Today: Expt. 7
Turn in: p65-66

HYDRATES

- Ionic compounds that have incorporated WATER MOLECULES into their crystal structure.

- will DECOMPOSE when heated - sometimes by losing just the water, sometimes by losing water and other substances

$$\text{hydrate} \xrightarrow{\text{(heat)}\ \Delta} \text{anhydrous salt} + \text{water}$$

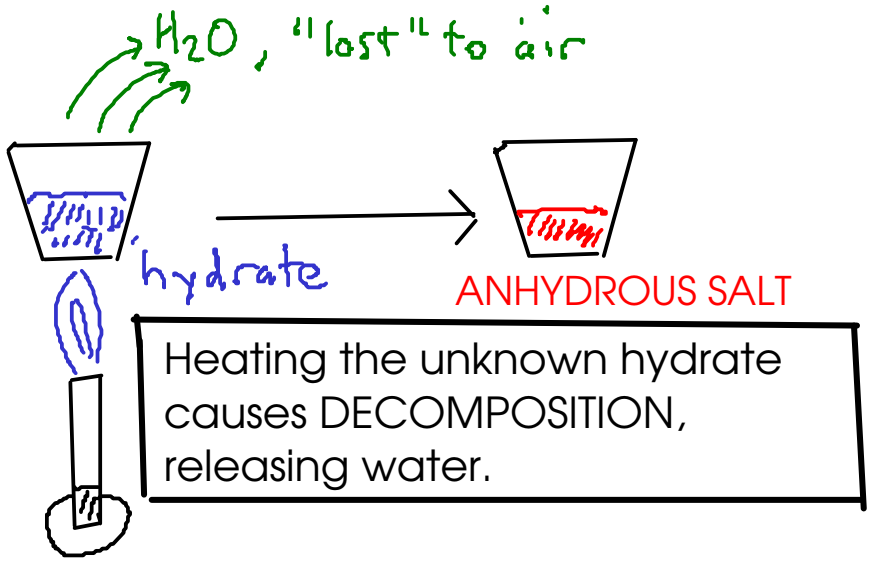
$$CuSO_4 \cdot 5H_2O \xrightarrow{\Delta} CuSO_4 + 5H_2O$$

- We'll look at the decomposition above QUALITATIVELY. The reaction can be easily detected by a COLOR CHANGE.

- The ANHYDROUS SALT can regain its lost water. This reaction may be accompanied by a color change, too!. You may also be able to detect a change in temperature.

SAFETY:
- Do not touch crucible with yoru hands - use crucible tongs! (Burn hazard)
- Make sure your gas tap is OFF before you leave!
- Dispose of all solid waste IN THE DESIGNATED BOTTLE!

QUANTITATIVE EXPERIMENT



Heating the unknown hydrate causes DECOMPOSITION, releasing water.

CALCULATIONS

(6) mass original sample = mass CCS* (before heat) − mass empty crucible/cover

(7) mass lost = mass CCS (before heat) − mass CCS (after last heating)

(8) % water = $\frac{\text{mass lost}}{\text{mass original sample}} \times 100\%$

* CCS = "crucible, cover, and sample"

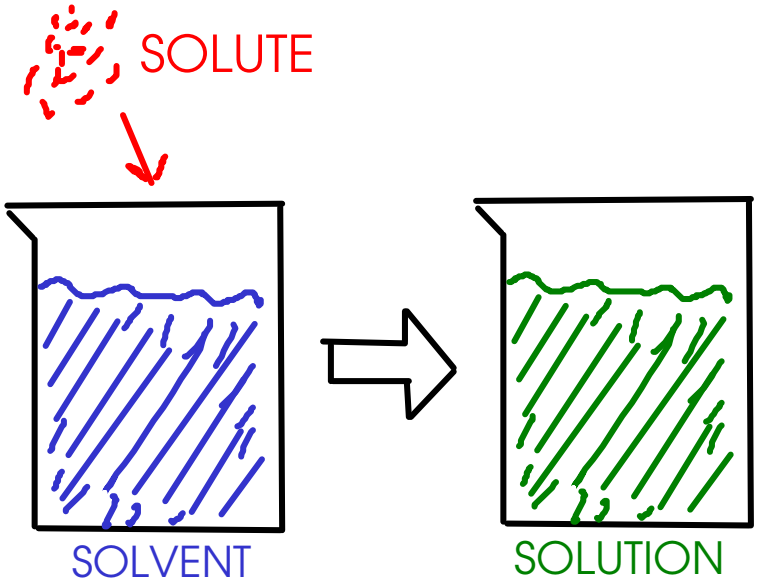
Today: Expt 9
Due: p89-92

SKIP Part G, p 88, and G1-2ab on p91

Safety/Waste:
- Burn hazard - use tongs to handle hot evap. dish!
- Waste may be flushed down the sink with water

