

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

1. Department of Irrigation and Drainage is carrying out an investigation on a pollution complaint of River P caused by wastes produced by Factory Q.  
As the department's Research and Development (R&D) officer, you are required to carry out a laboratory experiment to investigate the level of water pollution at different locations along River P.

*Jabatan Pengairan dan Saliran sedang menjalankan siasatan tentang aduan pencemaran di Sungai P yang disebabkan oleh bahan buangan dari Kilang Q.*

*Sebagai seorang Pegawai Penyelidikan dan Pembangunan (R&D), anda dikehendaki menjalankan satu eksperimen makmal untuk mengkaji tahap pencemaran air di lokasi berbeza sepanjang Sungai P.*

Diagram 1 shows the apparatus set-up used in this experiment.

*Rajah 1 menunjukkan susunan radas yang digunakan dalam eksperimen ini.*

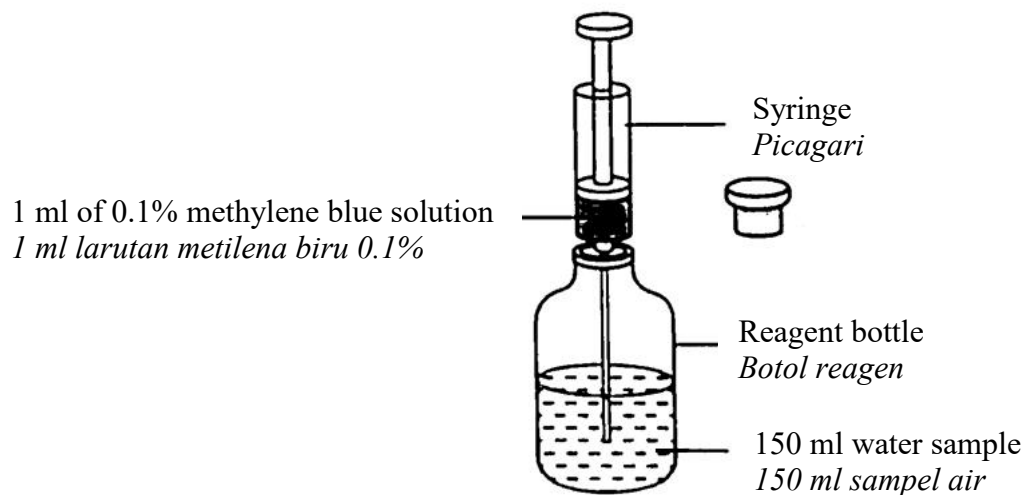


Diagram 1  
*Rajah 1*

The following steps are taken :

*Langkah-langkah berikut diikuti :*

- Step 1 : 150 ml of river water from different locations is placed in reagent bottles labelled X, Y and Z.  
*Langkah 1 : 150 ml sampel air sungai dari lokasi berbeza dimasukkan ke dalam botol reagen berlabel X, Y dan Z.*
- Step 2 : 1 ml of 0.1% methylene blue solution is added to the base of each reagent bottles by using a syringe.  
*Langkah 2 : 1 ml larutan metilena biru 0.1% ditambah ke dasar setiap botol reagen dengan menggunakan picagari.*
- Step 3 : All the reagent bottles are closed immediately and placed in a dark cupboard.  
*Langkah 3 : Semua botol reagen ditutup dengan segera dan diletakkan di dalam almari gelap.*
- Step 4 : The time taken for methylene blue solution to decolourise is recorded by using a digital stopwatch.  
*Langkah 4 : Masa yang diambil untuk larutan metilena biru dilunturkan direkodkan dengan menggunakan jam randik digital.*
- Step 5 : The experiment is repeated twice to get the average reading.  
*Langkah 5 : Ekperimen diulang dua kali untuk mendapatkan bacaan purata.*

*[Lihat halaman sebelah*

Table 1 shows the results of the experiment.  
*Jadual 1 menunjukkan keputusan eksperimen.*

Location of water sample <i>Lokasi sampel air</i>	Time taken for methylene blue solution to decolourise (minutes) <i>Masa yang diambil untuk larutan metilena biru dilunturkan (minit)</i>	
	Sample 1 <i>Sampel 1</i>	Sample 2 <i>Sampel 2</i>
X	<p>.....</p>	<p>.....</p>
Y	<p>.....</p>	<p>.....</p>
Z	<p>.....</p>	<p>.....</p>

