University of Salahaddin- Hawler
College of Education-Chemistry Department

P. Inorganic Chem., Third Stage

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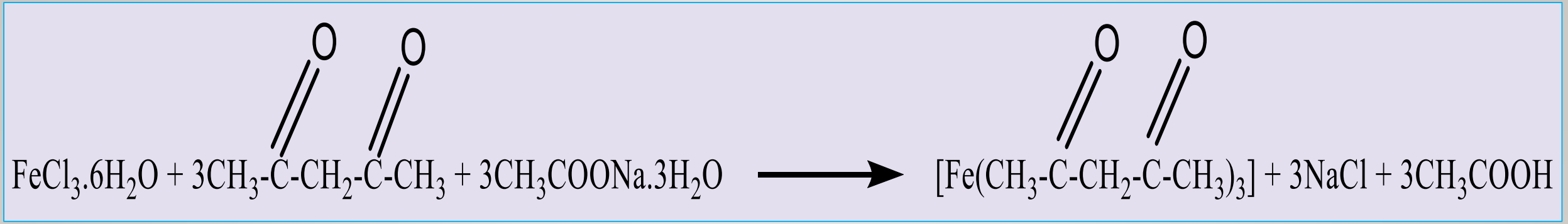
EXPERIMENT:

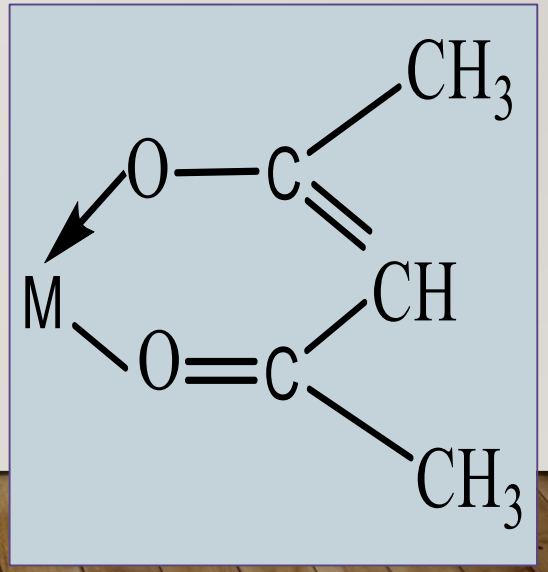
NO. 1

Preparation of tirs(acetylacetonato)iron(III) [$Fe(acac)_3$]



Theory:

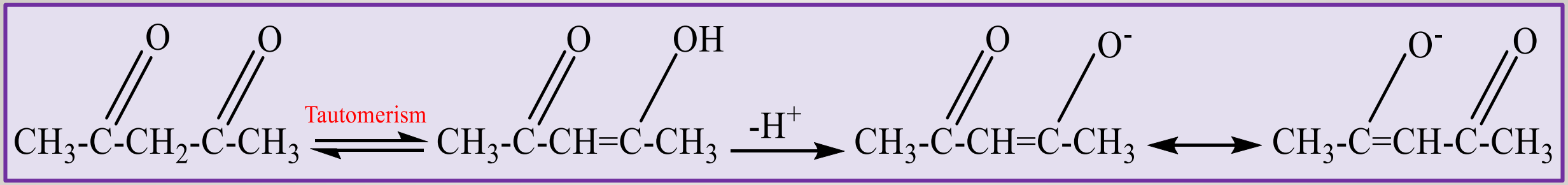
The acetylacetonate anion forms complexes with many metal ions where in both oxygen atoms bind to the metal to form a six-membered chelating ring.



There is Resonance stabilization in the acetyl acetone structure

Resonance: occurred in unsaturated system defined as a delocalization of electrons to the π orbitals.

Tautomerism: occurred in *equilibrium* system at *liquid* state, defined are isomers of a compound which differ only in the position of the protons and electron.



