Nama: ______________________________

Kelas: ______________________________

JABATAN PELAJARAN NEGERI JOHOR

4551/3

PEPERIKSAAN PERCUBAAN SPM 2008
TINGKATAN 5
BIOLOGY
Kertas 3
September

$1\frac{1}{2}$ hours

Satu jam lima belas minit.

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Sila tuliskan nama dan kelas anda di ruang yang disediakan di bahagian atas sebelah kanan kertas ini.*
2. *Kertas soalan ini disediakan dalam dwibahasa. Soalan bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.*
3. *Calon perlu menjawab semua soalan dalam bahasa Inggeris.*
4. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan.*

Untuk Kegunaan Pemeriksa		
Kod pemeriksa:		
Soalan	Markah Penuh	Markah Diperolehi
1	33	
2	17	
Jumlah	50	

Instructions: *Answer* **all** *questions.*
Arahan: Jawab ***semua*** *soalan*

1. A group of students carried out an experiment to study the effect of air movement on the rate of transpiration using a potometer shown in Diagram 1.

Sekumpulan pelajar telah melakukan eksperimen untuk mengkaji kesan pergerakan udara ke atas kadar transpirasi menggunakan potometer ditunjukkan dalam rajah 1

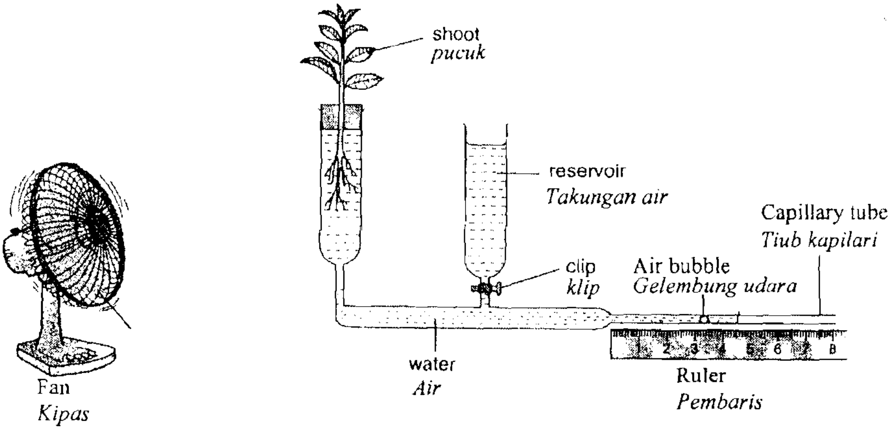


Diagram1
Rajah 1

Table 1 shows the different wind speed on the experimental specimen
Rajah 1 menunjukkan kelajuan udara yang berlainan keatas specimen eksperimen

Eksperiment *Eksperimen*	Speed of fan *Kelajuan kipas*
P	Fast *Laju*
Q	Medium *Sederhana*
R	Slow *Perlahan*

Table 1
Jadual 1

MOZ@C

Table 2 shows the distance moved by the air bubble in 5 minutes.
Jadual 2 menunjukkan jarak pergerakan gelembung udara dalam 5 minit

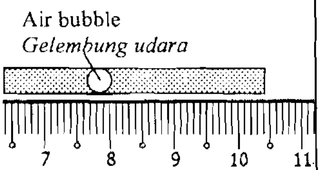
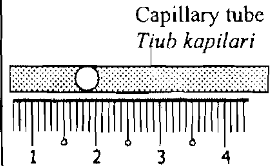
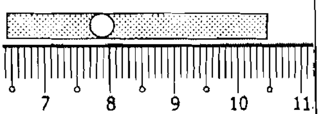
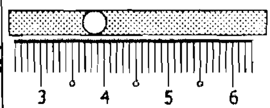
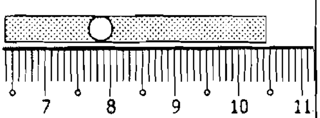
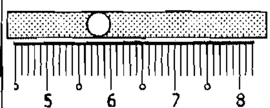
Experiment *Eksperimen*	Location of air bubble *Kedudukan gelembung udara*		Distance moved by air bubble in 5 minutes (cm) *Jarak pergerakan gelembung udara dalam 5 minit(cm)*
	Initial *Awal*	Final *Akhir*	
P			
Q			
R			

Table 2
Jadual 2

For Examiner's use

(a) (i) Based on Table 1.3 state **two different observations** made from Table 2.
Nyatakan dua pemerhatian yang berbeza berdasarkan Jadual 2.