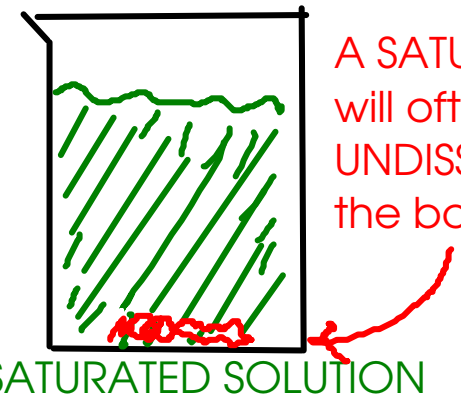
Solubility

- the amount of a substance that will dissolve in another



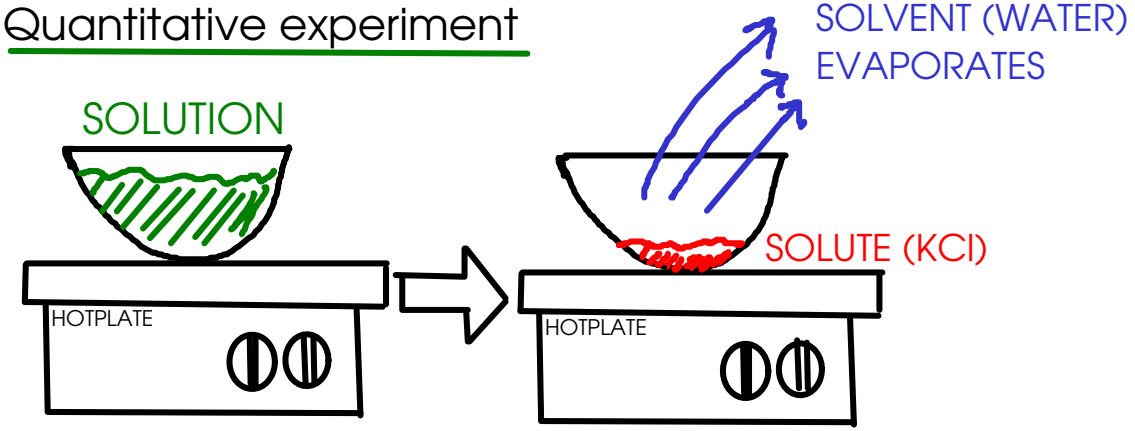
*An UNSATURATED solution can hold more SOLUTE than it is currently holding

*A SATURATED solution can hold NO more SOLUTE than it is currently holding.



A SATURATED SOLUTION will often have UNDISSOLVED solute at the bottom!

Quantitative experiment



Some hints for the calculations...

Finding the mass of water...

(7) $\text{mass } H_2O = \text{mass solution} - \text{mass KCl}$

Finding mass percentage of KCl...

(8) $\text{mass \% KCl} = \frac{\text{mass KCl}}{\text{mass solution}} \times 100\%$

Finding grams KCl per 100g water...

(9) $\text{g KCl}/100\text{g } H_2O = \frac{\text{mass KCl}}{\text{mass } H_2O} \times 100\text{g}$

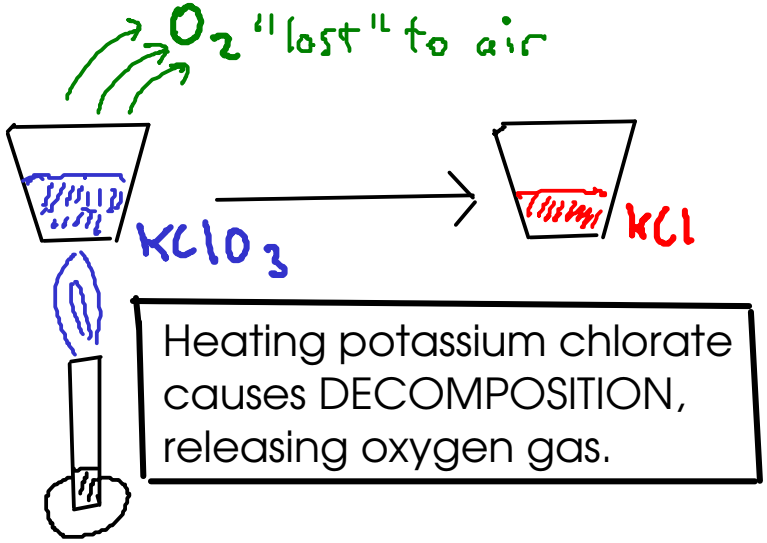
Today: Expt. 10
Turn in: p97-98, SKIP PART B, p98

SAFETY:
- DO NOT OMIT THE FIRST STEP IN "A" ON PAGE 95!
- DO NOT dispose of potassium chlorate in the trash can - flush any spills or waste down the sink with water.

