

Molarity Worksheet

1. Sea water contains roughly 28.0 g of NaCl per liter. What is the molarity of sodium chloride in sea water?
2. What is the molarity of 245.0 g of H₂SO₄ dissolved in 1.00 L of solution?
3. What is the molarity of 5.30 g of Na₂CO₃ dissolved in 400.0 mL solution?
4. What is the molarity of 5.00 g of NaOH in 750.0 mL of solution?
5. How many moles of Na₂CO₃ are there in 10.0 L of 2.0 M solution?
6. How many moles of Na₂CO₃ are in 10.0 mL of a 2.0 M solution?
7. How many moles of NaCl are contained in 100.0 mL of a 0.20 M solution?
8. What weight (in grams) of NaCl would be contained in problem 7?
9. What weight (in grams) of H₂SO₄ would be needed to make 750.0 mL of 2.00 M solution?
10. What volume (in mL) of 18.0 M H₂SO₄ is needed to contain 2.45 g H₂SO₄?
11. What volume (in mL) of 12.0 M HCl is needed to contain 3.00 moles of HCl?
12. How many grams of Ca(OH)₂ are needed to make 100.0 mL of 0.250 M solution?
13. What is the molarity of a solution made by dissolving 20.0 g of H₃PO₄ in 50.0 mL of solution?
14. What weight (in grams) of KCl is there in 2.50 liters of 0.50 M KCl solution?
15. What is the molarity of a solution containing 12.0 g of NaOH in 250.0 mL of solution?
16. Determine the molarity of these solutions:
 - a) 4.67 moles of Li₂SO₃ dissolved to make 2.04 liters of solution.
 - b) 0.629 moles of Al₂O₃ to make 1.500 liters of solution.
 - c) 4.783 grams of Na₂CO₃ to make 10.00 liters of solution.
 - d) 0.897 grams of (NH₄)₂CO₃ to make 250 mL of solution.
 - e) 0.0348 grams of PbCl₂ to form 45.0 mL of solution.
17. Determine the number of moles of solute to prepare these solutions:
 - a) 2.35 liters of a 2.00 M Cu(NO₃)₂ solution.
 - b) 16.00 mL of a 0.415-molar Pb(NO₃)₂ solution.
 - c) 3.00 L of a 0.500 M MgCO₃ solution.
 - e) 6.20 L of a 3.76-molar Na₂O solution.
18. Determine the grams of solute to prepare these solutions:
 - a) 0.289 liters of a 0.00300 M Cu(NO₃)₂ solution.
 - b) 16.00 milliliters of a 5.90-molar Pb(NO₃)₂ solution.
 - c) 508 mL of a 2.75-molar NaF solution.
 - d) 6.20 L of a 3.76-molar Na₂O solution.
 - e) 0.500 L of a 1.00 M KCl solution.
 - f) 4.35 L of a 3.50 M CaCl₂ solution.
19. Determine the final volume of these solutions:
 - a) 4.67 moles of Li₂SO₃ dissolved to make a 3.89 M solution.
 - b) 4.907 moles of Al₂O₃ to make a 0.500 M solution.
 - c) 0.783 grams of Na₂CO₃ to make a 0.348 M solution.
 - d) 8.97 grams of (NH₄)₂CO₃ to make a 0.250-molar solution.
 - e) 48.00 grams of PbCl₂ to form a 5.0-molar solution.

Compound	Molar mass	Mass of solute	Moles of solute	Volume of solution	Molarity
HCl	36.46	26.0		0.600	
H ₂ SO ₄	98.07	62.0		1.00	
HC ₂ H ₃ O ₂	60.05	100.0		1.200	
H ₃ PO ₄		75.0		0.750	
CaO		48.0		0.250	
Mg(OH) ₂		25.0		100.0 mL	
HBr			0.990	0.500	
NaOH		80.0			3.30
KOH			0.450		0.820
Na ₂ CrO ₄		22.0			0.400
KMnO ₄				2.50	0.300
Al ₂ (SO ₄) ₃			0.500		0.500
(NH ₄) ₂ SO ₄			0.500	525 mL	
CuNH ₄ (NO ₃) ₃		125.0			0.375
NaHCO ₃			1.50		0.525
K ₂ Cr ₂ O ₇	294.18			375 mL	0.800

Dilution Problems

Remember that moles = moles, so $M_1V_1 = M_2V_2$.

1. A solution of 1.00 M NaCl is available. How many milliliters of this solution are needed to make a total of 100.0 mL of 0.750 M NaCl solution.
2. What volume of 0.250 M KCl is needed to make 100.0 mL of 0.100 M KCl solution?
3. Concentrated H_2SO_4 is 18.0 M. What volume of 18 M solution is needed to make 2.00 L of 1.00 M H_2SO_4 solution?
4. Concentrated HCl is 12.0 M. What volume of 12 M solution is needed to make 2.00 L of 1.00 M HCl solution?
5. A solution of 10.0 M NaOH is prepared. From this solution, you need to make 250.0 mL of 0.375 M NaOH solution. How many mL will be required?
6. A solution of 6.00 M KOH is prepared. From this solution, you need to make 250.0 mL of 0.875 M solution. How many mL will be required?
7. 2.00 L of 0.800 M $NaNO_3$ must be prepared from a solution which 1.50 M in concentration. How many mL of the 1.50 M are required?
8. 2.00 L of 0.800 M KNO_3 must be prepared from a solution which 1.50 M in concentration. How many mL of the 1.50 M are required?
9. A 0.500 M solution is to be diluted to 500.0 mL with the new concentration to be 0.150 M. How many mL of the 0.500 M solution are required?

These two are a bit more difficult. Hint - calculate the total moles present and the total volume the moles are dissolved in.

10. Calculate the final concentration if 2.00 L of 3.00 M NaCl and 4.00 L of 1.50 M NaCl are mixed.
11. Calculate the final concentration if 2.00 L of 3.00 M NaCl, 4.00 L of 1.50 M NaCl and 4.00 L of water are mixed.

More Solution Problems (included for future reference, not required as HW)

1. Write a balanced equation for the dissolving of potassium chloride (KCl) in water. (KCl ionizes.)
2. When 4.00 grams of potassium chloride dissolve, how many moles of the solid dissolve?
3. How many moles of potassium ions dissolve in question 2?
4. Determine the total number of moles of ions that are formed in question 2.
5. Write a balanced equation for the dissolving of magnesium chloride ($MgCl_2$) in water. ($MgCl_2$ ionizes.)
6. When 44.00 grams of magnesium chloride dissolve, how many moles of the solid dissolve?
7. How many moles of chloride ions dissolve in question 6?
8. Determine the total number of moles of ions that are formed in question 6.
9. Write a balanced equation for the dissolving of sugar ($C_6H_{12}O_6$) in water. (Sugar does not ionize.)
10. When 54.00 grams of sugar dissolve, how many moles of the solid dissolve?
11. How many moles of molecules dissolve in question 10?