1. ....

....

2. ....

....

[3 *marks*]

1(a)(i)

(ii) State **two inferences** which corresponds to the observations in 1 (a)(i)

1. ....

....

2. ....

....

[3 *marks*]

1(a)(ii)

(b) Record the distance moved by the air bubble in 5 minutes in the boxes provided in Table 2.
Rekodkan jarak pergerakan gelembung udara dalam 5 minit dalam petak yang disediakan dalam Jadual 2.

[3 *marks*]

1(b)

For Examiner's use

(c) (i) Complete Table 3 based on the experiment.
Lengkapkan Jadual 3 berdasarkan eksperimen ini.

Variables *Pembolehubah-pembolehubah*	Method to handle the variable *Kaedah mengendalikan pembolehubah*
Manipulated variable *Pembolehubah dimanipulasi*	....
Responding variable *Pembolehubah bergerakbalas*	....
Controlled variable *Pembolehubah kawalan*	....

[3 *marks*]

1(c)(i)

TABLE 3
Jadual 3

MOZ@C

For Examiner's use

(ii) The following list is part of the apparatus and material used in this experiment.
Berikut adalah senarai peralatan dan bahan-bahan yang digunakan di dalam eksperimen ini.

Stopwatch, fan, capillary tube, ruler, leafy shoot, water *Jam randik, kipas, tiub kapilari, pembaris, pucuk berdaun, air*

Complete Table 4 by matching each variable with the apparatus and material used in this experiment.
Lengkapkan jadual 4 dengan memadankan pembolehubah dengan radas dan bahan yang digunakan dalam eksperimen ini

Variable Pembolehubah	Apparatus Peralatan	Materials Bahan-bahan
Manipulated variable *Pembolehubah dimanipulasi*		
Responding variable *Pembolehubah bergerakbalas*		
Fixed *Dimalarkan*		

TABLE 4
Jadual 4

[3 *marks*]

1(c)(ii)

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

....

....

....

[3 *marks*]

1(d)

(e) (i) Base on the Table 2, construct a table and record the results of this experiment which includes the following aspects:
Berdasarkan maklumat di Jadual 2, bina jadual dan catatkan keputusan eksperimen ini yang mengambil kira aspek-aspek berikut:

- Speed of fan
Kelajuan kipas

MOZ@C

For Examiner's use

- The distance moved by the air bubble in 5 minutes
  Jarak pergerakan gelembung udara dalam 5 minit
- Rate of transpiration (cm/min)
  Kadar transpirasi (cm/min)

[3 *marks*] 1(e)(i)

(ii) On the graph paper provided, draw the a bar chart on the rate of transpiration against the speed of fan.
Lukiskan carta bar di atas kertas graf yang dibekalkan ke atas kadar transpirasi terhadap kelajuan kipas.

[3 *marks*] 1(e)(ii)

(iii) Explain the relationship between the rate of transpiration and the speed of fan based on the bar chart in (e) (ii).
Terangkan perhubungan diantara kadar transpiresi dengan kelajuan kipas berdasarkan carta bar dalam (e)(ii)

....

....

....

[3 *marks*] 1(e)(iii)

(f) Based on this experiment, define transpiration operationally.
Berdasarkan pemerhatian yang dibuat, takrifkan transpirasi secara operasi.

....

....

....

[3 *marks*] 1(f)

(g) A few of the top leaves were removed from the shoot. Predict the rate of transpiration. Explain your prediction.
Beberapa helai daun dari bahagian atas pucuk telah dipetik. Ramalkan kadar transpirasi dan terangkan jawapan anda.

....

....

....

[3 *marks*] 1(g)

2. The rate of photosynthesis is influenced by different environmental factors. Base on the above statement, plan a laboratory experiment to determine the effect of light intensity on the rate of photosynthesis.

