ANSWER SCHEME
BIOLOGY
PAPER 3
4551/3

SPMRSM
2017

SPMRSM BIOLOGY 2017

1 (a) KB0603 – Measuring Using Numbers

Score	Mark Scheme
3	Sample Answer: Concentration of sodium chloride solution (M) / Final mass of fish fillet/g: First experiment / Second experiment 0.1 M sodium chloride solution: 70 / 74 0.4 M sodium chloride solution: 46 / 44 0.6 M sodium chloride solution: 42 / 40

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

Score	Explanation
3	Sample answer: 1. When the **concentration of solution** is **0.1 M sodium chloride solution** , the **final mass of fish fillet (in first reading) is 70 g and (in second reading) is 74 g.** **2.** When the **concentration of solution** is **0.6 M sodium chloride solution** , the **final mass of fish fillet (in first reading) is 42 g and (in second reading) 40 g.** 3. When the **concentration of solution** is **0.4 M sodium chloride solution** , the **final mass of fish fillet (in first reading) is 46 g and (in second reading) 44 g.**

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

Score	Explanation
3	Sample answers: **1.** The final mass of fish fillet in 0.1 M sodium chloride solution is the **highest** because **water diffuses into the fish fillet cell by osmosis**, due to **0.1 M sodium chloride solution is hypotonic / high water potential compared to fish fillet cell.** **2.** The final mass of fish fillet 0.6 M sodium chloride solution is the **lowest** because **water diffuses out from the fish fillet cell by osmosis**, due to **0.6M sodium chloride solution is hypertonic / low water potential compared to fish fillet cell.**

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1 (c) [KB0610 – Controlling Variables]

<table>
<tr><th>Score</th><th>Explanation</th></tr>
<tr><td>3</td><td>Sample Answer :
<table>
<tr><th>Variables</th><th>Method to handle the variable correctly</th></tr>
<tr><td><u>Manipulated variable</u>:
Concentration of solution // concentration of sodium chloride solution</td><td>Use <u>different</u> concentration of sodium chloride solution which are distilled water / 0.1 M, 0.4 M and 0.6 M.</td></tr>
<tr><td><u>Responding variable</u> :
Final mass of fish fillet

Average final mass of fish fillet

Difference in mass of fish fillet</td><td>Weigh / Measure and record the final mass of fish fillet by using (weighing) balance
• Reject : spring balance

Calculate and record average final mass of fish fillet by using formula =
<u>Final mass 1 + final mass 2</u>
2
Calculate and record difference in mass of fish fillet by using formula =
Average final mass – initial mass</td></tr>
<tr><td><u>Constant variable</u>:
Type of fish</td><td>Fix the same type of fish that is mackerel
• Reject : Volume of sodium chloride solution, inital mass of fish fillet</td></tr>
</table>
6 ticks</td></tr>
</table>

1 (d) [KB0611 – Making Hypothesis]

<table>
<tr><th>Score</th><th>Mark scheme</th></tr>
<tr><td>3</td><td>Sample answers :

1. The higher/lower the concentration of sodium chloride solution, the lower/higher the final mass of fish fillet.</td></tr>
</table>

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1 (e) (i) [KB0606 – Communication]

<table>
<tr><th>Score</th><th>Mark scheme</th></tr>
<tr><td>3</td><td>

Title – 1mark
Data recorded correctly - 1mark
Change in mass of fish fillet - 1mark

Sample answers :
<table>
<tr><th rowspan="2">Concentration of sodium chloride solution (M)</th><th rowspan="2">Initial mass</th><th colspan="3">Mass of fish fillet (g)
Final mass</th><th rowspan="2">Change in mass of fish fillet (g)</th></tr>
<tr><th>First</th><th>Second</th><th>Average</th></tr>
<tr><td>0.1</td><td>50</td><td>70</td><td>74</td><td>72.0</td><td>22.0</td></tr>
<tr><td>0.4</td><td>50</td><td>46</td><td>44</td><td>45.0</td><td>- 5.0</td></tr>
<tr><td>0.6</td><td>50</td><td>42</td><td>40</td><td>41.0</td><td>- 9.0</td></tr>
</table>
</td></tr>
</table>

1 (e)(ii) [KB0612 – Plotting a graph]

Score	Explanation
3	Axis/ *Paksi* (P) : Both axis with uniform scales. Points/ *Titik* (T) : All 3 points correctly transferred Shape/ *Bentuk* (S) : All points connected in smooth line

(f) [KB0608 – Interpreting Data]

Score	Mark Scheme
3	Sample answers : 1. Isotonic concentration is 0.33 M ± 0.1 M. This is because the rate of osmosis is 0 g/min due to volume of water molecules diffuse in and out of the fish cells are equal / no net movement of water molecules.