Table 1  
*Jadual 1*

- (a) Record the time taken for methylene blue solution to decolourise in Table 1.  
*Rekodkan masa yang diambil untuk larutan metilena biru dilunturkan dalam Jadual 1.*

1(a)

	3
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[3 marks]  
[3 markah]

- (b) (i) Based on Table 1, state **two** different observations.  
*Berdasarkan Jadual 1, nyatakan **dua** pemerhatian yang berbeza.*

Observation 1

*Pemerhatian 1:*

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.....

.....

Observation 2

*Pemerhatian 2:*

.....

.....

.....

[3 marks]  
[3 markah]

1(b)(i)

	3
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- (ii) State **two** inferences which correspond to the observations in 1 (b)(i).  
*Nyatakan **dua** inferens yang sepadan dengan pemerhatian di 1(b)(i).*

Inference from observation 1

*Inferens daripada pemerhatian 1:*

.....

.....

.....

Inference from observation 2

*Inferens daripada pemerhatian 2:*

.....

.....

.....

[3 marks]  
[3 markah]

1(b)(ii)

	3
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[Lihat halaman sebelah

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

<b>Variable</b> <i>Pemboleh ubah</i>	<b>Method to handle the variable</b> <i>Cara mengendali pemboleh ubah</i>
Manipulated variable <i>Pemboleh ubah dimanipulasikan</i> ..... ..... .....	..... ..... .....
Responding variable <i>Pemboleh ubah bergerak balas</i> ..... ..... .....	..... ..... .....
Constant variable <i>Pemboleh ubah dimalarkan</i> ..... ..... .....	..... ..... .....

Table 2  
*Jadual 2*

[3 marks]  
[3 markah]

1(c)  
3

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

.....  
.....  
.....

[3 marks]  
[3 markah]

1(d)  
3

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

- Location of water sample  
*Lokasi sampel air*
- Time taken for methylene blue solution to decolourise  
*Masa yang diambil untuk larutan metilena biru dilunturkan*
  - Sample 1  
*Sampel 1*
  - Sample 2  
*Sampel 2*
  - Average  
*Purata*
- Level of water pollution  
*Tahap pencemaran air*

Formula / Formula :

Level of water pollution :  $\frac{1}{\text{Average time taken for methylene blue solution to decolourise}}$

*Tahap pencemaran air* :  $\frac{1}{\text{Purata masa diambil untuk larutan metilena biru dilunturkan}}$

1(e)(i)

[3 marks]  
[3 markah]

3

[Lihat halaman sebelah

SULIT

- (ii) Use the graph paper provided on page 9 to answer this question  
Using the data in 1 (e)(i), draw a bar chart of the level of water pollution against location of water sample.

*Gunakan kertas graf yang disediakan di halaman 9 untuk menjawab soalan ini.  
Menggunakan data di 1(e)(i), lukis sebuah carta bar tahap pencemaran air melawan lokasi sampel air.*

1(e)(ii)

3
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[3 marks]  
[3 markah]

- (f) Based on the graph drawn in 1(e)(ii), explain the relationship between the level of water pollution and the locations of water sample.

*Berdasarkan graf yang dilukis di 1(e)(ii), terangkan hubungan di antara tahap pencemaran air dan lokasi sampel air.*

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.....  
.....  
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1(f)

3
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[3 marks]  
[3 markah]

- (g) Another experiment was carried out at location X but the reagent bottle is shaken vigorously after adding the methylene blue solution into the water sample. Predict the average time taken for methylene blue solution to decolourise. Explain your prediction.

