Solutions on Target

Plan and report two ways to prepare a solution

CHE.8.6 "Design, conduct, and communicate the results of experiments to produce a specified volume of a solution of a specific molarity, and dilute a solution of a known molarity."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the numbers needed to plan each solution, circle the equipment that sets each final volume, and number the solid-solution preparation steps in order. Use your marks to check the plans and results.

Preparing Solutions for a Conductivity Test

1. A chemistry lab needs 100.0 mL of 0.200 M sodium chloride, NaCl, for a conductivity test. Solid NaCl has a molar mass of 58.44 g/mol. Molarity means moles of dissolved substance per liter of finished solution. A balance, beaker, funnel, and 100.0 mL volumetric flask are available. Clean water is used throughout.

2. To prepare a solution from a solid, first dissolve the measured solid in less water than the final volume. Transfer it to a volumetric flask, rinse the beaker into the flask, and fill to the mark. Stopper and invert several times. Adding 100.0 mL of water to the solid would make the final volume too large.

3. For a second test, the lab needs 50.0 mL of 0.100 M NaCl from a 0.500 M stock solution. A 10.0 mL volumetric pipette and a 50.0 mL volumetric flask are available. Three possible stock volumes appear below. Each is diluted to 50.0 mL. To report a dilution, give the transferred stock volume, final volume, and calculated concentration.

POSSIBLE DILUTION PLANS

Plan	Stock used (mL)	Final volume (mL)	Calculated molarity (M)
A	8.0	50.0	0.080
B	10.0	50.0	0.100
C	12.0	50.0	0.120

2 ANSWER WITH EVIDENCE

Use the passage

1. What mass of solid NaCl is needed for the first solution? Show your calculation.

2. After measuring that mass, how would you prepare the first solution so its final volume is 100.0 mL?

3. Which dilution plan meets the second test's target? Use the stock concentration and volumes to check its calculated molarity.

4. If 12.0 mL of stock is diluted to 50.0 mL, what concentration should be reported? How far is it from the target?

3 YOUR TURN

Your own words

Design a dilution of 0.400 M NaCl stock to make 250.0 mL of 0.0800 M NaCl. Show the stock-volume calculation, describe how you would use a pipette and volumetric flask to prepare it, and state the concentration you would report if you followed your plan.

Solutions on Target

PART 1 · READ AND MARK

Underline the numbers needed to plan each solution, circle the equipment that sets each final volume, and number the solid-solution preparation steps in order. Use your marks to check the plans and results. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What mass of solid NaCl is needed for the first solution? Show your calculation.	**0.200 mol/L × 0.1000 L × 58.44 g/mol = 1.1688 g, or 1.17 g NaCl.**
2	After measuring that mass, how would you prepare the first solution so its final volume is 100.0 mL?	**Dissolve the NaCl in less than 100.0 mL of water. Transfer it to the 100.0 mL volumetric flask, rinse the beaker into the flask, fill to the mark, stopper, and invert to mix.**
3	Which dilution plan meets the second test's target? Use the stock concentration and volumes to check its calculated molarity.	**Plan B. (0.500 M × 10.0 mL) ÷ 50.0 mL = 0.100 M.**
4	If 12.0 mL of stock is diluted to 50.0 mL, what concentration should be reported? How far is it from the target?	**Report 0.120 M, as shown in plan C. It is 0.020 M above the 0.100 M target.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Stock volume = (0.0800 M × 250.0 mL) ÷ 0.400 M = 50.0 mL. I would use a pipette to transfer 50.0 mL of stock into a 250.0 mL volumetric flask. I would add water to the mark, stopper the flask, and invert it to mix. I would report a final volume of 250.0 mL and a calculated concentration of 0.0800 M.

Accept equivalent calculations with consistent volume units. The Your Turn response must dilute to a total volume of 250.0 mL, not add 250.0 mL of water.