

SULIT
4551/3
BIOLOGI
Kertas 3
Peraturan Pemarkahan
Oktober 2011
1½ jam



BAHAGAN PENGURUSAN
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KECEMERLANGAN
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN AKHIR TAHUN TINGKATAN 4
2011

BIOLOGI
Kertas 3

PERATURAN PEMARKAHAN (PP)
Untuk kegunaan pemeriksa sahaja

Peraturan pemarkahan ini mengandungi 14 halaman bercetak.

QUESTION 1**(1) (a) [Measuring using numbers]**

Score	Criteria										
3	<p>Able to record all four readings of the time taken for hydrolysis of starch to be completed correctly. Correct answers:</p> <table border="1"> <thead> <tr> <th>Concentration of salivary amylase, %</th> <th>Time taken for hydrolysis of starch to be completed, minute</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>8</td> </tr> <tr> <td>2</td> <td>7</td> </tr> <tr> <td>3</td> <td>6</td> </tr> <tr> <td>4</td> <td>5</td> </tr> </tbody> </table>	Concentration of salivary amylase, %	Time taken for hydrolysis of starch to be completed, minute	1	8	2	7	3	6	4	5
Concentration of salivary amylase, %	Time taken for hydrolysis of starch to be completed, minute										
1	8										
2	7										
3	6										
4	5										
2	Able to record 2-3 readings correctly										
1	Able to record 1 reading correctly										
0	Not able to respond or wrong response.										

1 (b) (i) [Observation]

Score	Criteria
3	<p>Able to state two different observations correctly based on the following criteria:</p> <p>C1: Enzyme concentration (MV) C2: Time taken for the dark blue solution to change to brown / hydrolysis of starch to be completed (RV)</p> <p><u>Sample answer: (Horizontal observation)</u></p> <ol style="list-style-type: none"> When salivary amylase enzyme concentration is 1%, the time taken for hydrolysis of starch to be completed / the dark blue solution to turn brown is 8 minutes When salivary amylase enzyme concentration is 4%, the time taken for hydrolysis of starch to be completed / the dark blue solution to turn brown is 5 minutes <p><u>(Vertical observation)</u></p> <ol style="list-style-type: none"> The time taken for hydrolysis of starch to be completed when the concentration of salivary amylase enzyme is 1% is longer than when the concentration of enzyme is 4%.
2	<p>Able to state one correct and one inaccurate / incomplete observation . Or Able to state two inaccurate / incomplete observation . Sample answers for inaccurate / incomplete observation:</p>

	<p><u>(Horizontal observation)</u></p> <p>1. The time taken for hydrolysis of starch to be completed / the dark blue solution to turn brown is longer when enzyme concentration is 1% / low.</p> <p>2. The time taken for hydrolysis of starch to be completed / the dark blue solution to turn brown is 5 minutes when enzyme concentration is high.</p> <p><u>(Vertical observation)</u></p> <p>3. The time taken for hydrolysis of starch to be completed when the concentration of salivary amylase enzyme is low is longer than when the concentration of enzyme is high.</p>
1	<p>Able to state only one correct observation or two observations at idea level or one inaccurate / incomplete observation and one idea level.</p> <p><u>Sample answer</u> (idea level):</p> <p>1. Salivary amylase enzyme hydrolyses the starch .</p> <p>2. The time taken for hydrolysis of starch to be completed is different.</p>
0	Not able to respond <i>or</i> wrong response

(b) (ii) [Making inference]

Score	Criteria
3	<p>Able to state two reasonable inference for each observation based on criteria:</p> <p>C1: Molecule of enzyme</p> <p>C2: Rate of hydrolysis of starch / rate of enzyme reaction</p> <p><u>Sample answer:</u></p> <p><u>Inference for observation 1: (Horizontal inference)</u> The number of enzyme molecule is low, rate of enzyme reaction is low.</p> <p><u>Inference for observation 2: (Horizontal inference)</u> Number of enzyme molecule is high, rate of enzyme reaction is high.</p> <p><u>Inference for observation 3 : (Vertical inference)</u> Rate of enzyme reaction in concentration of 1% of enzyme is lower compare to that in concentration of 4% as the number of enzyme molecule is smaller.</p>
2	<p>Able to state one correct <u>and</u> one inaccurate / incomplete inference .</p> <p>Or</p>

