

Biology Paper 3

No.	Mark Scheme	Score										
1(a)	<p>Able to record 1 reading for the initial mass and all 4 readings for the final mass of potato strips correctly.</p> <p>Sample Answer: Initial mass : <u>50</u> g</p> <table border="1"> <thead> <tr> <th>Type of solution</th> <th>Final mass of potato strip after 30 minutes (g)</th> </tr> </thead> <tbody> <tr> <td>0.2M</td> <td>58</td> </tr> <tr> <td>0.4M</td> <td>52</td> </tr> <tr> <td>0.6M</td> <td>46</td> </tr> <tr> <td>0.8M</td> <td>42</td> </tr> </tbody> </table>	Type of solution	Final mass of potato strip after 30 minutes (g)	0.2M	58	0.4M	52	0.6M	46	0.8M	42	3
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0.6M	46											
0.8M	42											
	Able to record 1 reading for the initial mass and all 3 readings for the final mass of potato strips correctly.	2										
	Able to record any 1 reading for the initial mass and all 2 readings for the final mass of potato strips correctly.	1										
	No response or 1 reading for the initial mass and 1 reading for the final mass.	0										

No.	Mark Scheme	Score
1 (b)(i)	<p>Able to state two correct observations based on the following criteria : [Observation must have values for MV and RV from Table 1]</p> <p>MV : Concentration of sucrose solution RV : The final mass of potato strip after 30 minutes</p> <p>Sample answer:</p> <ol style="list-style-type: none"> When the concentration of sucrose solution is 0.2M, the final mass of potato strip after 30 minutes is 58 g. When the concentration of sucrose solution is 0.8M, the final mass of potato strip after 30 minutes is 42 g. 	3
	<p>Able to state two different observations inaccurately OR without values.</p> <p>Sample Answer:</p> <ol style="list-style-type: none"> At concentration 0.8 M, the final mass is the lowest // inversely. The highest concentration of sucrose solution, the final mass is 58 g // inversely. The concentration of sucrose solution influences the final mass of potato strip. 	2
	<p>Able to state two different observations at idea level.</p> <p>Sample Answer:</p> <ol style="list-style-type: none"> The concentration changes / increases / decreases. The final mass of potato strip changes /increases /decreases. 	1
	No response or incorrect response	0

No.	Mark Scheme	Score
1 (b)(ii)	Able to state two inferences for each observation made correctly and accurately for each observation and equivalent in 1(b)(i). Sample answers: 1. At concentration of 0.2M, the solution is hypotonic to the cell sap, <u>water molecule diffuse into the cell.</u> 2. At concentration of 0.8M, the solution is hypertonic to the cell sap <u>water molecule diffuse out of the cell.</u> Inferences must correspond observations	3
	Able to state any two inferences inaccurately. Sample answers: 1. More water molecule diffuse. 2. The diffusion of water is influenced by concentration.	2
	Able to state two inferences at idea level. Sample Answer: 1. Osmosis occurs.	1
	No response OR wrong response.	0

No.	Mark Scheme	Score								
1 (c)	Able to state all 3 variables and the 3 methods to handle the variable Sample answers <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Variable</th> <th style="width: 50%;">Method to handle the variable</th> </tr> </thead> <tbody> <tr> <td> Manipulated variable: Concentration of sucrose solution </td> <td>Use 0.2M, 0.4M, 0.6M and 0.8M / different concentration of sucrose solution</td> </tr> <tr> <td> Responding variable : Final mass of potato strip // percentage change in mass of potato strip </td> <td> Measure and record the final mass of potato strip using a triple beam balance // Calculate the percentage change in mass of potato strip using formula: $\frac{\text{Final mass}-\text{Initial mass}}{\text{Initial mass}} \times 100\%$ </td> </tr> <tr> <td> Constant variable: 1. Duration of immersion// 2. Length / mass of the potato strip / Volume of sucrose solution </td> <td> 1. Fix the time of 30 minutes to immersed the potato strip. 2. Fix the length of potato strip to be 5mm / Fix the mass at 50 gm. 3. Fix the volume of sucrose solution at 20ml </td> </tr> </tbody> </table>	Variable	Method to handle the variable	Manipulated variable: Concentration of sucrose solution	Use 0.2M, 0.4M, 0.6M and 0.8M / different concentration of sucrose solution	Responding variable : Final mass of potato strip // percentage change in mass of potato strip	Measure and record the final mass of potato strip using a triple beam balance // Calculate the percentage change in mass of potato strip using formula: $\frac{\text{Final mass}-\text{Initial mass}}{\text{Initial mass}} \times 100\%$	Constant variable: 1. Duration of immersion// 2. Length / mass of the potato strip / Volume of sucrose solution	1. Fix the time of 30 minutes to immersed the potato strip. 2. Fix the length of potato strip to be 5mm / Fix the mass at 50 gm . 3. Fix the volume of sucrose solution at 20ml	3
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	Able to state 3-5 ticks	2
	Able to state 1-2 ticks	1
	No response or incorrect response	0