DECOMPOSITION REACTIONS

- are reactions that break a single reactant down into multiple products.

$$2KClO_3(s) \xrightarrow{\Delta} 2KCl(s) + 3O_2(g)$$



Heating potassium chlorate causes DECOMPOSITION, releasing oxygen gas.

CALCULATIONS

(6) mass sample = mass CCS − mass CC

(7) mass loss = mass CCS − mass CCR

(8) mass residue = mass CCR − mass CC

"CC" = crucible and cover
"CCS" = crucible and cover and sample (before heating)
"CCR" = crucible and cover and residue (after final heating)

CALCULATIONS CONTINUED

(9) $$\%\ \text{oxygen} = \frac{\text{mass loss}}{\text{mass sample}} \times 100\%$$

(10) $$\%\ KCl = \frac{\text{mass residue}}{\text{mass sample}} \times 100\%$$

Find the THEORETICAL VALUES for percent oxygen and percent KCl using the numbers at the top of page 94 in the lab manual.

(13) $$\%\ \text{error in O} = \frac{(\text{theoretical \% oxygen} - \%\ \text{oxygen})}{\text{theoretical \% oxygen}} \times 100\%$$

Today:
Expt 11
Due today:
p103-104

-SKIP #12 on p103
-SKIP #2 on p104

EXCHANGE REACTIONS

General form of an exchange reaction:

$$AB + CD \rightarrow AD + CB$$

A^+ B^- C^+ D^-

Remember: The IONS exchange partners, so you have to write products based on CHARGE!

Safety and waste disposal notes:

- Contact hazards: acids/bases
- Dispose of these tubed in the marked waste container: #2, #5, #7, #9
- The other tube contents may be disposed of in the sink

Example reaction:

$$FeCl_3(aq) + 3NH_4OH(aq) \rightarrow Fe(OH)_3(s) + 3NH_4Cl(aq)$$

Fe^{3+} Cl^- NH_4^+ OH^-

In exchange reactions, transition metals do not change their charge. Find the charge on the transition metal by looking at the formula of the reactant that originally contained the transition metal.

For a reaction to occur, AT LEAST ONE of the products must be...

1) An INSOLUBLE solid (called a "precipitate"). Precipitates will initially appear as cloudiness. You can check the solubility chart at the back of the lab manual to see if a compound is soluble.

2) A STABLE OR SLIGHTLY IONIZED molecule. The molecule is usually WATER, but may be:

H_2O, $HC_2H_3O_2$, H_3PO_4, $H_2C_2O_4$

The formation of these molecules may be detected by observing HEAT.

3) A GAS formed by the decomposition of an unstable product.

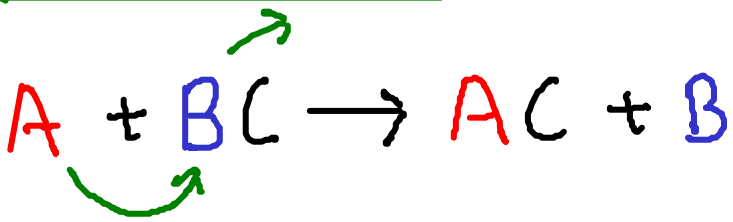
$H_2CO_3 \rightarrow H_2O + CO_2$ $\quad NH_4OH \xrightarrow{\Delta} H_2O + NH_3$ $\quad H_2SO_3 \rightarrow H_2O + SO_2$

Detect these gases by looking for BUBBLES or (in the case of ammonia or sulfur dioxide) an ODOR.

Today:
- Expt 12

Due today:
- p107-108

SINGLE REPLACEMENT



WASTE

- Dispose of all waste in the designated waste beaker. Make sure no pieces of metal go down the drain!

In a single replacement reaction, one element REPLACES another element in a compound (usually an ionic compound). For this to happen, the free element must TRANSFER ELECTRONS TO the element being replaced. This will happen if the free element is MORE ACTIVE THAN the element in the compound.

In the example above,

* If a reaction occurs, A is more active than B.

* If no reaction occurs, B is more active than A.

We will use the information from today's lab to rank the elements tested in an ACTIVITY SERIES, with the most active element at the top and the least active element at the bottom.

Once we have an ACTIVITY series, we can use it to PREDICT whether or not one element will replace another in a reaction.

TODAY"S ELEMENTS AND THE IONS THEY FORM

FREE ELEMENT	IN COMPOUND	FREE ELEMENT	IN COMPOUND
Cu	Cu^{2+}	Zn	Zn^{2+}
Ag	Ag^{+}	Mg	Mg^{2+}
Pb	Pb^{2+}	H_2	H^{+}