

**MONDAY, 8 JANUARY –
FRIDAY, 9 FEBRUARY 2024**

BIOLOGY – Unit 3 (3400U30)

PRACTICAL ASSESSMENT

**INVESTIGATING THE EFFECT OF
TEMPERATURE ON CELL MEMBRANES**

SECTION A

1 hour, plus your additional time allowance

Surname _____

First name(s) _____

Centre Number _____

Candidate Number 0 _____

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer ALL questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional pages at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The total number of marks available for this section of the task is 6.

The number of marks is given in brackets at the end of each question or part-question.

This task is in 2 sections, A and B. You will complete Section A in one lesson and Section B in the next science lesson.

(Turn over)

For Examiner’s use only		
	Maximum Mark	Mark Awarded
Section A	6	

Introduction

Beetroot cells contain a bright red pigment called betalain.

The betalain is contained by the semi-permeable cell membrane.

You are going to investigate how temperature affects the permeability of the cell membrane.

(Turn over)

Apparatus Required

The following apparatus is required for each group: (each group should consist of no more than three candidates).

eye protection

cylinders of beetroot

1 × white tile

1 × scalpel

5 × test tube containing 5 cm³ of deionised water

1 × test tube rack

5 × 250 cm³ beaker

1 × stopwatch

1 × thermometer

1 × forceps

1 × 30 cm ruler

1 × piece of white card

ACCESS TO:

water baths at 20 °C, 30 °C, 40 °C, 50 °C and 60 °C

paper towels

(Turn over)

READ THE METHOD AND ANSWER QUESTION 1.(a) BEFORE CARRYING OUT THE EXPERIMENT AND RECORDING YOUR RESULTS.

Method

- 1. Wear eye protection.**
- 2. On the white tile, use the scalpel to cut five pieces of beetroot, 1 cm long, from the cylinders provided.**
- 3. Wash under running water to remove the pigment released from cells during cutting.**
- 4. Set up beakers as water baths at 20 °C, 30 °C, 40 °C, 50 °C and 60 °C.**
- 5. Place a test tube containing 5 cm³ of deionised water into each water bath to equilibrate for 2 minutes.**

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Colour	Depth of colour	Concentration of betalain ($\mu\text{g/g}$)
	colourless	0
	very pale pink	30
	pale pink	60
	pink	90
	dark pink	120
	very dark pink	150
	purple	180
	dark purple	210

- 6. Place one piece of beetroot into each test tube at 20 °C, 30 °C, 40 °C, 50 °C and 60 °C for 5 minutes.**
- 7. After 5 minutes, shake the test tubes gently to make sure any pigment is well mixed into the water, then remove the beetroot cores using the forceps.**
- 8. Remove the test tubes from the beakers and arrange the tubes in order of temperature of the water baths in a test tube rack.**
- 9. Place a piece of white card behind the tubes to enable you to see the depth of colour in each tube.**
- 10. Use the colour chart of betalain concentration on the opposite page to work out and record the concentration of betalain in the water at each temperature. You should also record the depth of colour in each tube.**

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HAZARD	RISK	CONTROL MEASURE

SECTION A

Answer ALL questions.

- 1 (a) Complete the risk assessment on the opposite page for this experiment.
[2 marks]**

(Turn over)

**YOU MAY RECORD RAW RESULTS
IN THE SPACE BELOW.**

(Turn over)

**1 (b) Present your results in a table.
Include all of your results. [4 marks]**

6

END OF PAPER

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