Fermentation of sugar

MATERIALS

As selected by student

Introduction

The sugar industry is a thriving industry in Australia. A by-product from sugar cane processing is molasses, which is rich in sucrose and other sugars. The fermentation of molasses produces ethanol, which is widely used as a solvent.

In this investigation, you will design your own investigation that will enable you to produce ethanol from sucrose, and monitor mass changes during this process.

On completion of this investigation, you will be able to:

- demonstrate the use of appropriate equipment for the fermentation of sugar
- justify the use of a control
- recognise where and when modifications are needed to your investigation
- draw a diagram of your experimental set-up
- demonstrate that ethanol is produced by the fermentation of sugar
- account for mass changes in the fermentation process.

Syllabus

Solve problems, plan and perform a first-hand investigation to carry out the fermentation of sucrose and monitor mass changes.

Procedure

1. Find out from secondary sources about the most suitable equipment to use, and how to set it up for the fermentation of sugar.
2. Select the appropriate reagents.
3. Plan the procedure for carrying out fermentation, monitoring mass changes and identifying the gaseous products.
4. Using MSDS (or other sources), find out about the hazards and control measures for all selected reagents. Complete a pre-lab safety information and risk assessment for the investigation.
5. Set up your control.
6. Plan your own results table for recording all measurements and observations.
7. Draw a labelled diagram of your experimental set-up.
8. Plan a test you will carry out to prove that ethanol is produced.

Disposal of waste

All reactants and products can be washed down the sink.

9 Present a scientific report that includes answers to the Discussion and Follow-up questions.

Discussion

1 **a** What gas is produced in fermentation, and how did you identify it?
b Write a balanced equation for the fermentation reaction.
2 Explain what the purpose of the control set-up was.
3 **a** What evidence did you gather about the mass changes during the fermentation?
b Account for these changes.
4 Did you have to make any modifications to the experimental set-up? Explain.
5 What test did you perform to identify that one of the products of fermentation is most likely to be ethanol?
6 What is the function of yeast in fermentation?
7 List the optimum conditions in which the fermentation of sugars is promoted.

FOLLOW-UP

1 **a** *What was the approximate percentage of ethanol obtained in your fermentation?*
b *Most wines contain a maximum of about 12% ethanol. Suggest why this upper limit occurs in the fermentation process.*
c *How could a whisky containing 35–40% alcohol be produced?*
2 *Outline the procedure and chemistry of the industrial production of ethanol by the fermentation of molasses.*