

Question 1

(a) [KB0603 - Measuring Using Numbers]

Score	Criteria								
3	<p>Able to state <b>all</b> the thermometer readings.</p> <p>Answers:</p> <table border="1" style="width: 100%;"> <tr> <td colspan="2" style="text-align: center;">Time: 0 minute</td> </tr> <tr> <td style="text-align: center;">Set A : 31 °C</td> <td style="text-align: center;">Set B : 29 °C</td> </tr> <tr> <td colspan="2" style="text-align: center;">Time: 30 minutes</td> </tr> <tr> <td style="text-align: center;">Set A : 37 °C</td> <td style="text-align: center;">Set B : 29 °C</td> </tr> </table>	Time: 0 minute		Set A : 31 °C	Set B : 29 °C	Time: 30 minutes		Set A : 37 °C	Set B : 29 °C
Time: 0 minute									
Set A : 31 °C	Set B : 29 °C								
Time: 30 minutes									
Set A : 37 °C	Set B : 29 °C								
2	Able to state any <b>3 correctly</b>								
1	Able to state any <b>2 correctly</b>								
0	Able to state only <b>1 correctly</b> / not able to respond / wrong response.								

(b) (i) [KB0601 - Observation]

Score	Criteria				
3	<p>Able to state <b>any two</b> observations on Set A correctly based on 3 criteria.</p> <p><b>Criteria:</b></p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Thermometer</th> <th style="text-align: center;">Lime water</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>▪ time</li> <li>▪ reading</li> <li>▪ comparison</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>▪ time</li> <li>▪ change</li> <li>▪ comparison</li> </ul> </td> </tr> </tbody> </table> <p><b>Sample answers:</b></p> <p>Observation 1: At 30 minutes, the thermometer reading is 37 °C, higher than at time 0 minute / has increased.</p> <p>Observation 2: At 0 minutes, the lime water has not changed into chalky, compared to 30 minutes.</p>	Thermometer	Lime water	<ul style="list-style-type: none"> <li>▪ time</li> <li>▪ reading</li> <li>▪ comparison</li> </ul>	<ul style="list-style-type: none"> <li>▪ time</li> <li>▪ change</li> <li>▪ comparison</li> </ul>
Thermometer	Lime water				
<ul style="list-style-type: none"> <li>▪ time</li> <li>▪ reading</li> <li>▪ comparison</li> </ul>	<ul style="list-style-type: none"> <li>▪ time</li> <li>▪ change</li> <li>▪ comparison</li> </ul>				
2	<p>Able to state <b>any one</b> observation correctly,</p> <p style="text-align: center;"><i>or</i></p> <p>Able to state <b>any two incomplete</b> observations. [any two criteria from above]</p>				
1	Able to state <b>any one idea</b> of observation.				
0	Not able to respond <i>or</i> wrong response.				

(b) (ii) [KB0602 - Making Inference]

Score	Criteria				
3	<p>Able to make <b>two logical inferences</b> for each observation based on 3 criteria.</p> <p><b>Criteria:</b></p> <table border="1"> <thead> <tr> <th>Thermometer</th> <th>Lime water</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>▪ change in temperature</li> <li>▪ heat produced</li> <li>▪ from respiration of yeast / anaerobic respiration</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>▪ change in CO<sub>2</sub> produced by yeast</li> <li>▪ from respiration of yeast / anaerobic respiration</li> </ul> </td> </tr> </tbody> </table> <p><b>Sample answers</b></p> <p>Observation 1: At 30 minutes, the temperature increased because heat was produced from the respiration of yeast / anaerobic respiration of yeast.</p> <p>Observation 2: At 0 minutes, the CO<sub>2</sub> content in the lime water had not increased from the respiration of yeast / anaerobic respiration of yeast.</p>	Thermometer	Lime water	<ul style="list-style-type: none"> <li>▪ change in temperature</li> <li>▪ heat produced</li> <li>▪ from respiration of yeast / anaerobic respiration</li> </ul>	<ul style="list-style-type: none"> <li>▪ change in CO<sub>2</sub> produced by yeast</li> <li>▪ from respiration of yeast / anaerobic respiration</li> </ul>
Thermometer	Lime water				
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2	<p>Able to state <b>any one</b> inference correctly, <i>or</i> Able to state <b>any two incomplete</b> inferences.</p>				
1	<p>Able to state <b>any one idea</b> of inference.</p>				
0	<p>Not able to respond <i>or</i> wrong response.</p>				

