4551/3
Biologi
Kertas 3
Ogos 2008
1½ jam

Nama : _____

Tingkatan : _____

SEKOLAH BERASRAMA PENUH
BAHAGIAN PENGURUSAN SEKOLAH BERASRAMA PENUH/ KLUSTER
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN SETARA
SPM 2008

BIOLOGI

KERTAS 3

Satu jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Tulis **nama** dan **kelas** anda pada ruang yang disediakan

2. Kertas soalan ini adalah dalam bahasa Inggeris.

3. Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.

Soalan	Markah penuh	Markah diperolehi
1	33	
2	17	
Jumlah	50	

Kertas soalan ini mengandungi 9 halaman bercetak

Question 1

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.
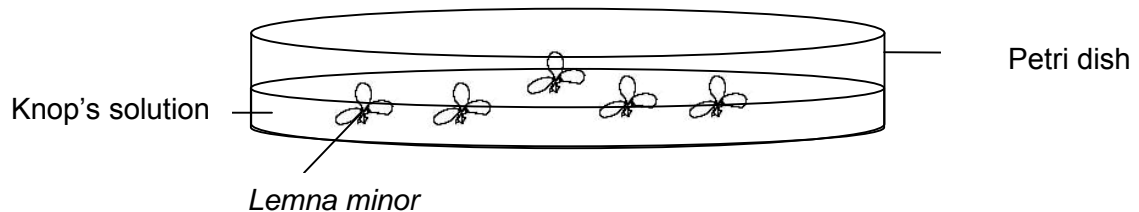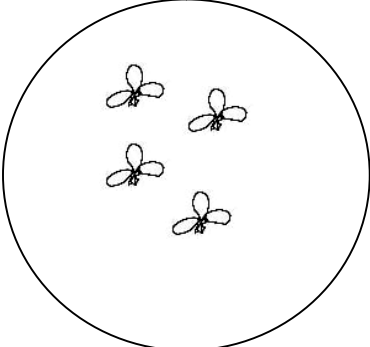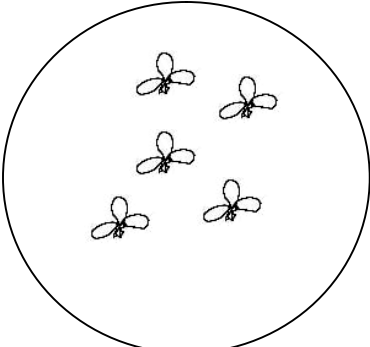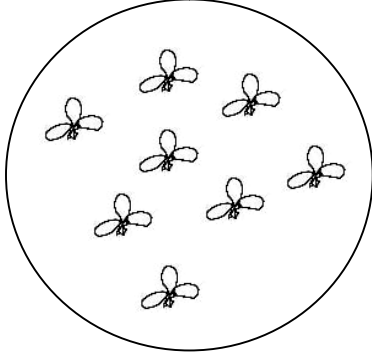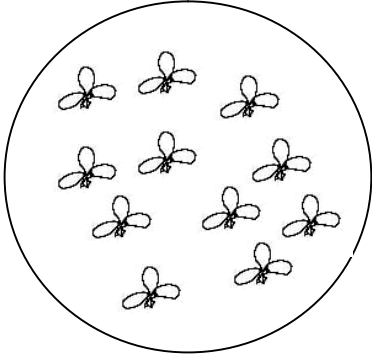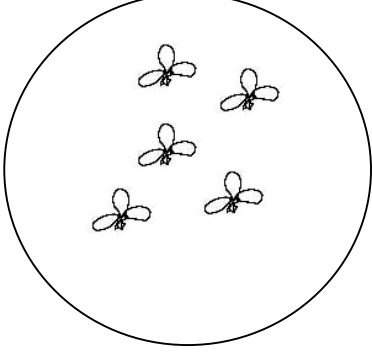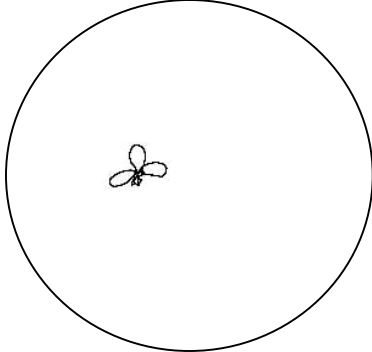

Figure 1

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

Table 1.1

pH value	Petri dish	Number of *Lemna* sp.
2		
4		

pH value	Petri dish	Number of *Lemna* sp.
6		
8		
10		
12		

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Base on the experiment, answer all questions below.