Kadar fotosintesis dipengaruhi oleh faktor-faktor persekitaran yang berbeza. Berdasarkan kenyataan di atas, rancang satu eksperimen dalam makmal untuk mengenalpasti kesan keamatan cahaya ke atas kadar fotosintesis

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

- Problem statement
  Pernyataan masalah
- Aim of investigation
  Tujuan kajian
- Variables
  Pembolehubah-pembolehubah
- Hypothesis
  Hipotesis
- List of materials and apparatus
  Senarai bahan dan radas
- Technique used
  Teknik yang digunakan
- Experimental procedure
  Prosedur eksperimen
- Presentation of data
  Persembahan data
- Conclusion
  Kesimpulan

[17 marks]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

Peraturan Pemarkahan
Biologi Kertas 3

Question 1
1(a) (i)

Score	Explanation
3	Able to state **two** correct observations based on following criteria C1 – Fan speed C2 – the distance of movement of air bubble in 5 minutes Sample answer: (either 2) 1. When the fan speed is fast, the distance of movement of air bubble in 5 minutes is 6 cm *(Horizontal observation)* 2. When the fan speed is average/medium, the distance of movement of air bubble in 5 minutes is 4 cm *(Horizontal observation)* 3. When the fan speed is slow, the distance of movement of air bubble in 5 minutes is 2 cm *(Horizontal observation)* 4. The distance of movement of air bubble in 5 minutes when the fan speed is fast is longer than when the fan speed is slow/average // inversely *(Vertical observation)* 5. The faster the fan speed, the longer the distance of movement of air bubble // inversely *(accept observation in the form of hypothesis)*
2	Able to state **one** correct observation **and one** inaccurate response Sample answer *(inaccurate response)* 1. When the fan speed is fast, the distance of movement is long/far 2. When the fan speed is slow, the distance of movement short *(no accurate distance given)* 2. The distance of movement of air bubble in 5 minutes when the fan speed is fast is different compare when the fan speed is slow/average
1	Able to state **one** correct observation **or two** inaccurate response or idea Sample answer (idea) 1. Air bubble move 2. The distance is different
0	No response or wrong response

1 (a) (ii)

<table>
<tr><th>Score</th><th>Explanation</th></tr>
<tr><td>3</td><td>Able to state two reasonable inferences for the observation with the following criteria

C1 – the air movement (Reject: the speed of fan)
C2 – the water molecule evaporate (Reject: the movement of air bubble)

[The inference is dependent to the observation given.
First inference is for first observation and second inference is for second observation.
If the wrong observation/no response given, no mark for inference]

Sample answer

1. When the air movement is fast, the water molecule evaporate from the surface of the leaves is fast.

2. When the air movement is medium, the water molecule evaporate from the surface of the leaves is medium

3. When the air movement is slow, the water molecule evaporate from the surface of the leaves is slow

4. The water molecule evaporate from the surface of the leaves is faster when the movement of the air is fast than when the movement of air is slow/average

5. The faster the air movement, the faster the water molecule evaporate from the surface of the leaves</td></tr>
<tr><td>2</td><td>Able to state one correct inference and one inaccurate inferences

Inaccurate inference – able to state either C1 or C2</td></tr>
<tr><td>1</td><td>Able to state one correct inference or two inaccurate inference or idea

Sample answer (idea level inference)

1. Water lost from the leave

2. Transpiration occurs</td></tr>
<tr><td>0</td><td>No response or wrong response</td></tr>
</table>

1(b)

<table>
<tr><th>Score</th><th>Explanation</th></tr>
<tr><td>3</td><td>Able to record 3 readings of distance of movement of air bubble in 5 minutes
<table>
<tr><th>Set</th><th>The distance of movement of air bubble in 5 minutes/cm</th></tr>
<tr><td>P</td><td>6</td></tr>
<tr><td>Q</td><td>4</td></tr>
<tr><td>R</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>Able to record 2 readings of the distance of movement of air bubble in 5 minutes</td></tr>
<tr><td>1</td><td>Able to record 1 reading of the distance of movement of air bubble in 5 minutes</td></tr>
<tr><td>0</td><td>Wrong / no response</td></tr>
</table>

1(c) (i)