(c) [KB0610 - Controlling Variable]

Score	Criteria								
3	<p>Able to state <b>5-6</b> of the variables and ways of operating the variables <b>correctly</b>.</p> <table border="1"> <thead> <tr> <th>Variable</th> <th>Operating the variables</th> </tr> </thead> <tbody> <tr> <td> <p>Manipulated variable:</p> <p>The presence of yeast</p> </td> <td> <p>How to alter the manipulated variable:</p> <p>Set A with yeast but Set B without yeast.</p> </td> </tr> <tr> <td> <p>Responding variables:</p> <p>Production of heat / increase in temperature, <u>and</u> production of CO<sub>2</sub> / change in lime water.</p> </td> <td> <p>How to determine responding variable</p> <p>Recording the thermometer reading in °C, <u>and</u> the change in lime water.</p> </td> </tr> <tr> <td> <p>Controlled variable:</p> <p>Volume / concentration of boiled glucose solution // Anaerobic condition</p> </td> <td> <p>How to maintain the controlled variable:</p> <p>Using the same volume / concentration of boiled glucose solution // Anaerobic condition (for both sets)</p> </td> </tr> </tbody> </table>	Variable	Operating the variables	<p>Manipulated variable:</p> <p>The presence of yeast</p>	<p>How to alter the manipulated variable:</p> <p>Set A with yeast but Set B without yeast.</p>	<p>Responding variables:</p> <p>Production of heat / increase in temperature, <u>and</u> production of CO<sub>2</sub> / change in lime water.</p>	<p>How to determine responding variable</p> <p>Recording the thermometer reading in °C, <u>and</u> the change in lime water.</p>	<p>Controlled variable:</p> <p>Volume / concentration of boiled glucose solution // Anaerobic condition</p>	<p>How to maintain the controlled variable:</p> <p>Using the same volume / concentration of boiled glucose solution // Anaerobic condition (for both sets)</p>
Variable	Operating the variables								
<p>Manipulated variable:</p> <p>The presence of yeast</p>	<p>How to alter the manipulated variable:</p> <p>Set A with yeast but Set B without yeast.</p>								
<p>Responding variables:</p> <p>Production of heat / increase in temperature, <u>and</u> production of CO<sub>2</sub> / change in lime water.</p>	<p>How to determine responding variable</p> <p>Recording the thermometer reading in °C, <u>and</u> the change in lime water.</p>								
<p>Controlled variable:</p> <p>Volume / concentration of boiled glucose solution // Anaerobic condition</p>	<p>How to maintain the controlled variable:</p> <p>Using the same volume / concentration of boiled glucose solution // Anaerobic condition (for both sets)</p>								

2	Able to state any <b>3-4 correctly</b>
1	Able to state any <b>2 correctly</b>
0	Not able to respond <i>or</i> wrong response

(d) [KB0611 - Making Hypothesis]

Score	Criteria
3	<p>Able to state the hypothesis based on <b>all three</b> criteria correctly.</p> <p><b>Criteria:</b>  <b>V1</b> : state the manipulated variable.  <b>V2</b> : state the responding variable  <b>R</b> : relationship between V1 and V2</p> <p><b>Sample answers:</b>  Yeast (V1) carries out anaerobic respiration (R) which produced heat / energy and carbon dioxide (V2).</p>
2	<p>Able to state <b>three criteria</b> incorrectly <b>or any two</b> criteria correctly</p> <p><b>Sample answer:</b></p> <ul style="list-style-type: none"> <li>▪ Yeast (V1) carries out anaerobic respiration (R).</li> <li>▪ Yeast (V1) produces heat / energy and carbon dioxide (V2).</li> </ul>
1	<p>Able to state hypothesis at idea level only</p> <p><b>Sample answer:</b></p> <ul style="list-style-type: none"> <li>▪ Set A has more heat / energy and carbon dioxide (V2).</li> </ul>
0	Not able to respond <i>or</i> wrong response

(e) (i) [KB 0606 - Communicating Skill]

Score	Criteria
3	<p>Able to <b>construct a table</b> and <b>record all the results</b> of the experiment <b>correctly</b> based on the following criteria.</p> <ul style="list-style-type: none"> <li>▪ Set / Presence of yeast</li> <li>▪ Thermometer reading with correct unit</li> <li>▪ Change in lime water</li> </ul>
2	All three criteria // Any 3 columns are recorded correctly.
1	Any two criteria // Any 2 columns are recorded correctly.
0	Not able to respond <i>or</i> wrong response.