(a) State the number of *Lemna* sp. in the spaces provided in Table 1.1

[3 marks]

1 (a)

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

Observation 1:

………..……………………………………………………………………..

………………………………………………………………………………

………………………………………………………………………………

Observation 2:

……………………………………………………….…………………….…...

………………………………………………………………………………

………………………………………………………………………………

1 (b) (i)

[3 marks]

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

Inference for observation 1:

………………………………………………………………………………..

………………………………………………………………………………..

………………………………………………………………………………..

Inference for observation 2:

…….……………………………. ……………………….…..………………..

……………………………………………………………………………

………………………………………………………………………………

1 (b) (ii)

[3 marks]

(c) Complete Table 1.4 to show the variables involved in the experiment and how the variables are operated.

Variables	Operating the variables
Manipulated variable: ……………………….... …………………………. ………………………….	How to alter the manipulated variable: …………………………….………………. ……………………………………………. ………………………………………………
Responding variable: ……………………….... …………………………. ………………………….	How to determine the responding variable: …………………………….………………. ……………………………………………. ………………………………………………
Controlled variable: ……………………….... …………………………. ………………………….	How to maintain the controlled variable: …………………………….………………. ……………………………………………. ………………………………………………

Table 1.2 [3 marks]

1 (c)

(d) State the hypothesis for this experiment.

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

1 (d)

[3 marks]

(e) (i) Construct a table and record the results of the experiment.
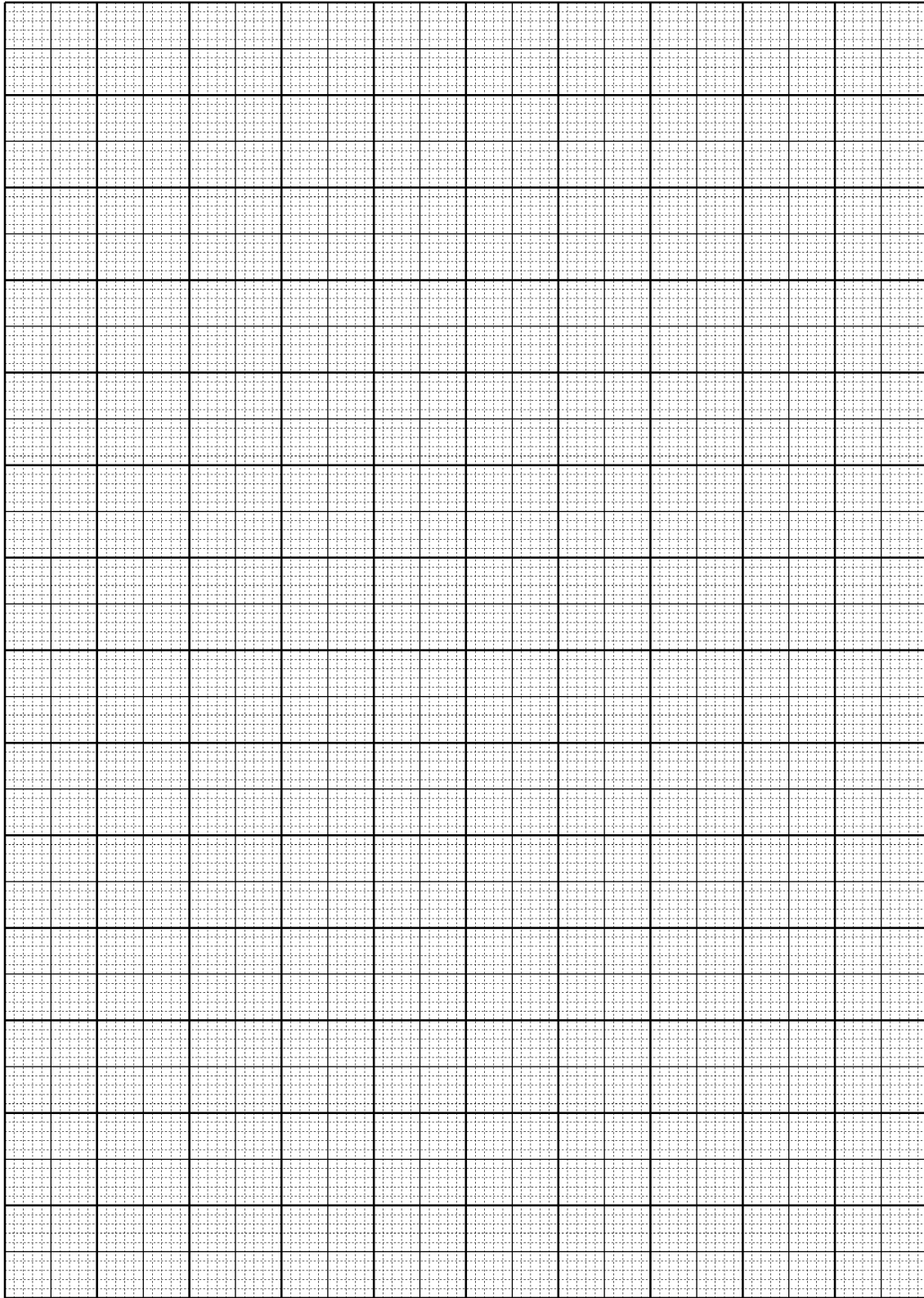   Your table should contain the following title.
   • pH of water
   • Number of *Lemna* sp.

