Soluble Salts

Answer the questions below.

1. Copy and complete this general equation for a neutralisation reaction

acid + alkali ⟶ salt + water

2. Name the products formed when nitric acid reacts with magnesium.

Magnesium nitrate and hydrogen

3. Name the products formed when hydrochloric acid reacts with sodium hydroxide.

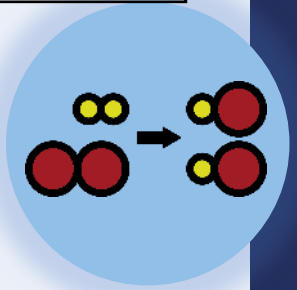
Sodium chloride and water

4. What pH range is alkaline?

pH 8 – pH 14

5. Link these symbol formulae to the correct names. HCl HNO_3 H_2SO_4

HNO_3	**Nitric acid**
HCl	**Hydrochloric acid**
H_2SO_4	**Sulfuric acid**

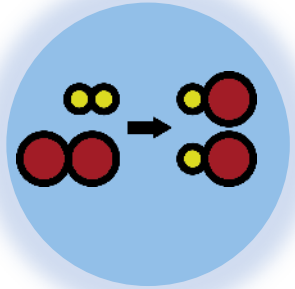


Do Now

Soluble Salts

C3.2.9

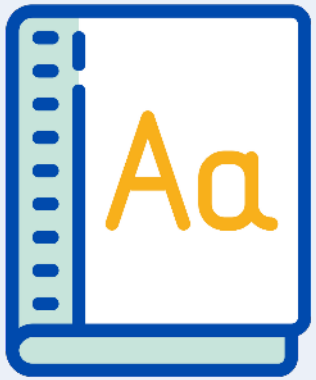
Science
Mastery



Following this lesson, students will be able to:

- Recall the difference between soluble and insoluble salts
- Describe dissolving in terms of particles
- Describe a chemical reaction to produce a soluble salt

Key Words:



soluble **insoluble** **dissolve**

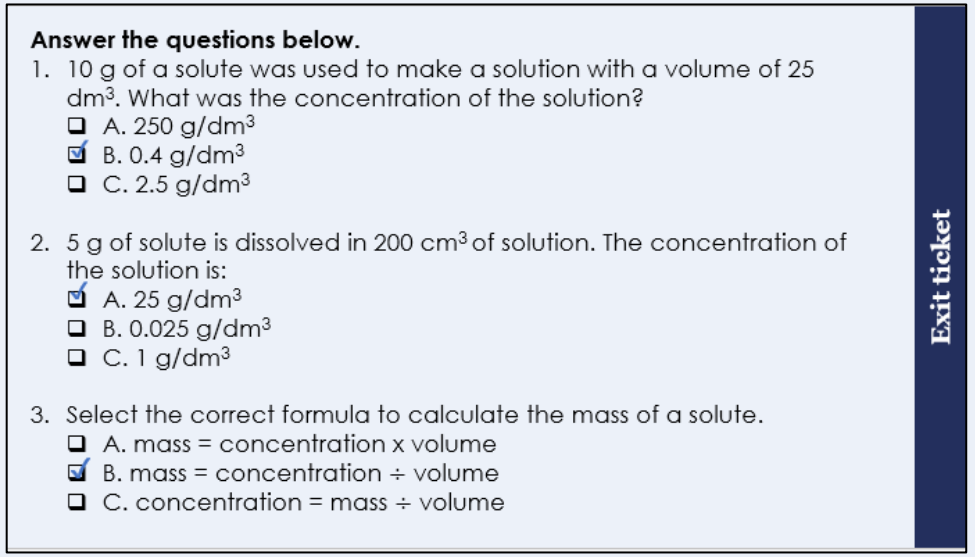
base **acid** **salt** **neutralisation**

Lesson Objectives

This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the previous lesson's exit ticket.

- The teacher should customise this slide as needed, to facilitate
  - **reteach**, **explanation, demonstration** or **modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key skills.
  - **redrafting** or **improving** previous work.



