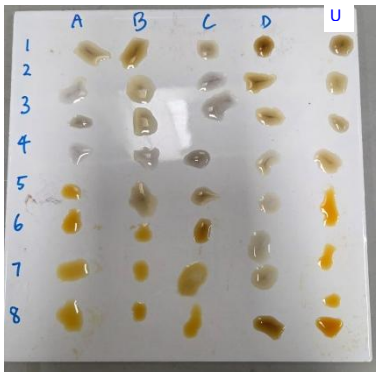
DUNMAN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2026 - SECONDARY 4 EXPRESS
BIOLOGY 6093/03 (MARKING SCHEME)

<table>
<tr><td colspan="3">Question</td><td>Marking scheme</td></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td>2% x 2.5 = 0.05
0.05 / 10 * 100 = <u>0.5</u> % [1]</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>
<table>
<tr><th>beaker</th><th>percentage concentration of amylase solution / %</th><th>time taken for start to be broken down / minutes</th></tr>
<tr><td>A</td><td>2.0</td><td>5</td></tr>
<tr><td>B</td><td>1.5</td><td>6</td></tr>
<tr><td>C</td><td>1.0</td><td>8</td></tr>
<tr><td>D</td><td>0.5</td><td>> 8</td></tr>
<tr><td>U</td><td>1.5 [1]</td><td>6</td></tr>
</table>

suitable table with minimum two columns (ie. beaker or percentage concentration amylase AND time / minutes) [1]
suitable headings with correct units [1]
five results recorded [1]
trend: A is faster than U [1]



</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>iodine solution added to the mixture remained yellow-brown / did not change to blue-black [1]</td></tr>
<tr><td></td><td></td><td>(iv)</td><td>value of U in the table [1]</td></tr>
<tr><td></td><td></td><td>(v)</td><td>method:

To a volume of sample, add equal volume of Benedict’s solution [1]
Place it in a boling water bath for 2 - 3 minutes [1]

positive test result:

green / yellow / orange / brick-red / red precipitate is formed in the presence of reducing sugar [1]

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	(b)		*independent variable:* **1** select at least five different temperatures in which seeds are allowed to germinate (i.e. 20°C, 30°C, 40°C, 50°C, 60°C) *method:* **2** method of maintaining a constant temperature (i.e. greenhouse / enclosed room etc) **3** allow time for seeds to germinate (i.e. 1 week) **4** description of making seed extract (i.e. grinding seeds / AW) *dependant variable:* **5** test the seed extract with Benedict's solution and record the time taken for reducing sugar to appear Accept: alternative method for data collection (i.e. use iodine solution AND record time taken for starch to be broken down / colour change of reagent instead of time taken / time taken for germination of seeds **6** *and* **7** *are variables kept constant (**max 2**):* • age / type / species, of seed • time of germination allowed • growing conditions / environmental factors • volume / mass, of extract / seeds • concentration of extract / amylase • volume / concentration of Benedict's / iodine solution • pH of soil *results analysis:* **8** Plot a graph of time taken against temperature and draw a trend line to see the relationship between temperature and activity of amylase in germinating seeds. **9** repeat the experiment 3 times / allow 3 seeds to germinate at each temperature to increase reliability of results Any six points [6]

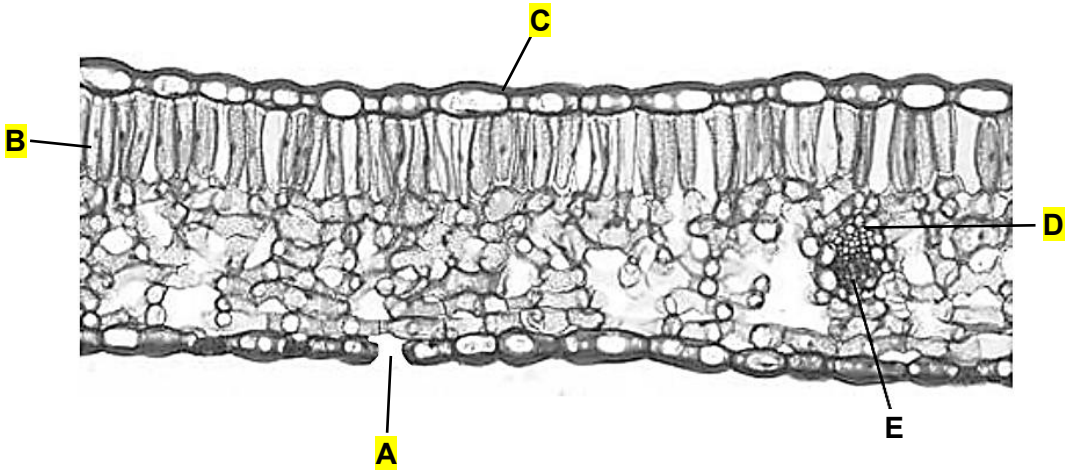
	(c)	(i)	• **S**cale: appropriate scale – [1] • **L**ine: line of best fit or points joined with ruled lines [1] • **A**xes: correct title and units [1] • **P**lot: correct plotting of data points [1]
		(ii)	• As time increases day 0 to 12, activity of amylase increases from 0 to 240 arbitrary units. From day 12 to 16, activity of amylase decreases from 240 to 65 arbitrary units. [1] • Between day 16 and 24, activity of amylase remains constant at 240 arbitrary units. [1]
	(d)	(i)	• no peak in the graph • values at day 12 and day 16 are the same • the intervals between recordings were too large • there are no readings on day 13, 14 and 15 any one point [1]
		(ii)	measure activity of amylase daily / at narrower intervals / between day 12 and day 16 / measure on day 13, 14 and 15 [1]
2	(a)	(i)	• clear, continuous outlines; no broken / sketchy lines [1] • correct proportion and large size (at least the width of the image) [1] • detail 1: six seeds shown **and** two openings without seeds [1] • detail 2: indents in external shape at the top and on both sides [1]
		(ii)	84.5 mm [1] (±1 mm)
		(iii)	$\text{magnification} = \frac{\text{length of line } \mathbf{PQ} \text{ in Fig. 2.1}}{\text{actual diameter of the persimmon fruit}}$ $2.2 \text{ x} = \frac{84.5}{\text{actual diameter}}$ [1] actual diameter = 84.5 / 2.2 = 38.4 mm (to 3sf) [1]

(b) (i)

structure	part of leaf	function
A	stoma / stomata	controls diffusion of gases between the atmosphere and air spaces inside the leaf
B	palisade mesophyll	layer that carries out the highest rate of photosynthesis
C	cuticle	reduces water loss from leaf surface
D	xylem	transports water and ions to leaf cells
E	phloem	transports sucrose by translocation

every two correct [1]

(ii)



every two correct [1]

(iii)

- Stomata will be found on the upper surface of the leaf, [1]
- so that they are exposed to air for gaseous exchange to occur. [1]

OR

- There will be more / larger intercellular air spaces. [1]
- so that the leaf can be more buoyant and float. [1]

(iv)

- During the day, guard cells carry out photosynthesis as they contain chloroplasts to produce glucose. [1]
- This lowers the water potential of guard cells causing water to enter by osmosis. [1]
- Guard cells swell and become turgid pulling open the stoma as they have a thicker cell wall facing the stoma. [1]