PAPER 3

Question 1

1 (a) [KB0603 – Measuring Using Number]

<table>
<tr><th>Score</th><th>Criteria</th><th>Notes</th></tr>
<tr><td>3</td><td>Able to record all data correctly :

Sample answer
<table>
<tr><th>Bread</th><th>Volume of distilled water damped on bread (ml)</th><th>Total area covered by Mucor sp. (cm^2)</th></tr>
<tr><td>P</td><td>5</td><td>7</td></tr>
<tr><td>Q</td><td>20</td><td>17</td></tr>
<tr><td>R</td><td>40</td><td>31</td></tr>
</table></td><td></td></tr>
<tr><td>2</td><td>Able to record 2 data correctly</td><td></td></tr>
<tr><td>1</td><td>Able to record 1 data correctly</td><td></td></tr>
<tr><td>0</td><td>No response or incorrect response</td><td></td></tr>
</table>

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

Score	Criteria	Notes
3	Able to state **two** observations correctly based on 3 aspects : P1 : manipulated variable (volume of distilled water) P2 : responding variable (total area covered by *Mucor* sp. // growth rate of *Mucor* sp.) P3 : value with units Sample answer 1. When bread P/Q/R is damped with 5/20/40 ml of distilled water, the total area covered by *Mucor* sp. is 7/17/31 cm^2. 2. When volume of distilled water is 5/20/40 ml, the total area covered by *Mucor* sp. is 7/17/31 cm^2 3. The total area covered by *Mucor* sp. is the highest when the volume of distilled water is 40 ml.	
2	Able to state **two** observations inaccurately Sample answer 1. When bread P/Q/R is damped with 5/20/40 ml of distilled water, the total area covered by *Mucor* sp. is high/low. 2. At less/more volume of distilled water, the the total area covered by *Mucor* sp. is the lowest/highest.	
1	Able to state observations at idea level Sample answer 1. *Mucor* sp. grows on bread P/Q/R. 2. Total area covered by *Mucor* sp. is different.	
0	No response or wrong response	

1 (b)(ii) [KB0604 – Making Inferences]

Score	Criteria	Notes
3	Able to state **two** inferences correctly based on 3 aspects P1 : humidity / volume of water high/low P2 : growth rate of *Mucor* sp. high/low P3 : suitable condition for growth of *Mucor* sp. Sample answer 1. When the humidity of bread P/Q/R is high/low, growth rate of *Mucor* sp. is high/low because the condition on bread is suitable/not suitable for growth of *Mucor* sp.	
2	Able to state **two** inferences inaccurately based on 2 aspects Sample answer 1. The humidity is high // growth rate of *Mucor* sp. is high. 2. More *Mucor* sp. can grow on bread.	
1	Able to make two inferences at idea level Sample answer 1. Humidity affects growth of *Mucor* sp.	
0	No response or incorrect response	

1 (c) [KB061001 – Controlling Variables]

<table>
<tr><th>Score</th><th>Criteria</th><th>Notes</th></tr>
<tr><td>3</td><td>Able to state all 6 variables and the method to handle the variables correctly
<u>Sample answers</u>
<table>
<tr><th>Variable</th><th>Method to handle the variable</th></tr>
<tr><td><u>Manipulated variable</u>
Volume of distilled water (damped on the bread)</td><td>Use <u>different</u> volume of distilled water to damp the bread that are (5 ml, 20 ml and 40 ml)</td></tr>
<tr><td><u>Responding variable</u>
Total area covered by Mucor sp.

Growth rate of Mucor sp.</td><td>Calculate and <u>record</u> the total area covered by Mucor sp. by using the formula :
Total number of small square covered by half or more Mucor sp. X area of 1 small square (cm^2)

Calculate and <u>record</u> the growth rate of Mucor sp. by using formula :
Growth rate =
<u>total surface area covered by Mucor sp.</u>
day</td></tr>
<tr><td><u>Fixed variable</u>
Type of bread //

Light intensity</td><td>Use the <u>same</u> type of bread that is white bread //
<u>Fix</u> the number / power of bulb used that is 2 / 40 Watt</td></tr>
</table>
All 6 ticks</td><td></td></tr>
<tr><td>2</td><td>Able to state 4-5 ticks</td><td></td></tr>
<tr><td>1</td><td>Able to state 1-3 ticks</td><td></td></tr>
<tr><td>0</td><td>No response <u>or</u> incorrect response</td><td></td></tr>
</table>

1 (d) KB0611 – Making Hypothesis]