1 (e) (i)

[3 marks]

(ii) Plot a graph showing the number of *Lemna* sp against the pH in the graph below

1 (e) (ii)

[3 marks]

[Lihat sebelah
                                                                                            SULIT

For examiner's use

(iii) Referring to the graph in (e) (ii), describe the relationship between the *Lemna* sp growth and the condition of the medium.

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

[3 marks]

1 (e) (iii)

(f)   Based on the experiment, define operationally the abiotic factor in an ecosystem.

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

[3 marks]

1 (f)

(g) The effluent from laundry shop flows into a pond nearby, predict the population of *Lemna* sp in the pond. Explain your answer.

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

[3 marks]

1 (g)

(h) Classify the biotic and abiotic factors from the list provided below.

> Humidity, light intensity, decomposer, parasites, symbiotic
>
> organism, soil texture, invertebrates, topography

.   [3 marks]

1 (h)

Question 2

When a boy drinks too much water, the osmotic pressure of blood will fall below normal level. Under such condition, the hypothalamus will not be stimulated and less antideuratic hormone (ADH) will be produced. Less water will be reabsorbed and most of the water is allowed to pass out through urine.

Design a laboratory experiment to determine the urine volume released by a student who drinks different volume of mineral water.

The planning of your experimental must include the following aspects:

- Problem statement

- Aim of investigation

- Hypothesis

- Variables

- List of apparatus and materials

- Technique used

- Experimental procedures or methods

- Presentation of data

- Conclusion

[17 marks]

END OF QUESTION PAPER

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INFORMATION FOR CANDIDATES

1. This question paper consists of two question: **Question 1** and **Question 2**

2. Answer all questions. Write your answer for **Question 1** in the spaces provided in this question paper.

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.

4. Show your working, it may help you to get marks.

5. The diagrams in the questions are not drawn to scale unless stated

6. The marks allocated for each question or sub-part of a question are shown in brackets.

7. If you wish to change your answer, cross out the answer that you have done. Than write down the new answer.

8. You may you a non-programmable scientific calculator.

9. You are advised to spend 45 minutes to answer **Question 1** and 45 minutes for **Question 2**

10. Detach **Question 2** from this question paper. Tie the 'helaian tambahan' together with this question paper and hand in to the invigilator at the end of examination.

