LESSON MAKER PRO

Mix It Right

Track concentration as you dilute a solution.

HIGH SCHOOL · CHE.8.5

CHE.8.5 "Use mathematical and computational analysis to analyze molarity, molality, dilution, and percentage dilution problems."

NAME _____ **DATE** _____

DILUTION RULES

Molarity, M, is moles of solute per liter of solution. Adding water changes the volume but not the amount of solute, so Mstock × Vstock = Mfinal × Vfinal. On this page, percentage dilution means the percent of the final volume that came from the stock solution: (Vstock/Vfinal) × 100%.

WORKED EXAMPLE

A student dilutes 40 mL of a 3.0 M stock solution to a final volume of 120 mL. What is the final molarity?

1. Write the dilution equation: Mstock × Vstock = Mfinal × Vfinal.
2. Substitute: 3.0 M × 40 mL = Mfinal × 120 mL.
3. Divide: Mfinal = (3.0 × 40)/120 M = 1.0 M.

Answer: 1.0 M

PRACTICE 6 problems

1 You dilute 25 mL of a 2.0 M solution to a final volume of 100 mL. What is the final molarity?

ANSWER _____

2 How many milliliters of a 4.0 M stock solution do you need to make 200 mL of a 0.50 M solution?

ANSWER _____

3 You start with 20 mL of a 5.0 M solution. What final volume will give you a 2.0 M solution?

ANSWER _____

4 You dilute 10 mL of stock solution to a final volume of 50 mL. What is the percentage dilution, as defined in the concept box?

ANSWER _____

5 You dilute 10 mL of an 8.0 M stock solution to a final volume of 50 mL. Find the final molarity and the percentage dilution.

ANSWER _____

6 You add 50 mL of water to 25 mL of a 6.0 M solution. What is the final molarity? Assume the volumes add.

ANSWER _____

APPLY IT Show your work

1 A robotics team needs 250 mL of a 0.20 M NaCl solution to test a conductivity sensor. The team has a 2.0 M NaCl stock solution. How many milliliters of stock and how many milliliters of water should they use? Assume the volumes add.

WORK SPACE

ANSWER _____

2 A student team tests a conductivity sensor by adding 50 mL of a 0.80 M NaCl stock solution to 150 mL of water. What is the final molarity, and what is the percentage dilution? Assume the volumes add.

WORK SPACE

ANSWER _____

CHALLENGE One step up

You dilute 25 mL of an 8.0 M stock solution to 100 mL. Then you take 20 mL of that new solution and dilute it to 80 mL. What is the final molarity? What percentage of the last solution's volume came from the original stock? Show how you found both answers.

WORK SPACE AND ANSWER

Mix It Right

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	You dilute 25 mL of a 2.0 M solution to a final volume of 100 mL. What is the final molarity?	**0.50 M**
2	How many milliliters of a 4.0 M stock solution do you need to make 200 mL of a 0.50 M solution?	**25 mL**
3	You start with 20 mL of a 5.0 M solution. What final volume will give you a 2.0 M solution?	**50 mL**
4	You dilute 10 mL of stock solution to a final volume of 50 mL. What is the percentage dilution, as defined in the concept box?	**20%**
5	You dilute 10 mL of an 8.0 M stock solution to a final volume of 50 mL. Find the final molarity and the percentage dilution.	**1.6 M; 20%**
6	You add 50 mL of water to 25 mL of a 6.0 M solution. What is the final molarity? Assume the volumes add.	**2.0 M**

PART 2 · APPLY IT

1. **25 mL of stock and 225 mL of water** Vstock = (0.20 M × 250 mL)/2.0 M = 25 mL. Subtract from the final volume to get 225 mL of water.
2. **0.20 M; 25%** The final volume is 200 mL, so Mfinal = (0.80 M × 50 mL)/200 mL = 0.20 M. The stock makes up (50/200) × 100% = 25% of the final volume.

CHALLENGE

The first dilution gives (8.0 M × 25 mL)/100 mL = 2.0 M, and the second gives (2.0 M × 20 mL)/80 mL = 0.50 M. The original stock makes up (25/100) × (20/80) × 100% = 6.25% of the last solution.

Accept equivalent decimal forms of the molarities. For the challenge, accept 6.25% found by dividing the final molarity by the original stock molarity.