No.	Mark Scheme	Score
1 (d)	<p>Able to state a hypothesis by relating the manipulated variable and responding variable correctly with following aspects:</p> <p>P1 : Stating manipulated variable. P2 : Stating responding variable H : Showing a specific relationship/ showing direction of relationship</p> <p>Sample Answer :</p> <ol style="list-style-type: none"> As the concentration of sucrose solution (P1) increases (H), the final mass of potato strip decreases // the percentage change in mass (P2) decreases. As the concentration of sucrose solution increases / decreases, the final mass of potato strip increases /decreases // the percentage change in mass increases // decreases 	3
	<p>Able to state a hypothesis relating the manipulated variable inaccurately.</p> <p>Sample Answer:</p> <ol style="list-style-type: none"> The increase of the concentration of sucrose solution influences / affects the final mass of potato strip. The percentage change in mass of potato strip is affected by concentration of sucrose solution. 	2
	<p>Able to state a hypothesis relating the manipulated variable at idea level.</p> <p>Sample Answer :</p> <ol style="list-style-type: none"> Final mass of potato strip / concentration of sucrose solution changes. As the final mass of potato strip increases the percentage change increases. 	1
	No response or wrong response if no P1 or P2 no mark for each.	0

No.	Mark Scheme	Score																				
1 (e)(i)	<p>Able to construct a table correctly with the following aspects:</p> <ol style="list-style-type: none"> Able to state the 4 titles with units correctly. Able to record all the data correctly. Able to calculate and record percentage change correctly <p>Sample answer :</p> <table border="1"> <thead> <tr> <th>Concentration of sucrose solution (M)</th> <th>Initial mass (g)</th> <th>Final mass (g)</th> <th>Percentage change in mass: $\frac{\text{Final mass}-\text{Initial mass}}{\text{Initial mass}} \times 100$ (%)</th> </tr> </thead> <tbody> <tr> <td>0.2</td> <td>50</td> <td>58</td> <td>16.0</td> </tr> <tr> <td>0.4</td> <td>50</td> <td>52</td> <td>4.0</td> </tr> <tr> <td>0.6</td> <td>50</td> <td>46</td> <td>-8.0</td> </tr> <tr> <td>0.8</td> <td>50</td> <td>42</td> <td>-16.0</td> </tr> </tbody> </table>	Concentration of sucrose solution (M)	Initial mass (g)	Final mass (g)	Percentage change in mass: $\frac{\text{Final mass}-\text{Initial mass}}{\text{Initial mass}} \times 100$ (%)	0.2	50	58	16.0	0.4	50	52	4.0	0.6	50	46	-8.0	0.8	50	42	-16.0	3
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	Any two aspects correct	2
	Any one aspect correct	1
	No response or wrong response.	0

No.	Mark Scheme	Score
1 (e)(ii)	Able to draw the graph correctly with the following aspects: P(paksi) : Corrected title with unit on both horizontal, vertical axis and uniform scale on the axis. T (titik) : All points plotted / transferred correctly. B(bentuk) : Able to join the points to form a smooth graph / line	3
	Able to state any two correct.	2
	Able to state any one correct	1
		0