1 (g) [KB0605 – Predicting]

Score	Explanation
3	R - Prediction of final mass (equal to) 500g P1 - skin / scale impermeable P2 - water molecules cannot diffuses into and diffuses out by osmosis / osmosis process does not occur Sample answers: The final mass of life mackerel fish will equal to 500g because the skin/scale is impermeable towards water,therefore osmosis process does not occur **OR** R - Prediction of final mass is (equal to) 500g P1 - undergo regulatory system / regulation / osmoregulatory process P2 - high intake of water through mouth // excrete small volume of urine // excrete excess salt through urine / gills (in form of urea) Sample answers: The final mass of life mackerel fish will equal to 500g because they undergo regulation process which is experience high intake of water through mouth //excrete small volume of urine(in form of urea) **R + P1 + P2** **Reject :** all answer related to tonicity (hypertonic, hypotonic and isotonic) of seawater

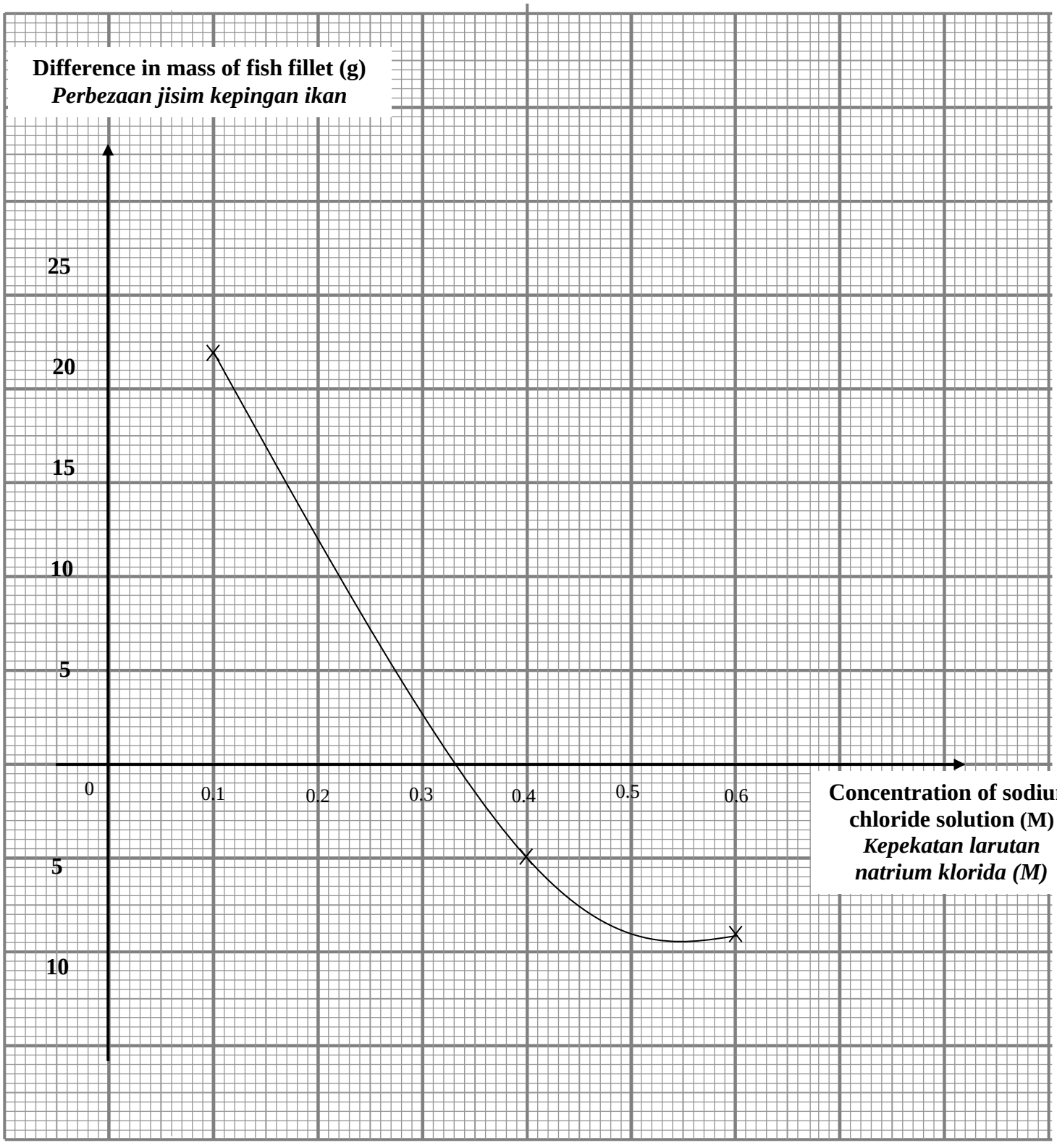
1 (h) [KB0609 –Defining by Operation]

Score	Mark scheme
3	Sample answers : Osmosis is a process of diffusion / movement of water molecules into mackerel fish fillet (cells) shown by the final mass/average final mass / change // difference // reduction // increment in mass of fish fillet affected by // depends on concentration of sodium chloride solution.