<table>
<tr><th>Score</th><th>Explanation</th></tr>
<tr><td>3</td><td>Able to state all the variable and the method to handle variable correctly (6 √)
[Method to handle the variable is dependent to the variable. If the variable is wrong/no response, no mark for method to handle]
[√ for each variable and method correct]
<table>
<tr><th>Variable</th><th>Method to handle the variable</th></tr>
<tr><td>Manipulated variable:
The speed of fan // air movement</td><td>Repeat the experiment using different speed of fan/air movement
[or correct explanation]</td></tr>
<tr><td>Responding variable:
The distance of movement of air bubble in 5 minutes// rate of transpiration</td><td>Using the ruler to measure the distance of movement of air bubble (in five minutes)//
Calculate the rate of transpiration using the following formulae:
$\text{The rate of transpiration} = \frac{\text{The distance of movement of air bubble (cm)}}{\text{5 minutes}}$</td></tr>
<tr><td>Fixed variable:
Temperature//humidity //light intensity// size/type of plant shoot/number of leave//diameter of capillary tube</td><td>Fixed the temperature at $27^{o}C$/any suitable temperature/room temperature//
Do the experiment in the same laboratory/room with the same humidity/light intensity //
Use the same size/number of leaves/type/species of the plant// diameter of capillary tube</td></tr>
</table>
Able to get 6√</td></tr>
<tr><td></td><td></td></tr>
<tr><td>2</td><td>Able to get 5-4√</td></tr>
<tr><td>1</td><td>Able to get 3-2√</td></tr>
<tr><td>0</td><td>Able to get 1√</td></tr>
<tr><td>0</td><td>All wrong / no response</td></tr>
</table>

1(c) (ii)

<table>
<tr><th>Score</th><th>Explanation</th></tr>
<tr><td>3</td><td>Able to match the apparatus and material used to obtain data for three variables correctly
<table>
<tr><td>Variable</td><td>Apparatus</td><td>Material</td></tr>
<tr><td>Manipulated</td><td>Fan</td><td>-</td></tr>
<tr><td>Responding</td><td>Ruler, capillary tube</td><td>Water</td></tr>
<tr><td>Fixed</td><td>Stopwatch, capillary tube</td><td>Leafy shoot</td></tr>
</table></td></tr>
<tr><td>2</td><td>Able to match the apparatus and materials for any two variables correctly</td></tr>
<tr><td>1</td><td>Able to match the apparatus and materials for any one variables correctly</td></tr>
<tr><td>0</td><td>No response or wrong response</td></tr>
</table>

1(d)

<table>
<tr><th>Score</th><th>Explanation</th></tr>
<tr><td>3</td><td>Able to state the hypothesis correctly based on the following criteria

V1 – state the manipulated variable (The speed of fan //air movement)
V2 – state the responding variable (distance of movement of air bubble in 5 minutes// rate of transpiration
R – state the relationship between V1 and V2

Sample answer:

1. The higher the speed of fan /air movement, the longer the distance of movement of air bubble in five minutes
2. The higher the speed of fan /air movement, the faster the rate of transpiration

[Accept the negative hypothesis]</td></tr>
<tr><td>2</td><td>Able to state the hypothesis but less accurate (any two criteria)</td></tr>
<tr><td>1</td><td>Able to state the idea of the hypothesis (any one criteria)</td></tr>
<tr><td>0</td><td>No response or wrong response</td></tr>
</table>

1(f)

Score	Explanation
3	Able to state the definition of transpiration operationally, complete and correct based on the following criteria C1 – water vapour lost from the plant C2 – water movement in the plant C3 – the speed of air affect the rate of transpiration Sample answer: The transpiration is the loss of water vapour from the plant/leaves causing water movement in the plant affected by the speed of air
2	Able to state the definition of transpiration based on any two criteria
1	Able to state the definition of transpiration based on one criteria // correct definition theorycally
0	No response or wrong response

1(g)

Score	Explanation
3	Able to predict correctly and explain the prediction on the following criteria C1 – the distance of the movement of air bubble is <u>less than 2 cm</u> C2 – the rate of transpiration <u>decreases</u> C3 – the <u>number of stomata decrease</u> Sample answer: The distance of the movement of air bubble is 1.5 cm/any suitable distance less than 2 cm because the rate of transpiration decreases because the number of stomata is decrease
2	Able to predict based on any two criteria
1	Able to predict based on any one criteria
0	No response or wrong response

