Science Mastery

Salts Worksheet

1. Write definitions for these key words:

   Soluble Dissolves in the solvent

   Insoluble Cannot dissolve in the solvent

2. Fill in the boxes below to describe **how a soluble salt dissolves in water**. You can use written sentences, diagrams, symbols, numbers and key words.

In this box, describe what you can **see**, **observe** and **experience** with your own eyes.

This box might include

- Description of dissolving in terms of what students can observe – the solid 'fades away' or seems to disappear. This happens faster when stirred or warmer water is used.
- Some salts dissolve in water while others are insoluble.
- In the case of copper oxide reacting with sulfuric acid, the black colour disappears while a blue colour appears as the reaction progresses.
- Salts are solid, crystalline looking substances.

In this box, describe what is happening to the atoms, molecules or particles **that are too small to see** with your own eyes.

This box might include

- Description of dissolving in terms of particle diagrams (see slide 6 of lesson_
- Solid salts have a regular particle arrangement (as with all solids) whereas when dissolved these particles spread out into the solution.

In this box, describe the **state symbols** that we can use as scientists to communicate this topic.

This box might include

- Chemical formulae for soluble salts
- (aq) or 'aqueous' in a chemical equation means 'dissolved' or 'in solution'. Before dissolving, salts will have an (s) to indicate they are solid.

3. Explain how dissolving is **different** to melting.
   - Melting is the change in state from a solid to a liquid whereas dissolving is a process where solute particles disperse throughout the solvent.
   - Melting only involves one substance whereas dissolving contains more than one substance, the solute(s) and the solvent.
   - Melting results in a liquid whereas dissolving results in a solution.

4. Use the table below to state whether the following salts a) to j) are soluble or insoluble. Use '**I**' for insoluble and '**S**' for soluble.

Soluble in water	Insoluble in water
All nitrates	
Most sulfates	Lead sulfate, barium sulfate
Most chlorides, bromides and iodides	Silver chloride, silver bromide, silver iodide, lead chloride, lead bromide, lead iodide
Sodium carbonate, potassium carbonate	Most other carbonates
Sodium hydroxide, potassium hydroxide	Most other hydroxides

a) Sodium bromide **S**
b) Sodium hydroxide **S**
c) Lead chloride **I**
d) Calcium sulfate **S**
e) Iron hydroxide **I**
f) Lead iodide **I**
g) Copper chloride **S**
h) Lithium carbonate **I**
i) Silver nitrate **S**
j) Sodium carbonate **S**

5. Complete the general word equations for these reactions:

Metal + acid ⟶ **salt** + **hydrogen**

Metal oxide + acid ⟶ **salt** + **water**

Metal hydroxide + acid ⟶ **salt** + **water**

Metal carbonate + acid ⟶ **salt** + **water** + **carbon dioxide**

6. A chemist needs to make copper chloride and water. Write a word equation to show a reaction that produces copper chloride and water.

Copper hydroxide + hydrochloric acid → copper chloride + water

Copper oxide + hydrochloric acid → copper chloride + water

7. Complete the symbol equations below. Make sure they are balanced.

(a) $CuO_{(s)}$ + **2** $HCL_{(aq)}$ ⟶ **$CuCl_{2\,(aq)}$ + $H_2O_{(l)}$**

(b) $ZnO_{(aq)}$ + $H_2SO_{4(aq)}$ ⟶ **$ZnSO_{4(aq)}$ + $H_2O_{(l)}$**

(c) **$CuO_{(s)}$ + $H_2SO_{4(aq)}$** ⟶ $CuSO_{4(aq)}$ + $H_2O_{(l)}$

(d) **$K_2CO_{3(aq)}$ + 2 $HNO_{3\,(aq)}$** ⟶ **2** $KNO_{3\,(aq)}$ + $H_2O_{(l)}$ + $CO_{2\,(g)}$

8. A student needs to show that an insoluble base can be used to produce a soluble salt. Using the information in Q4, write a word equation to show an example of this reaction.

Copper oxide + hydrochloric acid → copper chloride + water

Calcium carbonate + hydrochloric acid → calcium chloride + water + carbon

Magnesium hydroxide + nitric acid → magnesium nitrate + water