1 (i) [KB0602 – Classifying]

Score	Mark scheme
3	Sample answer Type of solution compared to cell sap of potato strip Hypotonic: 0.3 % sucrose solution, 0.5 % sucrose solution Hypertonic: 0.9 % sucrose solution, 1.2 % sucrose solution, 2.5 % sucrose solution, 3.0 % sucrose solution

Difference in mass of fish fillet and the concentration of sodium chloride solution
Perbezaan jisim kepingan ikan dan kepekatan larutan natrium klorida



Question 2

No.	Mark Scheme	Score
2(i)	**Sample answers:** 1. Does at temperature 37^0 C has the highest rate of salivary amylase reaction on plain rice porridge stain/starch? 2. Does at temperature 0^0C//60^0C//80^0C has the lowest rate of salivary amylase reaction on plain rice porridge stain/starch? 3. What is the effect of different temperatures on the rate of salivary amylase reaction on plain rice porridge stain/starch? 4. Do (different) temperature affect the rate of salivary amylase reaction on plain rice porridge stain/starch?	3

No.	Mark Scheme	Score
2(ii)	Sample answers: 1. Rate of salivary amylase reaction on plain rice porridge stain/starch at **30^0C/37^0C/40^0C** is the **highest** . 2. Rate of salivary amylase reaction on plain rice porridge stain/starch at 30^0C/37^0C/40^0C is **higher than** 20^0C//60^0C/80^0C. 3. Rate of salivary amylase reaction on plain rice porridge stain/starch at 20^0C//60^0C/80^0C. is **lower than** 30^0C/37^0C/40^0C.	3

No.	Mark Scheme	Score
2(iii)	**Able to state all <u>three</u> variables correctly** Sample answers: 1. <u>Manipulated variable:</u> Temperature (of waterbath / medium of reaction) 2. <u>Responding variable</u>: Rate of (salivary amylase) reaction / time taken for iodine solution to remain yellow 3. <u>Controlled variable</u>: Volume of saliva/volume of starch suspension/concentration of starch suspension/pH of medium	3

2(iv)	Sample answers: **Apparatus** • Beakers (√) • Test tube (√) • Syringes (√) • Droppers (√) • Glass rods (√) • White tiles (with grooves) • Thermometer (√) • Test tube rack • Stopwatch (√) • * water bath (√) (√) compulsory for 8A **Materials** • 1% starch suspension / plain rice porridge (√) • Saliva suspension (√) • Iodine solution (√) • Ice cubes • Distilled water (√) : compulsory for 3M *** Bunsen burner + tripod stand + wire gauze + distilled water + beaker = Waterbath = 1 Apparatus** **8A + 3M**	3

	Mark Scheme	**Score**	
2(v)	Sample answer : Procedures: 1. Mouth is **rinsed** with warm water . 2. Saliva is **collected** by using a beaker. 3. The saliva is **diluted** with an equal volume of distilled water. 4. **5 ml** of 1% starch suspension is **put** into a test tube by using a syringe, labelled A1. 5. **2ml** of saliva is **added** into another test tube by using a second syringe, labelled A2. 6. Test tube A1 and A2 are **immersed** into a beaker contained ice cybe at 0^oC. 7. The test tube are **left** for 5 minutes. 8. While waiting, a **dry** piece of white tile with groove is prepared. 9. A drop of iodin solution is **placed** into each groove. 10. **After 5 minutes** of immersion, starch suspension from test tube A1 is **poured** into the saliva in test tube A2. 11. The mixture is **stirred** by using a glass rod. 12. The stop watch is **started** immediatly. 13. A drop of mixture from test tube A2 is **placed** into first groove on the tile contain iodine solution. 14. The iodine test is **repeated** every minutes for 10 minutes. 15. The dropper in a beaker **is rinsed** after **each** sampling. 16. **Measure** and **record** the time taken for iodin solution to remain yellow **by using a stopwatch**. 17. **Calculate** and **record** the rate of enzyme reaction **by using a**	K's K5 K1 K1 K2/K1 K2/K1 K1 K1 K5 K1 K2 /K1 K1 K1 K1 K1 K5 K3(crv)	

	formula: **Rate of reaction = $\frac{1}{\text{Time taken for iodin solution to remain yellow}}$** 18. **Steps 1-17 are repeated** by using **different temperature of water bath that is 37ºC and 60ºC (* any other 2 value of temperature with different condition)** 19. All the data is recorded in the **table** / **tabulate** data. 20. The experiment **is repeated twice** to get the **average reading**. 21. A graph showing the rate of enzyme reaction against the temperature is **plotted**.	K3(arv) K4 K1 K5 K1	3

No.	**Mark Scheme**	**Score**
2(vi)	**Sample answers :** **(C1)** **(C2)** Temperature (^{0}C) | Time taken for iodin solution to remain yellow/time taken for the hydrolysis of starch to be completed (min) | Rate of enzyme reaction (1/ min) / (min^{-1}) 0 | | | 37 | | | 60 | | | ***Low temperature accept any value in range 00C-300C** **Optimum temperature accept any value in range 370C-400C** **High temperature accept any value in range 500C above**	**2**