

Is Your Solution Same As mine?

Introduction

Most of the liquids we see around us are solutions or mixtures having more than one substance in it. For example, the water you get in a tap or a hand pump, is not pure water, but is a solution containing several salts and some gases.

Yet we don't see that water as a salt solution. But if the water has a lot of salt in it like sea water we call it salty water or salt solution. Thus in our common life, the amount of dissolved substance makes us label the liquid as a pure substance or a solution. In fact, in most daily life needs, we prefer solutions over pure substances. This is because many properties of solutions can be changed more easily according to our needs than properties of pure substances. Most chemical reactions happen in solutions. Most biological processes including digestion of food also take place in solutions.

Solution is a mixture of solute and solvent. The component which is in less quantity is usually called 'solute' and component in high quantity is usually called 'solvent'.

But can we say one salt solution is the same as another salt solution? Usually the standard way of identifying a solution is by the name of the solute (like salt) in it and its concentration. In this unit, we will try to understand the meaning of concentration of a solution and its effects of properties of solution.

Task 1: Is your sherbet same as mine?

Imagine you need to prepare a drink for you and your 3 more friends using a ready made fruit syrup/ drink mix powder and drinking water. You can add salt/ sugar in addition if required.

Q1. How much quantity of final drink does your group need?

Q2. What quantity/amount of fruit syrup/ drink mix powder will your group take? How much water will you mix?

Q3. How will you measure the required quantities/amounts of

(i) fruit syrup/ drink mix powder

(ii) Water

Based on your answers for Question 1 to 3, complete the following table:

Group Number	Quantity of squash/juice	Quantity of water added	Quantity of the final drink

Table 1

Q4. If another friend of yours needs to prepare a drink exactly the same as yours, what instructions/recipe you will tell to your friend?

Task 2: Preparing Lemonade with seeds!

You may have prepared lemonade in summers by mixing lemon juice and sugar in cold water as a cooling drink. In this task, you will prepare the lemonade with lemon seeds in it to discover an interesting property of the lemonade.

Generally, it is not advisable to consume any drinks/ solutions prepared in these tasks. Any Solution can be tasted if and only if 1) drinking water is used as solvent. (2) You are not working in chemistry lab.

(3) Equipments and containers you used for this experiment are not used in the Chemistry lab.

Materials Required: Sugar- 50g, lemon- 1, two identical transparent glasses, spoon- 1, Knife (to cut lemon), drinking water

Preparation:

1) Take 2 identical transparent glasses labeled as A and B and add approximately same amount of lemon juice along with the seeds into A and B (do not remove seeds).

2) Add equal amount of water in each glass (to fill it approximately half). Check the water level by bringing your eye at the water level.

Q1. Where can you find the seeds in the glass (top/bottom/middle)?

3) Add 1 teaspoon of sugar to glass B. Stir it with the help of the spoon till it dissolves.

Q2. Now, where can you find the seeds in the glass B? (Top/bottom/middle)

4) Add 1 more teaspoon of sugar to glass B. Stir it with the help of the spoon till it dissolves.

Q3. If the seeds are still not at the top of glass B, how much sugar must be added to bring the seeds to the top?

Q4. In your opinion why the seeds in B start floating but not in A? Something changes in seeds or in solution?

Q5. Can you think of the number of solutes present in the prepared lemon juice?

Q6. What did we learn from the above observations of seeds sinking and floating?

5) Add half the amount of initially added water into beaker B again.

Q7. Now, where can you find the seeds?

Q8. How much more sugar you may need to add to bring the seeds again at the top of the glass?

6) Add sugar and dissolve it until the seeds come to the top of the glass.

Q9. How much sugar you added to bring the seeds to the top of the glass?

Q10. Is there any relationship between the amount of water added and the sugar in both the cases before and after step 5)?

Task 3: What all can sugar do to a solution?

In this task, you will add different quantities of sugar to same amount of water, and discover some changes which it can cause to the water solution through three kinds of observations.

Materials required: transparent glass/ beaker (100ml)- 4, spoon/ any other small volume measuring cup/medicinal bottle cap -1, sugar- 40g, light weight items (ajwain, mustard seeds etc), stop watch- 1, glass rod- 1, 100ml measuring cylinder -1, pen refill/toothpick/small stick -1, white paper-1, marker pen.

Procedure:

1. Measure 60 ml of water using measuring cylinder and take in 3 transparent glasses/ beakers labelled as (i), (ii) and (iii). Mark the level of water in each.
2. Then, add 1, 2 and 4 teaspoons of sugar in (i), (ii) and (iii), respectively. Stir it till the sugar dissolves.

Observation 3 A. (Less or more) Notice the level of solutions in the three beakers. (Place white paper in background for better clarity)

Q1. Is it the same, higher or lower than the mark you made before adding sugar? Is there a pattern in the volumes in the three beakers? Can you think of any explanation for your observations?

Q2. To calculate concentration of sugar solutions, would be better to take volume of water taken or the final volume of solution?

Observation 3 B. (Slow or fast) Stir the above solutions specific number of times (say 5 times), remove the stirrer and immediately start the stopwatch. Stop the stop watch when the particle comes to rest. Note down the time taken by solution to come to rest.

4. Repeat step 3 for remaining solutions.

From the above observations, fill the following table:

SOLUTION	TIME (min / s)
i	
ii	
iii	

Table 2

Q3. According to you, why the time taken by (i), (ii) and (iii) to come to rest changes from one another?

Observation 3C: (Same or distorted) Put a refill/ small stick inside the three solutions and look at it from the side/ front (not from the top). For clarity, you can keep white paper behind these solution containers.

Q4. What do you observe? Is there any difference in shape of refill/toothpick/small stick observed in the three solutions?

Q5. Have you seen such apparent change in shape of objects in a liquid? Can you think why it happens?

Task 4: Reading concentration labels

Now that you have seen how concentration of solute change change some properties of solutions, let us try to make sense of concentration values given on packets of household items sold in market.

Ingredient list of an oral re-hydration salt (ORS) powder is given below;

Each 21 g packet contains:	
Sodium Chloride.....	2.6 g
Potassium Chloride.....	1.5 g
Sodium Citrate.....	2.9 g
Dextrose (anhydrous).....	13.5 g

Image 1

Q1. Can you express the mass percentage of Sodium chloride content in the given packet?

Q2. The direction of usage is 1 tablespoon (4 gms) in 200 ml water. If you consume this ORS, how much of Sodium Chloride will enter into your body?

Read and write the composition of ingredients mentioned on carton / wrapper of juice or drink packets or packets of any other house hold items.

Packet (sample) name _____

Sr. No.	Ingredients	Quantity	Concentration/ Percentage

Table 3

If the concentration/percentage is already given in the carton, think about the different terms in which quantity and concentration of ingredients in the solution is expressed.

Task 5: Solution Concentrations in different professions

For water used in irrigation and construction, salinity and sodicity are considered as very important parameters. Salinity is the dissolved salt concentration in water and sodicity refers to sodium ion concentration in water. These properties can affect the nature of irrigated soils, for example soil can become hard, clumpy or it can develop cracks over time.

Q1. Try to find out the salinity and sodicity values of water used in irrigation in your district/state? Is there any impact of these water qualities in the soil?

Q2. Can you think of other professions where the concentration of solute in solution plays an important role? Such that any mistake in concentration can lead to unexpected/unwanted incidences. Do you know any such incident?
