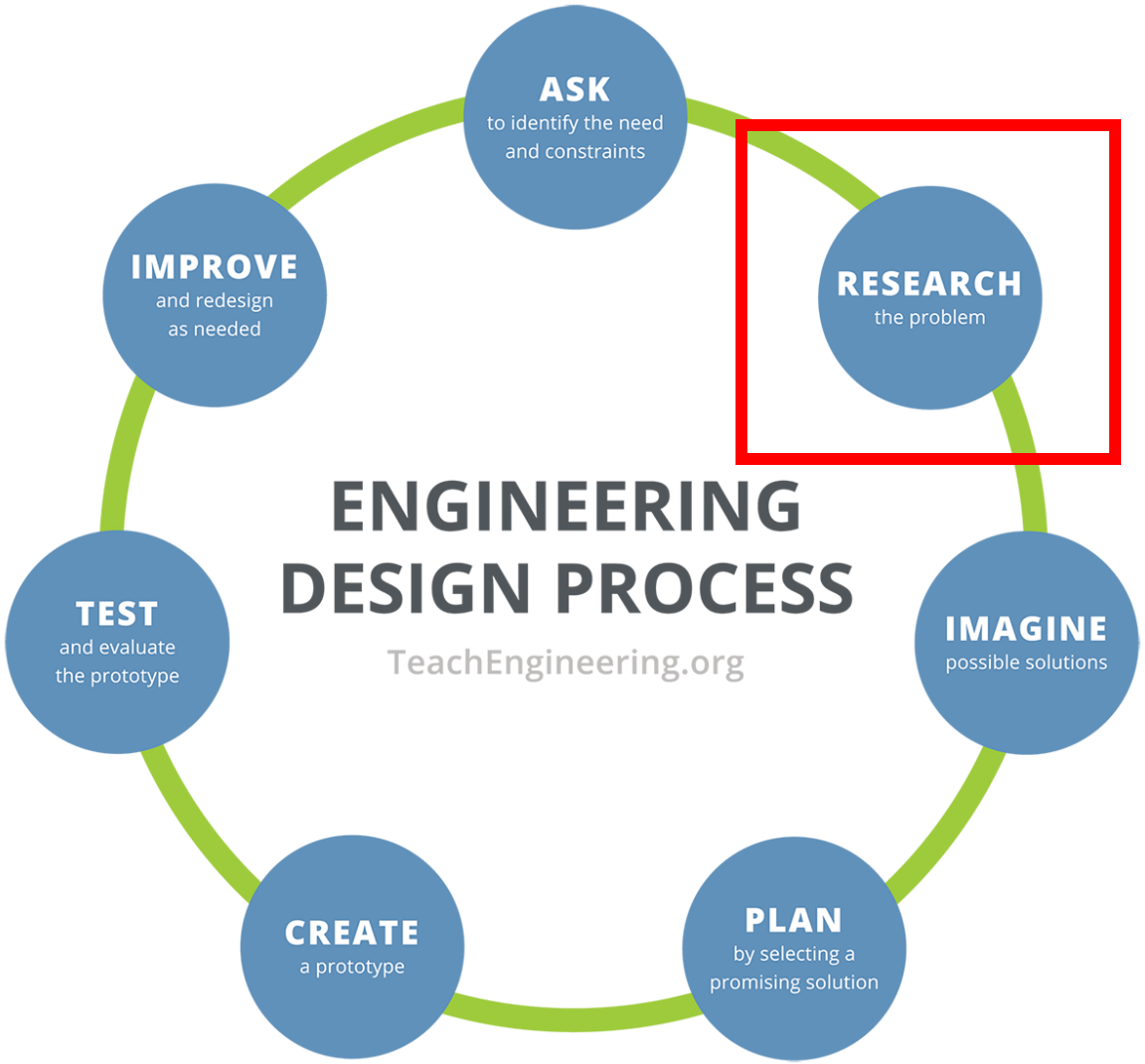
TeachEngineering

Mines to Mobiles: Aqueous Solutions and Environmental Chemistry

Day 2

DAY 2 (45 MINS)