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BIOLOGI

KERTAS 3

PERATURAN PEMARKAHAN

UNTUK KEGUNAAN PEMERIKSA SAHAJA

Peraturan pemarkahan ini mengandungi 13 halaman bercetak

1 (a) [KB0603 – Measuring Using Number]

Score	Criteria
3	Able to count and record the number of *Lemna* sp in Table 1.1 correctly: **Sample answers** <table><tr><td>pH</td><td>Number of *Lemna* sp</td></tr><tr><td>2</td><td>4</td></tr><tr><td>4</td><td>5</td></tr><tr><td>6</td><td>8</td></tr><tr><td>8</td><td>11</td></tr><tr><td>10</td><td>5</td></tr><tr><td>12</td><td>1</td></tr></table>
2	Able to count and record **4 - 5** number of *Lemna* sp
1	Able to count and record **2 - 3** number of *Lemna* sp
0	Able to give one number, no response or wrong response.

1 (b) (i) [KB0601 - Observation]

Score	Criteria
3	Able to state **any two** observations correctly according to 2 criteria: • pH (Manipulated Variable) • Number of *Lemna* sp (Responding Variable) **Sample answers:** 1. At pH 2 (Knop solution), the number of *Lemna* sp is 4 2. At pH 8 (Knop solution), the number of *Lemna* sp is 11 3. At pH 12 (Knop solution), the number of *Lemna* sp is 1 4. At pH 12 (Knop solution), the number of *Lemna* sp grow is less than at pH 2/4/6/8/10 5. At pH 8 (Knop solution), the number of *Lemna* sp is more than at pH2/4/6/10/12 *1,2 &3 is a horizontal observation *4 & 5 is a vertical observation
2	Able to state **any one** observation correctly. *or* Able to state **any two incomplete** observations (any 2 criteria) **Sample answers:** 1. At pH 2 (Knop solution) the number of *Lemna* sp is less 2. At pH 12 (Knop solution) the number of *Lemna* sp is lowest 3. At pH 8 (Knop solution) the number of *Lemna* sp is the most 4. At pH 12 (Knop solution) the number of *Lemna* sp is lowest compare to others 5. At pH 8 (Knop solution) the number of *Lemna* sp is highest compare to others
1	Able to state **any one idea** of observation.(any 1criteria) **Sample answers:** 1. The number of *Lemna* sp is different in different pH 2. *Lemna* sp grow rapidly in pH neutral 3. pH alkali is not suitable for *Lemna* to grow 4. acid medium not suitable for *Lemna* to grow Or any other suitable answer.
0	Not able to response *or* wrong response.

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1 (b) (ii) [**KB0604 - Making inferences**]

Score	Criteria
3	Able to make **one logical inference** for each observation based on the criteria • suitable abiotic factor • Favourable for *Lemna* sp growth **Sample answers:** 1. Strong acidic condition is not favorable for *Lemna* growth. 2. Weak/slight alkaline // neutral condition is most favorable for *Lemna* growth. 3. Strong alkaline is not favorable for *Lemna* growth. 4. Strong alkaline condition is the least favorable for *Lemna* growth compare with other conditions. 5. Neutral/Slight alkaline condition is the best/moss favorable condition for *Lemna* growth. *1,2 &3 is a horizontal inference *4 & 5 is a vertical inference
2	Able to make **one logical inference** for any one observation**.** *or* Able to make **one logical** and **incomplete inference** base on one criterion for each observation. **Sample answer:** 1. Different pH condition will cause different growth rate of *Lemna sp*. 2. *Lemna* sp. grow in neutral condition 3. Neutral condition is the most suitable medium. 4. Acidic or alkali medium is not suitable for *Lemna* sp. 5. pH affect the *Lemna* sp. growth rate.
1	Able to make an **idea** of inference with one criterion. **Sample answers** 1. *Lemna* sp. able to grow in water 2. *Lemna* sp. will grow in different condition 3. *Lemna* sp. not grow in unsuitable pH. Or any other suitable answer
0	Not able to response *or* wrong response.

