

University of Salahaddin- Hawler
College of Education
Chemistry Department



P. Inorganic Chem., Third Stage

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Study of Cu(II) and EDTA complex formation

MOLE RATIO METHOD

complex formation

A metal complex is formed by association between a **metal** atom or ion behaves as a Lewis acid and **ligand** which is either an anion or polar molecular behaves as a Lewis base.

$[ML_n]$ when M=metal, L=ligand, n=number of ligand

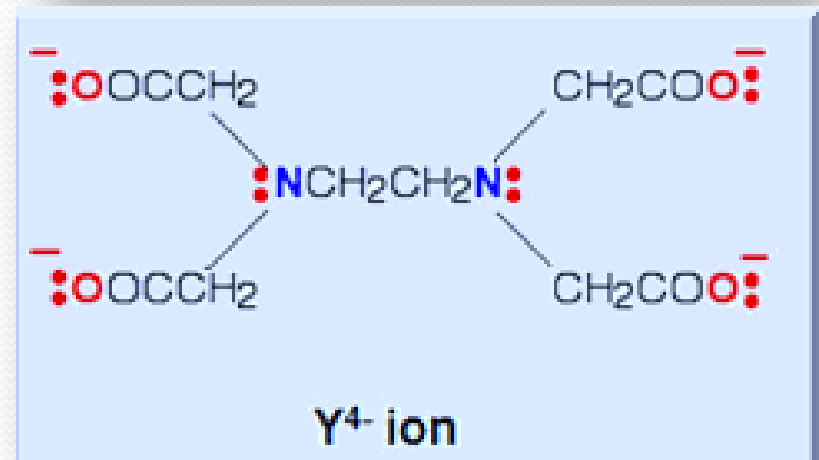
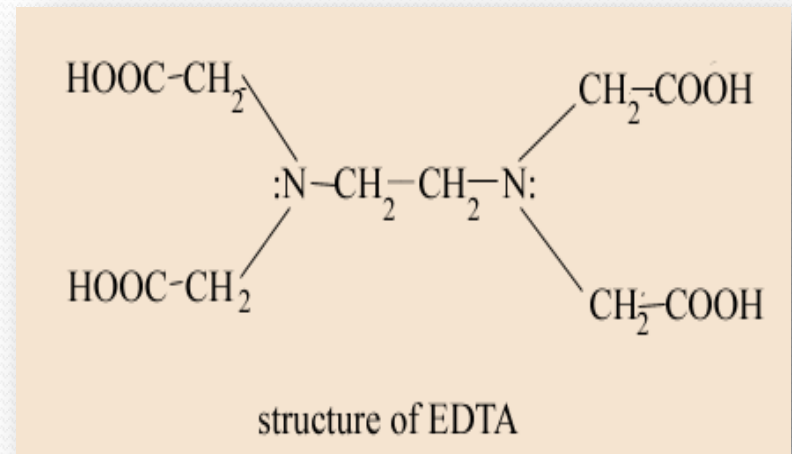
Mole ratio method

In this method a series of solution is prepared in which the analytical **concentration** of one (reactant usually the **cation**) is held **constant** while that of the other is varied.

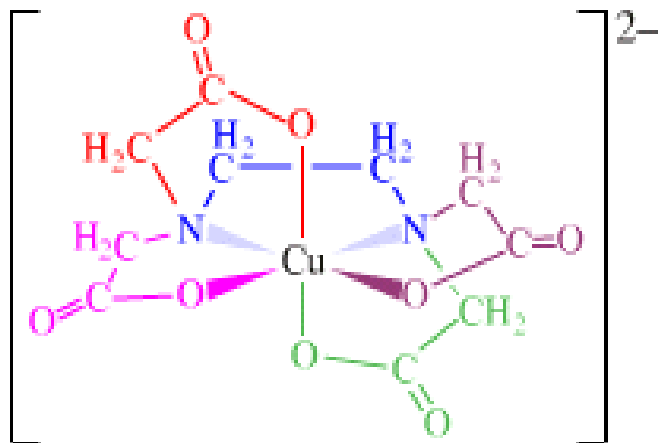
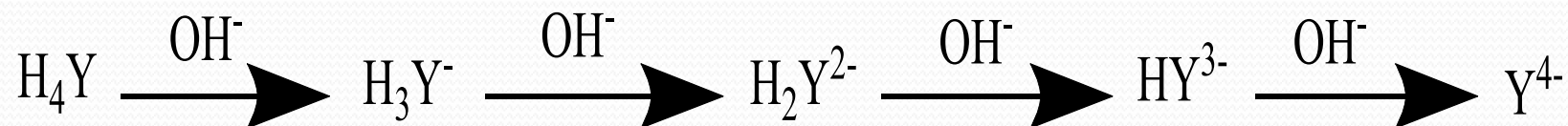
This method used to determine the number of ligand to find the **composition** or **structure** of complex.