	<p>Able to state two inaccurate / incomplete inferences .</p> <p><u>Sample answers for inaccurate / incomplete observation:</u></p> <p><u>Inference for observation 1: (Horizontal inference)</u> The number of enzyme molecule is low // rate of enzyme reaction is low.</p> <p><u>Inference for observation 2: (Horizontal inference)</u> Number of enzyme molecule is high // rate of enzyme reaction is high.</p> <p><u>Inference for observation 3 : (Vertical inference)</u> Rate of enzyme reaction if concentration of enzyme is 1% is lower compare to that in concentration of 4% // the number of enzyme molecule is smaller.</p>																														
1	<p>Able to state two idea of inference Or One correct inference and one idea of inference Or One correct inference only Or One inaccurate inference and one idea of inference</p> <p><u>Sample answer for idea level:</u></p> <ol style="list-style-type: none"> 1. Rate of enzyme reaction is affected by concentration of enzyme. 2. Rate of enzyme reaction changes. 3. Enzyme hydrolyses the starch. 																														
0	Not able to respond <i>or</i> wrong response																														
	<p>Summary of scoring for 1(b)(i)- Observation and 1(b)(ii - Inference) :</p> <table border="1"> <thead> <tr> <th>Score</th> <th>Correct</th> <th>Inaccurate</th> <th>Idea</th> <th>Wrong</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>2</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>2</td> <td>1 -</td> <td>1 2</td> <td>- -</td> <td>- -</td> </tr> <tr> <td>1</td> <td>1 - 1 -</td> <td>- - - 1</td> <td>1 2 - 1</td> <td>- - 1 -</td> </tr> <tr> <td>0</td> <td>-</td> <td>1</td> <td>-</td> <td>1</td> </tr> <tr> <td>0</td> <td>-</td> <td>-</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	Score	Correct	Inaccurate	Idea	Wrong	3	2	-	-	-	2	1 -	1 2	- -	- -	1	1 - 1 -	- - - 1	1 2 - 1	- - 1 -	0	-	1	-	1	0	-	-	1	1
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1	1 - 1 -	- - - 1	1 2 - 1	- - 1 -																											
0	-	1	-	1																											
0	-	-	1	1																											

(c) [Controlling variables]

Score	Criteria								
3	<p>Able to state all the three variables and three methods of handling the variables correctly. [6 items]</p> <table border="1"> <thead> <tr> <th>Variable</th> <th>Method of handling the variables</th> </tr> </thead> <tbody> <tr> <td> <i>Manipulated variable ;</i> Enzyme concentration </td> <td> <i>How to alter the manipulated variable</i> Use different concentration of enzyme (which are 1%, 2%, 3% and 4%.) Change the concentration of enzyme. </td> </tr> <tr> <td> <i>Responding variable :</i> Time taken for hydrolysis of starch // the rate of enzyme reaction </td> <td> <i>How to determine responding variable</i> Record the time taken for hydrolysis of starch by using stopwatch // calculate (and record) the rate of enzyme reaction using formula : 1/time </td> </tr> <tr> <td> <i>Fixed variable :</i> Temperature//Concentration of starch suspension </td> <td> <i>How to maintain the fix variable</i> Fix the temperature at 37 °C// Use 1% starch suspension throughout the experiment. </td> </tr> </tbody> </table>	Variable	Method of handling the variables	<i>Manipulated variable ;</i> Enzyme concentration	<i>How to alter the manipulated variable</i> Use different concentration of enzyme (which are 1%, 2%, 3% and 4%.) Change the concentration of enzyme.	<i>Responding variable :</i> Time taken for hydrolysis of starch // the rate of enzyme reaction	<i>How to determine responding variable</i> Record the time taken for hydrolysis of starch by using stopwatch // calculate (and record) the rate of enzyme reaction using formula : 1/time	<i>Fixed variable :</i> Temperature//Concentration of starch suspension	<i>How to maintain the fix variable</i> Fix the temperature at 37 °C// Use 1% starch suspension throughout the experiment.
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2	Able to state any 4 – 5 items correctly								
1	Able to state any 2 – 3 items correctly								
0	Able to give only one correct item / not able to respond <i>or</i> wrong response								

