

LESSON
83

CLASSWORK

Is It Toxic? Mystery Solutions

Name _____

Date _____ Period _____

Purpose

To use molarity calculations to identify several solutions.

Part 1: Which Solution Is Which?

1. Containers 1, 2, and 3 all hold 1.0 M solutions. One solution is sodium hydroxide, NaOH; another is sodium bromide, NaBr; and the third is potassium chloride, KCl. Which solution is which container?
2. Briefly describe the method you used to determine the identities of the solutions.

Part 2: Is the Solution Toxic?

1. A description of the toxicity of each of the three mystery solutes is given below, along with the toxicity of sodium chloride (NaCl, or table salt). Based on the LD₅₀, place the four ionic compounds in order of toxicity from least toxic to most toxic. (Remember: The smaller the LD₅₀, the more toxic the substance.)

Toxicities of Four Ionic Compounds

Sodium chloride (NaCl)

Toxicological data: LD₅₀ (rat, oral) = 3.0 g/kg. Very large doses can cause vomiting and diarrhea. Dehydration and congestion occur in most internal organs.

Potassium chloride (KCl)

Toxicological data: LD₅₀ (rat, oral) = 2.6 g/kg. Very large doses can cause vomiting and diarrhea. Dehydration and congestion occur in most internal organs.

Sodium bromide (NaBr)

Toxicological data: LD₅₀ (rat, oral) = 3.5 g/kg. May cause nausea, vomiting, and abdominal pain. Symptoms may include skin rash, blurred vision, drowsiness, irritability, dizziness, mania, hallucinations, and coma.

Sodium hydroxide (NaOH)

Toxicological data: LD₅₀ (rat, oral) = 0.040 g/kg. Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. May cause severe and permanent damage to the digestive tract. Causes severe pain, nausea, vomiting, diarrhea, and shock.

2. Use the molar mass of each of the four compounds (including NaCl) to convert the LD_{50} from grams per kilogram to moles per kilogram.

3. Place the four compounds in order of toxicity based on the number of moles per kilogram, from least toxic to most toxic.

4. Did the order of toxicity change when you converted to moles per kilogram? Explain.

5. What volume of a 1.0 M solution of NaOH would be lethal for a 2 kg animal?

6. What volume of 1.0 M NaCl solution would likely be lethal for a 60 kg person?

7. **Making Sense** Examine the lethal dose information again.
 - a. Which solution would be most harmful to drink? Which would be least harmful to drink? Explain your thinking.

 - b. Does your answer to Part A agree with your answers to Questions 1 and 3?

8. **If You Finish Early** What volume of a 2.0 M NaOH solution would be lethal for a 60 kg person? (LD_{50} NaOH = 0.0010 mol/kg)