Teach Engineering

JIGSAW LABORATORY RESEARCH

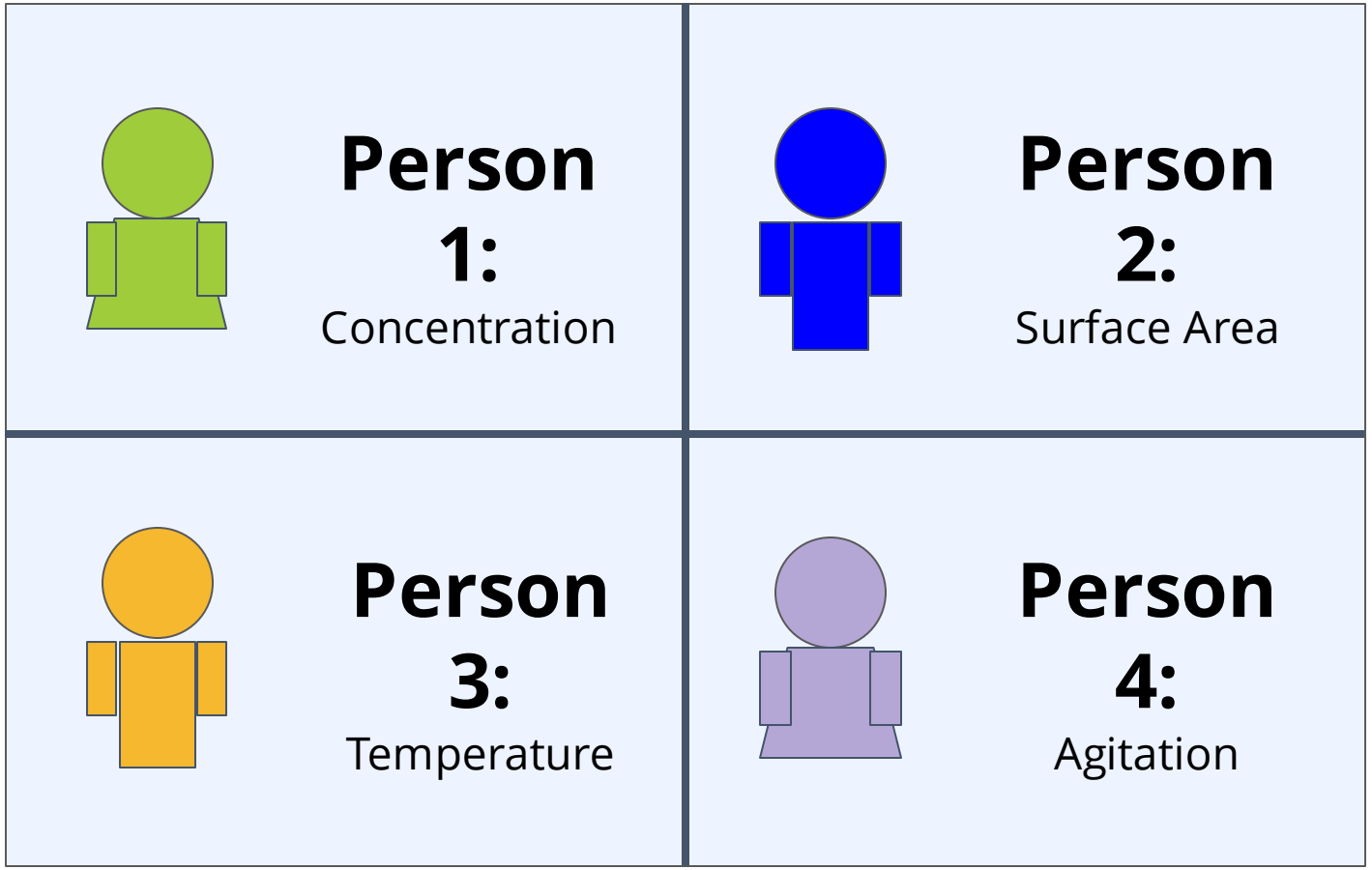
Goal: Learn how salt, sugar, and pepper dissolve in water.

Assignment: Each table group person gets a different station.

Time: 20 minutes for data collection.

Collaboration: Work with others at your lab station.

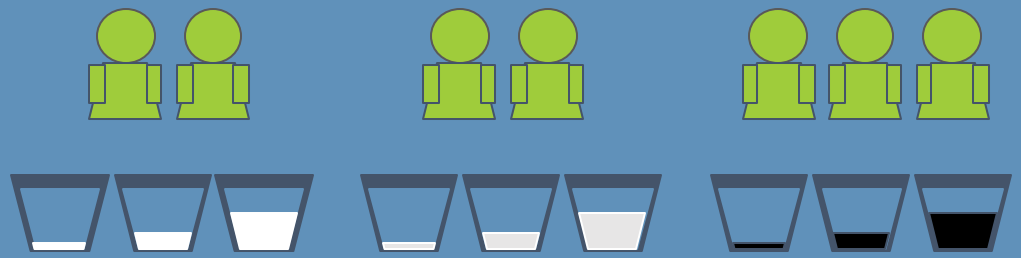
Reporting: Share findings with your original table group.