(d) [Making hypothesis]

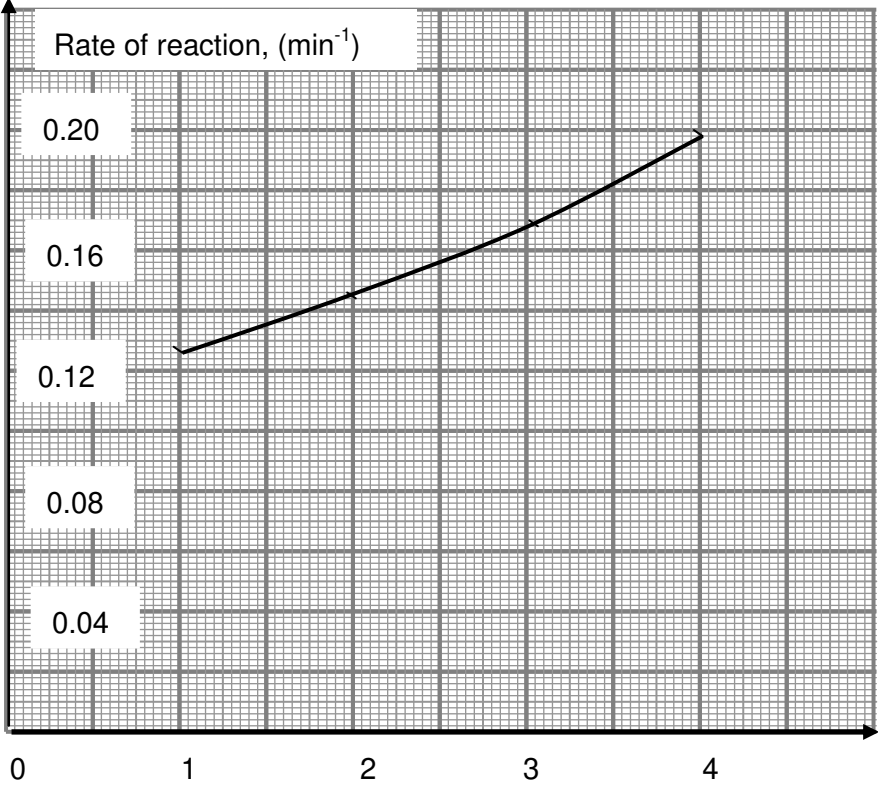
Score	Criteria
3	<p>Able to state a hypothesis by relating the MV and RV correctly based on three criteria:</p> <p>Criteria</p> <p>C1 : manipulated variable (MV)</p> <p>C2 : responding variable (RV)</p> <p>R : relationship of C1 and C2</p> <p>Sample answer:</p> <p>The higher / lower(R) the enzyme concentration (MV), the shorter / longer (R) the time taken for the complete hydrolysis of starch / blue black solution turns brown / the higher / lower(R) the rate of enzymatic reaction.(RV)</p>

