LESSON MAKER PRO

Mix It Right

Calculate what you need before making a solution.

HIGH SCHOOL · CHE.5.c

CHE.5.c "Use mathematics and computational thinking to prepare solutions from both solids and concentrated solutions when given a desired molarity and volume."

NAME _____ DATE _____

TWO WAYS TO START

When you start with a solid, multiply the desired molarity by the final volume in liters to find moles. Then multiply by molar mass to find grams. When you start with a concentrated solution, use $M_1V_1 = M_2V_2$ to find the volume of stock to use. In either case, add solvent until the solution reaches the desired final volume.

WORKED EXAMPLE

How many grams of NaCl (58.5 g/mol) are needed to make 200 mL of 0.30 M NaCl solution?

1. Convert the final volume: 200 mL = 0.200 L.
2. Find moles: 0.30 mol/L × 0.200 L = 0.060 mol.
3. Find mass: 0.060 mol × 58.5 g/mol = 3.51 g.

Answer: 3.51 g NaCl

PRACTICE 6 problems

1 How many grams of NaOH (40.0 g/mol) are needed to make 100 mL of 0.50 M solution?

ANSWER _____

2 How many grams of KCl (74.5 g/mol) are needed to make 500 mL of 0.20 M solution?

ANSWER _____

3 How many grams of glucose (180 g/mol) are needed to make 250 mL of 0.10 M solution?

ANSWER _____

4 How many milliliters of 2.0 M HCl stock are needed to make 250 mL of 0.40 M HCl?

ANSWER _____

5 How many milliliters of 1.2 M $CuSO_4$ stock are needed to make 300 mL of 0.40 M $CuSO_4$?

ANSWER _____

6 How many milliliters of 4.0 M NaCl stock are needed to make 150 mL of 0.80 M NaCl?

ANSWER _____

APPLY IT Show your work

1 A student is testing how glucose affects yeast growth for a science fair. They need 250 mL of 0.20 M glucose solution. How many grams of glucose (180 g/mol) should they weigh?

WORK SPACE

ANSWER _____

2 For an LED conductivity display, a student needs 400 mL of 0.15 M NaCl solution. They have 1.2 M NaCl stock. How many milliliters of stock should they use before adding water to reach the final volume?

WORK SPACE

ANSWER _____

CHALLENGE One step up

You need 250 mL of 0.60 M KCl solution. You have 100 mL of 1.0 M KCl stock and solid KCl (74.5 g/mol). If you use all the stock, how many grams of solid KCl must you add before bringing the solution to a final volume of 250 mL? Show the moles needed and the moles supplied by the stock.

WORK SPACE AND ANSWER

Mix It Right

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	How many grams of NaOH (40.0 g/mol) are needed to make 100 mL of 0.50 M solution?	**2.00 g NaOH**
2	How many grams of KCl (74.5 g/mol) are needed to make 500 mL of 0.20 M solution?	**7.45 g KCl**
3	How many grams of glucose (180 g/mol) are needed to make 250 mL of 0.10 M solution?	**4.5 g glucose**
4	How many milliliters of 2.0 M HCl stock are needed to make 250 mL of 0.40 M HCl?	**50 mL of stock**
5	How many milliliters of 1.2 M $CuSO_4$ stock are needed to make 300 mL of 0.40 M $CuSO_4$?	**100 mL of stock**
6	How many milliliters of 4.0 M NaCl stock are needed to make 150 mL of 0.80 M NaCl?	**30 mL of stock**

PART 2 · APPLY IT

1. **9.0 g glucose** The solution needs 0.20 mol/L × 0.250 L = 0.050 mol. Multiply by 180 g/mol to get 9.0 g.
2. **50 mL of stock** Use $M_1V_1 = M_2V_2$. The stock volume is (0.15 M × 400 mL) / 1.2 M = 50 mL.

CHALLENGE

Moles needed: 0.60 mol/L × 0.250 L = 0.150 mol. Moles from stock: 1.0 mol/L × 0.100 L = 0.100 mol. Solid needed: (0.150 − 0.100) mol × 74.5 g/mol = 3.725 g KCl.

Accept equivalent numerical forms with correct units. For stock-solution problems, students should add solvent to the stated final volume, not add a fixed volume of solvent.