

Solutions

We will,

1. Learn what a solute, solvent and a solution are.
2. Learn about water as a solvent.
3. Learn about Suspensions.
4. Examine the difference between a dilute, concentrated and saturated solution.
5. Investigate the solubility of substances in water and look at the effect of temperature.
6. Grow crystals using copper sulfate.



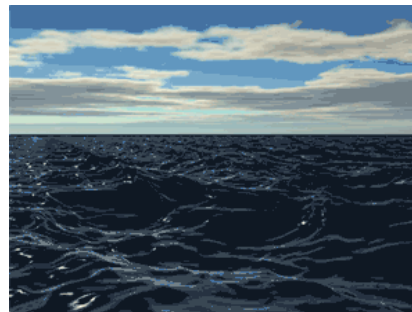
Solutions

A solvent is a chemical that dissolves other materials and forms a solution.

What solutions do you know?

Examples of Solutions -

Cup of coffee, sea-water, Ribena.





A solute is a substance that is dissolved in a solvent.
Coffee is dissolved in hot water, (the solvent) and forms a solution (cup of coffee).

HINT: **V**ater is a sol**V**ent

Where did it go?

When a solute is dissolved in a solution where has it gone?
Where does sugar go in coffee?

Does it disappear?

How can we check?



We can taste the substance, e.g. sugar in coffee.

We can see the colour change, e.g. coffee or ribena.

We can weigh the beaker and see that the mass goes up when we add a solute.

Suspensions

What does suspension mean?

**When something is suspended it usually hangs around.
Suspensions are formed when the solid in a liquid doesn't dissolve fully.**

Examples of Suspensions,

Milk, Medicine, Muddy Water.
Tomato Ketchup



Dilute and Concentrated Solutions

A bottle of **Ribena** will have **Dilute to taste** written on it.

What does this mean?

Dilute means add more water (solvent).

A Dilute solution has a small amount of solute and a large amount of solvent.
A Concentrated solution has a large amount of solute and a small amount of solvent.



What word can we use to describe the Ribena in the bottle?



The Ribena is Concentrated.
This means there is more solute than water.

SIMULATION

Solubility and Saturation

Does anyone take sugar in their tea?

What happens to the sugar if you don't stir it properly?

If you keep adding sugar what will happen eventually even if you stir it?



When a solvent cannot dissolve anymore solute it is said to be saturated.

A saturated solution is one that contains as much dissolved solute as possible at a given temperature.

Investigation

Do you think the temperature of a solution will affect how much solute it can hold?

YES =

NO =

We will look at **Copper Sulfate** and see how well it dissolves in water and how the **temperature** affects the amount of it that will be dissolved.

P.148 in your books.

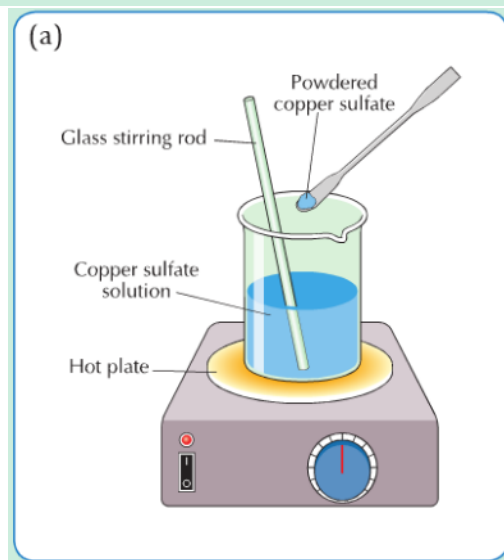


To Grow Crystals of Copper Sulfate

Safety: Goggles and Hair

Apparatus required: pestle and mortar; stirring rod; beaker; Bunsen burner (or hotplate); tripod; wire gauze; evaporating basin; thermometer

Chemicals required: alum or copper sulfate; water



Method

1. Grind up a sample of alum or copper sulfate using a pestle and mortar. This will help it to dissolve more quickly.
2. Gradually add the powdered substance to 100 cm³ of water in a beaker, Fig. 22.7(a). Use a stirring rod to help the powder to dissolve. Continue adding until the solute no longer dissolves but settles at the bottom of the beaker. Using a thermometer, note the temperature of the water.
3. Heat the water to about 60 °C and note what happens to the undissolved copper sulfate. What does this show? Add in more copper sulfate and heat until no more will dissolve.
4. Pour about half of the solution into a warm evaporating basin and put it aside to cool slowly, Fig. 22.7(b). Cool the other half quickly by holding the beaker under running water from the tap. Note what you observe.

Results and Conclusions

What did you observe when you heated the solution to 60 °C?

The copper sulfate was able to dissolve again.
The solvent could dissolve even more solute.

What does this show?

That the more you heat a solvent, the more solute will dissolve.

What do you think happens if the water boils?

If the water boils then we lose water.

If we lose water what happens to the copper sulfate?

The copper sulfate will be left behind and will come back out of solution at the bottom.

If we let the water get cold quickly, under the tap, what happens?

The copper sulfate is seen in the bottom of the beaker.



Growing Copper Sulfate Crystals



Examples of Solubility and Temperature

Washing dishes with warm water is better than cold water because more grease dissolves in hot water.



Coffee is easier (and nicer) to make with hot water as the coffee grains dissolve a lot easier.



Solubility

The Solubility of a substance is its mass that will dissolve in 100g of a solvent at a fixed temperature.

We dissolved copper sulfate in 100g of water but we didn't measure the mass of the crystals.

However, we know that 40g of copper sulfate dissolves in 100g of water at 60°C.

To be finished....

Basically, the hotter the liquid the more solute we can dissolve into it.

Attachments

sugar-and-salt-solutions_en.jar

soluble-salts_en.jar