

## Solution Equilibrium and $K_{sp}$

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### Launch *Soluble Salts*.

**Learning Goals:** Students will be able to:

- Describe the equilibrium of a saturated solution macroscopically and microscopically with supporting illustrations.
- Write equilibrium expressions for salts dissolving
- Calculate  $K_{sp}$  from molecular modeling.

1. Observe what happens as you add one shaker of salt to the water. Talk about your observations with a partner and then investigate salts dissolving in water further.

- Provide a brief set of points summarizing your observations & discussion.

When you feel like you understand what equilibrium means for a salt dissolving in water, explain your understanding of equilibrium below, being sure to illustrate it with “test tube” size drawings and “close-up” views to show the ions and crystals. Some things (this is not a complete list, but the minimum) to address in your explanation are:

- a. In general terms, what the reactant is and what the products are when you put a salt in water.
- b. What would a test tube of the salt/water equilibrium look like?
- c. What is happening on a molecular scale when equilibrium is established?
- d. How does the speed at which you add the salt effect the equilibrium?
- e. How does the volume of water or amount of salt added affect the equilibrium?

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2. Play with the sim to determine the value of

- # of cations & anions at saturation
- molarity of each ion
- the equilibrium expression
- the  $K_{sp}$

for each salt listed below. Also, include the effect of varying volume upon the # ions at saturation.

a. strontium phosphate

b. silver bromide

c. your choice: \_\_\_\_\_

3. Write a paragraph that addresses these questions.

- a. How do your values compare to the published ones? Cite your references.
- b. How do the solubility rules relate to the  $K_{sp}$  values that you determined?
- c. How could you use  $K_{sp}$  values to predict solubility?