What is EDTA

1. EDTA is a molecular abbreviation for ethylenediaminetetraacetic acid, $C_{10}H_{16}N_2O_8$.
2. Considered a "chelating, poly or multi dentate ligand" because it binds to the metal from more than one atom (six tooth).
3. Forms stable complex with various metal ions.
4. Used in industry and agriculture.



5. It's a weaker acid that dissociated by four steps:



Copper(II) EDTA complex ion
 $[\text{Cu}(\text{EDTA})]^{2-}$





To Determination of molecular formula
of a compound using *spectroscopy*

Spectrophotometric

is a valuable tool for elucidating the composition of complex ions in solution and for determining their formation constants.

Procedure:

1. Prepare (0.1M) **coppersulphate** solution in 250ml D.W.
2. Prepare (0.1M) **EDTA** solution in 250ml D.W.
3. Prepare buffer solution pH=10 from (144ml NH_4OH concentration + 18g NH_4Cl) in 250ml D.W.

Series	1	2	3	4	5	6	7	8
EDTA	0.5	1	1.5	2	2.5	3	3.5	4
Cu(II)	2	2	2	2	2	2	2	2
buffer	2	2	2	2	2	2	2	2

4. Take 8 volumetric flasks and prepare the following solutions.

5. Then complete the volume in all flasks with D.W. to 25ml.

6. Determine the λ_{max} .

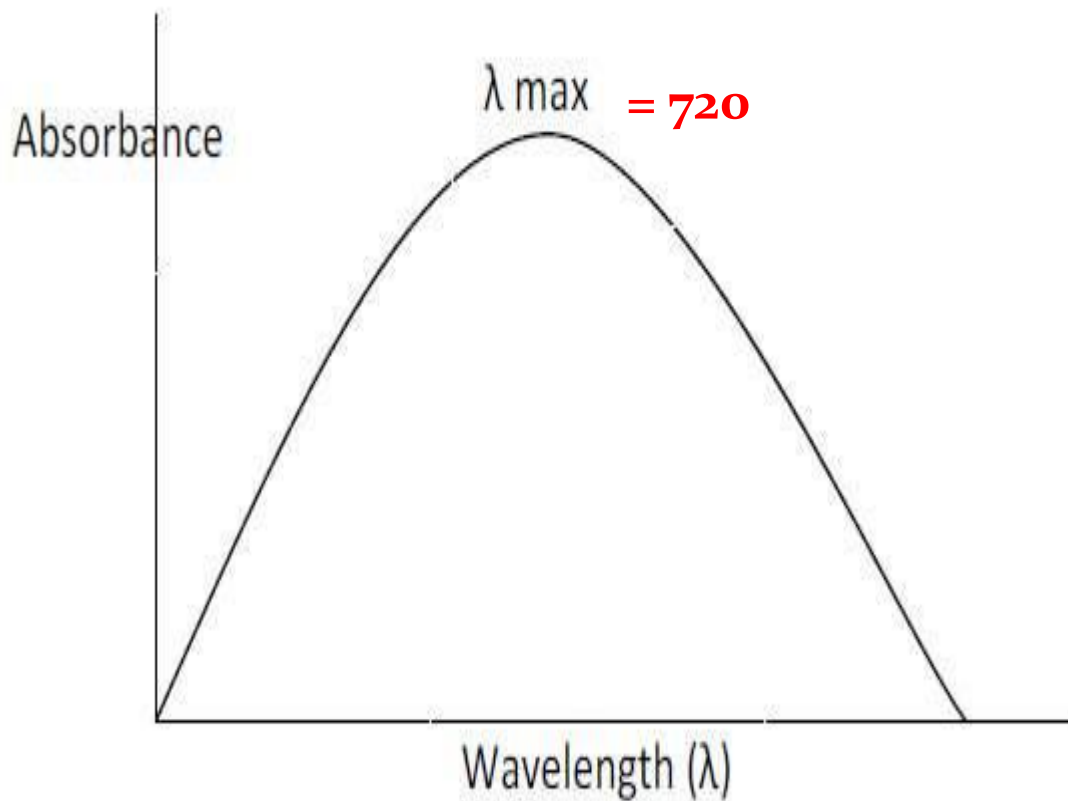
7. Record the **absorbance** of the solutions.

