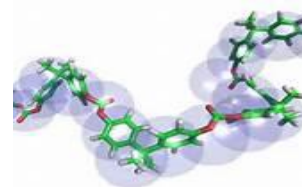




Welcome to your new job as a scientist for GB Discovery Laboratories. We are dedicated to designing polymer solutions to problems in biology and medicine. Polymers are large thread-like molecules made of smaller repeating chemical subunits. The specialty of your department is quantifying the effectiveness of liquid absorbing polymers. Your department has previously studied and published their experimental findings on liquid-absorbing polymers used in soft contact lenses, dressing for burns, tissue engineering, and oil spill containment.

Model of a Polymer:



As members of the scientific community, we value and expect your full participation in Working with others is critical to improving the quality of science done by our group. Our lab meetings will focus on:

- Communication: sharing your information with others
- Collaboration: working together with others toward a goal.
- Skepticism: evaluating information critically and looking for evidence and reasoning behind claims.

Your department has been divided into lab teams to investigate the ability of gummy bear polymers to hold water. Our goal is to determine the best procedure for measuring changes in gummy bear volume. Your team will design a plan, conduct an experiment, and then share your findings with the entire department during our lab meeting. Following our own internal peer review, GB Discovery Laboratories plans to submit your findings for publication in the *Journal of QISS Hallway Display* for broader peer review by the scientific community.

#### Day One Protocol:

1. In your lab notebook,
  - a. Title a page "Gummy Bear Discovery Lab."
  - b. Record the question: *How much does the volume of a gummy bear increase after soaking in water?*
  - c. Record your descriptive (qualitative) observations about the gummy bear, including color and shape.
2. Collaborate with your lab team to determine a way to measure the volume of the gummy bears. (NOTE: there are many ways possible.)
3. Once your lab group has agreed on a method, record your planned procedure in your lab notebook.
4. Construct a data table to record the volume data of each team member's gummy bear. Be sure to have a column for "initial volume before soaking" and "volume after 24 hours" (or however long you soaked your bears).
5. Measure your bear using the team method, record the measurement in your data table, and communicate your findings so each team member includes all bear volume in their table.
6. Label your equipment for soaking and your bear(s) so Ms. Rust can place your bears in to soak the 24 hours before.

#### Day Two Protocol:

1. Gently remove gummy bears from the beakers and pat them dry. Be very careful because the candy is now extremely breakable.
2. Using the same method your team used before soaking, measure the volume of the bears and record the data in your table.
3. Calculate the percent change for each measurement for each bear using the formula provided below. Share your answer with your team members.

$$\text{Percent Change} = \frac{\text{Final-Initial}}{\text{Initial}} \times 100$$

Final= Volume after 24 hours  
Initial= Volume before soaking

4. Choose one member of your team to record your data on the table in the color assigned to your team. You will need to round the percentage change for each bear to the nearest 50 before recording your data.
5. Record all group data in your lab notebook.

## 2 Gummy Bear Discovery Lab

6. Answer the following questions in your lab notebook:
  - a. What was your method?
  - b. What can you conclude about the effectiveness of your method of measurement? (Claim)
  - c. What did you find to be the percentage increase of gummy bears soaked in water?
  - d. How do the data or your experience support your claim and why? (Justification)
  - e. What worked with your method? What did not?
7. Collaborate with your team to determine the best way to present your data and answers to the questions in #5 above. **Each person in the team must present.**
8. Throw the bears away in the trash and clean all equipment used. Follow your teacher's instruction on putting away the equipment.
9. **Lab Meeting:**
  - a. Be respectful: listen, take notes, and ask questions in a professional manner.
  - b. Have courage: put your ideas out for criticism, critique the views of others and speak up, give up a cherished idea and not take it personally.
  - c. Complete the lab meeting data sheet throughout the meeting.
10. Collaborative Redesign:
  - a. How can we as a group modify our existing protocol to get better measurements?
  - b. Record the new protocol agreed upon in your lab notebook.
  - c. Complete the new protocol if time permits.

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**Day Three Protocol: *for groups who have NOT completed the collaborative redesign.***

1. Collaborative Redesign:
  - a. How can we as a group modify our existing protocol to get better measurements?
  - b. Record the new protocol agreed upon in your lab notebook.
  - c. Complete the new protocol if time permits.

**Day Three Protocol: *for groups who HAVE completed the collaborative redesign.***

1. Make and record your final measurements with the redesigned protocol. Record in your lab notebook.
2. Choose one member of your team to record your data on the table in the color assigned to your team. You will need to round the percentage change for each bear to the nearest 50 before recording your data.
3. Record all group data in your lab notebook.
4. Lab Meeting for discuss final results.

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**Day 4: *if needed.***

1. Make and record your final measurements with the redesigned protocol. Record in your lab notebook.
2. Choose one member of your team to record your data on the table in the color assigned to your team. You will need to round the percentage change for each bear to the nearest 50 before recording your data.
3. Record all group data in your lab notebook.
4. Lab Meeting for discuss final results.

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**Lab Participation Rubric:**

Date:

Criteria	5 (Great)	3 (Fair)	1 (Poor)
On Task	Participated in the lab activity the entire time and gave 100% effort.	Participated in the lab activity from time to time, but did not put in much effort.	Did not participate in the lab activity at all.
Behavior	Did not receive any reprimands and behaved properly throughout the lab activity.	Had to be reprimanded one to two times but mostly behaved properly during the lab activity.	Had to be reprimanded three or more times for inappropriate lab behavior.
Following Directions	Student followed all directions.	Student followed directions somewhat.	Student did not follow directions and it affected the results of their experiment.