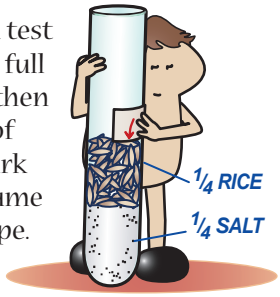
Another FREE SAMPLE LAB from TOPS LEARNING SYSTEMS!

This **TOPS Idea** is taken from an original series of black-and-white line masters, adapted to stand alone as an independent mini-lesson. Please purchase our original book to get the whole in-depth program.

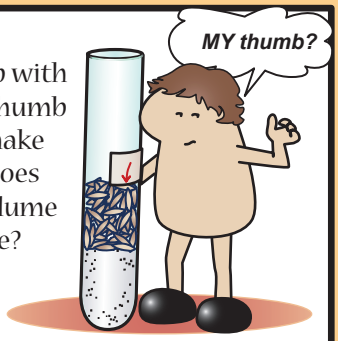
in between

…adapted from **SOLUTIONS #12** by TOPS Learning Systems

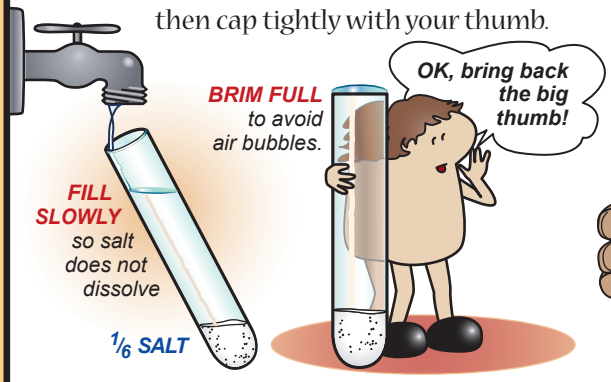
1. Fill a test tube 1/4 full of salt, then 1/4 full of rice. Mark the volume with tape.



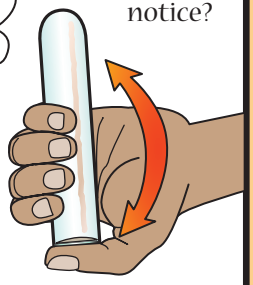
2. Cap with your thumb and shake well. Does the volume change? Why?



3. Empty the tube, and fill 1/6 full of salt. Trickle water down the side until brim full, then cap tightly with your thumb.



4. Rotate the tube slowly to mix. What pressure change do you notice?



5. Explain the pressure change in terms of the rice/salt model.

OBJECTIVE

To understand why salt and water lose volume when mixed together.

LAB NOTES

BACKGROUND: Solid crystals of table salt break apart into positively and negatively charged atoms called *ions* as they dissolve in water. Alcohol molecules, by contrast, intermix with water molecules in the process of dissolving, but they never break apart into atoms or charged ions.

Step 3. *Gently* adding water prevents the salt from dissolving too soon. Filling the tube *brim* full expels *all* air from the tube before capping its mouth.

MATERIALS

- A small, dry test tube.
- Rice and fine-grained table salt.
- Masking tape and scissors.
- Water source and paper towels.
- A metric ruler (optional).
- For extension: rubbing alcohol. 70% concentration will work.

ANSWERS

2. Yes, the level drops about 1 cm below the marker after mixing. The volume decreases because salt fills the empty spaces between rice grains.

4. The pressure decreases in the sealed tube, drawing the thumb gently inward.

5. Salt grains fill spaces between rice grains, so the mixture loses volume. Similarly, dissolving salt (sodium and chloride ions) enters sites between water molecules, reducing the volume of the solution and creating a slight vacuum.

EVALUATION

Q: Corn oil plus water, and alcohol plus water, are combined in graduated cylinders with these results:

10.0 mL oil + 10.0 mL water = 20.0 mL mixture

10.0 mL alcohol + 10.0 mL water = 19.8 mL mixture

Account for the differences in volume.

A: The results suggest that alcohol molecules dissolved between water molecules, resulting in decreased volume. Oil and water are additive, however, suggesting mutual insolubility.

EXTENSION

Gently trickle alcohol into a test tube half full of water. Fill to brim, cap with thumb, and invert to mix. *Again a slight vacuum is created, because water and alcohol molecules occupy less space when dissolved than when layered separately.*

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