A-level Biology example for required practical 11

Production of a dilution series of a glucose solution and use of colorimetric techniques to produce a calibration curve with which to identify the concentration of glucose in an unknown 'urine' sample

Student sheet

Glucose in the urine is one of the first indications of diabetes.

Method

You are provided with the following:

- 10 mmol dm^{-3} glucose standard.
- distilled water
- urine samples from "Tom", "Dick" and "Harry"
- Benedict's solution

- graduated pipettes (2cm³ and 1cm³) and pipette filler
- test tubes
- test-tube rack
- water bath set at 90°C
- colorimeter and cuvettes.

Prepare urine samples for testing

1. Label the test tubes with the name of the patient and add 2cm³ urine samples from each patient.
2. To each test tube, add 2cm³ Benedict's solution. Mix the contents of each tube.

Prepare the glucose calibration curve

1. Label six test tubes 0 to 10 mmol dm^{-3} as shown in the table below.

2. Dilute the glucose standard (10 mmol dm^{-3}) with water in the labelled test tubes and complete the table to show volumes used to achieve each concentration.

Concentration of final solution/ mmol dm^{-3}	0.0	2.0	4.0	6.0	8.0	10.0
Volume of water/cm³	2.0					
Volume of glucose standard/cm³	0.0					

3. Add 2cm³ of Benedict's solution to each tube. Mix the contents of each tube.

4. Place all the test tubes into the water bath together (including the tubes with the urine samples) and leave them for four minutes. Allow to cool before taking readings from the colorimeter.

5. Use the contents of the 0.0 mmol dm^{-3} glucose solution tube, which you have heated with Benedict's, as a blank to calibrate the colorimeter to zero absorbance. Place the remaining samples in cuvettes into the colorimeter and read their absorbances.

6. Record your results in a table and plot a graph of absorbance against the known concentrations of glucose.

7. Using the graph and the absorbance values obtained for the urine samples, read off from the graph the concentration of glucose in the urine samples.

8. Record your results in a suitable table.