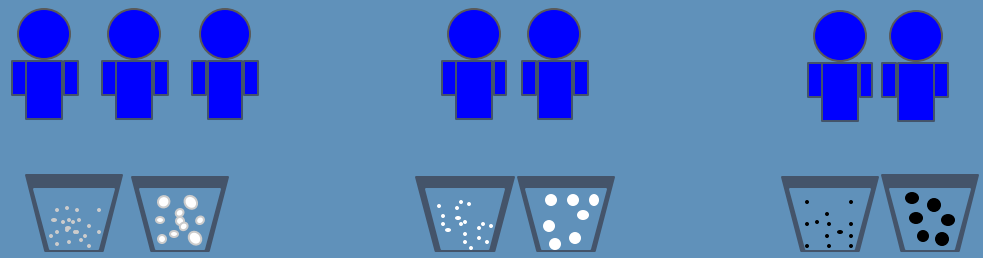
JIGSAW Research Roles

4 TOTAL RESEARCH STATIONS

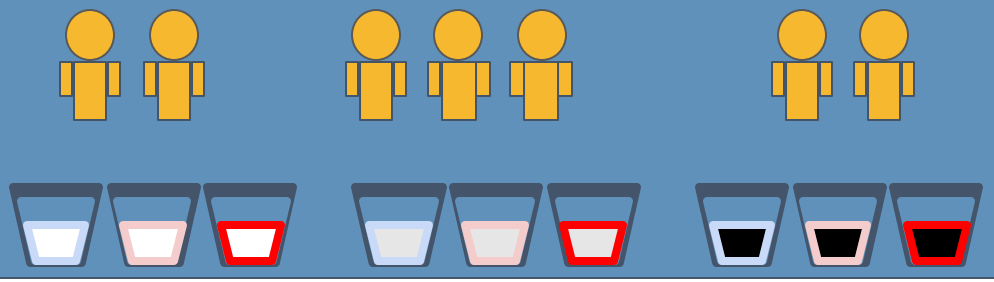
Investigation 1: Increasing Amount of Salt, Sugar, and Pepper



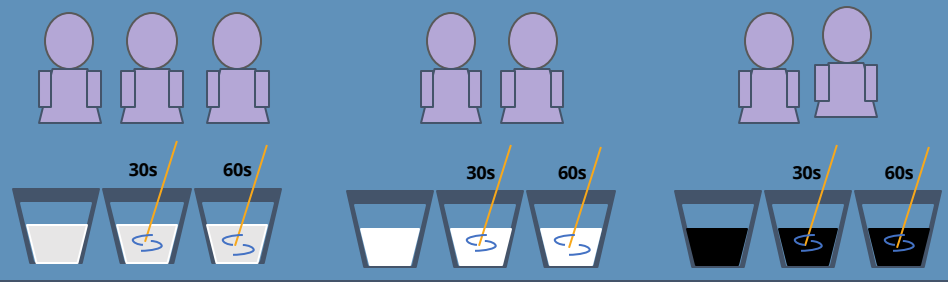
Investigation 2: Changing Size of Sugar, Salt, and Pepper



Investigation 3: Increasing Temperature of the Water



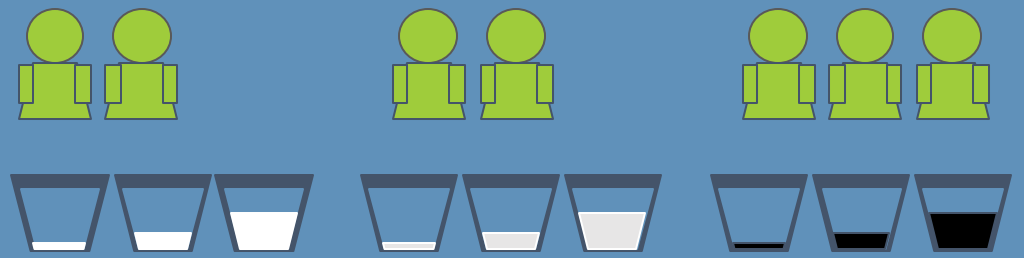
Investigation 4: Increasing Time of Agitation (Amount of Stirring)



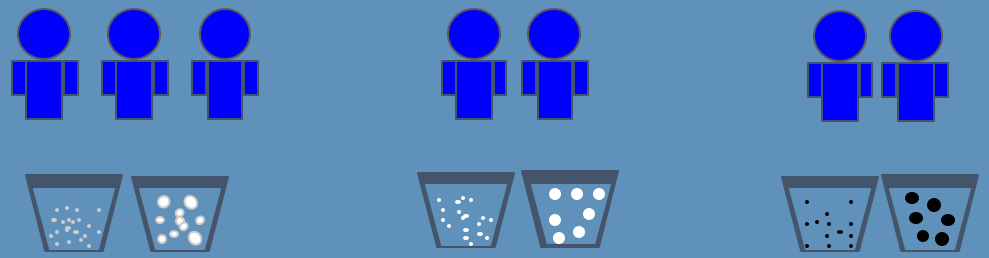
Research Stations

LAB SAFETY

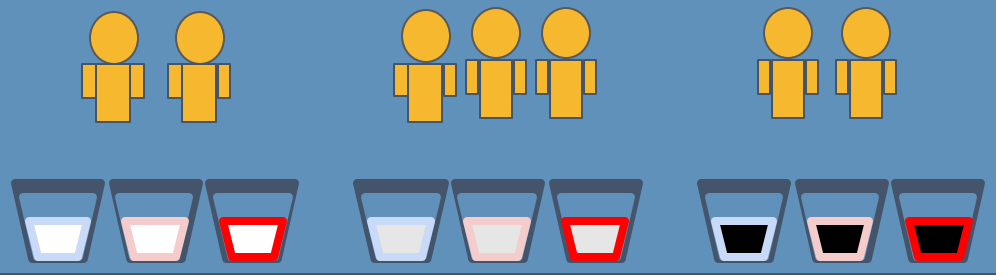
Investigation 1: safety goggles, hair back, sleeves up