2	<p>Able to state a hypothesis based on any two criteria. <u>Sample answer :</u></p> <p>C1 + C2 // C1/C2 + R</p> <ol style="list-style-type: none"> 1. The enzyme concentration affect the rate of enzyme reaction/ the time taken for the hydrolysis of starch to be completed. (no R) 2. The higher the enzyme concentration, the higher the reaction of enzyme. (no C2)
1	<p>Able to state a hypothesis at idea level only or based on any one criterion. <u>Sample answer :</u></p> <p>The rate of enzyme reaction is affected by enzyme (no R + no C1) To determine the effect of enzyme concentration on the enzymatic reaction (no R and no C2)</p>
0	Not able to respond <i>or</i> wrong response

(e)(i) [Communicating data]

Score	Criteria															
3	<p>Able to construct a table based on 3 criteria: C1: Title with correct units --T C2: Data (Enzyme concentration +Time taken) --D C3: Calculation (Rate of reaction) --C</p> <div style="text-align: center;"> <p>T</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Concentration of salivary amylase enzyme ,%</th> <th style="text-align: center;">Time taken for hydrolysis of starch to be completed(min)</th> <th style="text-align: center;">Rate of reaction, 1/time (min⁻¹)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">8</td> <td style="text-align: center;">0.125 / 0.13</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">7</td> <td style="text-align: center;">0.143 / 0.14</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">6</td> <td style="text-align: center;">0.167 / 0.17</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">0.200 / 0.20</td> </tr> </tbody> </table> <p style="text-align: center;">D</p> </div> <p style="text-align: right; margin-right: 20px;">} C</p> <p>Note: Accept – calculation for rate of reaction at two decimal places</p>	Concentration of salivary amylase enzyme ,%	Time taken for hydrolysis of starch to be completed(min)	Rate of reaction, 1/time (min ⁻¹)	1	8	0.125 / 0.13	2	7	0.143 / 0.14	3	6	0.167 / 0.17	4	5	0.200 / 0.20
Concentration of salivary amylase enzyme ,%	Time taken for hydrolysis of starch to be completed(min)	Rate of reaction, 1/time (min ⁻¹)														
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3	6	0.167 / 0.17														
4	5	0.200 / 0.20														
2	Any two criteria															
1	Any 1 criterion															
0	Not able to respond <i>or</i> wrong response															

(e)(ii) [Corelating time and space]

Score	Criteria										
3	<p>Able to draw a graph of rate of enzyme reaction against the concentration of salivary amylase enzyme based on the criteria below:</p> <ul style="list-style-type: none"> • label of axis-x and axis- y with correct unit and uniform scale (P) • all point have been transferred correctly(T) • smooth graph shape (B)  <table border="1" data-bbox="435 590 1308 1371"> <caption>Data points from the graph</caption> <thead> <tr> <th>Concentration of salivary amylase enzyme, %</th> <th>Rate of reaction, (min⁻¹)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.12</td> </tr> <tr> <td>2</td> <td>0.14</td> </tr> <tr> <td>3</td> <td>0.16</td> </tr> <tr> <td>4</td> <td>0.20</td> </tr> </tbody> </table>	Concentration of salivary amylase enzyme, %	Rate of reaction, (min ⁻¹)	1	0.12	2	0.14	3	0.16	4	0.20
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2	Any two criteria										
1	Any 1 criterion										
0	Not able to respond <i>or</i> wrong response										

(f) [Interpreting data]

Score	Criteria
3	<p>Able to state and explain the relationship between rates of enzyme reaction with enzyme concentration based on the criteria below:</p> <p>C1 : Relation between MV and RV C2 : more active sites to bind with substrate // higher number of enzyme molecule to bind with substrate // more collision or binding of enzyme (molecule) and substrate (molecule) C3 : more product (per unit time)</p> <p><u>Sample answer:</u> When the enzyme concentration increases, the rate of enzymatic reaction increases (C1). More active sites to bind with substrate (and forming enzyme-substrate complex)(C2), thus increase the production of product. (C3)</p>
2	Based on any two criteria
1	Based on any one criterion
0	Not able to respond <i>or</i> wrong response

