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Salinization Lab

Soil salinization is a serious threat to agriculture around the world. Tap water, which is used directly for irrigation, contains a variety of dissolved salts including NaCl, $MgSO_4$, $CaCO_3$, and many others. Adding salt to roads during the winter also has an effect on local plant life through runoff. Additionally, as sea level around the world begins to rise, coastal ecosystems are at risk of being negatively affected by this change in **salinity,** the **concentration** of dissolved salts in a solution. As water is absorbed by the plants or evaporates into the atmosphere, salts can be left behind (because they don't evaporate at Earth temperatures) and will build up in the soil over time.

Throughout this lab, you and your group will work collaboratively to answer questions about salinization. Your group will ultimately determine the salt concentration, specifically Sodium chloride [NaCl] at which this plant species will show effects of salinization, including prevention of germination.

Materials:

- Beakers
- Graduated cylinder
- Beans (8)
- Weighboats
- Balance
- Distilled water
- Sodium chloride (NaCl)
- Plastic stirring rod
- Paper towels
- Petri dishes
- Goggles
- Plastic spoon

Facts to know:

- The concentration of NaCl in seawater is about **0.51M**, with **3 grams** of NaCl dissolved **per 100 mL**.
- Plants and animals can be affected by **very small changes** in Sodium chloride concentration, so your molarities don't have to be **DRASTIC** changes.

Pre-Lab:

You will prepare four (4) solutions, each with 10mL of distilled water and each with a different [NaCl]. One must be a control situation (10mL with a 0.0M [NaCl] – Use JUST distilled water) and the other three are have concentrations that are chosen for you. **Our goal is not to "KILL ALL THE SEEDS!"** but we **do** want to have *some* negative effect on the growth of the bean plants.

Table 1: [NaCl] for my Group (1000 mL = 1 L)

Trial	mL H_2O Used	L H_2O Used	Molarity	Moles of NaCl	g of NaCl needed (Convert from moles)
A	*10 mL*		*0.0 M*	*0.0 mol NaCl*	*0.0 g NaCl*
B	*10 mL*		*0.25 M*		
C	*10 mL*		*0.50 M*		
D	*10 mL*		*0.75 M*		

Use the space below for your calculations for NaCl mass values:

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Procedure:

This lab will be conducted over a 3-4 calendar day time span.

1. Start by **preparing your solutions**. Once calculated, you can measure out the Sodium chloride at the balance stations. Use the weighboats at your station and be sure to label them A-D so you know which one goes with each part of the lab. Measure out the correct amounts of NaCl for each trial.

2. While someone is obtaining the NaCl, have someone else measure 10mL of distilled water into each of the four beakers using the graduated cylinder.

3. Once all materials are measured and verified, combine the NaCl with the H_2O and stir using the stirring rod until the solute is no longer visible (as best you can!).

4. While someone is preparing the solutions, have someone else begin preparing the petri dishes. Cut out four rectangles from the paper towels at your station; one for each of the four trials (A-D). Fold this in half (hamburger style) and place it into the bottom of the petri dish. The exact size is not extremely important; just that it can fold in half and can fit flat in the petri dish without spilling over the sides.

5. Label the top of the petri dish with "Pd. #" and then the letter that corresponds to the trial (A-D).

6. Pour each solution over the middle of the paper towel for each corresponding petri dish. Cover the petri dish.

7. Use the plastic spoon to obtain two (2) beans for the first petri dish. AVOID TOUCHING THE SEEDS WITH YOUR HANDS! Obtain the mass for these two seeds. Use the weighboats from earlier in the lab but wipe them out to ensure that they are not coated with salt. Once the mass is recorded in Table 1, place the seeds on the now-damp paper towel inside the first petri dish so that they are about 1-1.5" apart in the middle of the paper towel piece. Repeat this step for each petri dish.

8. Cover the petri dishes with the correct, labeled cover and place them in the area that I recommend for you to put them in (Ask me if you forget!) This is the end of "Day 1"

9. On "Day 2" of the lab, take the seeds/seedlings out of the drawer and measure their current mass. This will give us an indication as to how much the seeds grew (or didn't grow!). NOTE: There will be a slight increase in mass for ALL of them as they gained mass simply by absorbing water.

Data:

Table 2: Seed Growth in Mass (g)

Trial	Initial Mass of Seeds	Final Mass of Seeds	Δ in Mass (+/-)
A			
B			
C			
D			

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Data Analysis:

1) Calculate the percent change in mass for the seeds in each of the four trials. The % change in mass for each can be calculated by subtracting the *initial* mass from the *final* mass, then dividing that value by the *initial* mass. Once calculated, make this value a percentage by multiplying it by *100*. You may refer to the formula below for a visual representation of this calculation:

[(Final Mass – Initial Mass)/Initial Mass)] x 100

Table 3: Percent Change in Mass of Seeds

Trial	% Change in Mass
A	
B	
C	
D	

2) Share this data with your teacher in the class file!

3) What does a positive % change in mass indicate for seed growth? What might a negative % change in mass have indicated?

4) **Graph your data. Your x-axis should be "Molarity of Solution" and your y-axis should be "% Change in Mass". Don't forget TALKS for your graph!**

5) Did the concentration of NaCl in the solution have an effect on the growth of the seedlings? Explain in detail **using your data**!

6) Given the information about the effect of NaCl on plant growth and increasing salt runoff from icy roads in the winter, what kind of implications does this lab potentially have for the future of our ecosystems?

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