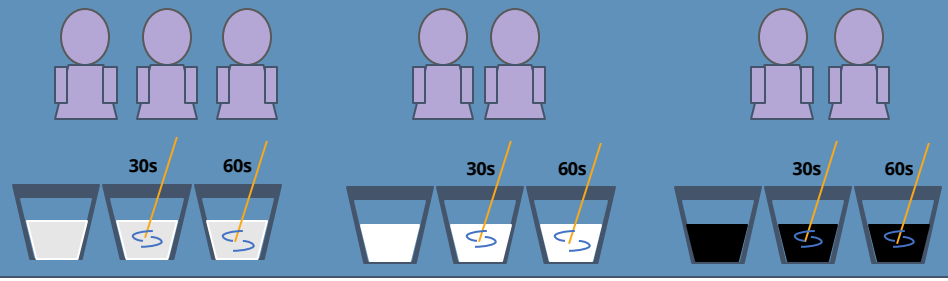
Investigation 2: safety goggles, hair back, sleeves up



Investigation 3: safety goggles, hair back, sleeves up, heat-protection gloves, teacher supervision



Investigation 4: safety goggles, hair back, sleeves up

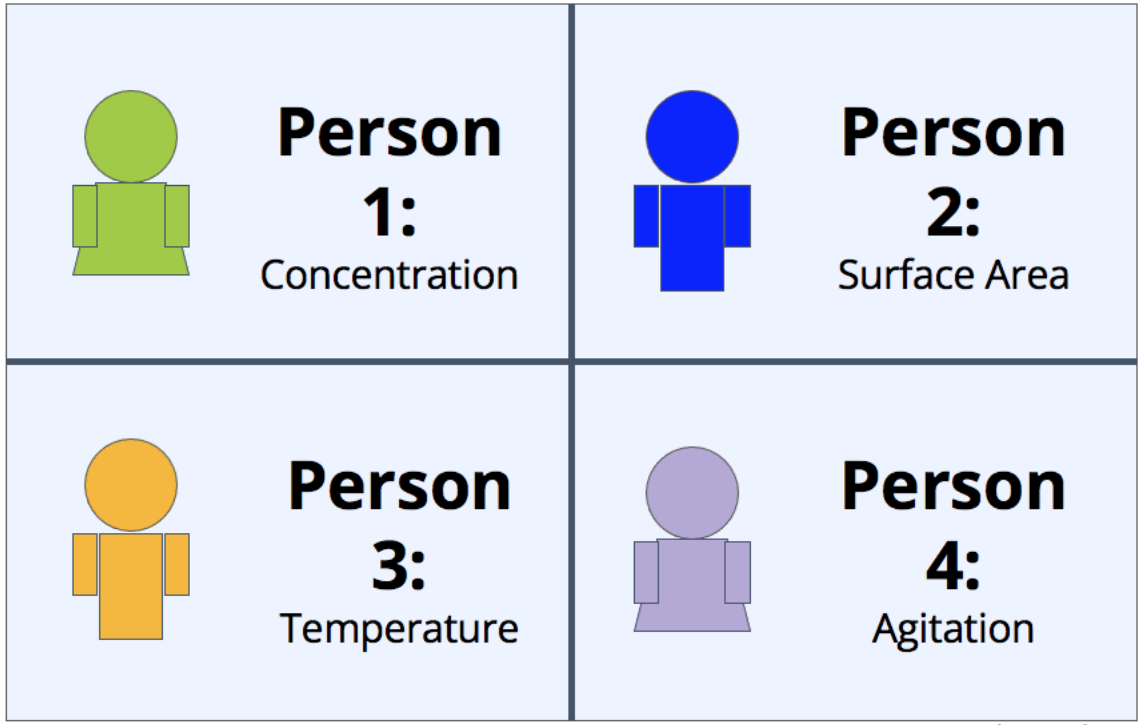


AQUEOUS SOLUTIONS RESEARCH

1. Put the safety glasses on and tie your hair back.
2. Grab a **Data Sheet** and read it front to back aloud with your group.
3. Assign 1 person the "**Lab Manager**" role. They will read the **instructions for each step of the lab.**
4. Assign the other people to work on salt, sugar, and pepper. Try to make even groups.
    i. ***2 people will work on salt research.***
    ii. ***1 will work on sugar research.***
    iii. ***1 will work on pepper research.***
5. The salt research should be conducted first. While that person is conducting and listening to the Lab Manager, the other students will observe what is happening to the salt. In the **Observations** box, record how well the salt dissolves each step of the way. Be as detailed as possible.
6. After the salt research is complete, **record a summary of what you just learned about salt and Concentration in the "Explain" box.**
7. Repeat Steps 6-7 for both sugar and pepper.
8. Verbally share your results with the people at your table, and make sure everyone has the information on their data sheets. **Call your teacher over to confirm if your data is correct**.
9. Clean the lab before returning to your original group of 4.