8. Then draw the relationship between absorbance and EDTA volume to know the **M:L** ratio.

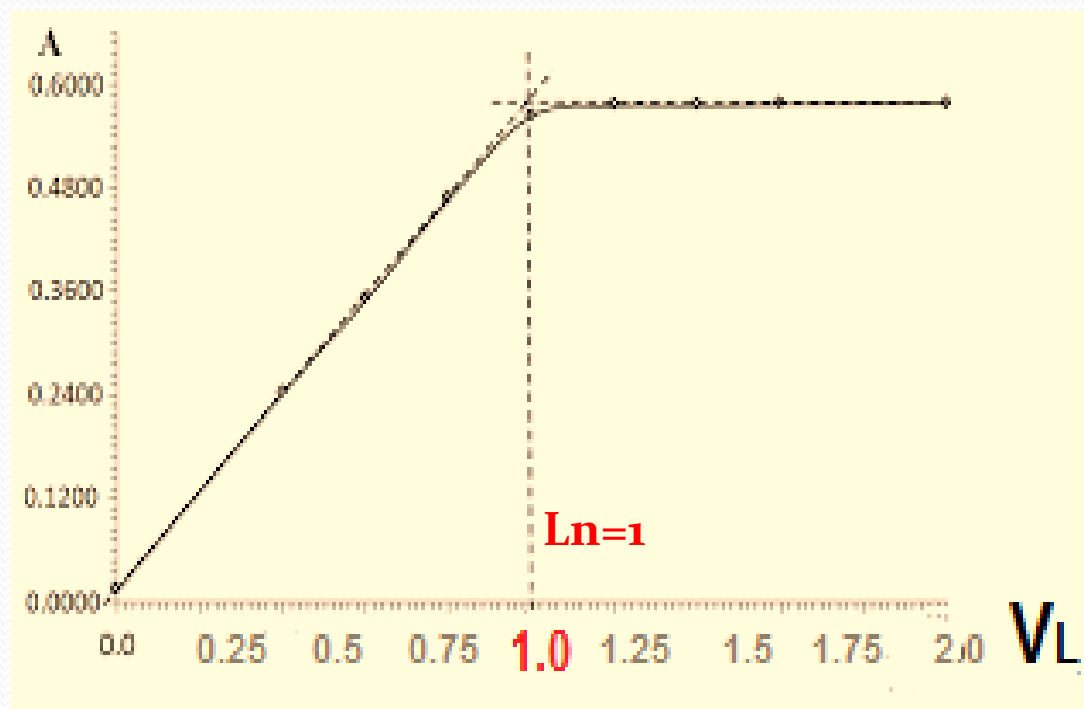
Lambda maximum (λ_{max}) (wave length)(nm):

It is the wave length which its absorbance (Abs.) is the greatest.

λ_{max}	Abs.
700	0.665
705	0.680
710	0.690
715	0.694
720	0.703
725	0.700
730	0.690



Series	Abs.
1	---
2	---
3	---
4	---
5	---
6	---
7	---
8	---



$$\cancel{\text{mol}} = \cancel{M_{\text{metal}}} \times V_L \quad C_{\text{CuSO}_4} = 0.1\text{M}$$

$$\cancel{\text{mol}} = \cancel{M_{\text{ligand}}} \times V_L \quad \text{EDTA} = 0.1\text{M}$$

$$\text{mol} = V_L$$



Ethylenediaminetetraacetate Copper (II)

*Thank
you*

