



Annotated Lecture Slides for Saturated Solutions Lecture Demo

SIMULATIONS USED

Salts and Solubility, Concentration, Molarity

AUTHORS

Ted Clark (The Ohio State University)

Julia Chamberlain (University of Colorado Boulder)

COURSE

General Chemistry

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Learning goals

- Compare and describe saturated and unsaturated solutions at the particle-level, and in terms of macroscopic observations.
- Explain how and whether changes in solute amount and changes in volume affect the concentration of unsaturated and saturated solutions.
- Relate the maximum concentration of saturated solutions (at a particular temperature) to the identity of the solute.

- **Solubility** is the amount of solute required to form a saturated solution.
- A solution with a concentration of dissolved solute that is less than the solubility is said to be **unsaturated**.
- A solution with a concentration of dissolved solute that has reached its “maximum” value is **saturated**.
- A solution is said to be **supersaturated** if more solute is dissolved than in a saturated solution. This is an unstable condition.

*Copyrighted textbook
image omitted*

Description:

A supersaturated solution undergoing crystallization
after addition of a seed crystal.

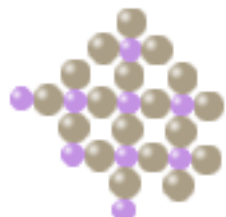
Salt

Mercury(II) Bromide

Ions ● Mercury(II) ● Bromide

