

Name _____

Bell _____

Learning to use Solubility Rules

Please define the following terms and give examples.

Soluble

Solute

Solvent

Insoluble

Teacher Checkpoint _____

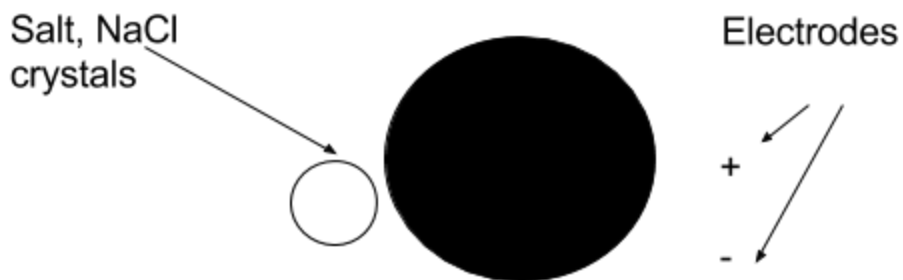
Examine the following “rules” . Use NaCl as an example and explain if it is soluble.

Solubility Rules

1. All alkali metal and NH_4^+ salts are soluble.
2. NO_3^- , $\text{C}_2\text{H}_3\text{O}_2^-$, ClO_3^- , and ClO_4^- salts are soluble.
3. Ag^+ , Pb^{2+} , and Hg_2^{2+} salts are insoluble.
4. Cl^- , Br^- , and I^- salts are soluble.
5. CO_3^{2-} , PO_4^{3-} , OH^- , S^{2-} and CrO_4^{2-} salts are insoluble.
6. SO_4^{2-} salts are soluble except for Ca^{2+} , Sr^{2+} , and Ba^{2+} .

1. Is NaCl soluble? How do you know?

2. Take a drop of distilled water, about the size of a nickel, and place it in the black dot when this sheet is in a protective sleeve. Check for conductivity. Then place a few crystals on of NaCl on one side and push them into the water. Slowly place the conductivity tester on the other side without electrodes touching each other and bring it towards the salt. What happens? How do the lights change as they get closer to the side of the salt?



Observations:

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3. Draw a model of what you think is happening at a particulate level that would account for your observations.

Model



Stop! Teacher checkpoint _____

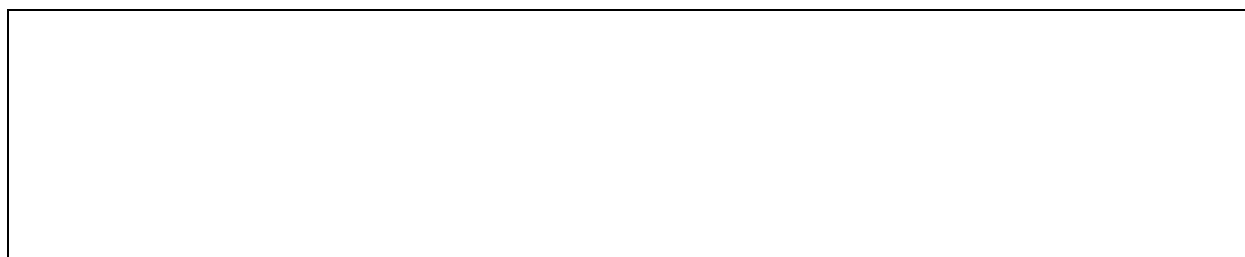
4. Go to "[Atomsmith](#)"

A. Click on "Models" and then "Live Lab".

B. Insert 2 "chloride ions" and 2 "sodium ions".

C. Click on "Simulation" and click "Start 100 ps".

What happened? Why?



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5. Go back to the “Box Builder” tab and click on “Add a water layer”.
Go back to “Simulation” and click on “Start 100 ps”. Stop after about 10 ps.
What did you observe?

What does it mean when an ionic solid is “soluble”?

Checkpoint _____

6. Examine the “Solubility Rules” for copper (II) sulfate, CuSO_4 , and sodium carbonate, Na_2CO_3 .

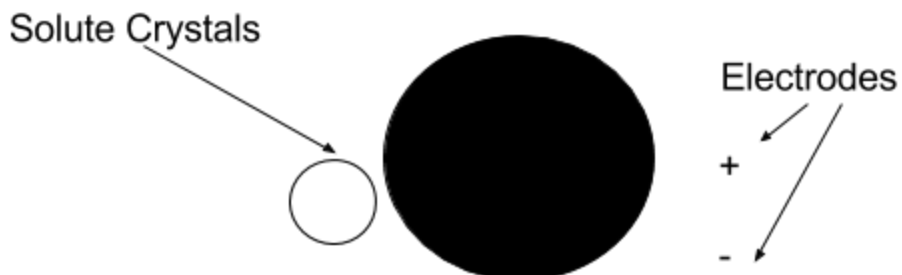
Soluble? _____ Not Soluble? _____

Would you predict them to behave similar to sodium chloride?

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7. Repeat the experiment in problem 2 for sodium carbonate and copper(II)sulfate. Record your observations.



Observations Sodium Carbonate	Copper(II)sulfate

8. Draw a model of sodium carbonate and copper(II) sulfate dissolved in water based on your observations. How is this similar to the NaCl experiment?

Observations Sodium Carbonate	Copper(II)sulfate

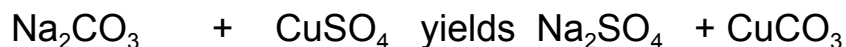
Checkpoint _____

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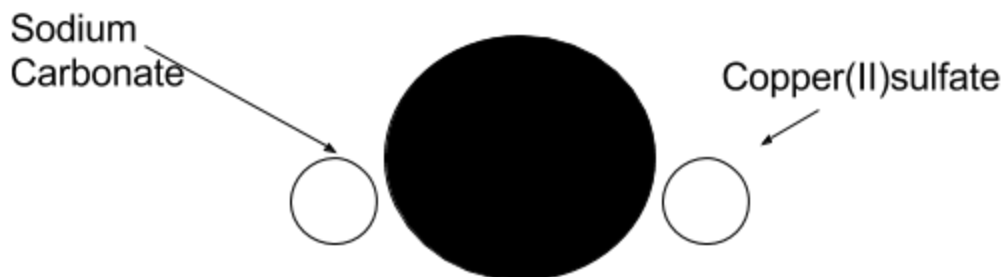
Putting it all together.

10 Balance the reaction:



B. Use the solubility rules to include state symbols. (aq) means soluble or dissolved. (s) means that a solid or precipitate forms.

11. Do a reaction. CAREFULLY place a few crystals of sodium carbonate on one side of the “puddle” and then copper(II)sulfate into the other side. Wait patiently and observe what happens.



Observations

What is the substance you observe? How do you know?

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