Chemistry 11

Solution Chemistry I

Name: Notes
Date:
Block:

1. **Molarity**
2. **Dilutions**

Molarity (review)

$\frac{mol}{L}$

Practice 1.
What is the molar concentration of NaCl in a solution containing 5.12 g of NaCl in 250.0 mL of solution? *(0.350 M NaCl)*

$$\frac{5.12\ g_{NaCl}}{250.0\ mL_{NaCl}} \times \frac{1\ mol_{NaCl}}{58.44\ g_{NaCl}} \times \frac{1000\ mL}{1\ L} = 0.350\ M_{NaCl}$$

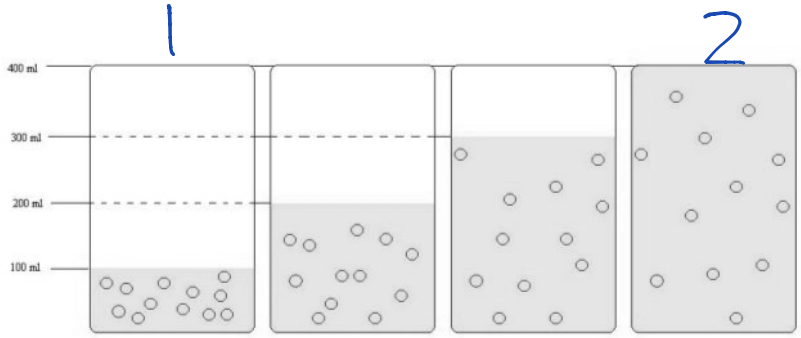
Practice 2.
What mass of NaOH is contained in 3.50 L of 0.200 M NaOH? *(28.0 g NaOH)*

$$3.50\ L_{NaOH} \times \frac{0.200\ mol_{NaOH}}{1\ L_{NaOH}} \times \frac{40.00\ g_{NaOH}}{1\ mol_{NaOH}} = 28.0\ g_{NaOH}$$

Practice 3.
How many moles of $AlCl_3$ are contained in 350.0 mL of 0.250 M $AlCl_3$? *(0.0875 mol $AlCl_3$)*

$$0.3500\ L_{AlCl_3} \times \frac{0.250\ mol_{AlCl_3}}{1\ L} = 0.0875\ mol_{AlCl_3}$$

Dilutions



n = number of moles (particles)

V = volume

c = molarity = concentration

= [ ]

The amount of the chemical (number of moles and mass) does not change – only the concentration.

Therefore, $n_1 = n_2$

Since $n_1 = c_1 \times V_1$ and $n_2 = c_2 \times V_2$

mol/L x L

Because....

Therefore, $c_1 \times V_1 = c_2 \times V_2$ ★

Example 1:
If 200.0 mL of 0.500 M NaCl is added to 300.0 mL of water, what is the resulting [NaCl] in the mixture? *(0.200 M NaCl)*

$C_1 = 0.500\,M$
$V_1 = 200.0\,mL$
$C_2 = ?$
$V_2 = 200.0 + 300.0 = 500.0\,mL$

$C_1V_1 = C_2V_2$
$(0.500)(200.0) = (C_2)(500.0)$
$C_2 = \frac{(0.500)(200.0)}{(500.0)} = 0.200\,M\ NaCl$

Example 3:
What volume of 12.0 M NaOH is required in order to prepare 3.00 L of 0.750M NaOH? *(0.188 L NaOH)*

$C_1 = 12.0\,M$
$V_1 = ?$
$C_2 = 0.750\,M$
$V_2 = 3.00\,L$

$C_1V_1 = C_2V_2$
$(12.0)(V_1) = (0.750)(3.00)$
$V_1 = \frac{(0.750)(3.00)}{(12.0)} = 0.188\,L\ NaOH$

Example 4:
When 350.0 mL of 0.250 M $MgCl_2$ is boiled down to a final volume of 275.0 mL, what is the molarity of the $MgCl_2$ in the resulting solution? *(0.318 M $MgCl_2$)*

$C_1 = 0.250\,M$
$V_1 = 350.0\,mL$
$C_2 = ?$
$V_2 = 275.0\,mL$

$C_1V_1 = C_2V_2$
$(0.250)(350.0) = (C_2)(275.0)$
$C_2 = \frac{(0.250)(350.0)}{(275.0)}$
$= 0.318\,M\ MgCl_2$