Dissolved

Bound



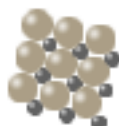
Salt

Silver Bromide

Ions ● Silver ● Bromide

Dissolved

Bound



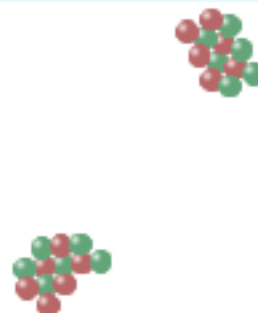
Salt

Copper(I) Iodide

Ions ● Copper(I) ● Iodide

Dissolved

Bound



Salt

Strontium Phosphate

Ions ● Strontium ● Phosphate

Dissolved

Bound



Salt

Thallium(I) Sulfide

Ions ● Thallium ● Sulfide

Dissolved

Bound



Salt

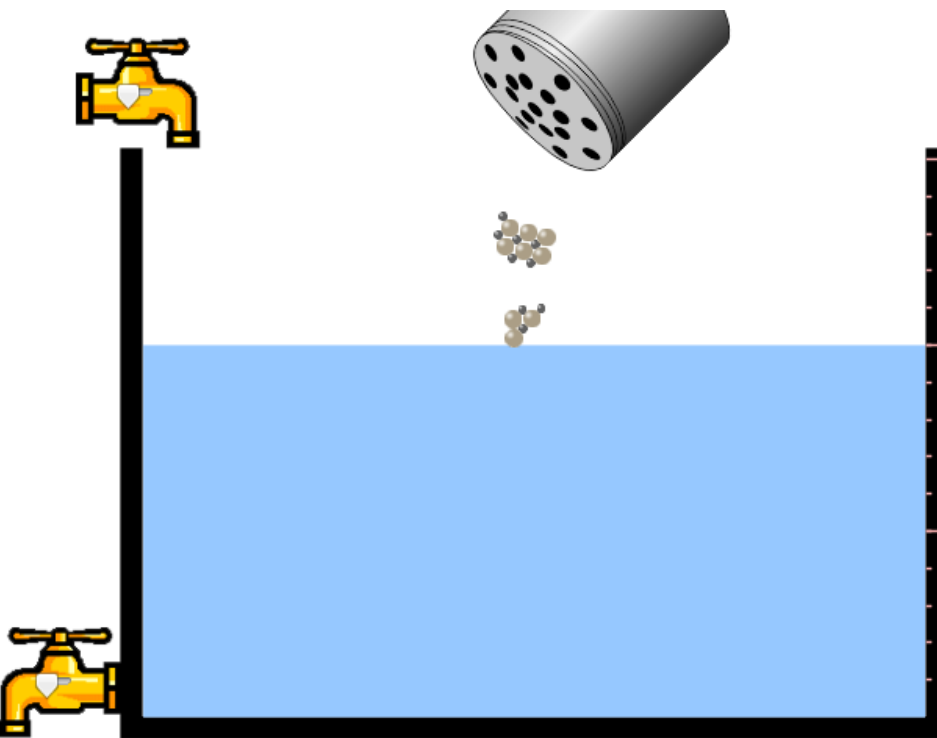
Silver Arsenate

Ions ● Silver ● Arsenate

Dissolved

Bound



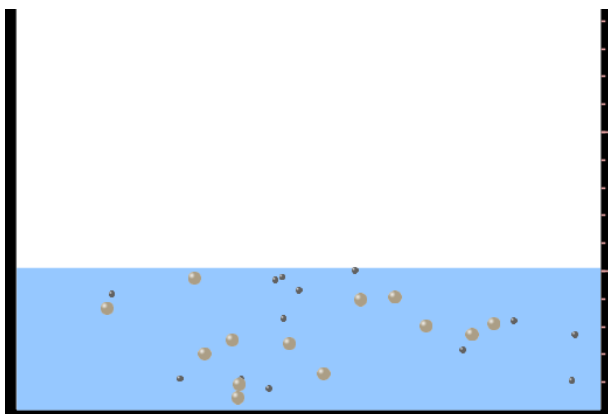


Sketch what happens when $\text{AgBr}(s)$ is added to water.

Describe the salt

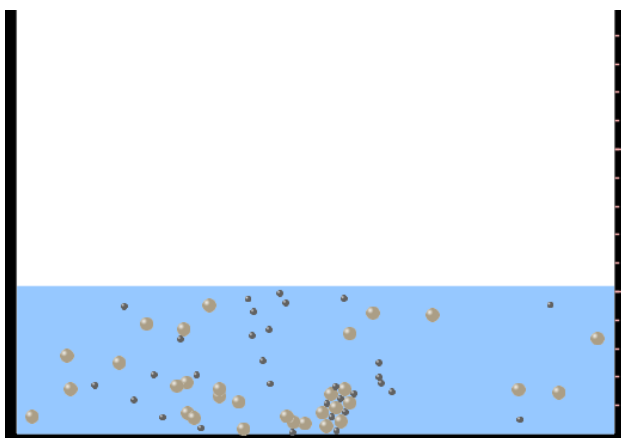
- Before it is added to water.
- When it is first added.
- When a lot is added.

Use the terms unsaturated, saturated, and supersaturated (as applicable) to in your description.



Ions	Silver	Bromide
Dissolved	15	15
Bound	0	0
Total	15	15

Unsaturated or saturated?

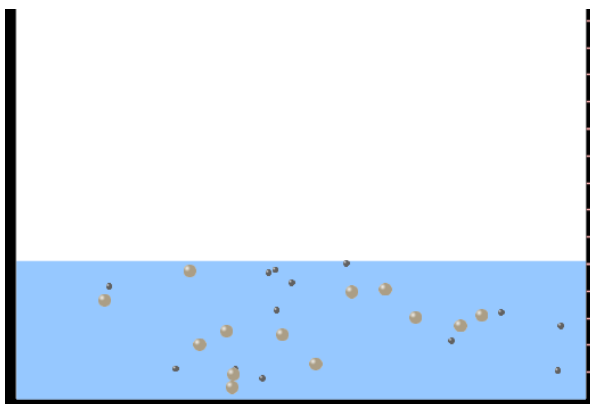


Ions	Silver	Bromide
Dissolved	23	23
Bound	8	8
Total	31	31

Unsaturated or saturated?

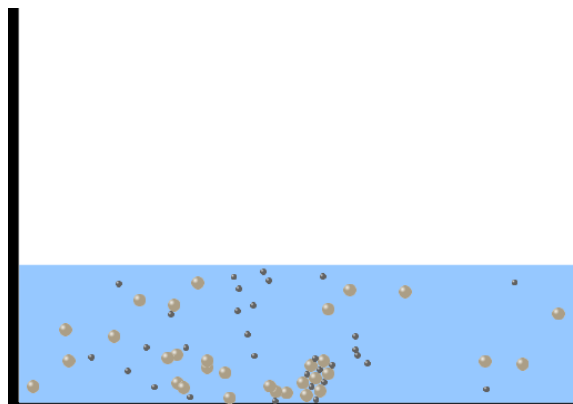
Will Ag^+ ions combine with Br^- ions in this saturated solution?

- A. Yes, some $\text{AgBr}(s)$ will form.
- B. Yes, more and more $\text{AgBr}(s)$ will form until all the ions are used up.
- C. No, $\text{AgBr}(s)$ will not form since the solution is saturated.



