

## Investigation of the factors that affect the rate of respiration

### Introduction

Yeast is a microorganism that carries out respiration. One factor that can affect the rate of respiration is the concentration of glucose. As yeast carries out respiration, bubbles of carbon dioxide are produced.

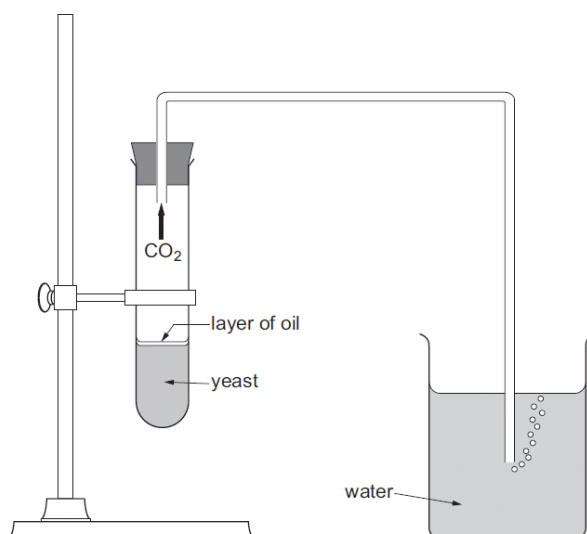
### Apparatus

boiling tube  
 250 cm<sup>3</sup> beaker  
 clamp stand, clamp and boss  
 10 cm<sup>3</sup> measuring cylinder  
 bung and glass tubing (as shown in diagram)  
 stirring rod  
 pipette  
 stopwatch

#### Access to:

electronic balance  $\pm 0.1$  g  
 vegetable oil or equivalent  
 10% yeast suspension  
 2, 4, 6, 8, 10% glucose solutions

### Diagram of Apparatus



## Method

1. Place 10 cm<sup>3</sup> of yeast suspension into a boiling tube.
2. Place 10 cm<sup>3</sup> of 2% glucose solution into the same boiling tube.
3. Stir the contents gently with a stirring rod.
4. Using a pipette, place a few drops of oil on the top of the liquid so that it forms a thin layer.
5. Place the bung with glass tubing into the boiling tube.
6. Clamp the boiling tube in a clamp stand.
7. Fill a 250 cm<sup>3</sup> beaker with water.
8. Arrange the apparatus so that the end of the glass tube is underwater in the beaker as shown in the diagram.
9. Start the stopwatch when the first bubble appears, and then count the bubbles produced for 2 minutes.
10. Repeat steps 1-9 with 4, 6, 8 and 10 % glucose solution.

## Analysis

1. Plot a graph of concentration of glucose (x- axis) against number of bubbles (y-axis).

## Risk Assessment

Hazard	Risk	Control measure
Broken glass can cut	Tube could break due to overtightening. Glass can easily break resulting in cuts	Do not overtighten.

## Teacher/Technician notes

2, 4, 6, 8 and 10% glucose solutions are suggested concentrations. It will be necessary to try out the experiment before presenting it to students to establish the optimum concentrations of glucose to use.

Yeast suspension should be made using warm water. This should be left to stand for 15 minutes before being used by students.

No repeat readings are planned but can be carried out if time permits.

Glass tubing can be fragile therefore plastic or rubber could be substituted as necessary.

Dried yeast can be used as an alternative to fresh yeast.

## Working scientifically skills covered

### **2. Experimental skills and strategies**

Carry out experiments appropriately having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.

Evaluate methods and suggest possible improvements and further investigations.

### **3. Analysis and Evaluation**

Evaluate data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error.