(g) [Defining by operation]

Score	Criteria
3	<p>Able to define enzyme by operation correctly based on the following criteria:</p> <p>C1: Characteristic of enzyme C2: Effect of enzyme to substrate C3: Effect of enzyme concentration (MV) on the rate of reaction(RV)</p> <p><u>Sample answer:</u> Enzyme is biological catalyst/protein which is found in saliva/salivary amylase(C1) that hydrolyses the starch // cause the change of blue black solution into brown(C2). The rate of enzyme reaction is affected by the concentration of enzymes(C3).</p>
2	Able to state any two criteria
1	<p>Able to state any one criterion // complete theoretical definition only.</p> <p><u>Theoretical definition:</u> Enzyme is a biological catalyst that made up of protein which speed up biochemical reactions.</p>
0	Not able to respond <i>or</i> wrong response

(h) [Prediction]

Score	Criteria
3	<p>Able to predict and explain the effect of 0.5% salivary amylase enzyme to the rate of enzymatic reaction based on the following criteria:</p> <p>C1: Prediction on time taken to for the complete hydrolysis of starch. C2: Enzyme concentration. C3: Collision between enzyme and substrate // active sites to bind with substrate</p> <p><u>Sample answer</u> The time taken for the complete hydrolysis of starch is more than 9 minutes / any value more than 9 minutes. Enzyme concentration is low. Less collision between enzyme and substrate//less active site of enzyme will bind to substrate.</p>
2	Based on any two criteria including C1 (correct prediction)
1	C1 only (correct prediction)
0	Not able to respond <i>or</i> wrong response

(i) [Classifying]

Score	Criteria						
3	<p>Able to classify all materials and apparatus into their respective variables:</p> <table border="1"> <thead> <tr> <th>Manipulated variable</th> <th>Responding variable</th> <th>Fixed variable</th> </tr> </thead> <tbody> <tr> <td>Albumen</td> <td>Stopwatch</td> <td>Pepsin Thermometer Beaker</td> </tr> </tbody> </table>	Manipulated variable	Responding variable	Fixed variable	Albumen	Stopwatch	Pepsin Thermometer Beaker
Manipulated variable	Responding variable	Fixed variable					
Albumen	Stopwatch	Pepsin Thermometer Beaker					
2	Able to classify 3-4 correct materials and apparatus						
1	Able to classify 2 correct materials and apparatus						
0	Able to classify 1 correct material / apparatus only						

QUESTION 2

Aspect	Mark Scheme	Marks	Notes on scoring
Problem statement	<p>Able to state a problem statement relating manipulated variable to the responding variable correctly based on criteria: P1 : MV (Temperature) P2 : RV (Rate of respiration // Height / Level of (coloured) liquid R : Relationship in question form (What is the effect of.....? // Does the...affect...?)</p> <p><u>Sample answers:</u></p> <ol style="list-style-type: none"> 1. What is the effect of temperature on the rate of respiration? 2. How does temperature affects the rate of respiration? 3. What is the effect of temperature on the height of (coloured) liquid? 	3	P1+P2+R
	<p>Able to state a problem statement inaccurately based on any two criteria:</p> <p><u>Sample answers:</u></p> <ol style="list-style-type: none"> 1. What is the effect of temperature on respiration? (P1 and R) 2. What can affect the rate of respiration? (P2 and R) 3. What is the effect of temperature on the rate of respiration. (P1 and P2) 4. What is the rate of respiration of cockroaches? (P2 and R) 	2	P1 and P2 only P1/P2 and R only
	<p>Able to state a problem statement based on any one criterion at idea level.</p> <p><u>Sample answer:</u></p> <ol style="list-style-type: none"> 1. What factor affect the respiration of insects? (idea) 2. Does temperature affect the respiration of grasshoppers. (P1 only) 	1	P1/P2 only Idea
	No response/wrong response	0 mark	

