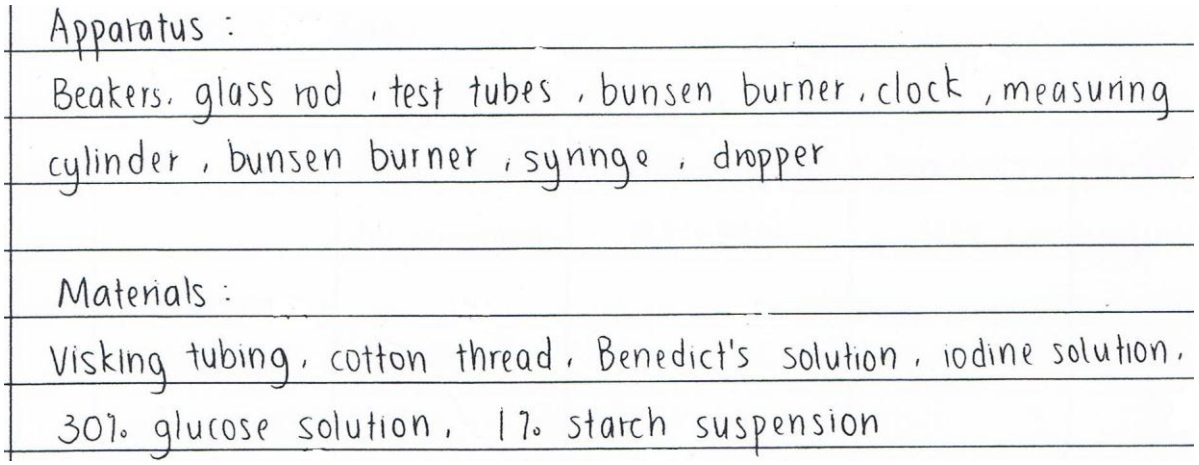



Dapat menyatakan dua pembolehubah yang betul sahaja.

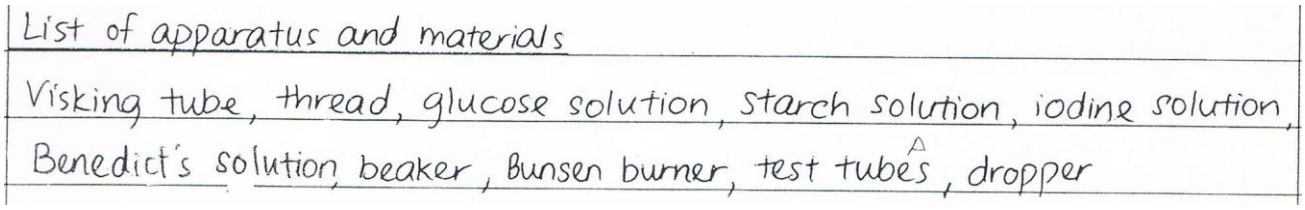



Dapat menyatakan satu pembolehubah yang betul sahaja.

<u>Aspek menyenaraikan radas dan bahan eksperimen</u>




Menyenaraikan 7 jenis radas dan 6 jenis bahan yang lengkap untuk eskperimen.




Tidak dapat menyenaraikan radas dan bahan dengan lengkap.
Calon hanya menyenaraikan enam hingga empat jenis bagi kedua-dua radas dan bahan.

Apparatus and materials : beaker, visking tube, test tube, glucose solution, starch suspension, iodine solution, distilled water, Benedict's solution.

Hanya menyenaraikan tiga hingga satu jenis bagi kedua-dua radas dan bahan.

Aspek menulis prosedur eksperimen

Procedures of Experiment

1. One visking tubing is soaked in water to soften it.
2. The one-end of the visking tubing is tied with a white thread tightly to
3. 5 ml of 2% glucose solution is measured using a measuring cylinder.
4. 5 ml of 2% of starch suspension is measured using another measuring cyllnder.
5. The 5ml of 2% of glucose solution is poured into the visking tubing
6. The 5ml of 2% of starch suspension is poured into the same visking tubing.
7. The other end of the visking tubing is tied using another thread tightly to prevent leakage.
8. The visking tubing is soaked in distilled water a few time.
9. A beaker is labelled with A.
10. The visking tubing is immersed in the beaker A for 30 minutes. The observation is recorded
11. After 30 minutes, the visking tubing is bring out of the beaker A and is placed in another empty beakerwhich is then labelled

| | |
|---|---|
| | as beaker B. |
| 12. | The solution in the visking tubing is poured into beaker B. |
| | |
| | |
| | |
| 13. | The initial colour of each solution is recorded. |
| 14. | 2 ml of solution from beaker A is poured into a test tube. The iodine |
| | test is carry out by adding 2ml of iodine solution into the test tube. |
| 15. | The observation is observe and the colour changes is recorded. |
| 16. | Steps 14 and 15 are repeated by replacing solution in beaker A with solution in |
| | beaker B. |

| | |
|---|---|
| 16. | Steps 14 and 15 are repeated by replacing solution in beaker A with solution in |
| | beaker B. |
| 17. | 2 ml of solution from beaker A is poured into a boiling tube. The benedict |
| | test is carry out by adding 2ml of benedict reagent into the same |
| | boiling tube. The mixture is heated. |
| 18 | Any observation is observe and the colour changes is recorded. |
| 19. | Steps 17 and 18 are repeated by replacing solution in beaker A |
| | with solution in beaker B. |
| 20. | The experiment is repeated to obtain average result which is |
| | more accurate. |

Procedure : ① A visking tube is washed with water to soften it.