Question 2

Explanation	Score	Tick
01 : Problem statement		
Able to relate P1, P2 and H in a question form P1 – manipulated variable (MV) P2 – Responding variable (RV) H – Relationship and question form Sample answer: 1. How does light intensity affect the rate of photosynthesis? 2. What is the effect of light intensity on the rate of photosynthesis? 3. Does light intensity affect the rate of photosynthesis?	3	
Able to state a problem statement inaccurately Sample answer: What is the effect of light intensity on plant? Does light intensity affect the activity of plant?	2	
Able to state a problem statement at idea level Sample answer Plant is affected by light intensity	1	√
No response or wrong problem statement	0	
Objective Able to state the aim of the investigation correctly Sample answer: To investigate the effect of light intensity on the rate of photosynthesis	-	√
02 : Making Hypothesis		
Able to state a hypothesis relating the manipulated variable to the responding variable P1 – manipulated variable (MV) P2 – Responding variable (RV) H – Relationship Sample answer: 1. As light intensity increases/decreases the rate of photosynthesis increases/decreases 2. The higher/lower the light intensity the higher/lower the rate of photosynthesis 3. As light intensity increases/decreases the number of bubbles released increases/decreases [*Accept the negative hypothesis*]	3	
Able to state a hypothesis inaccurately Sample answer: 1. The light intensity <u>influences/affect</u> the rate of photosynthesis 2. As light intensity increases/decreases the number of bubbles released <u>changes</u>	2	
MOZ@C	1	

Able to state a hypothesis at idea level Sample answer: The light intensity affects the activity of photosynthesis		√
Identify Variable **Able to state all three variables correctly** 1. Manipulated variable: Light intensity 2. Responding variable: The number of bubbles released//volume of oxygen collected// the rate of photosynthesis 3. Controlled variable: Time taken//temperature//concentration of carbon dioxide//concentration of sodium hydrogen carbonate solution//size/type of plant	-	√
05 – Apparatus and materials	3 2 1 0	√

Apparatus	Materials
1. light source/bulb 2. test tube 3. thermometer 4. glass filter funnel 5. ruler 6. stop watch 7. Measuring cylinder(if RV is volume of oxygen collected)	1. *Elodea/hydrilla* 2. 1% sodium hydrogen carbonate (or any fixed concentrated)// sodium hydrogen carbonate + distilled water 3. Plasticine

Scoring table

Item to be stated	Score
1. light source/bulb + *Elodea/hydrilla* + 5 apparatus + 1-2 materials	3
2. light source/bulb + *Elodea/hydrilla* + 3-4 apparatus + 1-2 materials	2
3. light source/bulb + *Elodea/hydrilla*	1
4. **Without** light source/bulb + Elodea/hydrilla	0

B1 – Technique Able to state the operating responding variable correctly, using suitable apparatus Sample answer: 1. Using the stopwatch to count the number of bubbles released in 5 minute/any suitable time 2. Using measuring cylinder to measure the volume of oxygen released 3. Using the following formulae to calculate the rate of photosynthesis: The rate of photosynthesis $= \frac{\text{Number of bubbles released}}{\text{Time taken (min)}}$ **Or** The rate of photosynthesis $= \frac{\text{Volume of oxygen collected (cm}^3\text{)}}{\text{Time taken (min)}}$ [Defend to the responding variable given]	1	√
04 - Procedure **K1** – <u>Preparation of materials and apparatus</u> **(any 3)** 1. Set up as shown in diagram with any 5 label 2. The strands of *Elodea /Hydrilla* is placed inside a glass filter funnel. 3. The funnel is placed up side down in a 500 ml beaker 4. The beaker is placed at a distance of 50 cm from the 60 W bulb as a light source (any first distance) 5. The graph of the rate of photosynthesis against the light source is plotted **K2** – <u>Operating controlled variable</u> **(any 1)** 1. The temperature of water in beaker is maintained at <u>28°C/any suitable temperature</u> 2. The beaker is filled with <u>400 ml of 1 %</u> sodium bicarbonate. 3. The number of gas bubbles released in <u>five minute</u> are counted 4. Use the <u>same type/species/size of plant</u> in each experiment **K3** – <u>Operating responding variable</u> Count and record the number of bubbles release//measure the volume of oxygen collected//calculate the rate of photosynthesis using .... **K4** – Operating manipulated variable Repeat experiment at different distance / 40 cm, 30 cm, 20 cm and 10 cm (at least 4 reading including the first distance) **K5** – <u>Precaution step / Accurating experiment</u> **(any 1)** 1. Repeat experiment (for every distance) to get average reading 2. Leave the elodea/hydrilla for about 2-3 minute to the altered light intensity 3. Start the stopwatch after the bubble coming out of the plant become regular		