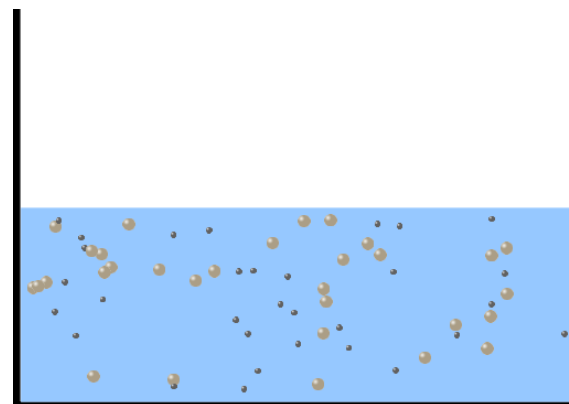
Ions	Silver	Bromide
Dissolved	15	15
Bound	0	0
Total	15	15

I



Ions	Silver	Bromide
Dissolved	23	23
Bound	8	8
Total	31	31

II



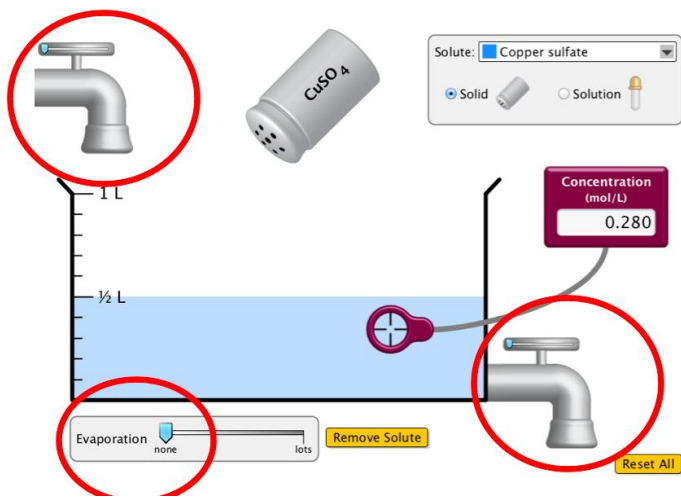
Ions	Silver	Bromide
Dissolved	31	31
Bound	0	0
Total	31	31

III

Use the terms unsaturated, saturated, and supersaturated (as applicable) to describe solutions I, II, and III.

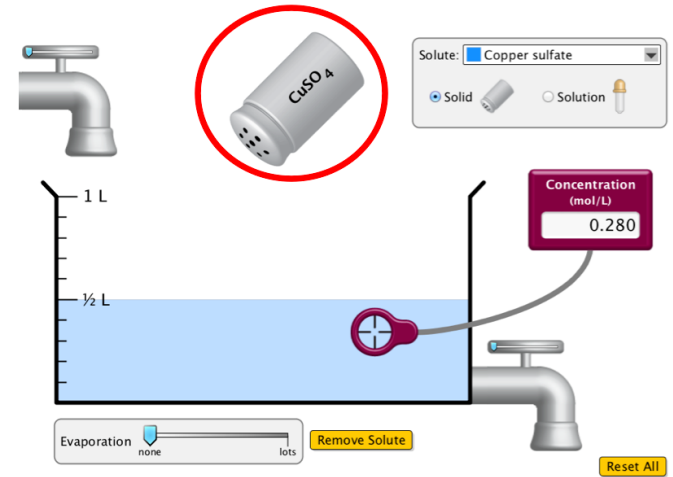
Which solution has the highest concentration?

Change volume



Change volume

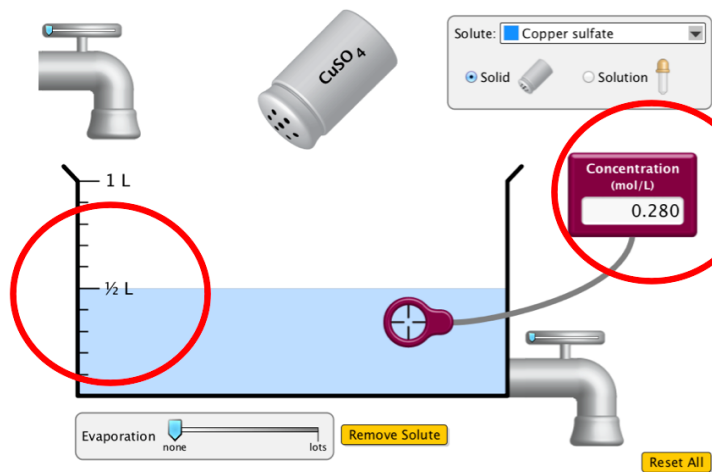
Add solute



Change volume

Add solute

Observations



The Concentration of Unsaturated vs. Saturated Solutions

Type of solution

Unsaturated Saturated

Exp. 1

Volume = constant
Solute increased

Exp. 2

Solute = constant
Volume change

Will the
concentration
change?