No.	Mark Scheme	Score
1 (f)	Able to interpret data correctly and explain with the following aspects : Relationship : P1 = State the concentration of sucrose solution which is isotonic to the cell sap P2 = No percentage change in mass of the potato strips P3 = Movement of water in and out of potato strip is equal Sample answer: The concentration of sucrose solution which is isotonic to the cell sap is % (from graph where the curve intersects the x-axis). When the sucrose solution is isotonic to the cell sap, there is no percentage change in mass of the potato strips because movement of water in and out of potato strip is equal.	3
	Able to interpret data with two aspects correctly.	2
	Able to interpret data only one aspect correctly.	1
	No response or wrong response.	0

No.	Mark Scheme	Score
1 (g)	Able to define operationally based on the result of the experiment with the following aspects: P1 : Movement of water in / out P2 : Plasma membrane of the potato cells P3 : Difference in concentration gradient between the sucrose solution and the cell sap. Sample answer: 1. Osmosis is a process in which water molecules entering / leaving the	3

	potato strips (P1) across the plasma membrane of the potato strip (P2) when there is a difference in concentration gradient between the sucrose solution and the cell sap (P3).	
	Able to define operationally based on the result of the experiment with two aspects correctly.	2
	Able to define operationally based on the result of the experiment with only one aspects correctly.	1
	No response or wrong response	0

No.	Mark Scheme	Score
1 (h)	<p>Able to predict and explain the outcome of the experiment correctly with the following aspects:</p> <p>Prediction :</p> <p>P1: Able to predict the mass of the potato strip correctly.</p> <p>Explanation :</p> <p>P2 : Able to state distilled water is hypotonic</p> <p>P3 : Able to state more water molecules diffuse into the potato strip</p> <p>Sample answer:</p> <p>1. The mass of the potato strip increases more than 46 g // any values more than 46 g .Water molecules diffused into the potato strip because distilled water is hypotonic to the cell sap of the potato strip.</p> <p>** P1 must be correct to get P2 & P3, if P1 wrong automatically reject P2 & P3</p>	3
	Able to predict and explain the outcome of the experiment correctly with the two aspects	2
	Able to predict and explain the outcome of the experiment correctly with one aspect correctly.	1
	No response or wrong response.	0

No.	Mark Scheme	Score								
1 (h)	<p>Able to classify all 3 solutions concentration and types of solution correctly:</p> <table border="1" data-bbox="181 1566 1163 1877"> <thead> <tr> <th>Solution concentrations (%)</th> <th>Types of solution compared to the osmotic concentration of cell sap</th> </tr> </thead> <tbody> <tr> <td>0.25% natrium chloride solution</td> <td>Hypotonic</td> </tr> <tr> <td>0.8% natrium chloride solution</td> <td>Isotonic</td> </tr> <tr> <td>1.10% natrium chloride solution.</td> <td>Hypertonic</td> </tr> </tbody> </table>	Solution concentrations (%)	Types of solution compared to the osmotic concentration of cell sap	0.25% natrium chloride solution	Hypotonic	0.8% natrium chloride solution	Isotonic	1.10% natrium chloride solution.	Hypertonic	3
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1.10% natrium chloride solution.	Hypertonic									
	Able to classify 2 solutions concentration and types of solution correctly	2								
	Able to classify 1 solution concentration and types of solution correctly	1								
	No response or wrong response	0								