B1 – Technique Able to state the operating responding variable correctly, using suitable apparatus Sample answer: 1. Using the stopwatch to count the number of bubbles released in 5 minute/any suitable time 2. Using measuring cylinder to measure the volume of oxygen released 3. Using the following formulae to calculate the rate of photosynthesis: $$\text{The rate of photosynthesis} = \frac{\text{Number of bubbles released}}{\text{Time taken (min)}}$$ **Or** $$\text{The rate of photosynthesis} = \frac{\text{Volume of oxygen collected (cm}^3\text{)}}{\text{Time taken (min)}}$$ [Defend to the responding variable given]	1	√
04 - Procedure **K1** – <u>Preparation of materials and apparatus</u> **(any 3)** 1. Set up as shown in diagram with any 5 label 2. The strands of *Elodea /Hydrilla* is placed inside a glass filter funnel. 3. The funnel is placed up side down in a 500 ml beaker 4. The beaker is placed at a distance of 50 cm from the 60 W bulb as a light source (any first distance) 5. The graph of the rate of photosynthesis against the light source is plotted **K2** – <u>Operating controlled variable</u> **(any 1)** 1. The temperature of water in beaker is maintained at <u>28°C/any suitable temperature</u> 2. The beaker is filled with <u>400 ml of 1 %</u> sodium bicarbonate. 3. The number of gas bubbles released in <u>five minute</u> are counted 4. Use the <u>same type/species/size of plant</u> in each experiment **K3** – <u>Operating responding variable</u> Count and record the number of bubbles release//measure the volume of oxygen collected//calculate the rate of photosynthesis using .... **K4** – Operating manipulated variable Repeat experiment at different distance / 40 cm, 30 cm, 20 cm and 10 cm (at least 4 reading including the first distance) **K5** – <u>Precaution step / Accurating experiment</u> **(any 1)** 1. Repeat experiment (for every distance) to get average reading 2. Leave the elodea/hydrilla for about 2-3 minute to the altered light intensity 3. Start the stopwatch after the bubble coming out of the plant become regular MOZ@C		

<table>
<tr>
<td>Scoring table
<table>
<tr><td>Number of K (K1/K2/K3/K4/K5)</td><td>Score</td><td>tick</td></tr>
<tr><td>All 5 K</td><td>3</td><td></td></tr>
<tr><td>3-4 K</td><td>2</td><td></td></tr>
<tr><td>2 K</td><td>1</td><td></td></tr>
<tr><td>1 K</td><td>0</td><td>√</td></tr>
<tr><td>0 K</td><td>0</td><td></td></tr>
</table>
</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>B2 – Recording Data
Able to construct a table to record all data with the following aspects
1. 3 titles with correct units
2. No data is required

Sample answer:
<table>
<tr><td>Distance from light to plant (cm)</td><td>Light intensity (1/cm)</td><td>Number of bubble release in 5 minute</td><td>Rate of photosynthesis (No. of bubbles per min)</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>
</td>
<td>1</td>
<td>√</td>
</tr>
<tr>
<td>Conclusion
Re-write the hypothesis. If the hypothesis is rejected, write the right hypothesis</td>
<td>-</td>
<td>√</td>
</tr>
<tr>
<td>03 – Planning an experiment
Count the number of ‘tick’
Scoring table
<table>
<tr><td>Number of tick</td><td>score</td></tr>
<tr><td>7 - 9</td><td>3</td></tr>
<tr><td>4 - 6</td><td>2</td></tr>
<tr><td>1-3</td><td>1</td></tr>
<tr><td>0</td><td>0</td></tr>
</table>
</td>
<td></td>
<td></td>
</tr>
</table>

Summary:

Code	Item	Maximum score	‘tick’
01	Problem statement	3	√
-	Objective	-	√
02	Making hypothesis	3	√
-	Identify variable	-	√
05	Apparatus and materials	3	√
B1	Technique	1	√
04	Procedure	3	√
B2	Recording data	1	√
-	Conclusion	-	√
03	Planning an experiment	3	
	Total	**17**	9