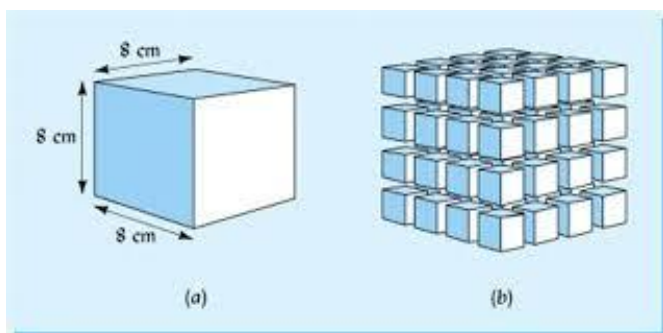


Surface Area and Solubility

Background

Solubility is the maximum amount of a substance that will dissolve in a given amount of solvent at a specific temperature. There are two direct factors that affect solubility: temperature and pressure. Temperature affects the solubility of both solids and gases, but pressure only affects the solubility of gases. Surface area does not affect how much of a solute will be dissolved, but it is a factor in how quickly or slowly the substance will dissolve.

In this experiment, we will explore the effect of the surface area in the solubility (dissolution rate) of “Life Savers” Mints.



Learning Objectives

Students will be able to:

- Determine the affect of surface area on solubility and rate of dissolution.

Standard (s)

NGSS: 5-PS1-3. Make observations and measurements to identify materials based on their properties.

CCSS-Math: 8.SP.2. Know that straight lines are widely used to model relationships between two quantitative variables.

Materials

Balance to measure mass to nearest 0.1 grams.

Timer

Mints

Learning Experience

1. Determine the mass of each mint
2. Measure dissolution time for each mint:
 - a. Without chewing or moving the mint around.
 - b. Moving the tongue around only without chewing.
 - c. Chewing mint.
3. Compute each rate of dissolution\ (mass/time).

- Graph dissolution rates and make comparison among groups.

Solubility Worksheet

- How long did it take each mint to dissolve?
- Scientifically explain your results. Use the following words in your explanation:

Surface area

Agitation

Chewing

Solvent

Solute

Solution

- Complete the following table

Solute	Time (in seconds)
Whole mint	
Swirled around mint	
Chewed mint	

Questions

- What happened to the surface area as the size of the mint increased?
- Which is better able to absorb enough nutrients to supply its total volume, a small cell or a large cell?
- Can unicellular organisms grow very large? Explain why or why not.
- Research and list all the factors that affect the rate at which a solid dissolves in a liquid?

Conclusions

- If we were to increase the surface area of a solid, then it would have been broken into smaller pieces. We would do this to increase how quickly the solute would dissolve in solution. If you were to dissolve a mint in your mouth, a whole mint without agitation will dissolve slower than a mint agitated in your mouth. The fastest dissolution occurs when the mint is chewed inside the mouth.
- The combined surface area of all of the sugar crystals in a chewed mint have a much greater surface area than the one from the swirled and whole mint and will have more contact with the water molecules present in saliva. This allows the sugar crystals to dissolve much more quickly.

Assessment

Students describe in a written report, that includes data tables and graphs, how solubility and rate of dissolution are affected by variations in surface area.

References

- <http://www.ck12.org/user:krogers/section/Factors-Affecting-Solubility/>
- <http://www.education.com/reference/article/surface-area-solubility/>

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