*Suatu eksperimen lain dijalankan pada lokasi X tetapi botol reagentnya digoncang dengan kuat selepas menambahkan larutan metilena biru ke dalam sampel air.  
Ramalkan purata masa yang diambil untuk larutan metilena biru dilunturkan.  
Terangkan ramalan anda.*

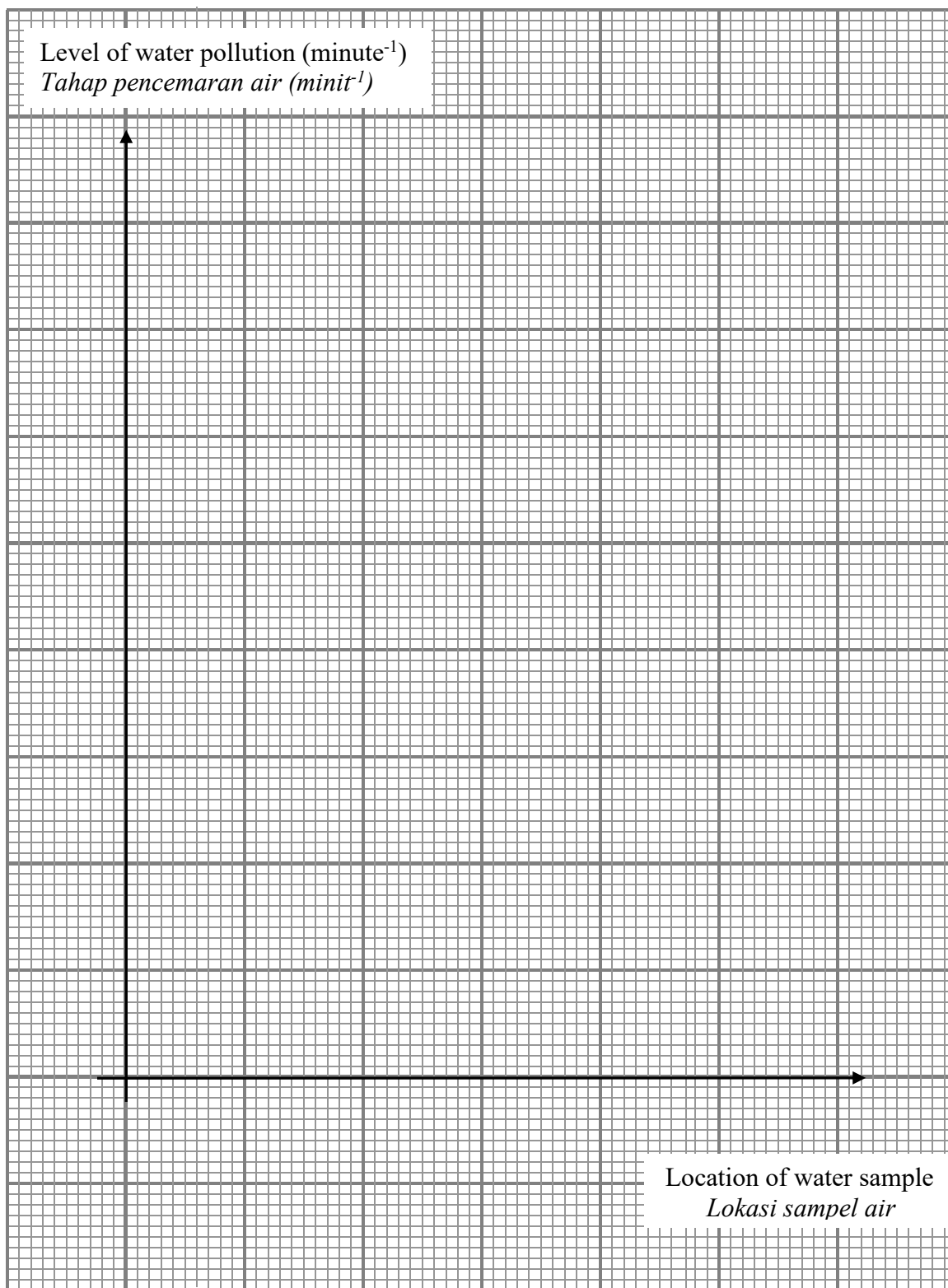
.....  
.....  
.....  
.....

1(g)

3
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[3 marks]  
[3 markah]

Level of water pollution against the locations of water samples  
*Tahap pencemaran air melawan lokasi sampel air*



[Lihat halaman sebelah  
SULIT



- (h) Based on the result of this experiment, state the operational definition for water pollution.  
*Berdasarkan keputusan eksperimen ini, nyatakan definisi secara operasi bagi pencemaran air.*

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.....  
.....  
.....

