Name Answer Key Hour _____

Diluting Solutions

Honors Chemistry

1. A stock solution of 2.00-*M* NaCl is available. How many milliliters of stock solution are needed to make 200.0-mL of 0.750-*M*? How much water (in mL) must be added?

$M_1 = 2\ M$ $M_1V_1 = M_2V_2$

$V_1 = ?$

$M_2 = 0.75M$ $(2\ M)V_1 = (.75\ M)(200\ mL)$

$V_2 = 200\ mL$ $V_1 = 75\ mL$

$200\ mL - 75\ mL$

125 mL H_2O added

2. What volume of 3.50-*M* KCl stock solution is needed to make 2000.0-mL of 1.50-*M* solution? How much water (in mL) must be added?

$M_1 = 3.5\ M$ $M_1V_1 = M_2V_2$

$V_1 = ?$ $(3.5M)V_1 = (1.5\ M)(2000\ mL)$

$M_2 = 1.5\ M$ $V_1 = 857\ mL$

$V_2 = 2000\ mL$

$2000\ mL - 857\ mL$

1143 mL H_2O added

3. A stock solution of concentrated H_2SO_4 is 18.0-*M*. What volume is needed to make 2.50-L of 1.00-*M* solution? How much water (in liters) must be added?

$M_1 = 18\ M$ $M_1V_1 = M_2V_2$

$V_1 = ?$ $(18\ M)V_1 = (1\ M)(2.5L)$

$M_2 = 1\ M$ $V_1 = 0.14\ L$

$V_2 = 2.5L$

$2.5\ L - 0.14\ L$

2.36 L H_2O added

4. Concentrated HCl is 12.0-*M*. What volume is needed to make 2.00-L of 1.00-*M* solution? How much water (in liters) must be added?

$M_1 = 12\ M$ $M_1V_1 = M_2V_2$

$V_1 = ?$ $(12\ M)V_1 = (1\ M)(2\ L)$

$M_2 = 1\ M$ $V_1 = 0.17\ L$

$V_2 = 2\ L$

$2.00\ L - 0.17\ L$

1.83 L H_2O added

5. A stock solution of HCl is 15.0-*M*. What volume is needed to make 2500.0-mL of 6.00-*M* HCl solution? How many milliliters of water must be added?

$M_1 = 15\ M$ $M_1V_1 = M_2V_2$

$V_1 = ?$ $(15M)V_1 = (6\ M)(2500\ mL)$

$M_2 = 6\ M$ $V_1 = 1000\ mL$

$V_2 = 2500\ mL$

$2500\ mL - 1000\ mL$

1500 mL H_2O added

6. A stock solution of 14.0-*M* NaOH is prepared. From this solution, you need to make 750.0-mL of 2.75-*M* solution. How many milliliters of stock solution are required? How much water (in mL) is needed?

$M_1 = 14\ M$
$V_1 = ?$
$M_2 = 2.75\ M$
$V_2 = 750\ mL$

$M_1V_1 = M_2V_2$
$(14M)V_1 = (2.75M)(750\ mL)$
$V_1 = 147.3\ mL$

$750\ mL - 147.3\ mL$
602.7 mL H_2O added

7. You are making 3.00-L of 1.50-*M* $NaNO_3$ solution using 8.00-*M* $NaNO_3$ stock solution. How many milliliters of stock solution are required? How much water (in mL) is needed?

$M_1 = 8\ M$
$V_1 = ?$
$M_2 = 1.5\ M$
$V_2 = 3\ L$

$M_1V_1 = M_2V_2$
$(8M)V_1 = (1.5M)(3000\ mL)$
$V_1 = 562.5\ mL$

$3000\ mL - 562.5\ mL$
2437.5 mL H_2O added

8. Calculate the final concentration if 3.00-L of 3.00-*M* NaCl, 2.00-L of 2.00-*M* NaCl, and 4.00-L of 4.0-*M* NaCl are mixed.

$M_1 = \frac{3\ mol}{L} \times 3\ L = 9\ mol$
$V_1 =$
$M_2 = ?$ $\frac{2\ mol}{L} \times 2\ L = 4\ mol$
$V_2 =$ $\frac{4\ mol}{L} \times 4\ L = 16\ mol$

total mol = 29 mol
total V = 9 L

$M_F = \frac{29\ mol}{9\ L} = 3.2\ M$

9. Calculate the final concentration if 2.50-L of 3.50-*M* NaCl, 4.20-L of 2.50-*M* NaCl and 6.00-L of water are mixed.

$\frac{3.5\ mol}{L} \times 2.5\ L = 8.75\ mol$

$\frac{2.5\ mol}{L} \times 4.2\ L = 10.5\ mol$

total mol = 19.25 mol
total V = 12.7 L

$M_F = \frac{19.25\ mol}{12.7\ L} = 1.5\ M$

10. Calculate the final concentration if 450.0-mL of 2.50-*M* NaCl, 2751.0-L of 5.50-*M* NaCl and 5500.0-mL of water are mixed.

$\frac{2.5\ mol}{L} \times 0.45\ L = 1.125\ mol$

$\frac{5.5\ mol}{L} \times 2751\ L = 15130.5\ mol$

total mol = 15131.6 mol
total V = 2757 L

$M_F = \frac{15131.6\ mol}{2757\ L} = 5.5\ M$