

Molarity/Dilutions Worksheet

1. Molarity Problems - Find the missing value.

Chemical	Mass	Volume	Molarity
(a) Na ₂ SO ₄	16.0g	50.0mL	$2.25M$
(b) HCl	143.28g	0.925L	4.25M
(c) Pb(NO ₃) ₂	149g	150.0mL	3.00M

2. Dilution Problems

- (a) 110.0mL of 3.00M sulfuric acid has 25.0mL of water added to it. What is the resulting concentration of the solution? (2.44M)

$$V_1 = 110.0 \text{ mL}$$

$$C_1 = 3.00 \text{ M}$$

$$V_2 = 110.0 + 25.0 = 135.0 \text{ mL}$$

$$C_2 = ?$$

$$C_1 V_1 = C_2 V_2$$

$$(3.00)(110.0) = C_2 (135.0)$$

$$C_2 = \boxed{2.44 \text{ M H}_2\text{SO}_4}$$

- (b) How much water must be added to 50.0mL sample of 18.0M nitric acid to give a resulting concentration of 0.250M? (3550mL)

$$V_1 = 50.0 \text{ mL}$$

$$C_1 = 18.0 \text{ M}$$

$$V_2 = (V + 50.0 \text{ mL})$$

$$C_2 = 0.250 \text{ M}$$

$$C_1 V_1 = C_2 V_2$$

$$(18.0)(50.0) = (0.250)(V + 50.0)$$

$$V = \boxed{3550 \text{ mL H}_2\text{O}}$$

- (c) Barium nitrate is purchased as a 17.0M concentration. Explain how you would prepare 500.0mL of a 5.00M solution. (147mL)

$$C_1 = 17.0 \text{ M}$$

$$V_1 = ?$$

$$C_2 = 5.00 \text{ M}$$

$$V_2 = 500.0 \text{ mL}$$

$$C_1 V_1 = C_2 V_2$$

$$(17.0) V_1 = (5.00)(500.0)$$

$$V_1 = \boxed{147 \text{ mL H}_2\text{O}}$$

1. measure 147 mL of barium nitrate

2. Add $(500.0 - 147 \text{ mL} = 353 \text{ mL})$ of water to make 500.0mL solution!

- (d) If 25.0mL of 4.0M HNO₃ solution is diluted to a volume of 600.0mL, what will be the molarity of the diluted solution? (0.17M)

$$C_1 = 4.0 \text{ M}$$

$$V_1 = 25.0 \text{ mL}$$

$$C_2 = ?$$

$$V_2 = 600.0 \text{ mL}$$

$$C_1 V_1 = C_2 V_2$$

$$(4.0)(25.0) = C_2 (600.0)$$

$$C_2 = \boxed{0.17 \text{ M HNO}_3}$$

- (e) What initial volume of 18M hydrochloric acid is required to make 2.0L of 0.50M hydrochloric acid solution? (56mL)

$$C_1 = 18 \text{ M}$$

$$V_1 = ?$$

$$C_2 = 0.50 \text{ M}$$

$$V_2 = 2.0 \text{ L}$$

$$C_1 V_1 = C_2 V_2$$

$$(18) V_1 = (0.50)(2.0)$$

$$V_1 = 0.056 \text{ L} = \boxed{56 \text{ mL H}_2\text{O}}$$

- (f) 250.0mL of 0.20M phosphoric acid is added to 1.00L of water. What is the molarity of the resulting solution? (0.040M)

$$C_1 = 0.20 \text{ M}$$

$$V_1 = 250.0 \text{ mL}$$

$$C_2 = ?$$

$$V_2 = 1.00 \text{ L} + 0.250 \text{ L} = 1.250 \text{ L}$$

$$C_1 V_1 = C_2 V_2$$

$$(0.20)(250.0) = C_2 (1.250 \text{ L})$$

$$C_2 = 0.040 \text{ M H}_3\text{PO}_4$$