

## Topic 6: SOLUTION STOICHIOMETRY

A Solution is an homogeneous mixture

gas / gas	CO <sub>2</sub> / air
liquid / liquid	ethanol / water
solid / liquid	salt / water
gas / liquid	HCl / water
solid / solid	gold / silver

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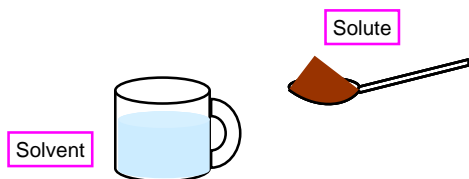
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## Topic 6: SOLUTION STOICHIOMETRY

### Definition of a SOLUTION:

Mixture where SOLUTES are dissolved in a SOLVENT  
(or in a mixture of solvents)



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## 6: Expressing Concentrations of Solutions

### MOLARITY

- Most useful (and common) expression of concentration
- Units are Molarity (M) or mol.L<sup>-1</sup>
- Molarity = MOLES of solute per LITRE of solution

$$\text{Molarity (mol/L)} = \frac{\text{moles of solute}}{\text{Volume of solution in Litres}}$$

Example:

0.5 moles of KMnO<sub>4</sub> in 250 mL of solution

$$= 0.5 \text{ moles} / 0.25 \text{ L}$$

$$= 2 \text{ M KMnO}_4 \text{ solution}$$

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6: Molarity continued

EXAMPLE 1

To begin making Coca-Cola, place 64 g of sucrose ( $C_{12}H_{22}O_{11}$ ) in a beaker and make up the final volume to 600 mL with distilled water.

What is the concentration of sucrose?

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6: Molarity continued

EXAMPLE 2

- 50.0 g of NaCl are added to a solution and the final volume is 175 mL. What is the concentration of NaCl?

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6: Molarity continued

EXAMPLE 3

- How many grams of  $Na_2SO_4$  are needed to make 400.0 mL of 0.25 M solution?

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## 6: Molarity continued

### EXAMPLE 3

- How many grams of  $\text{Na}_2\text{SO}_4$  are needed to make 400 mL of 0.25 M solution?

Convert moles to mass using the molar mass of  $\text{Na}_2\text{SO}_4$

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## 6: Molarity continued

### EXAMPLE 4

- In the 0.25 M solution of  $\text{Na}_2\text{SO}_4$  from Example 3, what is the concentration of sodium ions and what is the concentration of sulfate ions?

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## 6: Molarity continued: Gatorade

Information given:  
(per 100 mL)

Sodium – 47 mg  
Potassium – 22.5 mg  
Sugars – 6 g  
(sucrose – 5.5g)

What is the concentration  
of sodium ions?

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## 6: Molarity continued: Gatorade

Information given:  
(per 100 mL)

Sodium – 47 mg  
Potassium – 22.5 mg  
Sugars – 6 g  
(sucrose – 5.5g)

What is the concentration  
of potassium ions?

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## 6: Molarity continued

### EXAMPLE 5

Kikkoman Soy Sauce has a sodium concentration of 6620 mg of sodium per 100.0 mL. Assuming all the sodium has come from sodium chloride, what is the [NaCl] in mol.L<sup>-1</sup>?

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## 6: Dilution

If you place 25.00 mL of a 2.00 M solution of NaCl into a 250.0mL flask and make it up to the mark, what is the concentration of the new solution?

For any dilution,

#moles before dilution = #moles after dilution

Molarity<sub>conc.</sub> × Volume<sub>conc.</sub> = Molarity<sub>dilute.</sub> × Volume<sub>dilute.</sub>

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