

# I will find out how temperature affects solubility

**AIM:** The reason we are doing this experiment is to find out how temperature affects the solubility of copper sulfate. EG will heating the solution help more of the substance dissolve.

## BACKGROUND INFORMATION:

Solubility is a measurement of how much of a substance will dissolve in a given volume of a liquid. The liquid is called the solvent, the substance you are dissolving is called the solute.

Basically, solids become more soluble as the temperature increases. This is why sugar dissolves better in a hot cup of tea than in cold water.

## EQUIPMENT:

- ◆ Bunsen burner to heat the solution,
- ◆ thermometer to measure the temperature of the solution,
- ◆ boiling tubes to put the solution in,
- ◆ test tube rack to hold boiling tubes not in use,
- ◆ lighted splint to light your Bunsen burner (this should be lit from a teacher's already lit Bunsen burner),
- ◆ copper sulfate,
- ◆ electronic scales to measure the mass of the copper sulphate,
- ◆ tripod to rest the boiling tube on when you are heating it,
- ◆ spatula to scoop out copper sulphate from the container,
- ◆ scientific tongs to hold boiling tube over the heat,
- ◆ water to dissolve the copper sulfate into,
- ◆ Stirring rod to stir the solid into the water,
- ◆ measuring cylinder to measure out 100ml of water, 100ml of water weighs 100g
- ◆ heatproof mat to make sure the Bunsen burner doesn't damage the bench.

## METHOD

1. Add 100ml of water and 5g of copper sulfate to a boiling tube.
2. Hold the boiling tube with the tongs and hold it over the roaring flame of the Bunsen burner, stirring with the rod until the copper sulfate dissolves and turns the water blue. To save holding the tube up, you can rest it on a tripod placed above the burner.
3. Immediately remove the tube from the heat, rest it on a heatproof mat and measure the temperature of the solution with the thermometer.
4. Record this temperature (in degrees c) and the amount of copper sulfate dissolved (in grams) in a table.
5. Repeat steps 1-5 with a new boiling tube of 100ml of water and using different masses of copper sulfate each time . Eg 10g, 15g 20g etc.

## DIAGRAM OF EQUIPMENT

### RESULTS:

My method did not yield good results, therefore the following results were given to me:

Temperature (degrees c)	Solubility (g/100g water)
10	27
20	32
30	38
40	45
50	53
60	62
70	72
80	84
90	100
100	114

the results were plotted into a graph—see attached

Please see evaluation for the problems we had with our experiment and a method that should have been used to give these results.

## CONCLUSION:

The graph shows that there were no scientific anomalies in these results. An increase in temperature gives an increase in the solubility of copper sulfate. The higher the temperature, the greater the mass of copper sulfate that dissolves in 100g of water.

## EVALUATION:

The small amounts of copper sulfate we used dissolved very quickly once we started to heat the tubes. This meant it was very difficult to accurately measure the temperature of the water at the point where all the solid dissolved. We should either have used much more solid, or heated the boiling tubes slower.

I think the following method would give the type of results shown in the table and graph:

1. Fill ten boiling tubes with 100ml (=grams) of cold water and stand them in a test tube rack.
2. Weigh 100g of copper sulfate into a beaker using the scales.
3. Put the thermometer into the water and hold the boiling tube in the tongs over the yellow flame of the Bunsen burner. Once it reaches 10 degrees c, remove it from the heat and take out the thermometer.
4. Add copper sulfate to the water using a spatula and stir with the stirring rod — the solid will dissolve and turn the water blue. After every spatula full, check the temperature and re-heat to ten degrees if necessary. Continue to do this until no more dissolves.
5. Once no more solid dissolves, weigh the remaining copper sulfate to see what is left. (100g minus what is left = what you have dissolved).
6. Record the temperature (i.e. 10 degrees) and the mass of copper sulfate used in a table.
7. Weigh out another 100g of copper sulfate and repeat the experiment with a new tube of water— heating to 20 degrees this time.
8. Repeat step 7 a number of times, raising the temperature by 10 degrees each time. (Please note you may need more than 100g of copper sulfate at high temperatures.)

## REFERENCES:

[www.bbc.co.uk](http://www.bbc.co.uk)— BBC bite-size website, key stage 3

Exploring Science—How Science Works—Published by Pearson Education

Collins Science Dictionary