Today: sections 4.1 - 4.3, 4.5 September 20th

↳ This weekend: LEARN solubility rules
↳ quizlet flashcards @ CHM 203 website
↳ Naming acids quizlet

Sunday Sept. 22nd → Problem club w/ Kendall, EPPLEY 211

Monday: last new material for CK2

Tuesday: Expt. 5, classes of chemical reactions

Penicillin contains C, H, N, O and S. What is the simplest (empirical) formula?

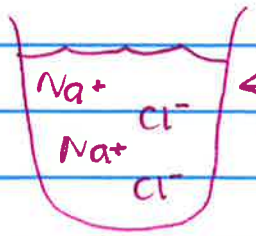
↳ 57.45% C → 57.45g ÷ 12.01 = 4.78 mol → 16
5.43% H → 5.43g ÷ 1.008 = 5.387 mol → 18
8.38% N → 8.38g ÷ 14 = 0.599 mol → 2
9.59% S → 9.59g ÷ 32.066 = 0.299 mol → 1
19.15% O → 19.15g ÷ 16 = 1.197 mol → 4

$C_{16}H_{18}N_2SO_4$

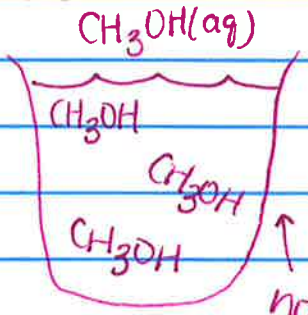
How do we know if a substance dissolves in H_2O?

* Is the substance covalent molecular?
↳ * we will learn how to predict this in November
* If it dissolves, it stays all put together

* Ionics - use solubility rules
* all ionics that dissolve dissociate 100% into ions
↳ ex: $NaCl(s) \longrightarrow Na^+(aq) + Cl^-(aq)$



← ELECTROLYTE SOLUTION
↳ conducts electricity



non-electrolyte
↳ doesn't conduct electricity

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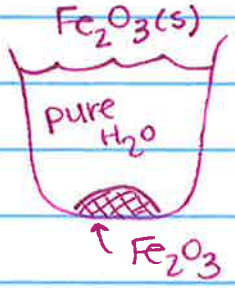
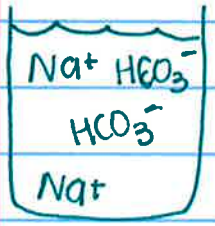
* Some ionics don't dissolve and do not make ions and do not conduct (not a solution)



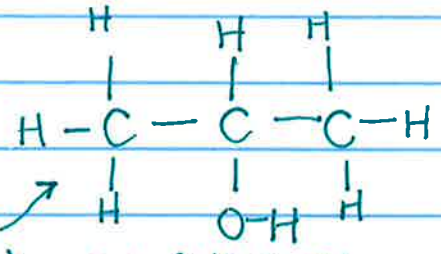
DEMONSTRATION:



$NaHCO_3$ → Na^+ + HCO_3^-

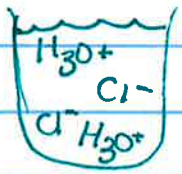
Sugar → $C_{12}H_{22}O_{11}$
↳ dissolves, but doesn't conduct electricity

↳ dissolves + conducts electricity



Rubbing Alcohol : → $CH_3CHOHCH_3$
SAME $C_3H_8O_1$

↳ covalent molecular, doesn't conduct electricity



* Acids dissolve in water, "strong acids", dissociate 100% as per:

↳ $HCl(aq) + H_2O \xrightarrow{100\%} H_3O^+_{(aq)} + Cl^-_{(aq)}$

Solubility Rules

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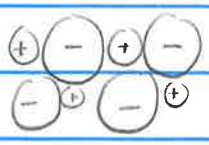
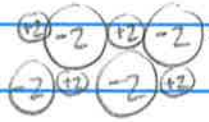
Cations

+1 cations are generally soluble
↳ Li^+ Na^+ K^+ Rb^+ Cs^+



+2 cations can be soluble but are often not soluble



+3 cations — insoluble as a rule

Anions

-1 anions NO_3^- $C_2H_3O_2^-$ ClO_4^- always soluble

Cl^- Br^- I^- generally soluble → exceptions: Ag^+, Pb^{2+}, Hg^{2+} (all insoluble)

$AlPO_4$ → no dissolving
↳ Al^{3+}
↳ PO_4^{3-}

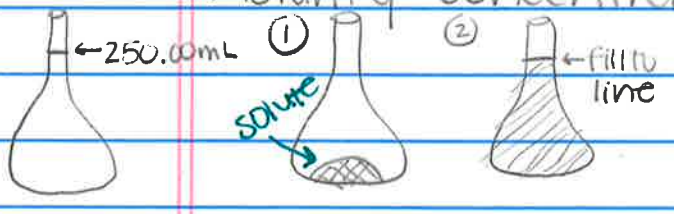
*the bigger the charges are, the less likely it is to be soluble

*OH^- are generally insoluble, except for group 1
↳ ex: LiOH NaOH

-2 anions some are SO_4^{2-}
some aren't CO^{3-} O^{2-} S^{2-}

-3 anions not soluble

Molarity concentration unit



*for a pure substance: $m_A \rightarrow n_A \rightarrow n_B \rightarrow m_B$

* for a solution

molarity $n = M \cdot V \rightarrow L$
(moles) = molarity mol/L

Molarity of $FeBr_2$ (aq)

*mean same thing!

