

8th International Junior Science Olympiad
Durban, South Africa

Experimental Examination: Practical 1
Model Answer

7 December 2011

**TO DETERMINE THE EFFECT OF CHEMICALS AND TEMPERATURE ON
MEMBRANE DESTRUCTION AND PERMEABILITY IN BEETROOT (*Beta vulgaris*)**

SECTION A

a. State whether the following statements are true or false by ticking the appropriate box.

	TRU E	FALSE
1. Betacyanin is not soluble in water. 0.25 mark		<input type="checkbox"/>
2. Betacyanin is soluble in organic solvents only. 0.25 mark		<input type="checkbox"/>
3. Damaged cells were empty of betacyanin after repeated washing, and no further cell membrane damage occurred. 0.25 mark	<input type="checkbox"/>	

(0.25 x 3 = 0.75 marks)

b. Choose the correct answer by ticking the appropriate box.

TT1 <input type="checkbox"/>	TT2	TT3	TT4
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(0.5

mark)

c. Choose the correct answer by ticking the appropriate box.

TT2 <input type="checkbox"/>	TT3
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(0.5 mark)

d. Choose the correct answer by ticking the appropriate box.

Upper

Lower

(0.5 mark)

e. State whether the following statements are true or false by ticking the appropriate box.

	TRU E	FALSE
1. The cell membranes in TT1 were not further disrupted.	<input type="checkbox"/>	
2. Cyclohexane damaged the cell membranes in TT4, causing betacyanin to leak out.	<input type="checkbox"/>	
3. Cyclohexane dissolved the lipids in the cell membranes in TT4, causing betacyanin to leak out, which dissolved in the water only.	<input type="checkbox"/>	

(0.5 x 3 = 1.5 mark)

SECTION B**f.**

- i.** Draw a table to show the mean absorbance (to 2 decimal places) at each temperature and record it in the space provided below.

(0.25 x 5 = 1.25 marks)

Temperature (°C)	Mean
20	0.02
30	0.02
40	0.03
60	0.45
80	0.50

- ii.** Write your answer in the box below.

(0.5 mark)

- iii. Draw a line graph on the graph paper provided using the mean absorbance to show the effect of temperature on membrane permeability in beetroot.

(2.5 marks)

SECTION C

g. Write T or F in the box provided.

- i. Betacyanin requires water for maximum solubility
- ii. Betacyanin is more soluble in 100% acetone than in 50% acetone

(0.5 x 2 = 1 mark)

h. Choose the correct answer by ticking the appropriate box/es.

Cyclohexane	<input type="checkbox"/> Room temperature water	<input type="checkbox"/> Hot water
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(0.5 mark)

SECTION D

- i. Record the masses of the 2 cylinders (TT5 and TT6) in the table below.

	Initial Mass	Final Mass	
TT5			
TT6			

(0.25 x 6 = 1.5 marks)

- j. Indicate whether the following statements are true or false by ticking the appropriate box.

	TRUE	FALSE
i. NaCl caused plasmolysis in the beetroot cells.	<input type="checkbox"/>	
ii. NaCl dissolved the lipids in the cell membranes.		<input type="checkbox"/>
iii. The beetroot cells absorbed NaCl and became turgid.		<input type="checkbox"/>
iv. The beetroot cells lost betacyanin to the surrounding water.	<input type="checkbox"/>	

(0.5 x 4 = 2 mark)

Figure 1: Effect of temperature on membrane permeability in beetroot

Mark scheme	
0.25	For each plotted point = 1.5
0.25	For each correct axis label = 0.5
	Scale = 0.5
0.25	For caption = 0.25. No penalty if Figure-1 is not written. Must have caption.

TOTAL MARK (13)