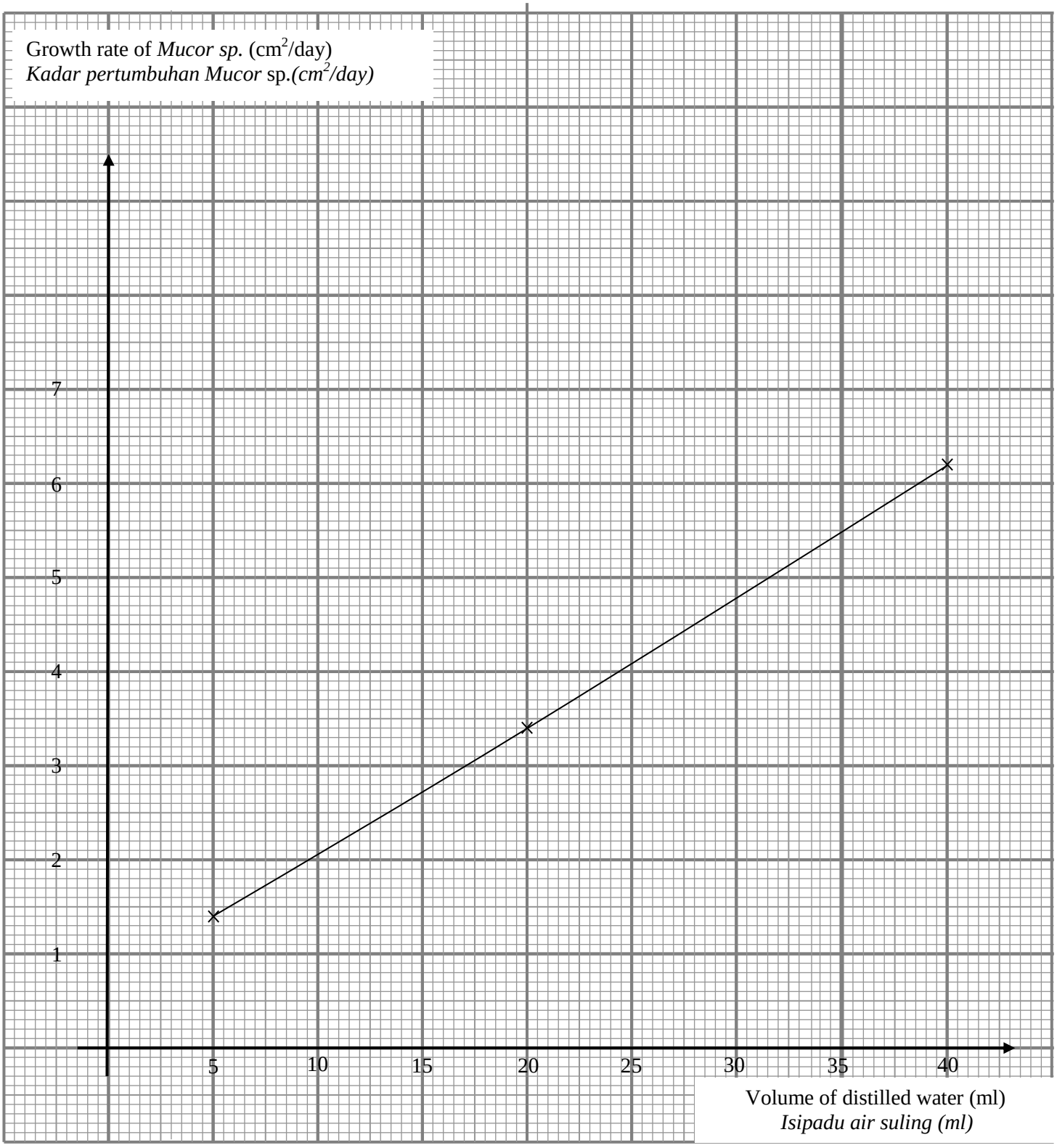
Score	Criteria	Notes
3	Able to make a hypothesis based on the following aspects P1 : manipulated variable (Volume of distilled water) P2 : responding variable (Total are covered by *Mucor* sp. // Growth rate of *Mucor* sp.) P3 : relationship Sample answer 1. The higher the volume of distilled water / humidity of bread, the higher the total area covered by / growth rate of *Mucor* sp. 2. As the volume of distilled water / humidity of bread increases, the total area covered by / growth rate of *Mucor* sp. increases. 3. The total area covered by / growth rate of *Mucor* sp. is the highest when the volume of distilled water is the highest.	
2	Able to make a hypothesis based on any two aspects Sample answer 1. Different volume of distilled water will cause different total area covered by / growth rate of *Mucor* sp. 2. When the volume of distilled water is high/low the total area covered by / growth rate of *Mucor* sp. is higher/lower.	
1	Able to make a hypothesis at idea level Sample answer 1. *Mucor* sp. can grow on bread.	
0	No response or incorrect response	