[3 marks]  
[3 markah]

1(h)

3
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- (i) The following list are the elements that cause water pollution.  
*Senarai berikut adalah elemen-elemen yang menyebabkan pencemaran air.*

Magnesium <i>Magnesium</i>	Lead <i>Plumbum</i>	Mercury <i>Merkuri</i>
Cadmium <i>Kadmium</i>	Sodium <i>Natrium</i>	Copper <i>Kuprum</i>

Classify the factors that causes water pollution in Table 3.  
*Kelaskan faktor-faktor yang menyebabkan pencemaran air dalam Jadual 3.*

<b>Heavy metal</b> <i>Logam berat</i>	<b>Non-heavy metal</b> <i>Bukan logam berat</i>

Table 3 / *Jadual 3*

[3 marks]  
[3 markah]

1(i)

3
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**Total**  
**1**

33
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2. The process of water loss through transpiration in plants plays an important role in absorption and transportation of water and mineral ions from the roots to different parts of the plants. Besides that, it also produces a cooling effect in plants. The rate of transpiration, however, is affected by environmental factors such as light intensity, air movement, relative humidity and surrounding temperature.

*Proses kehilangan air melalui transpirasi memainkan peranan utama dalam penyerapan dan pengangkutan air dan ion-ion mineral dari akar ke bahagian-bahagian berlainan dalam tumbuhan. Selain itu, ia juga dapat menghasilkan kesan penyejukan pada tumbuhan. Walau bagaimanapun, kadar transpirasi dipengaruhi oleh faktor-faktor persekitaran seperti keamatan cahaya, pergerakan udara, kelembapan relatif dan suhu persekitaran.*

Based on the above information, design a laboratory experiment to study the effect of number of leaves on the rate of transpiration in hibiscus plants. The planning of the experiment must include the following aspects:

*Berdasarkan maklumat di atas, rancangkan satu eksperimen makmal untuk mengkaji kesan bilangan daun ke atas kadar transpirasi pokok bunga raya. Perancangan eksperimen perlu merangkumi aspek berikut:*

The planning of your experiment must include the following aspects:

*Perancangan eksperimen anda harus merangkumi aspek-aspek berikut:*

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

[17 marks]  
[17 markah]

**END OF QUESTION PAPER**  
***KERTAS SOALAN TAMAT***

**INFORMATION FOR CANDIDATES**  
**MAKLUMAN UNTUK CALON**

1. This question paper consists of two question: **Question 1** and **Question 2**  
*Kertas soalan ini mengandungi dua soalan: Soalan 1 dan Soalan 2*
2. Answer all questions. Write your answer for **Question 1** in the spaces provided in this question paper.  
*Jawab semua soalan. Jawapan anda bagi Soalan 1 hendaklah ditulis pada ruang yang disediakan dalam kertas soalan ini.*
3. Write your answer for **Question 2** on the 'helaian tambahan' provided by the invigilators. You may use equations, diagrams, tables, graphs and other suitable methods to explain your answers.  
*Jawapan anda bagi Soalan 2 hendaklah ditulis dalam helaian tambahan yang dibekalkan oleh pengawas peperiksaan. Anda boleh menggunakan persamaan, rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda.*
4. Show your working, it may help you to get marks.  
*Tunjukkan kerja mengira, ini membantu anda mendapatkan markah*
5. The diagrams in the questions are not drawn to scale unless stated  
*Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*
6. The marks allocated for each question or sub-part of a question are shown in brackets.  
*Markah yang diperuntukkan bagi setiap soalan atau ceraihan soalan ditunjukkan dalam kurungan.*
7. If you wish to change your answer, cross out the answer that you have done. Than write down the new answer.  
*Jika anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.*
8. You may use a scientific calculator.  
*Anda dibenarkan menggunakan kalkulator saintifik.*
9. You are advised to spend 45 minutes to answer **Question 1** and 45 minutes for **Question 2**.  
*Anda dinasihatkan supaya mengambil masa 45 minit untuk menjawab Soalan 1 dan 45 minit untuk menjawab Soalan 2.*
10. Tie the 'helaian tambahan' together with this question paper and hand in to the invigilator at the end of examination.  
*Ikat helaian tambahan bersama-sama kertas soalan ini dan serahkan kepada pengawas peperiksaan pada akhir peperiksaan.*