

**Names:** \_\_\_\_\_

## **Investigation of Yeast Populations Dynamics**

### **Introduction**

Yeast is a single-cell fungus that produces carbon dioxide as a byproduct of cellular respiration. The release of carbon dioxide by yeast causes bread dough to rise. Yeast are small and reproduce rapidly making them useful organisms for studying populations. Various factors such as food availability, temperature change and a shift in pH may influence the rate at which a population of yeast can grow. During this laboratory investigation you will take advantage of the production of carbon dioxide gas as a way to measure the relative number of living yeast organisms in your experimental populations.

### **Your Task**

Your lab group will grow yeast in a molasses solution (food for the yeast) and investigate how one factor influences the change in yeast population growth as measured by the amount of carbon dioxide produced.

To calculate the volume of gas in a test tube (a cylinder) use the formula: **Volume =  $3.14159 * r^2 * h$**

### **Available materials:**

prepared yeast suspension	test tube rack
prepared 25% molasses solution	pH paper
several 1 ml graduated dropping pipettes	clean test tubes (18 mm x 150 mm)
100 ml graduated cylinder	clean test tubes (25 mm x 150 mm)
metric ruler	safety goggles
weak acid/base	lab aprons
refrigerator/microwave	electronic balance (optional)

### **Designing and Conducting Your Experiment**

- 1. In your own words, state the problem you are going to investigate. Write a hypothesis using an “If ... then ... because ...” statement that describes what you expect to find and why.**
  
- 2. Independent variable**
  
- 3. Dependent variable**

## **Before Designing Your Experiment Review the General Procedure For Growing Yeast:**

1. Place 35 ml of 25% molasses solution into a small test tube.
2. Stir the yeast suspension and then place 1 ml of the yeast suspension into the same test tube.
3. Place the test tube in the rack.
4. Wash and rinse your hands. Place your palm over the end of the small test tube and invert it five times.
5. Hold the test tube with the yeast mixture upright
6. Have your partner carefully slide a larger tube down over the smaller tube.
7. Use your finger to support the bottom of the yeast test tube while holding the outer (larger) test tube.
8. Quickly invert (flip) the tubes so that the tube with the yeast mixtures is upside down and the mouth of the large tube is facing up.
9. Using a metric ruler measure the height of the air bubble (mm or cm) in the smaller tube and record on your data table.
10. Carefully place the test tubes in the rack. Do not disturb the air bubble
11. Incubate these samples for 24 hours at 30 degrees Celsius.
12. Measure the bubble and record the **change in the size due to carbon dioxide gas production** on your data table. (Subtract the initial gas bubble size from the total bubble size. Remember you will need this data to calculate the total **volume of carbon dioxide each day over five days.**)
13. Repeat steps 6-8 for five days.

**2. Design an experiment to investigate your problem.** Your experimental design should match your statement of the problem and should be clearly described so that someone else could easily replicate your experiment. Include a control group if appropriate and state which variables need to be held constant.

**Draw your laboratory apparatus. Label each part.**

**Design your data tables and describe what observations you will need to make.**

You will need to establish a schedule for collecting data even on drop days.

**When you have completed your design and data tables call your teacher to check your work for possible safety violations.**

**4. Conduct your experiment.** While conducting your experiment, take notes and organize your data into tables.

**Safety note: You must wear approved safety goggles and follow all safety instructions.**

**When you have finished, your teacher will give you instructions for cleanup procedures, including proper disposal of all materials**

## Communicating Your Findings – The Lab Report

Working as individuals, summarize your work in a laboratory report that includes the following:

- **A statement of the problem you investigated. A hypothesis (“If ... then ... because ...” statement) that described what you expected to find and why.** Include a clear identification of the independent and dependent variables.
- **A description of the experiment you carried out.** Your description should be clear and complete enough so that someone could easily replicate your experiment.
- **Data from your experiment.** Your data should be organized into tables, charts and/or graphs as appropriate.
- **Your conclusions from the experiment.** Your conclusions should be fully supported by your data and address your hypothesis.
- **Discuss the reliability of your data and any factors that contribute to a lack of validity of your conclusions.** Include ways that your experiment could be improved if you were to do it again.
- **Complete the evaluation rubric on the next page and include it as the last page of your lab report**

# Molasses and Yeast Lab Report Rubric

Student Name:		Due Date:		
If the task has been completed, all points are awarded. If the task is incomplete half points may be awarded. No points are awarded if the task is not complete.				
Category	Scoring Criteria	Points	Student Evaluation	Teacher Evaluation
<b>Lab Introduction</b> <i>12 points</i>	The question to be answered during the lab is stated.	3		
	The hypothesis clearly shows it is based on facts.	3		
	A connection is made between the lab and the “real world”	3		
	A brief summary of your experimental approach	3		
<b>Methods</b> <i>10 points</i>	Procedures reflect what you actually did, written in paragraph form	7		
	Procedure is detailed and complete (no missing steps).	3		
<b>Results</b> <i>17 points</i>	Measurements show proper units.	2		
	A before diagram of your test tubes	3		
	An after diagram of your test tubes	3		
	Data Table of your group results – start, finish, change, volume	3		
	A bar graph of your results (day 1 compared to day 2 & change in bubble)	3		
	A bar graph of your change in VOLUME	3		
<b>Graphs</b> <i>10 points</i>	The graphs properly displays all of your data	5		
	On graph paper (or printed), used ruler, proper units and headings	5		
<b>Discussion</b> <i>35 points</i>	Summarize the lab data. (come to a conclusion)	10		
	Show how the data answers the lab question from the introduction.	15		
	Discuss the reliability of your data and any factors that contribute to a lack of validity of your conclusions.	5		
	Last sentence restates the final conclusion	5		
<b>Presentation</b> <i>15 points</i>	Report is printed in black ink on white paper using 12 point font. Paragraphs are double spaced with 1 inch margins on all sides with no visible corrections.	5		
	A diagram of the lab apparatus used in the experiment is drawn in the largest available white space on the front of the lab report (or cover).	5		
	Report is written so that other students could accurately duplicate the experiment.	5		
<b>Participation</b> <i>5 points</i>	No group members were cited for safety or participation violations.	5		
<b>Score</b>	Total Points	104		
<b>Self-evaluation</b>	If the difference between the student evaluation and the teacher evaluation is less than 5 points, 5 points will be added to the teacher's score when the grade is recorded.			
<b>Deadline</b>	Reports turned in after the beginning of class on the due date will lose 10 points.			

