Yeast Respiration Contest Lab

Your goal: Design a method to inflate a balloon using the carbon dioxide given off by respiring yeast. The group with the biggest balloon (as measured by circumference around the middle) on day 2 wins the contest.

Materials Needed: LabQuest dataloggers, CO2 probes, yeast, balances, graduated cylinders, balloons, string or flexible measuring tape (to measure circumference), test tubes, sugar, warm water bath(s), hot plates, ice bath, test tube racks, rubber bands, other assorted items as desired…

Lab Report Instructions: For every numbered step, follow instructions and write out your responses.

**Preliminary Research and Design:**

1. Do some background research. What are yeast and how can you get them to respire?
2. Using the LabQuest and CO2 probe, devise some experiments to figure out the best conditions for yeast respiration.  **Make sure that the CO2 probes don’t get wet!** Explain your procedure for each one. You can divide this work up within your group.
3. Design a clear data table for each experiment and record your data.
4. Analyze your data to determine which set of conditions will enable you to fill a balloon to the maximum extent with CO2 from respiration.
5. Based on your analysis, write out the procedure you will use in tomorrow’s contest (filling up a balloon to the largest possible size) in complete, clear sentences.
6. Make the following table (with enough space to draw and explain):

|  |  |
| --- | --- |
| Drawing of apparatus | Explain of how apparatus works: |
|  |  |

1. Draw and Fill in the provided table:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Measurement (include units)** | **Rationale (Explain Your Reasoning)** |
| Amount of Yeast |  |  |
| Amount and type of Sugar |  |  |
| Amount of Water |  |  |
| Temperature |  |  |
| Any Other Variables |  |  |

1. Group Data Table: Comparison of Carbon Dioxide Production for Different Groups as Measured by Balloon Circumference.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Group # | Balloon Circumference (cm) | Yeast Amount  (g) | Sugar Amount  (g) | Water Amount  (ml) | Temperature  (oC) | Other variables |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |

1. Bar Graph: Include a bar graph comparing the results of different groups below (Be sure to fill in any missing graph components!):

Group Number

Analysis Questions

1. Which group won? Analyze your data table. Which variables seem to have been most significant to this group’s victory? Why?
2. Which gas was being produced by the yeast to fill up the balloons? Write the equation for respiration below and circle this gas.
3. Explain the role of sugar in this lab.
4. Why is it necessary to give the yeast water?
5. How did temperature influence respiration? Why might this be? Hint: remember that the reactions of respiration are catalyzed by enzymes.
6. How would excessive amounts of sugar (a solute) affect yeast in terms of osmosis? Do you see any evidence that suggests a group may have added too much sugar? Explain.
7. Did adding a higher quantity of yeast always cause a higher production of carbon dioxide through respiration? Suggest reasons for your observation (consider concepts relating to population ecology, limiting factors etc.).
8. Referencing our class data, explain how you would modify your design and why.