Answer the questions below.

1. 10 g of a solute was used to make a solution with a volume of 25 dm^3. What was the concentration of the solution?
   - ☐ A. 250 g/dm^3
   - ☑ B. 0.4 g/dm^3
   - ☐ C. 2.5 g/dm^3

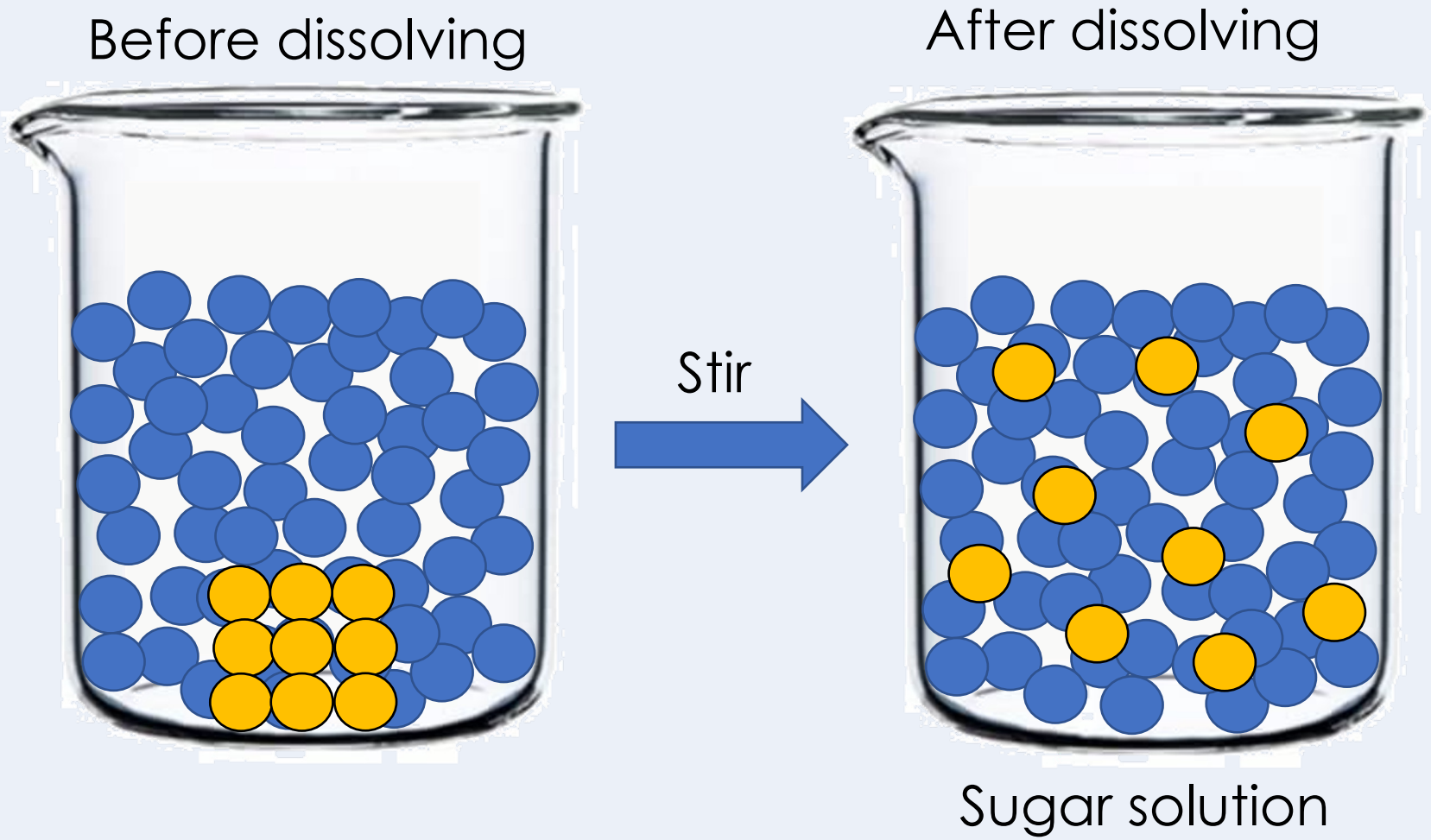
2. 5 g of solute is dissolved in 200 cm^3 of solution. The concentration of the solution is:
   - ☑ A. 25 g/dm^3
   - ☐ B. 0.025 g/dm^3
   - ☐ C. 1 g/dm^3