QUESTION 2

Aspect	Criteria	Score
Problem Statement	Able to state the problem statement of the experiment correctly that include criteria: <ul style="list-style-type: none"> ▪ Manipulate variables ▪ Responding variables ▪ Relation in question form and question symbol [?] Sample answers: <ol style="list-style-type: none"> 1. What is the relationship between the average height/growth /growth rate of maize plants and time/days after planting? 2. Does the time/days after planting affect the average height/growth rate of maize plants? 	3
	Able to state the problem statement of the experiment with any 2 criteria. Sample answers: <ol style="list-style-type: none"> 1. Does the time/days/duration after planting affect the average height/growth rate of maize plants. (no ?) 2. What is the effect of time/days/duration after planting on maize plants? 3. The time/days/duration after planting affect the average height/growth rate of maize plants. 	2
	Able to state the of problem statement with any 1 criterion. Sample answers: <ol style="list-style-type: none"> 1. Growth of maize depends on days of planting. 	1
	Wrong or no response	0
Variables	Manipulate variables : The time/days/duration after planting Responding variables : The average height of maize plants / the growth rate of maize plants. Fixed variables : Distance between each maize seed// Number of seedlings/types//quantity of garden soil/amount of water/light intensity /time taken	3 (1 mark each)
	Able to state the any 2 variables correctly.	2
	Able to state the any 1 variable correctly.	1
	Wrong or no response	0
Hypothesis	Able to state the hypothesis correctly according to 3 criteria: <ul style="list-style-type: none"> ▪ Manipulate variables (P1) ▪ Responding variables (P2) ▪ Relationship of the variables (H) Sample answers: <ol style="list-style-type: none"> 1. The longer (H) the time/days/duration after planting (P1), the more the average heights/growth rate of maize plants (P2) until they reach maturity. 	3
	Able to state the hypothesis with any 2 criteria Sample answers <ol style="list-style-type: none"> 1. The time/days/duration after planting (P1) affect the average height/growth rate of maize plants. (P2) (no H) 	2

	2. The average height/growth rate of the plants depends on the time/days/duration after planting.	
	Able to state the idea of the hypothesis.	1
	Sample answers: 1. The time/days/duration after planting affect the plants	
	Wrong or no response	0
Materials and apparatus	Able to list 4 materials and 2 apparatus correctly to make a functional experiment. MATERIALS: 1. Maize seeds 2. Nursery site 3. garden/loam soil 4. tap water 5. fertilizer APPARATUS: 1. Measuring tape 2. metre rule	3
	Able to state 3 materials and 1 apparatus for the experiment.	2
	Able to state 2 materials and 1 apparatus for the experiment.	1
	Wrong or no response	0
Procedure	Able to write all the steps in carrying out the experiment successfully. K1 : Steps to set up the materials & apparatus (4) K2 : Steps to handle the fixed/constant variable (1) K3 : Steps to handle the responding variable (1) K4 : Steps to handle the manipulated variable (1) K5 : Steps to increase reliability of results accurately/ Precaution(1)	5K=3
	3-4K	2
	1-2K	1
	Wrong or no response	0
	S1 – Prepare a site for nursery with garden/loam soil.	K1
	S2 – Plant 10 maize seeds in the soil with even /same spacing between each seed.	K2
	S3 – Water the seeds daily throughout the period of experiment.	K1
	S4 – After 10 days, measure and record the height of maize plants using the metre rule or measuring tape.	K3
	S5 – Repeat steps 4 over 90/120 days /3-4 consecutive month	K4
	S6 – Record all the results obtained in a table	K1
	S7- Plot a graph of the average height/growth of maize plants against time/days after planting.	K1
	S8 -Repeat the experiment to get average readings.	K5

Presentation of data	Able to construct a table of data with 2 criteria: <ul style="list-style-type: none"> ▪ (i) Manipulated variable with title and units ▪ (ii) Responding variable with title and units Sample answers:	2																																																																																							
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Time/days after planting (days)</th> <th colspan="10" style="text-align: center;">The height of maize plants/ cm</th> <th rowspan="2" style="text-align: center;">Average heights of maize plants (cm)</th> </tr> <tr> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">5</th> <th style="text-align: center;">6</th> <th style="text-align: center;">7</th> <th style="text-align: center;">8</th> <th style="text-align: center;">9</th> <th style="text-align: center;">10</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">10</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td> </tr> <tr> <td style="text-align: center;">20</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td> </tr> <tr> <td style="text-align: center;">30</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td> </tr> <tr> <td style="text-align: center;">40</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td> </tr> <tr> <td style="text-align: center;">50</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> <td></td> </tr> </tbody> </table>	Time/days after planting (days)	The height of maize plants/ cm										Average heights of maize plants (cm)	1	2	3	4	5	6	7	8	9	10	10													20													30													40													50													
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