1 (e) (i) [KB0606 – Communicating]

Score	Criteria	Notes
3	Able to construct a table and record all the data correctly based on the following aspects : T – title with correct units D – data transferred correctly C – calculation Sample answer	
2	Able to construct a table and record the data with any two aspects	
1	Able to construct a table and record the data with any one aspect	
0	No response or incorrect response	

Bread	**Volume of distilled water damped on bread (ml)**	**Total area covered by *Mucor* sp. (cm^2)**	**Growth rate of *Mucor* sp. (cm^2/day)**
P	5	7	1.4
Q	20	17	3.4
R	40	31	6.2

1 (e) (ii) [KB0607 – Space and Time Relationship]



1 (e) (ii) [KB0607 – Communicating]

Score	Criteria	Notes
3	Able to draw a graph based on the three following aspects : P – uniform scales for both axes T – correct height plotted B – line graph drawn smoothly	
2	Any two correct aspects	
1	Any one correct aspect	
0	No response or incorrect response	

1 (f) [KB0608 – Interpreting Data]

Score	Criteria	Notes
3	Able to explain the relationship between the total area covered by *Mucor* sp. and volume of distilled water correctly based on the following aspects : R : relationship E1 : humidity of bread // volume of water high / low E2 : condition suitable for growth of *Mucor* sp. Sample answer 1. The higher the volume of distilled water (damped on bread), the higher the growth rate of *Mucor* sp. This is because when the humidity of bread increases, the condition is suitable for the growth of *Mucor* sp.	
2	Able to explain the relationship with two aspects **(R+E1/E2)**	
1	Able to explain the relationship correctly **(R only)**	
0	No response or incorrect response	

1 (g) [KB0605 – Predicting]

Score	Criteria	Notes
3	Able to predict and explain the total area covered by *Mucor* sp. on the white bread X correctly based on the following aspects : P : total area covered by *Mucor* sp. is higher than $31cm^2$ E1 : light intensity lower / temperature lower / humidity higher E2 : more suitable for growth of *Mucor* sp. Sample answer 1. Total area covered by *Mucor* sp. is higher than $31cm^2$. This is because temperature of surrounding is lower, thus more suitable for growth of *Mucor* sp.	
2	Able to state **P** and **E** // **P** at idea level and **2E**	
1	Able to state **P** // **P** at idea level and **one E**	
0	No response or incorrect response	

1 (h) [KB0609 – Define Operationally]

Score	Criteria	Notes
3	Able to define population size operationally based on the following aspects : P1 : percentage of *Mucor* sp. on white bread P2 : shown by the total area covered by *Mucor* sp. P3 : affected by the volume of distilled water damped on bread <u>Sample answer</u> 1. Population size is the percentage coverage of *Mucor* sp. on white bread shown by the total area covered by *Mucor* sp. The population size is affected by the volume of distilled water.	
2	Any two correct aspects	
1	Any one correct aspect // Theoritical definition	
0	No response <u>or</u> incorrect response	

1 (i) [KB0602 – Classifying]

Score	Criteria	Notes
3	Able to classify **all** six factors correctly. <u>Sample answer</u> Biotic factor: Decomposer, Epiphytes Abiotic factor: Humidity, Temperature, pH, Mineral salts All 6 correct	
2	Able to classify 4-5 factors correctly	
1	Able to classify 1-3 factors correctly	
0	No response <u>or</u> incorrect response	

Question 2

2 (i)

Score	Criteria	Notes
3	Able to state a problem statement relating the manipulated variable to the responding variable correctly based on the following aspects : P1 : Manipulated variable (temperature) P2 : Responding variable (time taken for iodine solution to remain yellow // rate of amylase enzyme activity) P3 : Relationship between variables in question form Sample answer 1. Does the temperature affect the rate of amylase enzyme activity on starch in the rice? 2. What is the effect of temperature on the rate of amylase enzyme activity on starch in the rice?	
2	Able to state a problem statement with two aspects Sample answer 1. Does temperature affect on starch? 2. What factors affect the amylase enzyme activity? 3. Different temperature causes different rates of amylase enzyme activity.	
1	Able to state a problem statement with one aspect or at idea level Sample answer 1. Temperature affects enzyme. 2. Temperature affects amylase enzyme activity.	
0	No response or incorrect response	

2 (ii)