② One end of the visking tube is tied to prevent leakage.

③ The visking tube is then filled with glucose solution and starch suspension. The other end is tied up.

④ The colour of solution in the visking tube is observed and recorded.

⑤ The outer layer of the visking tube is washed with distilled water.

⑥ Distilled water and iodine solution is filled in a seperate beaker.

⑦ The visking tube is placed in the beaker and left to stand for 40 minutes

⑧ After 40 minutes, the colour of solution in the visking tube is observed and recorded.

⑨ Both solutions are then tested with Benedict's solution. Observations are recorded in the table below.

Calon cemerlang dapat menulis prosedur eksperimen dengan lengkap iaitu langkah-langkah eksperimen yang menyatakan persediaan bahan dan radas, mengoperasi semua pembolehubah dan menyatakan langkah berjaga-jaga.

Procedure :

1. Add 5ml of glucose solution followed by starch solution into an osmometer.
2. Place a glass tube in the osmometer.
3. Using a thread tie the osmometer together with the glass tube.
4. The surface of the osmometer is rinsed with distilled
5. The set up is placed into a beaker of water
6. After some time, some of the solution in the water is drawn up from the beaker.
7. It is then placed in two respective test tubes.
8. One of the test tube is tested with benedict's test.
9. The other is tested with lodine test.
10. The changes of colour in the two test tubes are observed.
11. The results are tabulated in a table.
12. Repeat the experiment using amino acid solution and protein solution, the test used is replaced with millon's reagent.

Prosedur yang dinyatakan calon kekurangan salah satu atau dua kriteria.

Procedure :

1. Soak a visking tubing in distilled water for 5 minutes to soften it.
2. Tie one end of the visking tubing b with a cotton thread

| | |
|---|---|
| 3. | Fill the visking tubing with 1% starch suspension and 30% glucose solution ~~and tie the oth~~ by using a syringe and tie the other end of the visking tubing. |
| 4. | Rinse the visking tubing with distilled water. (Precautionary step) |
| 5. | Pour 40ml of distilled water and 15ml of iodine solution into a beaker. Stir the ~~soluti~~ mixture by using a glass rod. |
| 6. | Immerse the visking tubing into the beaker and observe the colour of the solutions in the visking tubing and in the beaker. |

Jawapan calon lemah.

<u>Aspek mempersembahkan data eksperimen</u>

Tabulation of data:

| Solution in | Initial colour of solution. | Observation/Colour changes for | |
|---|---|---|---|
| | | Iodine test | Benedict test |
| Beaker A | | | |
| | | | |
| Beaker B | | | |
| | | | |

PRESENTATION OF DATA

| FOOD SAMPLE IN THE VISKING TUBE | FOOD TEST CARRIED IN THE WATER OF BEAKER | |
|---|---|---|
| | BENEDICT'S TEST | IODINE TEST |
| | | |
| Glucose Solution | | |
| | | |
| | | |

Dapat membina jadual dengan tajuk yang betul dan menyatakan pembolehubah dimanipulasikan iaitu larutan glukosa dan kanji.

Presentation of data

| | Iodine Test | | | Benedict's Test | | |
|---|---|---|---|---|---|---|
| | Initial colour | End colour | Presence of starch | Initial colour | End colour | Presence of glucose |
| Visking tube | | | | | | |
| Beaker | | | | | | |

Calon tidak dapat memberikan tajuk yang betul dalam jadual.

Presentation of data

| Solute | Colour of solution in the visking tube |
|---|---|
| Glucose solution + starch suspension | |
| Distilled water + iodine solution | |

Jawapan calon yang lemah.

**Saranan kepada calon**

1. Calon perlu terlibat secara aktif semasa menjalankan eksperimen dalam makmal
2. Laporan eksperimen perlu ditulis dengan lengkap sebaik sahaja selesai eksperimen dilakukan
3. Calon perlu mengetahui semua eksperimen dan aktiviti dalam buku teks amali sekolah.
4. Calon perlu menguasai semua aspek kemahiran proses sains serta kemahiran manipulatif.
5. Calon perlu didedahkan dengan pelbagai soalan berformat SPM Biologi 3.

**Saranan kepada guru**

1. Guru mesti memahami objektif pentaksiran elemen dan aspek bagi setiap kemahiran proses sains seperti yang terdapat dalam buku format pentaksiran LPM.
2. Guru baharu perlu mendapat pendedahan tentang format pentaksiran Biologi 3.
3. Guru wajib menjalankan semua eksperimen penting yang disaran dalam buku Huraian Sukatan Pelajaran.
4. Guru Biologi baharu perlu menghadiri kursus menanda kertas soalan SPM Biologi 3.