

Non-extractive uv-vis spectroscopic method for determination of iron metal in blood samples



By

Tayyaba Arshad

ID: 13004067006

SUPERVISOR

Shah Muhammad Haroon

DEPARTMENT OF CHEMISTRY

SCHOOL OF SCIENCE

UNIVERSITY OF MANAGEMENT AND TECHNOLOGY,

LAHORE, PAKISTAN.

2017

**Non-extractive UV-VIS spectroscopic method for
determination of iron metal in blood samples**

Submitted to University of Management and Technology

Lahore

In partial fulfillment of the requirements

For the award of degree of

BS

IN

CHEMISTRY

BY

TAYYABA ARSHAD

ID

1	3	0	0	4	0	6	7	0	0	6
---	---	---	---	---	---	---	---	---	---	---

SESSION: 2013-2017

DEPARTMENT OF CHEMISTRY

SCHOOL OF SCIENCE

UNIVERSITY OF MANAGEMENT AND TECHNOLOGY,

LAHORE, PAKISTAN.



*In the Name of Allah, the Most
Beneficent, the Most Merciful.
All the praises and thanks be to
Allah*

*“Read in the name of your Lord who created”
“Created man, out of a (mere) clot of congealed blood”
“Read, and your Lord is the most Generous”
“Who taught by the pen”
“Taught man that which he knew not.”
(Holy Qur’an 96:1-5)*

*“O my Lord! Increase me in knowledge.”
(Quran 20:114)*

DECLARATION

I TAYYABA ARSHADD/O MUHAMMAD ARSHAD

ID: 13004067006

Session 2013-2017 hereby declare that the matter printed in the thesis titled “Non-extractive UV-VIS spectroscopic method for determination of iron metal in blood samples.” is my own work and has not been printed, published and submitted as research work, thesis or publication in any form in any University, Research institution etc. in Pakistan or Abroad.

Dated: _____

(TAYYABA ARSHAD)

DECLARATION

I TAYYABA ARSHADD/O MUHAMMAD ARSHAD

ID: 13004067006

Session 2013-2017 hereby declare that the matter printed in the thesis titled “Non-extractive UV-VIS spectroscopic method for determination of iron metal in blood samples.” is my own work and has not been printed, published and submitted as research work, thesis or publication in any form in any University, Research institution etc. in Pakistan or Abroad.

Dated: _____

(TAYYABA ARSHAD)

RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis titled, “Non-extractive UV-VIS spectroscopic method for determination of iron metal in blood samples.” has been carried out and completed by **TAYYABA ARSHAD, ID: 13004067006**. The quantum and the quality of the work contained in this thesis is adequate for the award of Degree of BS (honors) in Chemistry.

Supervisor
Shah Muhammad Haroon

Dr. Sammia Shahid
Chairperson,
Department of Chemistry,
UMT, Lahore.

Dedication

I DEDICATE THIS EFFORT TO MY FAMILY
AND TEACHERS WHOSE COURAGE,
SUPPORT AND PRAYERS ENABLE ME TO
COMPLETE THIS WORK.

ACKNOWLEDGEMENT

Firstly I want to thank Allah Almighty who blessed me with such a wonderful life and family who supported me through thick and thin. I am grateful to HIM for the health and well being that were necessary to complete my work.

I would like to express my profound gratitude to my supervisor **Shah Muhammad Haroon**, Assistant Professor in Department of Chemistry, University of Management and Technology Lahore, whose expertise, understanding, and patience, added considerably to my graduate experience. I really appreciate his devoted, loveable behavior for me during my work.

I wish to express my sincere thanks to **Dr. Sammia Shahid**, Chairperson of Chemistry department, University of Management and Technology, for providing me with all the necessary facilities for the research.

I place on record, my sincere thanks to **Dr. Azhar Iqbal**, Dean of School of Science University of Management and Technology, for their continuous encouragement.

I take this opportunity to express gratitude to all of the Department faculty members for their help and support.

I am very thankful to my parents for the unceasing encouragement, support and attention.

Abstract

A validated, precised, accurate and simple spectrophotometric method has been worked out for the determination of Fe in human blood. Determination of Fe method is based on the reaction of iron with ammonium thiocyanate after the wet digestion of blood samples of HCV patients with HNO_3 and H_2O_2 . The absorption maxima occurred at 475nm. This method is an alternative method for the amount of Fe in blood other than test methods applied in medical lab.

CONTENTS

Acknowledgement	05
Abstract	06
List of Table	10
List of Graph	11

Chapter 01: Introduction **12-16**

1.1.1 Introduction	12
1.1.2 Blood's Role in Human Body	13
1.1.3 Iron	13
1.1.4 Importance	14
1.1.5 Iron deficiency	14
1.1.6 Causes and Symptoms of Iron Deficiency	15
1.1.7 Overcoming Iron Deficiency	15
1.1.8 UV-VIS Spectrophotometry	16

Chapter 02: Literature Review **17-22**

Chapter 03: Experimental Work 23-32

3.1	Materials & Methods	24
3.2	Apparatus required	24
3.3	Spectrophotometric determination of iron in aqueous media	25
3.3.1	Chemicals required	25
3.3.2	Preparation of 1000ppm stock solution of Fe ion	25
3.3.3	Preparation of standard solutions of Fe ion by dilution formula	26
3.3.4	Preparation of ammonium thiocyanate solution	28
3.3.5	Preparation of 8% ammonium thiocyanate solution	29
3.3.6	Colorimetric analysis	29
3.4	Sample collection and preservation	30
3.4.1	Chemicals required for blood sample digestion	30
3.4.2	Preparation of blood samples for analysis	31
3.5	Spectrophotometric determination of Fe ion in blood samples	31
3.5.1	Calculation of concentration of blood samples	32

Chapter 04: Results & Discussion 33-44

Results

- 4.1 Spectrophotometric determination of Fe in various standard solutions
and blood samples 35
- 4.1.1 Determination of Fe in various standard solutions 35
- 4.1.2 Determination of Fe in different blood samples 37
- 4.1.3 Concentration of Fe in $\mu\text{g/dL}$ in different blood samples 39

Discussion 43-44

Conclusion 45-46

Suggestions 47-48

References 49-52

List of Tables

Table 4.1	Absorbance of Standard solutions of Fe with various concentrations	35
Table 4.2	Concentration of Fe in different blood samples	37
Table 4.3	Concentration of Fe in $\mu\text{g/dL}$ in various blood samples	39
Table 4.4	Concentration of iron and their comparison with normal ranges according to gender and age	41

Introduction

1.1 Blood's Role in Human Body

Blood contains plasma (liquid portion) and cells. It is key body's fluid that supply necessary nutrients like oxygen, hormones and sugar to cells of our body, and substances and also carries deplete of cells which ambush of in sweat, urine, lungs (CO₂).and feaces. Clotting agents are also present in blood.

In humans, blood fluid contains 55% of blood plasma and in addition to water; plasma also consists of Glucose (sugar), hormones, blood cells, proteins, oxygen and CO₂.