Hypothesis	<p>Able to state a hypothesis by relating the manipulated variable to the responding variable correctly based on criteria:</p> <p>P1 : MV (Temperature) P2 : RV (The rate of respiration // Height / Level of (coloured) liquid) R : Relationship between P1 and P2. (The higher / lower.... higher / lower ...)</p> <p><u>Sample answer:</u></p> <ol style="list-style-type: none"> 1. The higher the temperature, the higher the rate of respiration (until 40°C.) 2. The higher the temperature, the higher the height of (coloured) liquid 3. The rate of respiration is the highest at 37°C. 	3 marks	P1+P2+R
	<p>Able to state a hypothesis inaccurately correctly based on any two criteria:</p> <p><u>Sample answer:</u></p> <ol style="list-style-type: none"> 1. The higher the temperature, the higher the respiration.(P1 and R) 2. Different temperature causes different rate of respiration. (P1 and P2) 3. Temperature affects the rate of respiration (in insects / a named organism) (P1 and P2) 	2	P1 + P2 only P1/P2 + R only
	<p>Able to state a hypothesis at idea level based on any one criterion:</p> <p><u>Sample answer</u></p> <ol style="list-style-type: none"> 1. Temperature influences respiration.(P1 only) 2. 37°C is the optimum temperature for respiration(P1 only) 3. Respiration changes with temperature. (P1 only) 	1	
	<p>No response/wrong response/R only.</p>	0 mark	

Variables	Able to state all three variables correctly. <u>Sample answers:</u> Manipulated variable : Temperature Responding variable : The rate of respiration // (Final height of coloured liquid Constant variable : Type of organism / insect // Number of organism / insect // Size of insect / Amount of soda lime	3	
	Able to state any two variables correctly.	2	
	Able to state any one variable correctly.	1	
	No response / wrong response	0	
Apparatus and materials	Able to list all the apparatus and materials correctly. 4 – 5M + 7-8A (including *) <u>Sample answers:</u> <u>Materials</u> : A * named insect ,(coloured) * liquid , water,soda lime, ice <u>Apparatus</u> : Stop watch,boiling tubes,beaker,thermometer,capillary tube, wire gauze, marker ,screw clips <u>Note:</u> A * named insect ,(coloured) * liquid - Compulsory Water bath = (beaker + water + thermometer) = 1A + 2M	3	
	3M + 4-6A (including *)	2	
	1-2M + 2-3A (including *)	1	
	No response / wrong response	0	

