LESSON MAKER PRO

Mix It Right

Calculate concentration and plan solutions.

HIGH SCHOOL · CHE.5

CHE.5 "Obtain, evaluate, and communicate information concerning factors that affect solubility and the properties of solutions. a. Use mathematics and computational thinking to express the concentrations of given solutions in terms of molarity..."

NAME _____ **DATE** _____

MOLES AND VOLUME

Molarity (M) is the moles of dissolved solute divided by the final volume of solution in liters. To find moles from a solid, divide its mass by its molar mass. When you dilute a solution, the amount of solute stays the same, so $M_1V_1 = M_2V_2$.

WORKED EXAMPLE

What is the molarity of a solution containing 0.24 mol of solute in a final volume of 800 mL?

1. Convert the volume: 800 mL / 1,000 = 0.800 L.
2. Divide moles by liters: 0.24 mol / 0.800 L = 0.30 M.

Answer: 0.30 M

PRACTICE 6 problems

1 What is the molarity of 0.40 mol of solute in 2.0 L of solution?

ANSWER _____

2 What is the molarity of 0.15 mol of solute in 250 mL of solution?

ANSWER _____

3 What is the molarity of 1.2 mol of solute in 3.0 L of solution?

ANSWER _____

4 You dissolve 4.0 g of NaOH (molar mass 40 g/mol) and add water until the final volume is 500 mL. What is the molarity?

ANSWER _____

5 How many moles of KCl do you need to make 250 mL of a 0.40 M solution?

ANSWER _____

6 How many milliliters of a 2.0 M stock solution do you need to make 100 mL of a 0.50 M solution?

ANSWER _____

APPLY IT Show your work

1 To test whether salt water leaves marks on phone cases, you dissolve 11.7 g of NaCl (molar mass 58.5 g/mol) and add water until the final solution volume is 400 mL. What is the molarity?

WORK SPACE

ANSWER _____

2 For a school lab on freezing, you need 300 mL of 0.50 M NaCl solution. How many milliliters of 2.0 M NaCl stock solution should you dilute to a final volume of 300 mL?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two students aim to make 200 mL of 0.50 M NaCl solution. Student A dissolves 5.85 g of NaCl (molar mass 58.5 g/mol) and adds water until the final volume is 200 mL. Student B dilutes 40 mL of 2.0 M NaCl stock to a final volume of 200 mL. Do both reach the target molarity? Show both calculations.

WORK SPACE AND ANSWER

Mix It Right

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	What is the molarity of 0.40 mol of solute in 2.0 L of solution?	**0.20 M**
2	What is the molarity of 0.15 mol of solute in 250 mL of solution?	**0.60 M**
3	What is the molarity of 1.2 mol of solute in 3.0 L of solution?	**0.40 M**
4	You dissolve 4.0 g of NaOH (molar mass 40 g/mol) and add water until the final volume is 500 mL. What is the molarity?	**0.20 M**
5	How many moles of KCl do you need to make 250 mL of a 0.40 M solution?	**0.10 mol**
6	How many milliliters of a 2.0 M stock solution do you need to make 100 mL of a 0.50 M solution?	**25 mL**

PART 2 · APPLY IT

1. **0.50 M** 11.7 g / 58.5 g/mol = 0.20 mol. Then 0.20 mol / 0.400 L = 0.50 M.
2. **75 mL** Use $M_1V_1 = M_2V_2$. The stock volume is (0.50 M × 300 mL) / 2.0 M = 75 mL.

CHALLENGE

No. Student A: 5.85 g / 58.5 g/mol = 0.10 mol, and 0.10 mol / 0.200 L = 0.50 M. Student B: (2.0 M × 40 mL) / 200 mL = 0.40 M. Only Student A reaches the target.

Accept equivalent expressions with correct units. For dilution problems, stock and final volumes may both be in milliliters because the units cancel.