Aqueous Solutions JIGSAW Key Patterns

How well did the SALT dissolve?	
Station 1	As concentration (amount of salt) increased….
Station 2	As surface area increased (as the size of the salt got smaller) ….
Station 3	As temperature of the solvent (water) increased…
Station 4	As agitation (amount of stirring) increased…



JIGSAW Research Roles

SHARING YOUR FINDINGS

In numerical order, take turns verbally sharing your findings with your **jigsaw group of 4**.

How did your station help (or not help) dissolving the following solutes:

- Salt
- Sugar
- Pepper

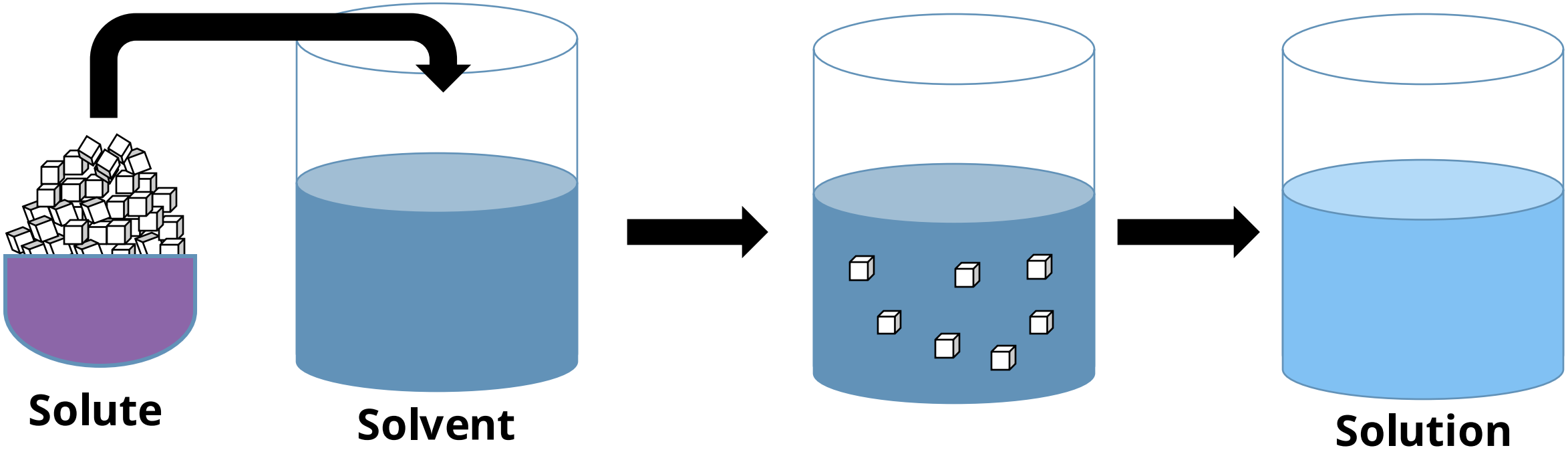
RESEARCH CLASS DISCUSSION

Your group be assigned one of these questions. You have 5 minutes to prepare an answer. Be prepared to share your answers with the whole class.

1. What helps sugar dissolve the best?
2. What helps salt dissolve the best?
3. What patterns did you notice about pepper in the lab?
4. How does this relate to rare earth elements?/mining?
5. Why is the problem with mining hard to solve?
6. Why did we choose salt, water, sugar, and pepper instead of acid and REEs?
7. How will we use this information?