The Concentration of Unsaturated vs. Saturated Solutions

Type of solution

Unsaturated Saturated

Exp. 1

Volume = constant

Solute increased

Increases

Constant

Exp. 2

Solute = constant

Open bottom faucet

constant

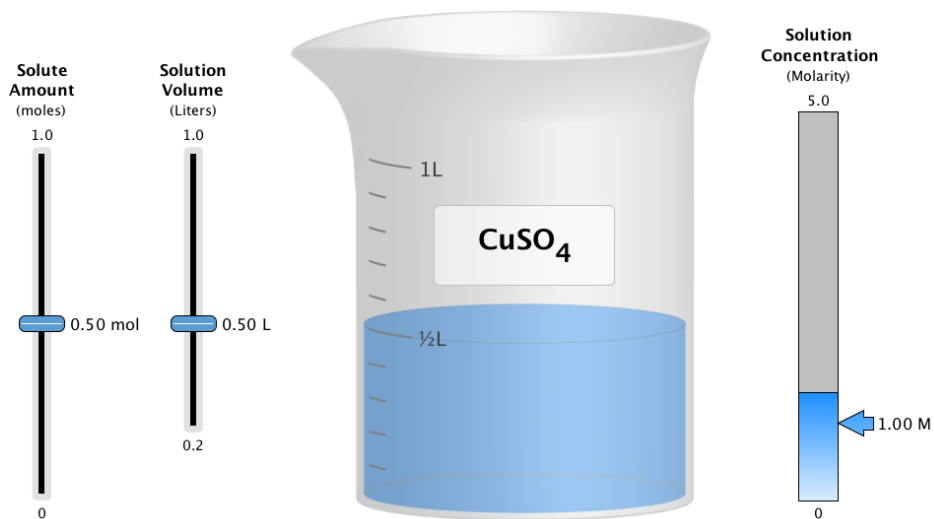
Open top faucet

decreases

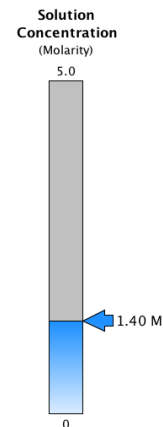
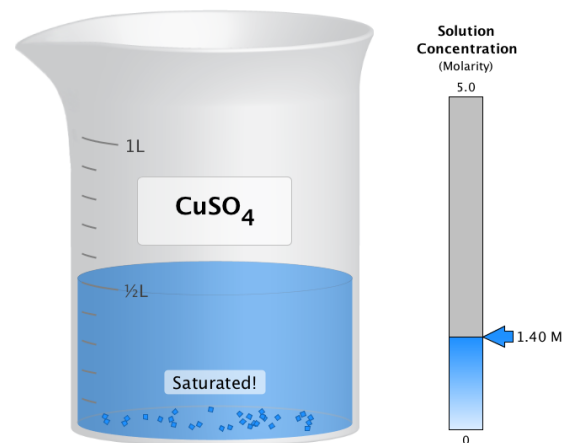
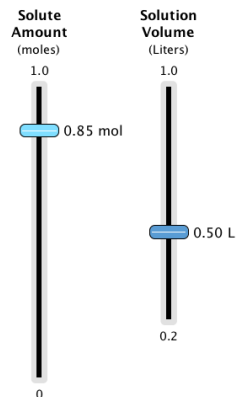
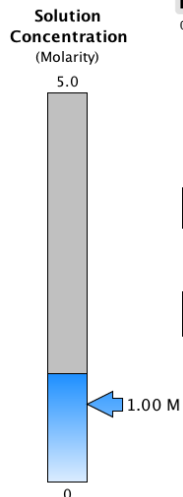
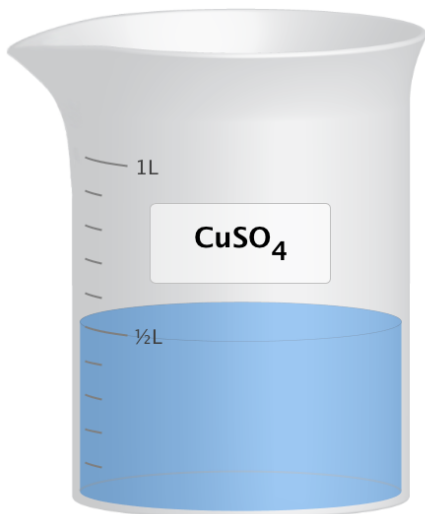
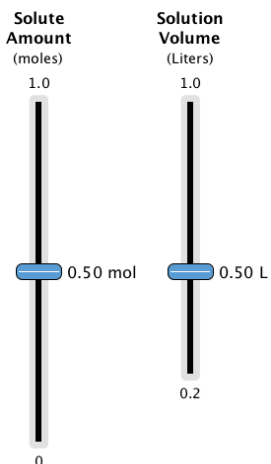
Wait & let it evaporate

increases

Initially a 1.00 M solution
0.50 mol solute
0.50 L solution



Initially a 1.00 M solution
0.50 mol solute
0.50 L solution



Add more solute

Volume decrease
(evaporation)

