3.2.1 Food tests and membrane practicals

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS semi-quantitative • colour standards • colorimeter

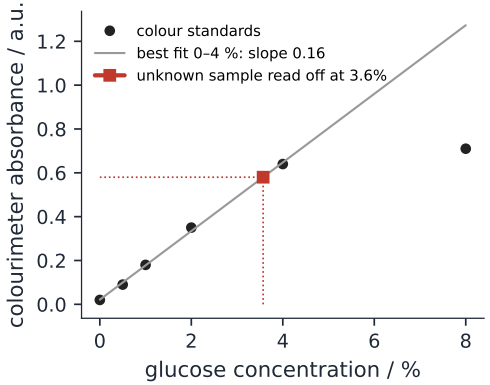
Objective

Justify the methods of the food-test and membrane core practicals (CP1–CP3): semi-quantitative colour standards, DCPIP titration for vitamin C, and beetroot pigment loss with a colorimeter. Original practice grounded in specification Topic 1 statements 1.1–1.9 and the Unit 3 assessed skills.

1 Key knowledge and worked examples

■ Semi-quantitative means judged against standards

Make a **series of known concentrations** by serial dilution (1 %, 2 %, 3 %, 4 % glucose), heat each with equal volumes of Benedict's for the same time, and compare the unknown's colour against the row of **colour standards** . The estimate is **semi-quantitative** : a range judged by eye, not an exact value. A **calibration curve** with a colorimeter turns the same idea quantitative: absorbance against concentration, unknown read inside the calibrated range.



■ DCPIP loses colour to vitamin C

Vitamin C decolourises DCPIP directly: the volume (or drop count) of sample that just removes the blue colour measures its content. Compare with a known ascorbic-acid solution: more volume needed means less vitamin C. Same starting volume of DCPIP, same temperature, drop from the same height.

■ Beetroot: every step protects the measurement

Equal-sized pieces (same surface area for pigment loss); **rinsed** before immersion (removes pigment freed by cutting, so absorbance reflects membrane leakage); same volume of liquid, temperature and time; **shake before sampling** (disperse pigment evenly); measure absorbance in a colorimeter **zeroed with plain solvent** (removes a systematic offset); a water-only treatment is the control; repeat each treatment for a mean and spread.

2 Practice

2.1 Describe how to prepare colour standards for estimating starch concentration with iodine, and how the standards are used with a sample. [3]

2.2 Explain the difference between a quantitative and a semi-quantitative result, giving one example of each from these practicals. [2]

2.3 Two fruit juices need the same volume to decolourise equal volumes of DCPIP, but juice A was diluted 1-in-5 before testing. Which juice has more vitamin C? Justify your answer with a calculation-style reason. [3]

2.4 Give three justifications a mark scheme expects in a written beetroot method, one for the pieces, one for the rinsing, and one for the measuring instrument. [3]

3 Exam-style questions

3.1 Beetroot pieces of identical size are rinsed, then immersed in methanol, methanol with cholesterol at two concentrations, and water. Pigment loss is estimated every five hours for 20 hours. Justify five steps of this method. [5]

3.2 A student claims a colour-match against standards “measures the sugar concentration exactly, because the match is perfect”. Correct the claim and describe the change that would make the measurement quantitative, including one step that removes systematic error. [4]

3.3 Membranes around beetroot cells are drawn soon after immersion in methanol with and without cholesterol. Explain how you would complete a diagram key for the membrane molecules, label the inside and outside of the cell, and show the net movement of the pigment betalain during the experiment. [4]