KEY VOCABULARY

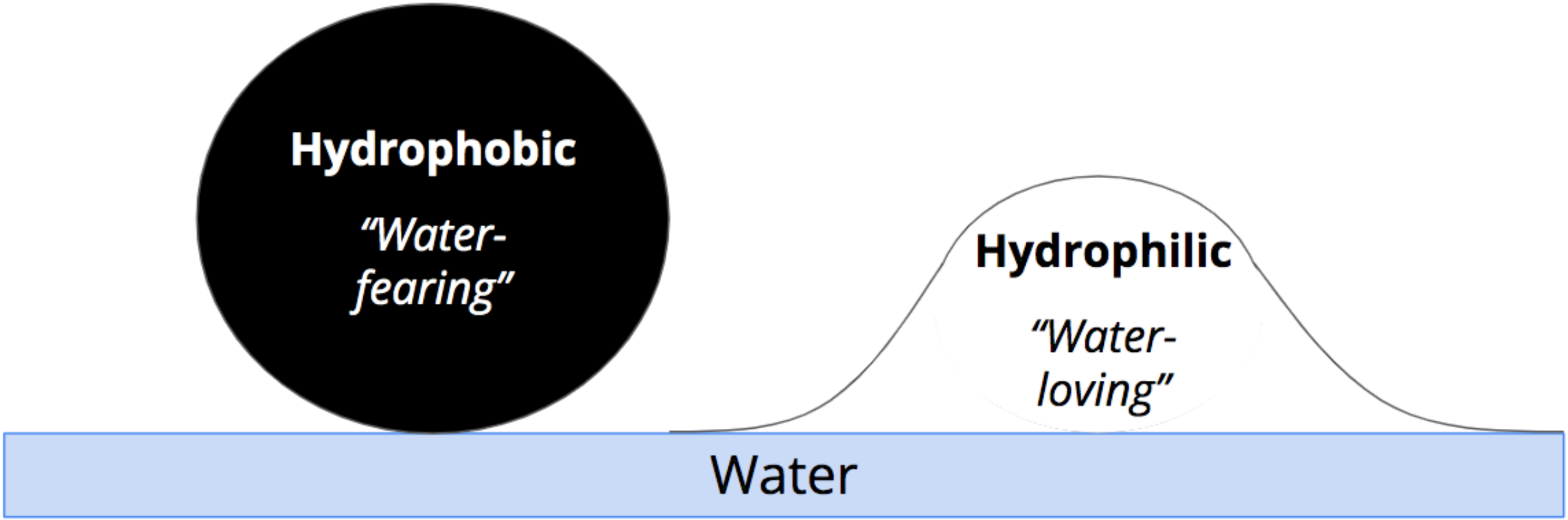
Solubility - The ability of a substance (solute) to form a solution with another substance (solvent)



Aqueous Solution -
Solvent is water

Dissolution Process

KEY VOCABULARY

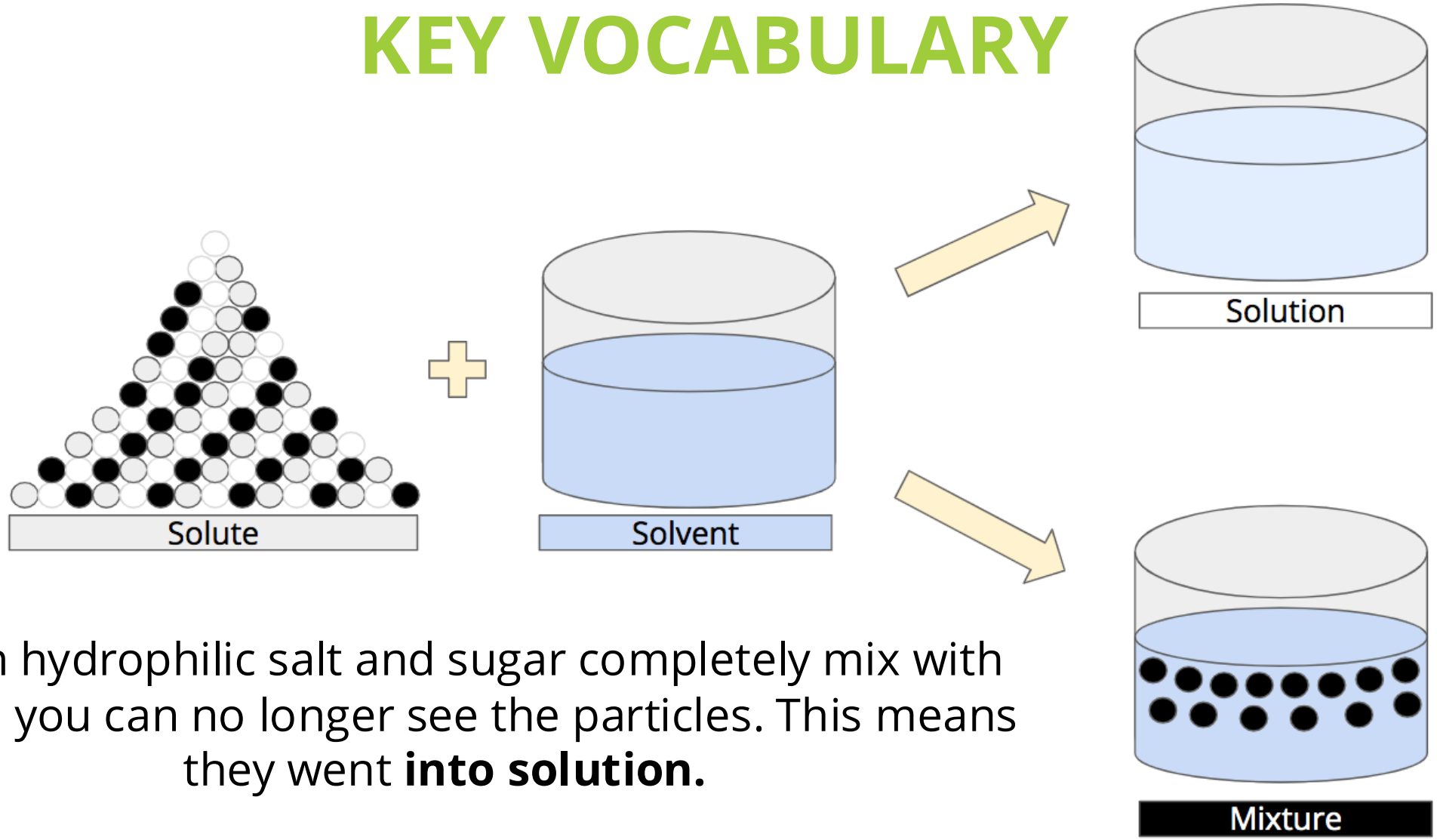


'Water Fearing"
These objects do not like water and do not mix with water.