3. Select the correct formula to calculate the mass of a solute.
   - ☐ A. mass = concentration x volume
   - ☑ B. mass = concentration ÷ volume
   - ☐ C. concentration = mass ÷ volume

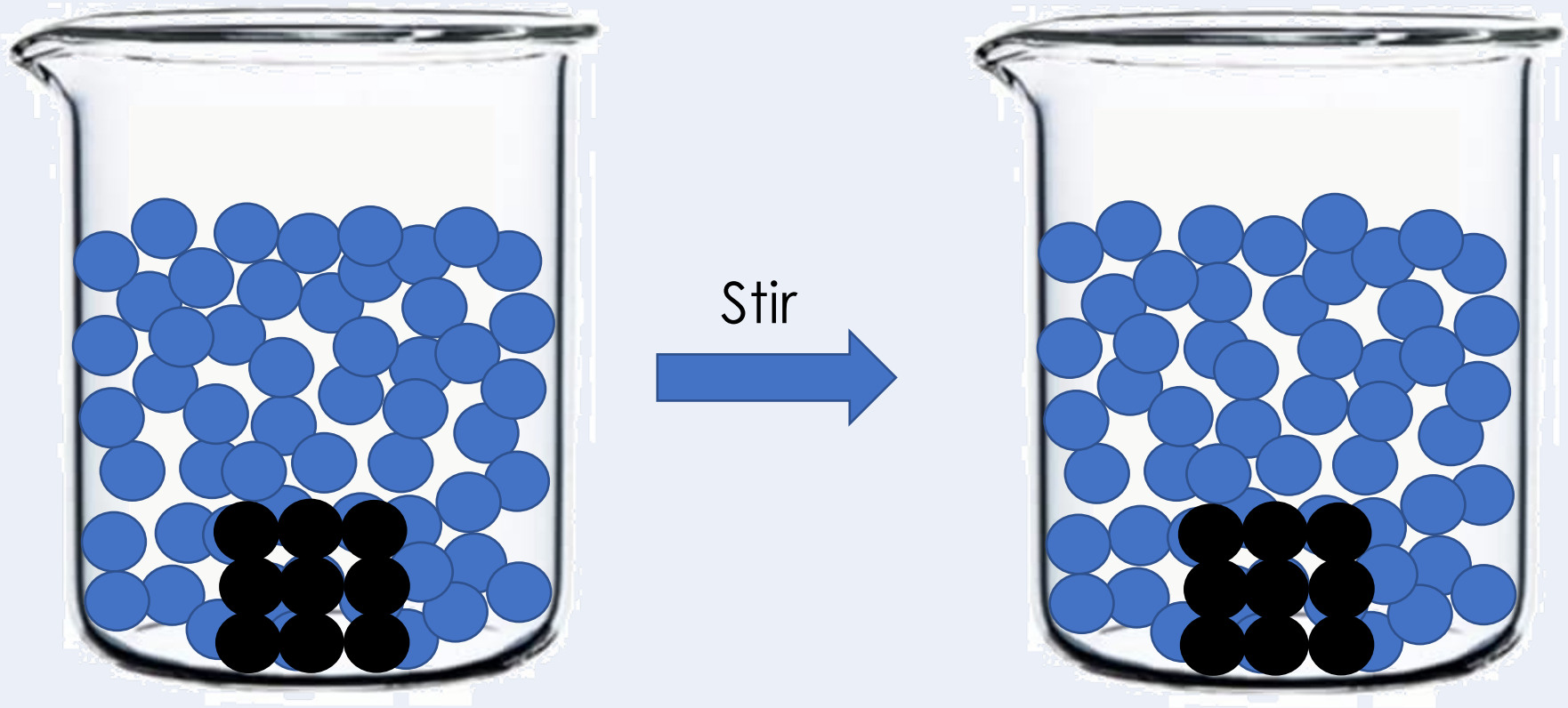
Exit ticket

Fix-it

What happens when a soluble substance dissolves?