1(c) [KB061001 – **Controlling Variables**]

Variables	How the variables are operated
Manipulated: pH	**Add/Use** acid or alkali to the Knop solution to get different pH condition// Use pH solution: pH2, pH4, pH6, pH8, pH10,pH12 // change/alter the medium condition
Responding: Number of *Lemna* sp	**Count** and record the number of *Lemna* sp. plants after **7 days.**
Fixed: Light exposure / Volume of Knop solution	**Fix** 12 hours light exposure every day / **Maintain** the volume at **20ml**

1(d) KB0611- **Making Hypothesis**]

Score	Criteria
3	Able to state a hypothesis to show a relationship between the manipulated variable and responding variable and the hypothesis can be validated, based on 3 criteria: • manipulated variable • responding variable • relationship **Sample answer** : 1. In low pH, number of *Lemna* sp is less than in a higher pH. 2. The higher pH the higher number of *Lemna* sp. 3. In a neutral condition the number of *Lemna* sp. plants is the highest /the most. 4. The more alkali the medium is the less number of *Lemna* sp.
2	Able to state less accurate hypothesis to show a relationship between manipulated variable and responding variable base on 2 criteria. **Sample answer** 1. Different pH has different number of *Lemna* sp. 2. Different condition has different number of *Lemna* sp. 3. pH affect the size of *Lemna* sp. population
1	Able to state idea of hypothesis to show a relationship between manipulated variable and responding variable base on 1 criterion. **Sample answer** 1. The number of *Lemna* sp. is varied 2. *Lemna* sp. can survive in different condition 3. pH affect the *Lemna* sp. growth
0	Not able to response *or* wrong response.

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1(e) (i) [KB0606 – Communicating]

Score	Criteria
3	Able to draw and fill a table with all columns and rows labeled with complete unit Sample answers | pH of water	Number of *Lemna* sp
---	---
2	4
4	5
6	8
8	11
10	5
12	1	
2	Able to draw a table with incomplete data
1	Able to draw a table without data
0	Not able to response *or* wrong response.

1(e) (ii) KB0607 – Space and time relationship

Score	Criteria
3	Able to plot a graph with 3 criteria: • A(axis): correct title with unit and uniform scale • P (point) : transferred correctly • S (Shape): able to joint all points, smooth graph, bell shape.
2	Able to plot a graph with any 2 criteria
1	Able to plot a graph with any 1 criteria
0	Not able to response *or* wrong response.

1(e) (iii) [KB0608 – Interpreting Data]

Score	Criteria
3	Able to state clearly and accurately the relationship between the condition of medium and Lemna growth based on the criteria: • P1- Alkali, acidic or neutral (abiotic factor) • P2- *Lemna* sp. growth **Sample answer:** ***(Associates each of the condition with the Lemna growth)*** 1. In the acidic medium the *Lemna* sp. growth is less, and increase when the medium become neutral but decrease when in alkali condition. *2* *Lemna* sp. grow very well in neutral medium and less growth rate in alkali or acidic medium
2	Able to state clearly but less accurate the relationship between the condition of medium and Lemna sp growth. **Sample answer:** 1. In the acidic medium the *Lemna* sp growth is less and increase when the medium become neutral

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	2. In the alkaline medium the *Lemna* sp growth is less and increase when the medium become neutral
	3. *Lemna* sp grow very well in neutral medium compare to other medium
1	Able to state the idea of the relationship .
	1. Growth rate of *Lemna* sp depend on the condition of the medium
	2. Different medium affect the *Lemna* sp growth .
	3. pH affect the growth of *Lemna* sp.
	4. *Lemna* sp growth is affected by different pH medium.
0	Not able to response *or* wrong response.

(f) [KB0609] [**Define operationally**]

Score	Criteria
3	Able to explain the abiotic factor operationally base on 3 criteria: • *Lemna* sp (organism) • affected (growth) • pH of medium (abiotic factor in ecosystem) Sample answer: 1. Abiotic factor is pH of the medium that affect the *Lemna* sp growth in an ecosystem.
2	Able to state the abiotic factor base on 2 criteria. Sample answer: 1. Abiotic factor is pH of the medium that affect the growth. 2. Abiotic factor is physical factor that affect the *Lemna* growth such as pH.
1	Able to state the idea of the abiotic factor or the theoretical definition of abiotic factor or hypothesis. 1. Abitiotic factor is physical factor that affect the organism growth in ecosystem.. 2. Abiotic factor is pH. 3. The physical factor that affect the *Lemna* sp population.
0	Not able to response *or* wrong response.