B-diketone form

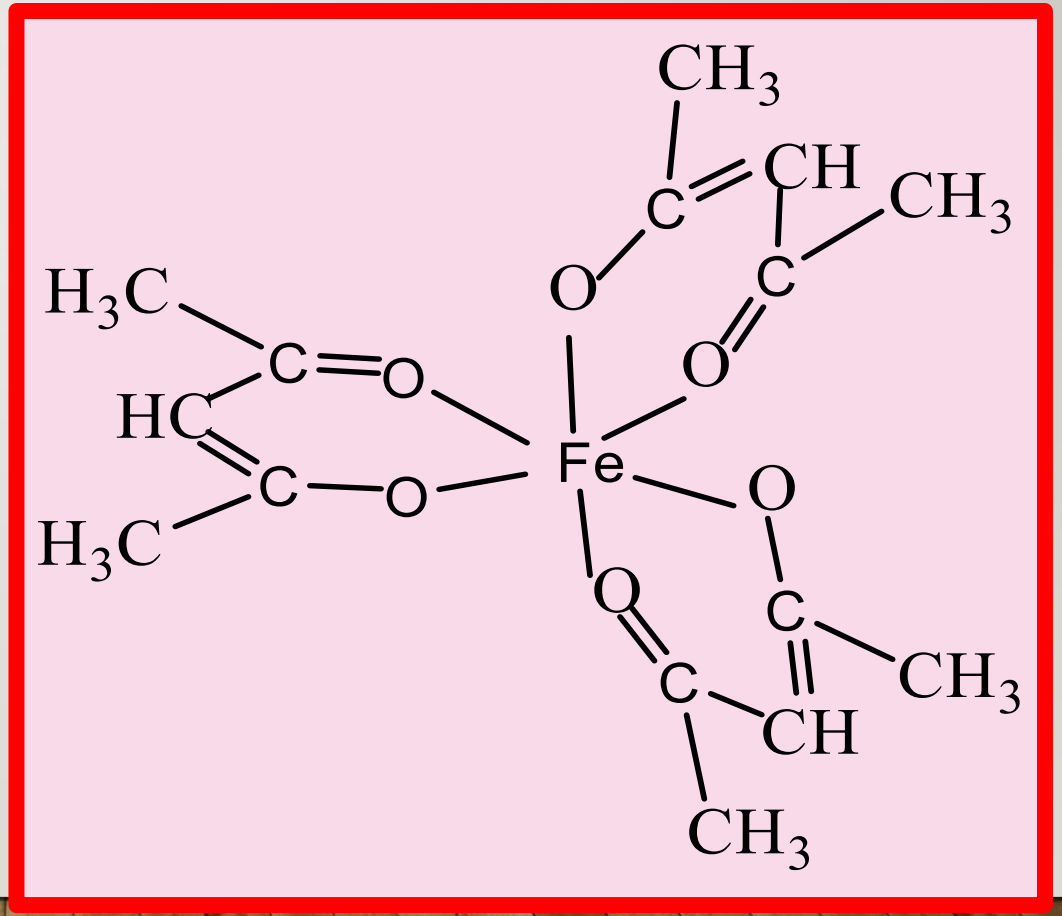
enol form

Tautomeric equilibrium

Resonance forms of the enolate an ion

This complex considers stable:

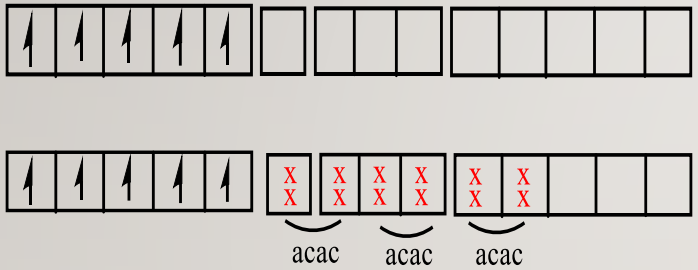
a. Resonance
b. Bidentate or chelated effect
c. 6-member ring



The electron configuration for this complex according to Valence bond theory

$_{26}Fe = [Ar_{18}]\ 3d^6 4s^2 4p^0 4d^0$ ground state atom

$Fe^{3+} = [Ar_{18}]\ 3d^5 4s^0 4p^0 4d^0$ ground state ion



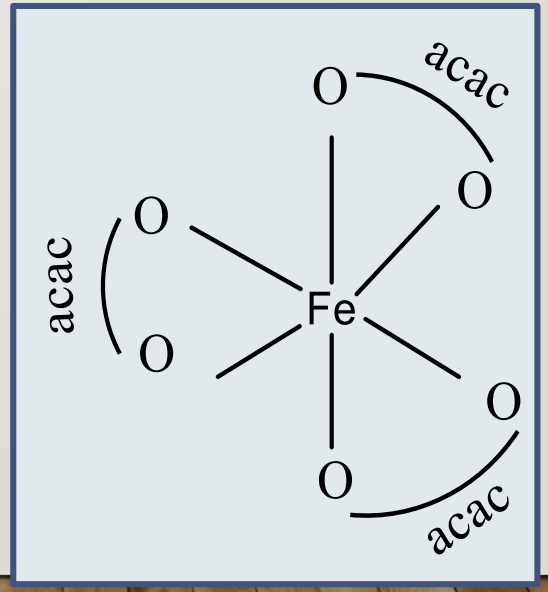
Excited state ion

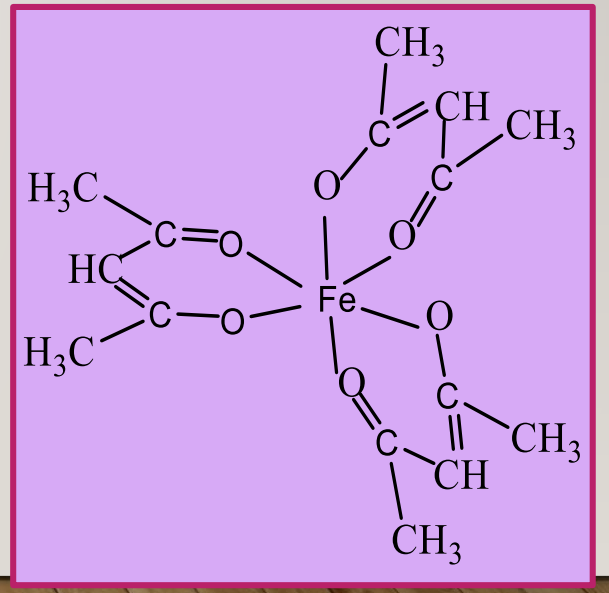
electron donated by 3 molecular of acac ligand

C.N. = 6

hybrid = sp^3d^2 outer d orbital

geometry = Oh





Procedure:

1. Dissolve (1.7g) from ($FeCl_3.6H_2O$) in (10ml) D.W. add (1.9ml) acac., let the solution in the room temperature about 15 minutes, with stirring.

2. Add (6.25g) $CH_3COONa.3H_2O$ to the mixture shaking well after each addition.

3. Cool the mixture in ice bath, until the red precipitation appears filter the precipitate wash with cool water.

4. Weight the dry product and record the percentage yield.

Calculation:-

$FeCl_3.6H_2O$	$[Fe(acac)_3]$
404	352.8
1.7g	x

x = 1.4gWt.Theory

$$\% \text{ yield} = \frac{\text{Wt.Pr. ?}}{\text{Wt.Th.}} * 100$$

$$\% \text{ yield} = \% \ [Fe(acac)_3]$$

Questions:

1.What is the role of $CH_3COONa.3H_2O$?

2. Why oxygen acts as a donor atom?


thank you