↳ $M_{FeBr_2} = \frac{n_{FeBr_2}}{V_{soln}} = \frac{\text{mol } FeBr_2}{L \text{ soln}} = M_{FeBr_2}$
↳ $[FeBr_2]$

→ suppose 35.0g of $FeBr_2$ are dissolved in water to make 250mL of solution. what is its molarity? or what is $[FeBr_2]$ or what is M_{FeBr_2}?

↳ $[FeBr_2] = \frac{35g\ FeBr_2}{215.65g} \Big| \frac{1 \text{ mol } FeBr_2}{0.25000L} = 0.649 \frac{\text{mol } FeBr_2}{\text{Liter}}$

$[Fe^{2+}] = 0.649$ mol Fe^{2+}/L
$[Br^-] = 1.298$ mol Br^-/L
$[FeBr_2] = 0.648$ mol $FeBr_2$/L

Dilution

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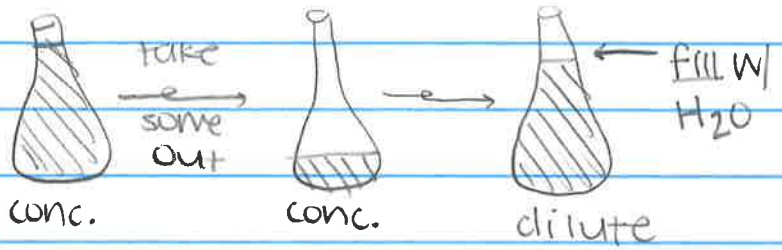

$n_c = n_d$

↳ Dilution Formula → $n_c = n_d$
→ $M_cV_c = M_dV_d$

Demonstration:

↳ $P_4S_6 + O_2 \rightarrow P_2O_5 + SO_2$

$C_6H_{10}O_5 + O_2 \rightarrow CO_2 + H_2O$ → combustion rxn w/ necessary components!

($C_6H_{10}O_5$: cellulose)

$C_3H_8 + O_2 \rightarrow CO_2 + H_2O$

$Fe + O_2 \rightarrow Fe_2O_3$

Chapter 4 Day 1 (Sections 4.1 - 4.3 and 4.5) (Unit 2) 20 September 2019

You will need to memorize the solubility rules. Cut them out and start learning them. They are also available as a Quizlet flashcard set. See Chm 203 website. They will be on the exam.

1. What mass of potassium nitrate is needed to make 500.0 mL of a 0.250 M solution?

2. What volume of the above solution is needed to deliver 0.080 mol KNO_3?

3. Suppose 5.00 mL of the solution in Question 1 is diluted to 100.00 mL using volumetric glassware. What is the molar concentration of the resulting solution?

4. Suppose 50.0 mL of the solution from Question 1 is diluted by adding 250 mL water. What is the resulting molarity?

5. Sketch the ions present in an aqueous solution of ammonium dichromate. Is this solution electrolytic?

6. What is the molarity of each ion present in a 0.20 M ammonium dichromate solution?

Questions in final exam format (multiple choice):

7. What is the concentration of NO_3^- ions in a solution prepared by dissolving 15.0 g of $Ba(NO_3)_2$ in enough water to produce 300.0 mL of solution?

   A. 0.057 M B. 0.191 M

   C. 0.573M D. 0.382 M

8. A student prepared a stock solution by dissolving 20.0 g of NaOH in enough water to make 150. mL of solution. She then took 15.0 mL of the stock solution and diluted it with enough water to make 65.0 mL of a final solution. What is the concentration of NaOH for the final solution?

   A. 0.769 M B. 0.548 M

   C. 1.40 M D. 1.82 M

9) Identify the statement that is true about nonelectrolytes.

   A. Nonelectrolytes dissolve in water producing ions.

   B. Nonelectrolytes do not dissociate in water.

   C. Nonelectrolytes conduct electricity.

   D. Most nonelectrolytes are ionic compounds.

Now try these problems from the book:

Section 4.1. (Molarity) Problems 1, 2, 3, 4, 46 – 56 (even)

Section 4.2. (Dilution) Problems 5, 6, 58, 60

Section 4.3. (Electrolytes) Problems 7, 8, 62, 64, 66, 68, 70

Section 4.5. (Net ionic equations for aqueous reactions) Problems 9, 10

Practice Test (pg 151) 1 - 6