Score	Criteria	Notes
3	Able to state a hypothesis relating the manipulated variable to the responding variable correctly based on the following aspects : P1 : Manipulated variable (temperature) P2 : Responding variable (time taken for iodine solution to remain yellow // rate of amylase enzyme activity) P3 : Relationship of the variables Sample answer 1. The time taken for iodine solution to remain yellow is the shortest // rate of amylase enzyme activity is the highest at 37^0C. 2. The higher the temperature, the shorter the time taken for iodine solution to remain yellow // the higher the rate of amylase enzyme activity until it reach 37^0C. 3. As the temperature increases, the time taken for iodine solution to remain yellow decreases // the rate of amylase enzyme activity increases.	
2	Able to state a hypothesis inaccurately based on any two aspects Sample answer 1. Different temperature affects the time taken for iodine solution to remain yellow // the rate of amylase enzyme activity. 2. The time taken for iodine solution to remain yellow // the rate of amylase enzyme activity is influenced by the temperature.	
1	Able to state a hypothesis at idea level Sample answer 1. Temperature affects the amylase enzyme activity.	
0	No response or incorrect response	

2 (iii)

Score	Criteria	Notes
3	Able to state all three variables correctly 1 Manipulated variable Temperature (of medium) 2 Responding variable Time taken for iodine solution to remain yellow // rate of amylase enzyme activity 3 Constant variable Volume of starch suspension / percentage of starch suspension / volume of (salivary) amylase	
2	Able to state any two variables correctly	
1	Able to state any one variables correctly	
0	No response or incorrect response	

2 (iv)

Score	Criteria	Notes
3	Able to list all the important apparatus and materials correctly Sample answer Materials : *Starch suspension, *(salivary) amylase solution, *iodine solution, distilled water, ice cubes Apparatus : test tube, glass rod, dropper, tiles with groove, thermometer **4 M + 5A**	* are compulsory
2	Able to list at least 3 materials and 3-4 apparatus correctly **3M + 3-4A**	At least 2*
1	Able to list at least 1-2 materials and 1-2 apparatus correctly **1-2M + 1-2A**	At least 1*
0	No response or incorrect response	

2 (v)

Score	Criteria	Notes
3	Able to describe the steps of the experiment procedure correctly based on the following aspects : K1 : Preparation of materials and apparatus K2 : Operating the constant variable K3 : Operating the responding variable K4 : Operating the manipulated variable K5 : Steps to increase reliability of results accurately / precaution Sample answer 1. **Rinse (K1)** mouth with warm water and collect the saliva. **Dilute (K1)** the saliva with equal volume of distilled water. 2. Using a syringe, **put (K1) 5 ml (K2)** of **1% (K2)** starch suspension into each of the test tubes **labeled (K1)** A_1, B_1 and C_1 respectively. 3. Using a second syringe, **add (K1) 2 ml (K2)** of saliva into each of another set of test tubes labeled A_2, B_2 and C_2. 4. **Immerse (K1)** test tubes A_1 and A_2 in water bath with temperature **0^0C**. 5. **Leave (K1)** the test tubes for 5 minutes. 6. **Prepare (K1)** a dry white tile with groove and place a drop of iodine solution into each groove. 7. After **5 minutes (K2)** of immersion, pour the starch suspension in test tube A_1 into the saliva in test tube A_2. Stir the mixture using glass rod. **Start (K1)** the stopwatch immediately. 8. Use a dropper to remove a drop of mixture from test tube A_2 and place it into iodine solution in the first groove of the tile. (The first groove is considered 0 minute)	

	9. Repeat the iodine test every minute for 10 minutes. **Rinse the dropper in a beaker of water after each sampling (K5)**. 10. **Measure and record the time taken for the iodine solution to remain yellow (completion of the hydrolysis of starch) by using a stopwatch (K3)**. 11. Repeat steps 4-9 by immersing test tube B_1 and B_2 in water bath with temperature **37^0C** and test tubes C_1 and C_2 in water bath with temperature **60^0C (K4)**. 12. **Use thermometers to ensure that the temperatures remain constant throughout the experiment (K5)**. 13. Record all data collected in a **table (K1)**. Scoring rubric K1 : Steps 1,2,3,4,5,6,7 and 13 (at least 5K1) K2 : Steps 2,3 and 7 K3 : Step 10 K4 : Step 11 K5 : Steps 9 and 12 } Each one K only **All 5 K**	
2	**Any 3-4 K**	
1	**Any 1-2 K**	
0	No response or incorrect response	

2 (vi)

Score	Criteria	Notes
2	Able to present all the data based on the following aspects : P1 : Correct manipulated variable P2 : Correct responding variable with unit Sample answer Test tube | Temperature (^{0}C) | Time taken for the iodine solution to remain yellow (minutes) | Rate of amylase enzyme activity (minute^{-1}) A_1 | 0 | | B_1 | 37 | | C_1 | 60 | |	
1	Able to present a table with P1 or P2	
0	No response or incorrect response	