



General Certificate of Education  
Advanced Subsidiary Examination  
June 2014

**Biology**

**BIO3T/Q14/TN**

**Unit 3T AS Investigative Skills Assignment**

**Teachers' Notes**

**Confidential**

The Exams Officer should make two copies of these Teachers' Notes; one copy for the Head of A-level Biology and one for the technician.

These copies can be released to the Head of A-level Biology and the technician at any point following publication but must be kept under secure conditions at all times.

Teachers can have sight of the Teachers' Notes but no further copies should be made.

All teacher-assessed marks to be submitted by 15 May

**Teachers' Notes****Confidential**

These notes must be read in conjunction with **Instructions for the Administration of the ISA: A-level Biology** published on the AQA Website. Please note that these have been revised for 2014.

**Estimating the concentration of glucose in a solution****Introduction**

In this investigation, candidates will test glucose solutions of known concentration and use their results to plot a reference curve. They will use this curve to estimate the concentration of glucose in two 'unknown' solutions.

Candidates will use potassium manganate (VII) solution and measure the time taken for the solution to change from pink to colourless when a glucose solution is added to it. The time taken for the change of colour is directly related to the concentration of glucose present.

**Materials**

In addition to access to general laboratory equipment, each candidate needs:

- 10 cm<sup>3</sup> of five labelled glucose solutions with concentrations of 2%, 4%, 8%, 10% and 12%
- 10 cm<sup>3</sup> of **two** solutions of glucose concentration of unknown concentration labelled **A** and **B**. (It is suggested that solution **A** is 8% and solution **B** is 5%. However, different unknown concentrations can be used within the range 2–12%)
- 35 cm<sup>3</sup> of 1 mol dm<sup>-3</sup> sulfuric acid
- 14 cm<sup>3</sup> of 0.4 g dm<sup>-3</sup> solution of potassium manganate (VII)
- timer / stop clock
- glass rod
- 7 boiling tubes and rack(s)
- 3 syringes or pipettes and fillers – one can be rinsed for each glucose solution or provide sufficient for all solutions
- eye protection.

Volumes of solutions stated are the minimum a candidate will need. Excess should be provided to allow accurate measurements of volumes by the candidates.

## Managing the investigation

If you have any queries about the practical work for the ISA, please contact your Assessment Adviser. Contact details can be obtained by emailing your centre name and number to [science-gce@aqa.org.uk](mailto:science-gce@aqa.org.uk)

Just before use, make up a  $0.4 \text{ g dm}^{-3}$  solution of potassium manganate (VII) using distilled water.

Glucose solutions can be made up in advance and kept in the fridge to prevent bacterial contamination. Allow them to reach ambient temperature before the start of the practical work.

## Trialling

The task(s) **must** be trialled before use.

This investigation has been trialled successfully using glucose concentrations of known concentration and two 'unknown' concentrations of 5% and 8%. If different concentrations are to be used for the 'unknowns', these must be trialled first to ensure that their concentration can be determined from the reference curve.

In trials, at high glucose concentrations, potassium manganate (VII) lost its colour in less than 2 minutes. Teachers are advised to have additional solution available to allow candidates to repeat any trial where they miss the end point.

## Colour-blind candidates

If a candidate is colour-blind, it is permissible for the candidate to use a colour-namer. The candidate must carry out all other aspects of the investigation and record their own results. Teachers should contact the Exams Officer at their centre to discuss access arrangements.

## Notes from CLEAPSS

See CLEAPSS Student Safety Sheet no. 48 'Manganese and its compounds' for details of hazards in handling the solid potassium manganate (VII) when making up solutions. This is available on the CLEAPSS Website. You will need to have a CLEAPSS login. The solution will stain hands and clothing.

## Additional Information

AQA might publish Additional Information about an ISA/EMPA practical. This will be placed on e-AQA in Secure Key Materials. We will email Exams Officers who have downloaded the particular Teachers' Notes so they can print a copy for the Head of Biology. Additional Information will cover issues such as suitable suppliers or tips on getting a practical to work.

Turn over ►

**Information to be given to candidates**

Candidates must **not** be given information about an ISA assessment until one week before Stage 1. One week before sitting Stage 1 of the ISA, teachers should give their candidates the following information.

You will investigate how to estimate the glucose concentration in unknown solutions. In addition, you will need to understand the following topics:

- biochemical tests for reducing and non-reducing sugars
- carbohydrate structure and function
- absorption of products of carbohydrate digestion.

There **must** be no further discussion and candidates must **not** be given any further resources to prepare for the assessment.

In this investigation, teachers **must not** give candidates the following information:

- when the solution becomes colourless.

## Task Sheet

### Estimating the concentration of glucose in a solution

#### Introduction

Adding glucose to a solution of potassium manganate (VII) changes its colour from pink to colourless. The time for this reaction is directly related to the concentration of glucose in the solution.

In this investigation, you will use the results from glucose solutions of known concentration to plot a curve on a graph. This will be your reference curve. You will then use this curve to estimate the concentration of glucose in two solutions, **A** and **B**.

#### Materials

You are provided with the following:

- glucose solutions of concentrations 2%, 4%, 8%, 10% and 12%
- 2 glucose solutions, **A** and **B**, of unknown concentration
- dilute sulfuric acid
- solution of potassium manganate (VII)
- timer / stop clock
- glass rod
- boiling tubes and rack(s)
- syringes or pipettes with pipette filler
- eye protection.

You may ask your teacher for any other apparatus you require.

Turn over ►

## Method

Read these instructions carefully before you start your investigation.

### Using the glucose solutions of known concentration to produce your reference curve

1. Add 10 cm<sup>3</sup> of the 2% glucose solution to a boiling tube.
2. Add 5 cm<sup>3</sup> of dilute sulfuric acid to the boiling tube.
3. Add 2 cm<sup>3</sup> of potassium manganate (VII) solution to the boiling tube and immediately start the timer.
4. Use the glass rod to stir the mixture continuously and record the time taken, in seconds, for the pink colour to disappear.
5. Repeat steps 1 to 4 with the four other known glucose concentrations. Rinse the syringe or pipette between concentrations.

### Obtaining results to estimate the glucose concentrations of solutions A and B

6. Add 10 cm<sup>3</sup> of solution **A** to a boiling tube.
7. Repeat steps 2 to 4.
8. Add 10 cm<sup>3</sup> of solution **B** to a boiling tube.
9. Repeat steps 2 to 4.
10. Record your results for solution **A** and solution **B** in the spaces below:

Result for solution **A** ..... seconds

Result for solution **B** ..... seconds

### You will need to decide for yourself:

- when the potassium manganate (VII) changes from pink to colourless.