TABLE OF CONTENTS

CONTENT	PAGE NO.
TITLE PAGE	I-II
TABLE OF CONTENTS	III-IX
DECLARATION BY THE SCHOLAR	X
SUPERVISOR'S CERTIFICATE	XI
ACKNOWLEDGEMENT	XII-XIV
ABSTRACT	XV-XVI
LIST OF UNITS, SYMBOLS & ABBREVIATIONS	XVII-XVIII
LIST OF FIGURES	XIX-XXII
LIST OF TABLES	XXIII
CHAPTER 1	**1-34**

Introduction & Review of Literature

1.1 General introduction

1.2 Birth and development of nanotechnology

1.3 Classification of nanomaterials

1.4 Types of nanoparticles based on composition

1.4.1 Carbon-based nanomaterials

1.4.2 Organic-based nanomaterials

1.4.3 Inorganic-based nanomaterials

1.4.4 Composite-based nanomaterials

1.5 Nanoparticles characteristic properties

1.6 Metal nanoparticles (M-NPs)

1.6.1 Characteristic properties of M-NPs

1.6.2 AuNPs

1.6.3 Ag-NPs

1.6.4 Copper nanoparticles (CuNPs)

1.6.5 Platinum nanoparticles (Pt-NPs)

1.6.6 Zinc oxide nanoparticles (ZnO)

1.7 Quantum dots

1.8 Approaches for M-NPs synthesis

1.8.1 Top-down approach of M-NPs synthesis

1.7.1.1 Mechanical milling

1.7.1.2 Physical vapour deposition (PVD)

1.7.1.2.1 Laser ablation

1.7.1.2.2 Nanolithography

1.7.1.2.3 Ion sputtering

1.8.2 M-NPs synthesis through a bottom-up technique

1.8.2.1 Chemical vapour deposition method of M-NPs synthesis

1.8.2.2 Sol-gel procedure of M-NPs synthesis

1.8.2.3 Spinning method of M-NPs synthesis

1.8.2.4 Pyrolysis method of M-NPs synthesis

1.8.2.5 Chemical reduction method

1.8.2.6 Biological methods

1.8.2.6.1 Bacteria

1.8.2.6.2 Fungi

1.8.2.6.3 Algae

1.8.2.6.4 Lichens

1.8.2.6.5 Plants

1.8.2.6.6 Wastes

1.9 Characterization techniques of M-NPs

1.9.1 UV-visible (UV-vis) spectrophotometry

1.9.2 Fourier transform infrared (FTIR) spectroscopy

1.9.3 X-ray diffraction (XRD) pattern analysis

1.9.4 Dynamic light scattering (DLS) analysis

1.9.5 Zeta potential analysis

1.9.6 Scanning electron microscopy (SEM) analysis

1.9.7 Transmission electron microscopy (TEM) analysis

1.9.8 Inductively coupled plasma mass spectrometry (ICP-MS) analysis

1.9.9 Atomic force microscopy (AFM) analysis

1.10 One-pot synthesis and its advantages

1.11 Applications of M-NPs

1.11.1 Antimicrobial activity

1.11.2 Antifungal activity

1.11.3 Antiviral activity

1.11.4 Anticancer activity

1.11.5 Catalytic activity

1.11.6 Biosensor

CHAPTER 2 **35**

Aim & objectives of the study

2.1 Aim

2.2 Objectives

CHAPTER 3 **36-55**

Development of gentamicin conjugated gold nanoparticles and evaluation of their antimicrobial potential

3.1 Introduction

3.2 Materials and methods

3.2.1 Chemicals

3.2.2 Microorganisms and their maintenance

3.2.3 G-AuNPs synthesis

3.2.3 Characterizations of synthesized G-AuNPs

3.2.4 G-AuNPs antibacterial activity evaluation

3.2.5 Minimum inhibitory concentration (MIC) determination

3.2.6 Determination of oxidative stress caused by G-AuNPs

3.2.6.1 Reactive oxygen species (ROS)

3.2.6.2 Evaluation of membrane lipid peroxidation (LPO) caused by G-AuNPs

3.2.7 Determination of bacterial membrane disruptions by G-AuNPs

3.2.8 Analysis of gentamicin release from G-AuNPs

3.2.9 Cytotoxicity analysis of G-AuNPs

3.2.10 Statistical analysis of data

3.3 Results and Discussions

3.3.1 Synthesis, optimization and characterization of G-AuNPs

3.3.2 Determination of antibacterial activity and MIC of G-AuNPs

3.3.3 Evaluation of ROS and LPO production in microorganisms due to G-AuNPs

3.3.4 Analysis of G-AuNPs effect on membrane permeability of microorganisms

3.3.5 Analysis of gentamicin release from G-AuNPs

3.3.6 Analysis of G-AuNPs cytotoxicity on C2C12 cell line

3.4 Summary

CHAPTER 4 **56-78**

Development of silver nanoparticles using quercetin for the colorimetric sensing of l-cysteine

4.1 Introduction

4.2 Materials and methods

4.2.1 Chemicals

4.2.2 Q-AgNPs synthesis and optimization

4.2.3 Q-AgNPs characterizations

4.2.4 Detection of L-Cys using Q-AgNPs

4.2.5 Determination of Q-AgNPs selectivity for L-Cys

4.2.6 Evaluation of temperature and time effect on the detection of L-Cys

4.2.7 Analysis of Q-AgNPs performance in aqueous, urine and FBS solution for the L-Cys detection

4.3 Results and discussions

4.3.1 Synthesis and optimization

4.3.2 Analysis of Q-AgNPs stability

4.3.3 Characterizations of Q-AgNPs

4.3.3.1 XRD analysis

4.3.3.2 FTIR analysis

4.3.3.3 SEM, TEM, and DLS investigation of Q-AgNPs

4.3.4 L-Cys detection using Q-AgNPs and their mechanism of action

4.3.5 The influence of variable time and temperature on the L-Cys detection by Q-AgNPs

4.3.6 Q-AgNPs selectivity towards L-Cys detection

4.3.7 Analytical performance and sensitivity of Q-AgNPs for L-Cys detection

4.4 Summary

CONCLUSION, FUTURE PROSPECTS & NEW FINDINGS 79-81

BIBLIOGRAPHY 82-137

LIST OF PUBLICATIONS & CONFERENCE PAPERS 138-139