PRE-LAB FOR YEAST RESPIRATION AND FERMENTATION

PURPOSE:
To identify the products of yeast cultures grown under aerobic and anaerobic conditions

STUDENTS' ENTERING COMPETENCIES:
Before doing this lab, students should understand:

- Safety
- The term: Cellular Respiration
- The products of yeast cultures grown under aerobic and anaerobic conditions
- Differences between cellular respiration and fermentation
- Distillation
- Yeast cultures
- Principles of Gas Chromatography
- How to use an analytical balance
- Indicators
- How to use a centrifuge
TOPS YEAST EXPERIMENT EXTENSION ACTIVITIES

1. Yeast/H₂O₂ with watch glass and glowing splint
2. Bread/pretzel making
3. Taste test: matzoh bread
4. Yeast and sugar in Erlenmeyer flask will blow up balloon over mouth of flask
5. Yeast reproduction: budding
6. Use straw to expire into bromthymol blue
7. Indicators and pH
8. Use centrifuge to separate oil, water, and food coloring
9. Use microscope to observe/identify yeast cells
10. Graphing activity: put 5 ml of EtOH and 3 ml of H₂O in a 25 mm diameter test tube. Place a #4, two hole rubber stopper in the test tube with a thermometer in one hole and a glass bend in the other. Slowly boil. Record temperature at 3 seconds intervals. Graphing of data will display plateaus of boiling points of liquids.

REAL LIFE EXAMPLES

1. STEROID TESTING
   - Ben Johnson, a member of the Canadian Olympic track team, was disqualified based on positive test results for anabolic steroid use as concluded by the use of gas chromatography (GC).

2. CRIME LAB
   - GC is often used to test for drug and alcohol content in the bloodstream.
   - The World Trade Center Bombing: GC was used to identify compounds found at the bomb site. These findings were consistent with compounds found in the terrorists' underground lab.

3. DRUG THERAPY
   - GC is used to analyze blood content of chemicals used in chemotherapy.

4. METEORS
   - When meteors enter our atmosphere, scientists are able to isolate the chemical components in the gas pockets of the meteor using GC.
SAFETY CONCERNS/LAB TECHNIQUES

1. A cold hot plate looks just like a hot hot plate. Be careful.

2. Be careful of the distillation tube because it also gets hot.

3. It is important to secure both the flask and the thermometer to the ring stand with clamps.

4. Place your thermometer properly.

   ![Incorrect Placement-Measuring Liquid Temp.](image1)  ![Correct Placement-Measuring Vapor Temp.](image2)

5. Verify the yeast sample you are going to use (aerobic or anaerobic) and write it in your lab book.

6. Weigh your centrifuge tube with the cap on prior to adding the yeast sample. Do not forget to write down the mass in your lab book. You will need this number to calculate the mass of the yeast cells that remain.

7. Be sure to stir yeast well prior to pouring into flask or centrifuge tube.

8. Label your centrifuge tube before placing in the centrifuge so you can find it when it is finished.

9. Be sure you have screwed the centrifuge cap on firmly.

10. All centrifuge tubes must be balanced. To balance your tube, place a classmate's tube, of the same volume, opposite yours.

11. Open the centrifuge only after it has stopped.

12. Do not stop the centrifuge with your fingers.

13. Decant as much water as possible before weighing the tube. You want to know the mass of the yeast, not the water.
This is an **Erlenmeyer flask**. They can come in various sizes (volumes) and are made out of glass or plastic. The volumetric scale on an Erlenmeyer flask shows only approximate values. Therefore, do not use an Erlenmeyer flask for measuring.

This is a **beaker**. They can come in various sizes (volumes) and are usually made out of glass. The volumetric scale on a beaker shows only approximate values. Therefore, do not use a beaker for exact measuring.

This is a **graduated cylinder**. It can be made out of glass or plastic. They, too, can come in various sizes. They are used for making exact measurements. It is important to know about the meniscus. Do you know what a meniscus is and how it is used to read a graduated cylinder? Ask your teacher if you do not.

This is a **centrifuge tube**. It is to be used for spinning in the centrifuge and short term storage only. The plastic cap on top screws on and should be checked for tightness before placing the tube in the centrifuge.

This is a **vial**. It is usually made out of glass with a plastic cap. They can come in a variety of sizes, but they tend to be small. Sometimes you'll also see them made out of brown glass. Check the cap to be sure it is securely fastened.
This is a three-fingered clamp. It comes in a variety of shapes and materials, depending on the manufacturer. It is used to secure something (a flask, a thermometer, etc.) to a stand.

This is a ring stand. It has two parts: the base and the vertical bar. Usually, both pieces are made out of metal. The ring stand is usually not an essential piece of equipment but is very handy because it provides support and a "third arm" when your own arms are busy taking down data.

This is a distillation tube and stopper. When used the stopper fits tightly into the mouth of a flask. Caution should be used when handling the distillation tube because it is fragile.

This is a hot plate. There are many styles and sizes, depending on the manufacturer. On some models, there is a light to notify you that the unit is "ON." With other models, there is no indicator light; thus, there is no way to know if the unit is "OFF." Be cautious when using the hot plate because it can get hot enough to burn you and others. Also, when unplugging the unit from the electric socket, pull from the plug only, not by pulling the cord.

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