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(g) [KB0605 – **Predicting**]

Score	Criteria
3	Able to predict the result accurately base on 2 criteria. • Expected population of *Lemna* sp • The reason of the answer • Not suitable for growth Sample answer: P1- No *Lemna* sp found/ very small population of *Lemna* sp, P2- Because water is contaminated with soap/detergent contain alkali, P3- Which is not suitable/favourable for *Lemna* to grow
2	Able to predict the result less accurate base on 1 criteria Sample answer: 1. The *Lemna* sp is less because the pond water is not suitable for *Lemna* sp. 2. The pond water becomes too alkali for *Lemna* sp to grow 3. The pH of pond water is too high for *Lemna* sp to grow 4. *Lemna* sp is not found because the condition of pond water is not suitable.
1	Able to give idea of the result Less *Lemna* sp in the pond. All *Lemna* sp in the pond died. The pond water unsuitable for *Lemna* sp to grow
0	Not able to response *or* wrong response.

(h) [KB0602 – **Classifying**]

Score	Criteria
3	Able to classify all 4 pairs of the abiotic and biotic factors in ecosystem Sample answer *(table below)*
2	Able to classify 3 pairs of abiotic and biotic factors
1	Able to classify 2 pairs of abiotic and biotic factors
0	Able to classify 2 pairs of abiotic and biotic factors or Not able to response *or* wrong response.

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

QUESTION 2

Aspect	Criteria	Score
KB061201 *Identifying Problem Statement*	Able to write a problem statement correctly base on 3 criteria: • Manipulated variables- (Volume of water intake) • Responding variables- (Volume of urine released) • Relationship. *Sample Answer* 1. How does the volume of water intake affect the volume of urine released? 2. Does volume of water intake affect the volume of urine released? 3. Which volume of water intake released more urine?	3
	Able to write a problem statement but less correctly base on 2 criteria.	2
	Able to give an idea about the problem statement base on 1 criterion.	1
	Wrong or no response	0

| *Objective /Aim* | Able to state the objective of the experiment correctly

Sample Answer
1. To study / investigate the effect of drinking different volumes of mineral water on urine output/volume | √ |

| *Variables* | Able to identify **all** the three variables correctly
Sample Answer
• Manipulated variable :   volume of mineral water
• Responding variable :   volume of urine released
• Fixed variable   :   same student/same environment | √ |

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Aspect	Criteria	Score
KB061202 *Making hypothesis*	Able to write a suitable hypothesis correctly base on the 3 criteria: • Manipulated variable • Responding variable • Relationship *Sample Answer* 1. The higher the volume of water intake, the higher the volume of urine released. 2. If more water is taken, the urine released will be more. 3. As the volume of water intake increases, the volume of urine released increases. **[note: wrong hypothesis is accepted]**	3
	Able to write a hypothesis but less correctly base on the 2 criteria.	2
	Able to give an idea about the problem statement base on 1 criterion.	1
	No response	0

Aspect	Criteria	Score

KB061205
 	
Materials and Apparatus
	Able to list **all** materials and apparatus needed to carry out the experiment successfully.
	
	Sample Answer
	
	 Specimen : Boy/girl/student
	   (*S)
	 Materials : mineral/drinking water
	   (M)
	
	 Apparatus : Beakers, glass/cup/mug, measuring cylinder
	             stop watch
	   (A)
	                               * S + 4A + 1M
		3

	No S , 4A + 1M **3A + 1M**	2
	2A + 1M	1
	Incomplete list or wrong or no response	0

Aspect	Criteria	Score
Technique	Able to state the technique used in carrying out the experiment correctly *Sample Answer* Measure the volume of urine released after a fixed hour (of consuming water) by using **measuring cylinder.** * fixed hours= 1-2 hours	**B₁ = 1**

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Aspect	Criteria	Score
KB061204 *Procedure*	Able to write **all** the steps in carrying out the experiment successfully. **K1** : Steps to set up the apparatus **K2** : Steps to handle the fixed variable **K3** : Steps to handle the manipulated variable **K4** : Steps to handle the responding variable **K5** : Precautionary steps / steps taken to get accurate results / readings	
	Scoring Rubric All K1-K5 present	3
	Any 3 – 4K present	2
	Any 2K present	1
	1K or wrong response [√] is given for any 1K present.	0