<p>Procedure</p>	<p>Able to describe the steps of the experiment procedure or method correctly based on the following criteria:</p> <p>K1 : How to set up the apparatus (at least 3 steps) K2 : How to operate the the control variable (Any one) K3 : How to operate the responding variable (Any one) K4: How to operate the manipulated variable (Any one) K5 : Precaution // steps to increase accuracy (Any one)</p> <p><u>Sample answer:</u></p> <table border="1" data-bbox="431 762 1141 1875"> <thead> <tr> <th>No</th> <th>Steps</th> <th>Criteria</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Diagram of apparatus set up with <u>five correct labels</u>.</td> <td>K1</td> </tr> <tr> <td>2</td> <td><u>Fill two boiling tubes with 5g of soda lime</u>.</td> <td>K1,K2</td> </tr> <tr> <td>3</td> <td>Place a <u>wire gauze</u> in the middle of the first boiling tube / boiling tube A.</td> <td>K1</td> </tr> <tr> <td>4</td> <td>Place a <u>grasshopper</u> / any named organism on the wire gauze.</td> <td>K1</td> </tr> <tr> <td>5</td> <td>The second boiling tube / boiling tube B without grasshopper acts as <u>control</u>.</td> <td>K1</td> </tr> <tr> <td>6</td> <td><u>Fill two beaker with 100ml of (coloured) liquid</u>.</td> <td>K1,K2</td> </tr> <tr> <td>7</td> <td><u>Connect</u> a capillary tube from each boiling tube into each beaker filled with the (coloured) liquid.</td> <td>K1</td> </tr> <tr> <td>8</td> <td><u>Immerse</u> both boiling tubes into a beaker of water / water bath at 10 °C.</td> <td>K1</td> </tr> <tr> <td>9</td> <td><u>Close</u> the screw clips.</td> <td>K1</td> </tr> <tr> <td>10</td> <td>Make sure the apparatus set up is <u>airtight</u> // <u>Seal</u> the stoppers with Vaseline.</td> <td>K5</td> </tr> <tr> <td>11</td> <td><u>Mark</u> the initial level of (coloured) liquid in both capillary tubes.</td> <td>K1</td> </tr> <tr> <td>12</td> <td>Start the <u>stopwatch</u>.</td> <td>K1</td> </tr> </tbody> </table>	No	Steps	Criteria	1.	Diagram of apparatus set up with <u>five correct labels</u> .	K1	2	<u>Fill two boiling tubes with 5g of soda lime</u> .	K1,K2	3	Place a <u>wire gauze</u> in the middle of the first boiling tube / boiling tube A.	K1	4	Place a <u>grasshopper</u> / any named organism on the wire gauze.	K1	5	The second boiling tube / boiling tube B without grasshopper acts as <u>control</u> .	K1	6	<u>Fill two beaker with 100ml of (coloured) liquid</u> .	K1,K2	7	<u>Connect</u> a capillary tube from each boiling tube into each beaker filled with the (coloured) liquid.	K1	8	<u>Immerse</u> both boiling tubes into a beaker of water / water bath at 10 °C.	K1	9	<u>Close</u> the screw clips.	K1	10	Make sure the apparatus set up is <u>airtight</u> // <u>Seal</u> the stoppers with Vaseline.	K5	11	<u>Mark</u> the initial level of (coloured) liquid in both capillary tubes.	K1	12	Start the <u>stopwatch</u> .	K1	3	
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	13	<u>Leave</u> the apparatus for <u>one hour</u> .	K1,K2																	
	14	After one hour, measure and <u>record</u> the final level of the (coloured) liquid for boiling tube A by using a <u>metre rule</u> .	K3																	
	15	<u>Repeat</u> the experiment by changing the temperature from <u>10 °C to 28 °C, 37 °C, and 50 °C</u> .	K4																	
	16	<u>Calculate</u> the <u>rate of respiration</u> by using formulae : <u>Height of (coloured) liquid / one hour</u> .	K3																	
	17	Record the result in a <u>table</u> .	K1																	
	All 5K																			
	3 - 4K			2																
	2 K			1																
	0 K or wrong response / no response			0																
Presentation of data	<p>Able to present all the data with the units correctly based on criteria:</p> <p>Titles and units : 1m</p> <ul style="list-style-type: none"> • Manipulated Variable (MV) – Temperature / °C. • Operating Responding Variable (RV) – Height of (coloured) liquid after one hour • Responding Variable (RV) - Rate of respiration(height / hour) <p>Data : 1m</p> <ul style="list-style-type: none"> • At least four different temperatures <p><u>Sample :</u></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Temperature / °C</th> <th>Height of (coloured) liquid after one hour</th> <th>Rate of respiration (cm / hour)</th> </tr> </thead> <tbody> <tr> <td>10</td> <td></td> <td></td> </tr> <tr> <td>28</td> <td></td> <td></td> </tr> <tr> <td>37</td> <td></td> <td></td> </tr> <tr> <td>50</td> <td></td> <td></td> </tr> </tbody> </table>			Temperature / °C	Height of (coloured) liquid after one hour	Rate of respiration (cm / hour)	10			28			37			50			2	
Temperature / °C	Height of (coloured) liquid after one hour	Rate of respiration (cm / hour)																		
10																				
28																				
37																				
50																				

End of mark scheme