(e) (ii) [KB0608 - Interpreting Data ]

Score	Criteria
3	<p>Able to explain the relationship between the boiled glucose solution and paraffin oil used in the experiment of the anaerobic respiration process in yeast based on the following criteria.</p> <p><b>Criteria:</b>  <b>F</b> : state the relationship between:            (i) boiled glucose solution used with the anaerobic respiration.            (ii) paraffin oil used with the anaerobic respiration  <b>E</b>: explanation</p> <p><b>Sample answer:</b></p> <ul style="list-style-type: none"> <li>▪ The glucose solution is boiled to remove all the (dissolved) oxygen.</li> <li>▪ Paraffin oil stops oxygen to enter (the solution).</li> <li>▪ Anaerobic respiration occurs in condition without oxygen.</li> </ul>
2	Able to explain the relationship based on <b>any one correct criterion</b> or <b>any two inaccurate criteria</b> .
1	Able to state at idea level only
0	Not able to respond <i>or</i> wrong response

(f) [KB0602 - Classification]

Score	Criteria									
3	<p>Able to categorise <b>all</b> the apparatus and materials <b>correctly</b> according their role in operating the variables in the experiment.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Manipulated variable</th> <th>Responding variable</th> <th>Controlled variable</th> </tr> </thead> <tbody> <tr> <td>Yeast suspension</td> <td>Thermometer</td> <td>Boiled glucose solution</td> </tr> <tr> <td>Distilled water</td> <td>Lime water</td> <td>Paraffin oil</td> </tr> </tbody> </table>	Manipulated variable	Responding variable	Controlled variable	Yeast suspension	Thermometer	Boiled glucose solution	Distilled water	Lime water	Paraffin oil
Manipulated variable	Responding variable	Controlled variable								
Yeast suspension	Thermometer	Boiled glucose solution								
Distilled water	Lime water	Paraffin oil								
2	Able to categorise the apparatus and materials according to <b>any two variables correctly</b> .									
1	Able to categorise the apparatus and materials according to <b>any one variable correctly</b> .									
0	Not able to respond <i>or</i> wrong response.									

(g) [KB0609 - Define Operationally]

Score	Criteria
3	<p>Able to define operationally the term anaerobic respiration based on the following criteria.</p> <p><b>Criteria:</b>            C1 – Respiration by yeast            C2 – Anaerobic condition / Condition without oxygen            C3 – Produce heat <u>and</u> carbon dioxide</p> <p><b>Sample answer:</b>            Anaerobic respiration is a type of respiration carried out by yeast (C1) in the condition without oxygen (C2), which increases the temperature / thermometer reading <u>and</u> turns lime water chalky / produces heat <u>and</u> carbon dioxide (C3).</p>
2	Able to define operationally the term anaerobic respiration based on any two criteria.
1	Able to define operationally the term anaerobic respiration at idea level only.
0	Not able to respond <i>or</i> wrong response

(h) (i) [KB0605 - Prediction]

Score	Criteria
3	<p>Able to explain the prediction on the thermometer readings, based on the following criteria.</p> <p><b>Criteria:</b>            C1 – Increase / higher than Set A            C2 – Any reading between 37 – 60 °C            C3 – More yeast perform anaerobic respiration</p>
2	Able to explain the prediction on the thermometer readings, based on <b>any two</b> of the criteria.
1	Able to explain the prediction on the thermometer readings, based on <b>any one</b> of the criteria // Able to state at idea level only.
0	Not able to respond <i>or</i> wrong response.

(h) (ii) [KB0607 - Relationship between Space and Time ]

Score	Criteria
3	Able to explain the time taken for the lime water to <u>turn chalky</u> , based on the following criteria.  <b>Criteria:</b> C1 – Faster than Set A. C2 – More CO <sub>2</sub> produced. C3 – More yeast performing anaerobic respiration // More yeast and glucose used
2	Able to explain the time taken for the lime water to change, based on <b>any two</b> of the criteria.
1	Able to explain the time taken for the lime water to change, based on <b>any one</b> of the criteria // Able to state at idea level only.
0	Not able to respond <i>or</i> wrong response

2.