'Water Loving"
These objects like water and like to mix with water.

Hydrophobic and Hydrophilic

KEY VOCABULARY



When hydrophilic salt and sugar completely mix with water, you can no longer see the particles. This means they went **into solution.**

Hydrophobic pepper won't mix with water. It can still be seen despite agitation. This makes it a **mixture.**

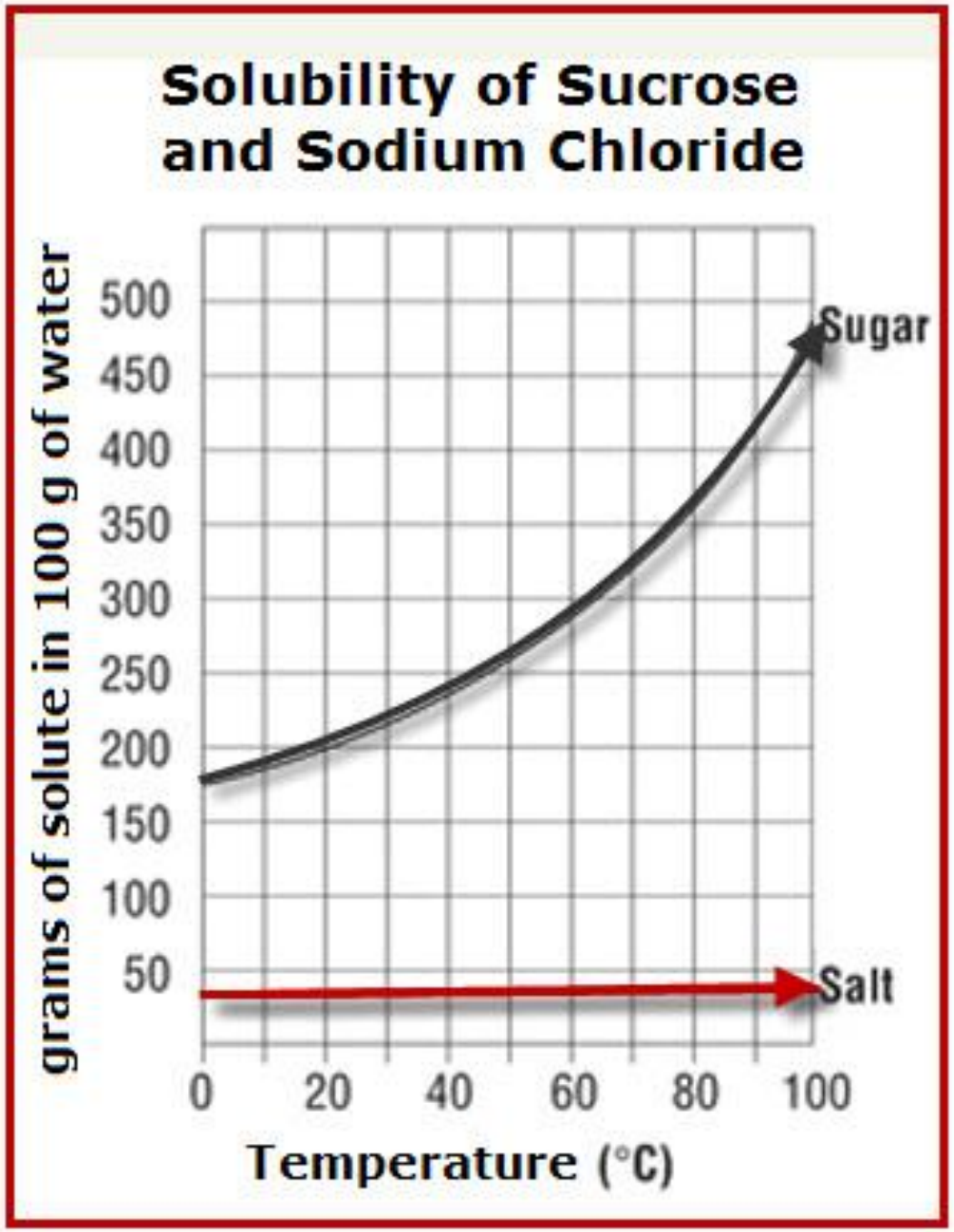
Salt and Sugar Dissolve; Pepper Does Not

SOLUBILITY GRAPH

On your personal copy of this graph, annotate:

What I see…

What it means…



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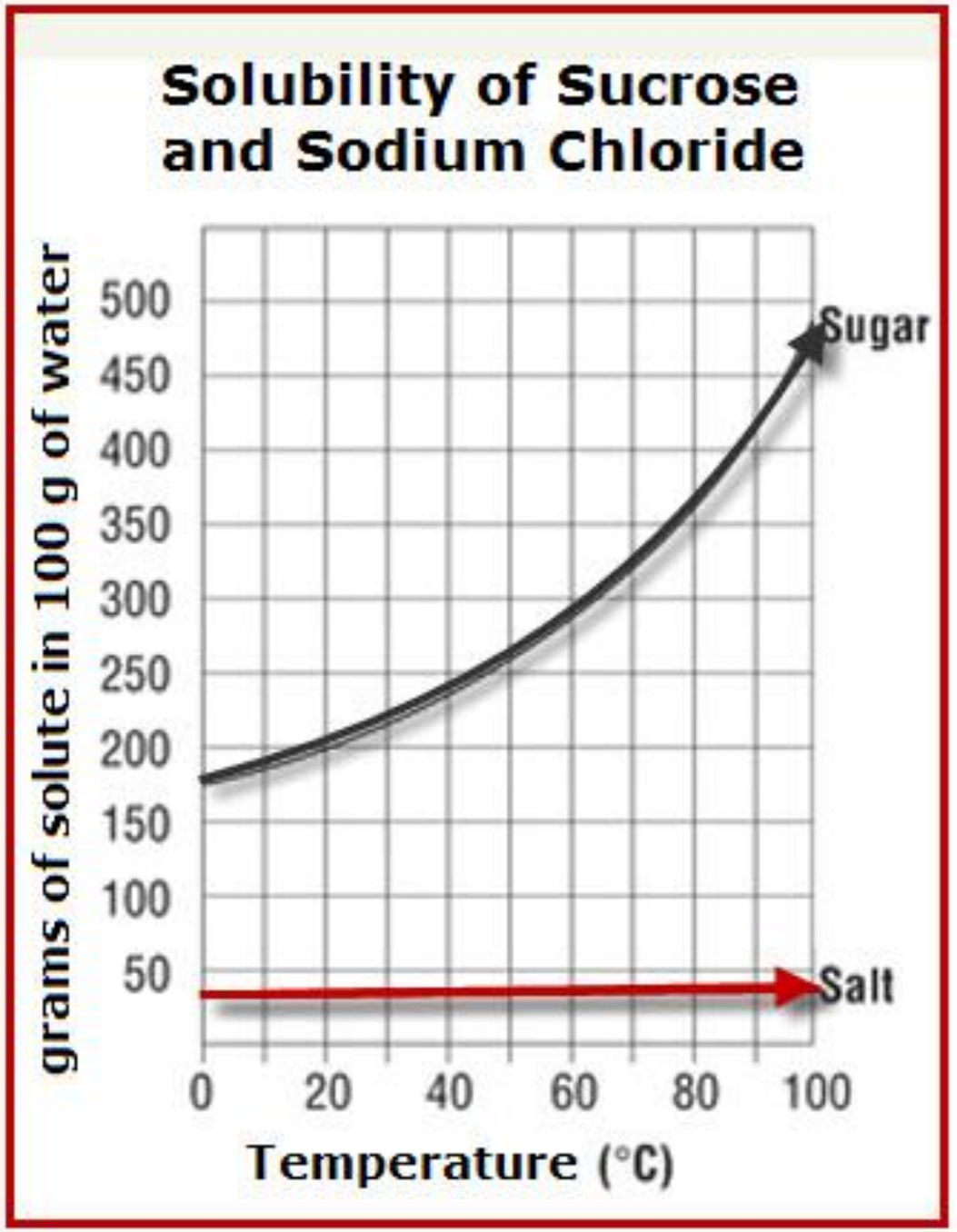
SOLUBILITY CONSENSUS

1. **Temperature:**

2. **Concentration:**

3. **Agitation:**

4. **Surface Area of Solute:**



American Chemical Society. (2023, August 25)

END OF DAY 2

Citations

- Ademski, E. (2025). *Dissolution Process* [Diagram]. Teach Engineering.
- Ademski, E. (2025). *Hydrophobic and Hydrophilic* [Diagram]. Teach Engineering.
- Ademski, E. (2025). *JIGSAW Research Roles* [Diagram]. Teach Engineering.
- Ademski, E. (2025). *Research Stations* [Diagram]. Teach Engineering.
- Ademski, E. (2025). *Salt and Sugar Dissolve; Pepper Does Not* [Diagram]. Teach Engineering.
- Ademski, E. (2025). *Stations Lab Safety* [Diagram]. Teach Engineering.
- American Chemical Society. (2023, August 25). *Lesson 5.6: Does Temperature Affect Dissolving?* American Chemical Society; American Chemical Society. https://www.acs.org/middleschoolchemistry/lessonplans/chapter5/lesson6.html
- Teach Engineering. *NGSS Engineering Design Process* [Diagram].
- *TeachEngineering.Org*, https://www.teachengineering.org/populartopics/designprocess. Accessed 24 June 2025.