		Procedure	Score
K1	1.	A student (Sample A) is chosen and instructed to empty his bladder before the start of the experiment	
K3	2.	Measure 200ml of water and put it into the mug/cup/glass	
K1	3	A student(Sample A) is given 200ml of mineral/drinking water to drink	
K1	4	A stop watch is started immediately after consuming the water.	
K2	5	During the experiment, he is kept in (any fixed suitable room) within* 1-2 hours(any suitable time range)	
K5	6	He is instructed not to eat or perform any vigorous physical activities (within the given time)	
K2	7	After half an hour, stop watched is stopped and he is asked to empty his bladder.	
K1	8	The collected urine is kept in a large beaker	
K4	9	At the interval of half an hour, until two hours , a student will empty his bladder.	
K2/K4	10	After two hours, the total collected urine is measured using measuring cylinder	
K1/K5	11	Repeat step 2 – 9 for different amount of drinking water (400 ml, 600ml,800ml,1000ml)	

		* Accept four readings and more	
K2	12	Step 7 is conducted for four consecutive days in a fixed time and place	**5K = 3 m**
K5	13	Dispose the measured urine properly	**3-4K = 2 m**
K4	14	Measure and record data collected into a table/ Graph of urine output against the water intake is plotted.	**1-2K = 1 m**

Aspect	Criteria	Score
Communi-cating data	Able to draw a **complete** table to record the relevant data base on the 3 criteria: • Volume of water intake • Volume of urine released • The units in ml or cm^3 *Sample Answer* <table><tr><td rowspan="2"></td><td colspan="5">Volume of water intake (ml)</td></tr><tr><td>200</td><td>400</td><td>600</td><td>800</td><td>1000</td></tr><tr><td rowspan="3">Volume of urine produced (ml)</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>	**B$_2$ = 1**
	Able to draw a **complete** table to record the relevant data with 2 criteria	2
	Able to draw a table to record the relevant data but incomplete with 1 criterion.	1
	Wrong or no response	0

Aspect	Criteria	Score
Conclusion	Able to write a suitable conclusion for the experiment: *Sample Answer* 1. The higher the volume of water intake, the higher the volume of urine released. 2. If more water is taken, the urine released will be more. 3. As the volume of water intake increases, the volume of urine released increases.	√
	Hypothesis accepted // Hypothesis rejected only	No tick

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Aspect	Criteria	Score
KB061203 *Experimenting*	Able to write a complete report for the experiment. **Scoring Rubric** **8 – 9** aspects correct	3
	6 – 7 aspects correct	2
	3 – 5 aspects correct	1
	Less than 3 aspects correct	0

Sample Answer

Aim   **:** To study the effect of drinking different volumes of water on urine output

Problem statement: What is the effect of water intake on urine output?

Hypothesis   **:** If more water is taken, more urine will be released

Variables   **:**
                Manipulated variable: Volume of water
                Responding variable: Volume of urine released
                Constant variable: Same student/ same environment

Apparatus   **:** Beakers, cup/mug, measuring cylinder, stop watch

Materials   **:** Drinking water

Specimen   **:** Boy/ girl/ a student

Technique   **:** Measuring the urine released by using a measuring cylinder

Procedure:

1. A student i(Sample A) is chosen and instructed to empty his bladders before the start of the experiment
2. Measure 200ml of water and put it into the mug
3. A student(Sample A) is given 200ml of mineral/drinking water to drink
4. A stop watch is started immediately after consuming the water.
5. During the experiment, he is kept in (any fixed suitable room) within* 1-2 hours(any suitable time range)
6. He is instructed not to eat or perform any vigorous physical activities (within the given time)
7. After half an hour, he is asked to empty his bladder.
8. The collected urine is kept in a large beaker
9. At the interval of half an hour, until two hours , a student will empty his bladder.
10. After two hours, the total collected urine is measured using measuring cylinder
11. Repeat step 2 – 9 for different amount of drinking water (400 ml, 600ml, 800ml, 1000ml)
    * Accept four readings and more
12. Step 7 is conducted for four consecutive days in a fixed time and place

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13 Dispose the measured urine properly
14 Measure and record data collected into a table/
    Plot a graph of urine output against the water intake is plotted.

Results:

	Volume of water intake (ml)				
Volume of urine produced (ml)	200	400	600	800	1000

Conclusion:

If more water is taken, more urine will be released. Hypothesis is accepted.

THE END OF MARKING SCHEME

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