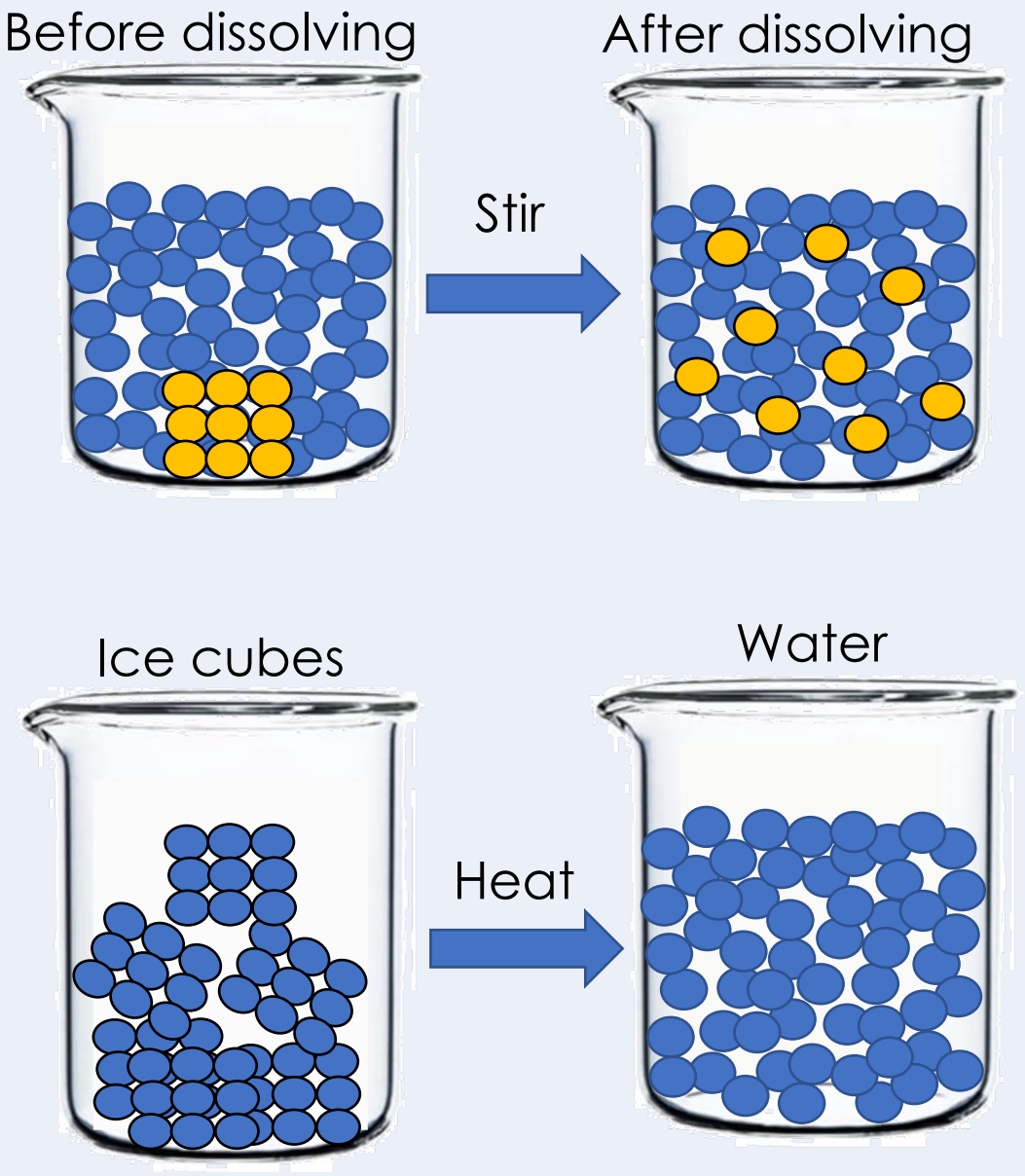
Insoluble substances



= a water particle

= a copper oxide particle

Comparing dissolving and melting



Use thumbs up or down to show if each statement is true or false. Rewrite the false statements to make them true.

1. Melting and dissolving are the same thing.
   Melting is the change in state from solid to liquid whereas dissolving is where solute particles disperse throughout the solvent.

2. Soluble salts can dissolve in water.

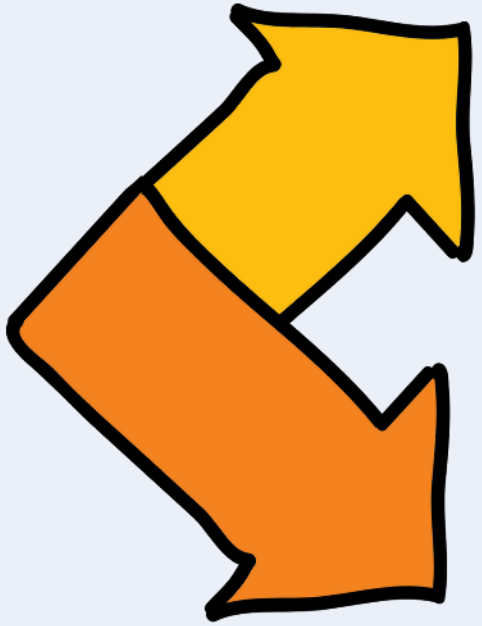
3. NaCl (l) means that the NaCl is dissolved in solution.
   (l) = liquid and (aq) = aqueous or in solution

4. If something cannot dissolve in water, then it is insoluble.

5. A solution is a mixture containing a solute dissolved in a solvent.

Check for understanding

Can you explain the difference between these two processes?



Melting

Dissolving

Talk Task

Is sodium hydroxide soluble?

Soluble in water	Insoluble in water
All nitrates Yes *e.g. calcium nitrate*	
Most sulfates Yes *e.g. magnesium sulfate*	**Lead sulfate, barium sulfate**
Most chlorides, bromides and iodides *e.g. sodium chloride, sodium bromide, sodium iodide*	**Silver chloride, silver bromide, silver iodide, lead chloride, lead bromide, lead iodide**
Sodium carbonate, potassium carbonate	**Most other carbonates** No
Sodium hydroxide, potassium hydroxide Yes	**Most other hydroxides**

Neutralisation reactions review

Acid + alkali → salt + water

Acid + base → salt + water

Alkali – neutralise acid, pH 8 – 14, soluble in water
Base – neutralise acid, pH 8 – 14, soluble **or** insoluble in water

Acid + metal oxide → salt + water

Acid + metal hydroxide → salt + water

Acid + metal carbonate → salt + water + carbon dioxide

I: Identifying soluble salts

Copper oxide and hydrochloric acid react to make a salt.

1. Name the salt produced.
   Copper chloride
2. Use the table below to determine whether this salt is soluble or insoluble.
   Soluble

Soluble in water	Insoluble in water
All nitrates *e.g. calcium nitrate*	
Most sulfates *e.g. magnesium sulfate*	**Lead sulfate, barium sulfate**
Most chlorides, bromides and iodides *e.g. sodium chloride, sodium bromide, sodium iodide* **Yes**	**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**

Apply

We: Identifying soluble salts

Barium hydroxide and sulfuric acid react to make a salt.

