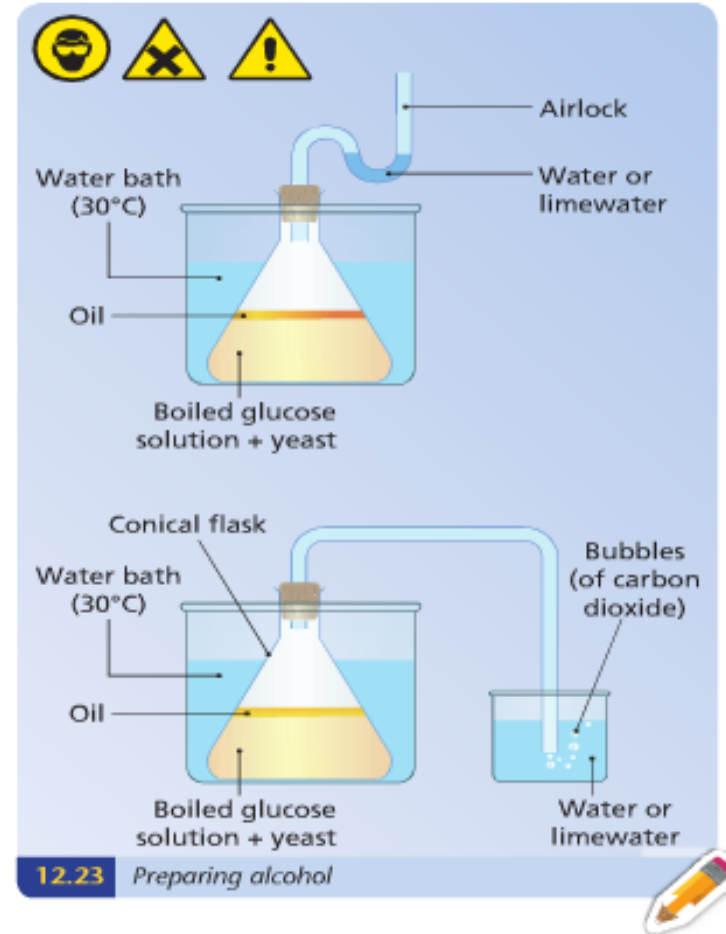


# 12 - Respiration

## Activity 13 To prepare and show the production of alcohol by yeast

### Preparation of alcohol

1. Prepare a glucose solution by dissolving glucose in water.
2. Boil the solution in a conical flask for 5 minutes (this eliminates gases from the solution, forming anaerobic conditions).
3. When the solution cools, add some dried yeast.
4. Cover the liquid in the flask with oil (this prevents oxygen from re-entering the solution).
5. Set up either of the two pieces of apparatus as shown in diagram 12.23.
6. The airlock is needed to prevent micro-organisms entering and to allow carbon dioxide to pass out.
7. Limewater or water may be used in the airlock (limewater turns milky in the presence of carbon dioxide).
8. The apparatus is placed in a water bath at 30°C (this is an ideal temperature for the maximum rate of respiration).
9. Bubbles of carbon dioxide will be seen in the limewater. Fermentation is complete when the bubbles stop forming (often after a few days).
10. As a control, the same apparatus is used without adding any yeast cells (or adding boiled yeast). In this case, no bubbles form and the limewater remains clear.



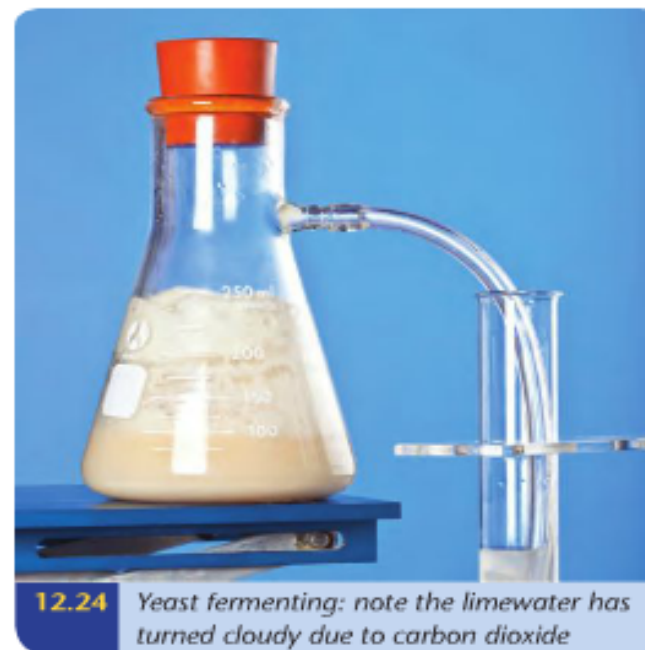
## Test for Alcohol

### To show the production of ethanol (the iodoform test)

1. Filter the solution (to remove yeast cells).
2. Place some of filtrate into a test tube.
3. Add an equal volume of potassium iodide solution. Note this is a colourless solution.
4. Add sodium hypochlorite solution (note that the solution turns a brown-orange colour and then becomes colourless).
5. Place the test tube in a water bath at 50–60°C for 4 or 5 minutes.
6. Remove the test tube and allow it to cool.
7. The appearance of pale yellow crystals (of a chemical called iodoform) indicates that ethanol is present.
8. As a control use water instead of the filtered solution. Yellow crystals do not form.

### To show that alcohol is produced

To test for alcohol, acidified potassium dichromate is added to the filtered solution. The test tube is placed in a warm water bath. If alcohol is present the colour changes from orange to green.



**12.24** *Yeast fermenting: note the limewater has turned cloudy due to carbon dioxide*

**Syllabus** According to EU regulations the use of potassium dichromate should be discontinued in schools. This test remains as a theoretical part of the syllabus but students are not required to carry out the test.