Aspect	Sample Answer	Remarks
<b>Aim/objective</b>	To determine the effect of carbon dioxide concentration on the rate of photosynthesis	√
<b>Problem statement</b> <b>KB061201</b>	Does the percentage/concentration of carbon dioxide affect the rate of photosynthesis?// What is the effect of carbon dioxide concentration on the rate of photosynthesis?  Does carbon dioxide affect the rate of photosynthesis?  Does carbon dioxide affect photosynthesis?	<b>3 marks</b> <b>2 marks</b> <b>1 mark</b> √
<b>Hypothesis</b> <b>KB061202</b>	As/When the concentration of carbon dioxide increases the rate of photosynthesis also increases until the rate becomes constant  As/When the concentration of carbon dioxide increases the rate of photosynthesis increases.  Carbon dioxide concentration influence/affect the rate of photosynthesis	<b>3 marks</b> <b>2 marks</b> <b>1 mark</b> √
<b>Variables</b>	Manipulated : Concentration of carbon dioxide Responding : The rate of photosynthesis// The number of bubbles released per minute Constant : Light intensity, temperature Size of plant	√
<b>Apparatus and materials</b> <b>KB061205</b>	Materials : <i>Elodea/Hydrilla</i> , different concentration of sodium bicarbonate, distilled water Apparatus : Beaker, boiling tube, clip, table lamp	All present – <b>3marks</b> 2 materials and 2 app – <b>2 marks</b>  One aquatic plant and a light source – <b>1 mark</b> √

<p><b>Technique</b></p>	<p>Observe and count the number of bubbles produced / released in 5 minutes</p>	<p><b>1 mark for report</b> √</p>																		
<p><b>Procedure</b> <b>KB061204</b></p>	<p>S1- How to set up the apparatus</p> <ul style="list-style-type: none"> <li>Choose 10 cm length of fresh <i>Elodea</i></li> <li>Clip the tip with a paper clip and put it in the boiling with the clip down</li> </ul> <p>S2- How to operate the constant variable</p> <ul style="list-style-type: none"> <li>Pour 40 ml of 1% sodium bicarbonate solution into the boiling tube.</li> <li>Place the apparatus at a fix distant from a light source</li> </ul> <p>S3 – How to operate the responding variable</p> <ul style="list-style-type: none"> <li>Count and record the number of bubbles released in 5 minutes</li> </ul> <p>S4 – How to operate the manipulated variable</p> <ul style="list-style-type: none"> <li>Repeat S1 to S4 using different percentage of sodium bicarbonate solution</li> </ul> <p>S5 - Precaution</p> <ul style="list-style-type: none"> <li>Place the boiling tube in a beaker of water to maintain the temperature</li> </ul>	<p>5 S – 3 m 3-4 S – 2 m 2S – 1m √</p>																		
<p><b>Observation</b></p>	<table border="1"> <thead> <tr> <th>Percentage of sodium bicarbonate solution (%)</th> <th>Number of bubbles released</th> <th>Rate of Photosynthesis (number of bubbles/minute)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> </tr> </tbody> </table>	Percentage of sodium bicarbonate solution (%)	Number of bubbles released	Rate of Photosynthesis (number of bubbles/minute)	1			2			3			4			5			<p>Headings and units are compulsory <b>1 mark for report</b> √</p>
Percentage of sodium bicarbonate solution (%)	Number of bubbles released	Rate of Photosynthesis (number of bubbles/minute)																		
1																				
2																				
3																				
4																				
5																				
<p><b>Conclusion</b></p>	<p>As/When the concentration of carbon dioxide increases the rate of photosynthesis also increases until the rate becomes constant</p>	<p>√</p>																		

<b>Planning</b>	Able to state correctly	
<b>KB061203</b>	8-9 aspects ( 8-9 ticks) - 3 marks 5-7 aspects (5-7 ticks) - 2 marks 3-4 aspects (3-4 ticks) - 1 mark < 3 - 0 mark	

**END OF MARK SCHEME**