1. Name the salt produced.
   Barium sulfate
2. Use the table below to determine whether this salt is soluble or insoluble.
   Insoluble

Soluble in water	Insoluble in water
All nitrates *e.g. calcium nitrate*	
Most sulfates *e.g. magnesium sulfate*	**Lead sulfate, barium sulfate** Yes
Most chlorides, bromides and iodides *e.g. sodium chloride, sodium bromide, sodium iodide*	**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**

Apply

You: Identifying soluble salts

Potassium hydroxide and nitric acid react to make a salt.

1. Name the salt produced.
   Potassium nitrate
2. Use the table below to determine whether this salt is soluble or insoluble.
   Soluble

Soluble in water	Insoluble in water
All nitrates *e.g. calcium nitrate* **Yes**	
Most sulfates *e.g. magnesium sulfate*	**Lead sulfate, barium sulfate**
Most chlorides, bromides and iodides *e.g. sodium chloride, sodium bromide, sodium iodide*	**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 soluble salt can be made from an insoluble base in a neutralisation reaction

$$CuO_{(s)} + H_2SO_{4(aq)} \rightarrow CuSO_{4(aq)} + H_2O_{(l)}$$

Solid copper oxide solid	Sulfuric acid solution	Copper sulfate solution	Water

Hydrochloric acid forms -chlorides
Sulfuric acid forms -sulphates
Nitric acid forms -nitrates

Drill

1. What is a soluble salt?
2. What is an insoluble salt?
3. If you add 1 g of sugar to 20 g of water, the sugar dissolves. What would the mass be?
4. If you see $KCl_{(aq)}$ what does it mean?
5. What is the difference between melting and dissolving?
6. What is a soluble base called?
7. The soluble salt made from insoluble copper oxide and nitric acid is called…
8. The soluble salt made from insoluble copper oxide and hydrochloric acid is called…
9. The soluble salt made from insoluble copper oxide and sulfuric acid is called…
10. How might you make calcium chloride and water?

Check for understanding

Drill answers

1. A salt that can dissolve in water
2. An insoluble salt is one that cannot dissolve in water
3. 21 grams as the particles have been added together
4. Potassium chloride has dissolved in water
5. Melting when you have a change of state from solid to liquid and dissolving is when a solute's particles disperses into a solvent
6. A soluble base is called an alkali
7. Copper oxide and nitric acid make copper nitrate
8. Copper oxide and hydrochloric acid make copper chloride
9. Copper oxide and sulfuric acid make copper sulfate
10. You can make calcium chloride and water by reacting calcium hydroxide and hydrochloric acid

Check for understanding

Answer the questions below.

1. Choose the correct general word equation.
   - ❑ A. Acid + base → salt + water
   - ❑ B. Acid + metal hydroxide → salt + water
   - ☑ C. Both A and B are correct

2. Nitric acid produces…
   - ☑ A. nitrates.
   - ❑ B. nitrides.
   - ❑ C. nitrites.

3. Choose the correct reactants that would produce calcium nitrate and water.
   - ❑ A. Calcium hydroxide + hydrochloric acid
   - ❑ B. Calcium + hydrochloric acid
   - ☑ C. Calcium hydroxide + nitric acid
   - ❑ D. Calcium + nitric acid

Check for understanding

Answer the questions below.

1. An insoluble salt…
   - ☐ A. dissolves in water to form a solution.
   - ☑ B. cannot dissolve in water.
   - ☐ C. are alkalis.

2. Copper sulphate is a salt. Which of the following would **not** be involved in a reaction to make copper sulfate.
   - ☑ A. Hydrochloric acid
   - ☐ B. Copper oxide
   - ☐ C. Sulfuric acid

3. Which is true of an aqueous solution of copper sulfate?
   - ☐ A. It is molten (melted) copper sulfate salt
   - ☑ B. It is copper sulfate dissolved in water
   - ☐ C. Answers A and B are the same thing.

Exit ticket

Feedback

Lesson C3.2.9	
What was good about this lesson?	What can we do to improve this lesson?

Send us your feedback by clicking this link
or by emailing sciencemastery@arkonline.org
Thank you!