LESSON MAKER PRO

Solution Strength Lab

Calculate how much solute is in a solution.

HIGH SCHOOL · CHE.8.1

CHE.8.1 "Use mathematical and computational analysis to quantitatively express the concentration of solutions using concepts such as molarity, percent by mass, and dilution."

NAME _____ DATE _____

THREE WAYS TO MEASURE

To find molarity (M), divide moles of solute by liters of solution. If you know the solute's mass in grams, divide by its molar mass to find moles. Percent by mass is (mass of solute / mass of solution) x 100%; when you dilute a solution, $M_1V_1 = M_2V_2$.

WORKED EXAMPLE

A solute has a molar mass of 45 g/mol. What is the molarity when 9 g of it is dissolved to make 0.80 L of solution?

1. Moles of solute = 9 g / (45 g/mol) = 0.20 mol.
2. Molarity = 0.20 mol / 0.80 L = 0.25 M.

Answer: 0.25 M

PRACTICE 6 problems

1 A solute has a molar mass of 20 g/mol. Find the molarity of a solution containing 4.0 g of solute in 0.50 L of solution.

ANSWER _____

2 A solute has a molar mass of 60 g/mol. Find the molarity of a solution containing 12 g of solute in 0.10 L of solution.

ANSWER _____

3 Find the percent by mass of a solution made with 5 g of solute and enough solvent to make 100 g of solution.

ANSWER _____

4 A solution contains 18 g of solute and 72 g of solvent. Find its percent by mass.

ANSWER _____

5 You dilute 20 mL of a 3.0 M solution to a final volume of 60 mL. Find the new molarity.

ANSWER _____

6 How many mL of a 2.0 M stock solution do you need to make 200 mL of a 0.50 M solution?

ANSWER _____

APPLY IT Show your work

1 A sports drink contains 6 g of dissolved sugar in 150 g of drink. What is its percent sugar by mass?

WORK SPACE

ANSWER _____

2 A science club is making saltwater for an LED conductivity test. How many mL of 1.5 M NaCl stock solution are needed to make 300 mL of 0.30 M solution?

WORK SPACE

ANSWER _____

CHALLENGE One step up

You need 300 mL of 0.20 M glucose solution. You have 1.0 M glucose stock. How many mL of stock do you need, and how many grams of glucose will be in the final solution? Use a molar mass of 180 g/mol.

WORK SPACE AND ANSWER

Solution Strength Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A solute has a molar mass of 20 g/mol. Find the molarity of a solution containing 4.0 g of solute in 0.50 L of solution.	**0.40 M**
2	A solute has a molar mass of 60 g/mol. Find the molarity of a solution containing 12 g of solute in 0.10 L of solution.	**2 M**
3	Find the percent by mass of a solution made with 5 g of solute and enough solvent to make 100 g of solution.	**5%**
4	A solution contains 18 g of solute and 72 g of solvent. Find its percent by mass.	**20%**
5	You dilute 20 mL of a 3.0 M solution to a final volume of 60 mL. Find the new molarity.	**1.0 M**
6	How many mL of a 2.0 M stock solution do you need to make 200 mL of a 0.50 M solution?	**50 mL**

PART 2 · APPLY IT

1. **4%** Divide 6 g by the total mass, 150 g, then multiply by 100%.
2. **60 mL** Use $M_1V_1 = M_2V_2$. V_1 = (0.30 M x 300 mL) / 1.5 M = 60 mL.

CHALLENGE

60 mL of stock; 10.8 g of glucose. Stock volume = (0.20 M x 300 mL) / 1.0 M = 60 mL. Glucose mass = 0.20 mol/L x 0.300 L x 180 g/mol = 10.8 g.

Accept equivalent concentrations, such as 0.4 M for 0.40 M. In the challenge, the grams of glucose come from the final solution volume, not the volume of stock.