

**THEORETICAL STUDY OF THE PHASE SPACE  
DYNAMICS OF A SIMPLE PENDULUM AND DRIVEN  
DAMPED PENDULUM**

Project report submitted to

**DEPARTMENT OF PHYSICS**

**CHRIST COLLEGE IRINJALAKUDA  
(AUTONOMOUS)**

*In partial fulfilment of the requirement for the award of the degree of*

**BACHELOR OF SCIENCE**

Submitted by

**LINUS C LIJU**

**CCAUSPH014**

Under the supervision of

**Dr. Ajith R**



**DEPARTMENT OF PHYSICS**

**CHRIST COLLEGE IRINJALAKUDA (AUTONOMOUS)**

**MAY 2023**

**CHRIST COLLEGE IRINJALAKUDA (AUTONOMOUS)**

**CALICUT UNIVERSITY**

**DEPARTMENT OF PHYSICS**

## **CERTIFICATE**

This is to certify that the project report entitled **THEORETICAL STUDY OF THE PHASE SPACE DYNAMICS OF A SIMPLE PENDULUM AND DRIVEN DAMPED PENDULUM** is a bonafide record of project work done by **LINUS C LIJU,CCAUSPH014** under my guidance and supervision in partial fulfilment of the requirement for the award of the degree of **BACHELOR OF SCIENCE IN PHYSICS** and it has not previously formed the basis for any Degree, Diploma and Associateship or Fellowship.

Irinjalakuda

May 2023



Dr. Ajith R

(Project Guide)

# DECLARATION

I, **LINUS C LIJU,CCAUSPH014** hereby declare that the project work entitled **THEORETICAL STUDY OF THE PHASE SPACE DYNAMICS OF A SIMPLE PENDULUM AND DRIVEN DAMPED PENDULUM** is a record of independent and bonafide project work carried out by me under the supervision and guidance of Dr. Ajith R, Department of Physics, Christ College Irinjalakuda.

The information and data given in the report is authentic to the best of our knowledge. The report has not been previously submitted for the award of any Degree, Diploma, Associateship or other similar title of any other university or institute.

Irinjalakuda

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May 2023

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# ACKNOWLEDGEMENT

“Gratitude is the healthiest of all human emotions. The more you express gratitude for what you have, the more likely you will have even more to express gratitude for”.

I take this opportunity to express my sincere gratitude to every person from whom I was fortunate enough to get valuable resources, guidance and help. First, I would like to thank the God Almighty, for showering his blessings to make this dissertation a success.

I owe my thanks to Fr. Dr. Jolly Andrews CMI, Principal, Christ College (Autonomous) Irinjalakuda, for providing the infrastructure for the conduct of the study.

I express my special gratitude to my project guide Dr. Ajith R, for his valuable support and motivation. Words are insufficient to thank him, who stood by me from the beginning motivating, directing and enlightening me with knowledge, meticulous care, patience, guidance and encouragement. I wholeheartedly thank him for all his support as a guide and moreover as a mentor.

I extend my sincere gratitude to Dr. Shaju K Y, Head of the Department of Physics for all his valuable suggestions and advice throughout the period of this work.

I am thankful to Dr. Edwin Jose, Assistant Professor, Department of Physics, my class teacher, for his unlisted encouragement and guidance.

I also thank for the support and help extended by the Faculty Members of the Department of Physics, Christ College (Autonomous) Irinjalakuda during this study.

Moreover, I am also thankful to all of my group members. Thanks to all my friends and family members whose endurance, concern and invariable support helped me in accomplishing this task.

LINUS C LIJU

# ABSTRACT

The study of phase space dynamics is an essential tool for understanding the behavior of physical systems. In this project report, we investigate the phase space dynamics of two types of pendulums: a simple pendulum and a driven damped pendulum. A simple pendulum consists of a mass suspended by a string, which swings back and forth under the influence of gravity. We analyze the motion of the simple pendulum using the Newton's formalism. We study the behavior of the pendulum in this phase space and show how the phase space dynamics change with the initial conditions. In contrast, a driven damped pendulum is a simple pendulum with a driving force and a damping force. The driving force can be either periodic or non-periodic, and the damping force is proportional to the velocity of the pendulum. We study the phase space dynamics of the driven damped pendulum using numerical simulations and find that the phase space is more complex than that of the simple pendulum. Furthermore, we investigate the effect of changing the parameters of the driving force and the damping force on the phase space dynamics of the driven damped pendulum. Overall, our study of the phase space dynamics of the simple pendulum and the driven damped pendulum provides insight into the behavior of these physical systems and demonstrates the usefulness of the phase space approach in understanding the dynamics of complex systems.

# TABLE OF CONTENTS

## 1) INTRODUCTION

1.1) Introduction	7
1.2) Simple Pendulum	7
1.3) Importance of Simple Pendulum	9
1.4) Driven Damped Pendulum	10
1.5) Importance of driven damped pendulum	12
1.6) Organization of the Report	13

## 2) THEORY AND METHODOLOGY

2.1) Introduction	14
2.2) Simple Pendulum	14
2.3) Driven Damped Pendulum	16
2.4) Concept of Phase Space	16
2.5) Methodology	17

## 3) SIMPLE PENDULUM: PHASE SPACE

3.1) Introduction	18
3.2) Phase Space of a Simple Pendulum	18
3.3) Effect of Initial Angle on the Phase Space of a Simple Pendulum	19
3.4) Summary	20

## 4) DRIVEN DAMPED PENDULUM: PHASE SPACE

4.1) Introduction	21
4.2) Driven Damped Pendulum	21
4.3) Effect of Damping Factor: Driven Damped Pendulum	22
4.4) Effect of Driving Force: Driven Damped Pendulum	23
4.5) Summary	24

## 5) CONCLUSION 25

# **“QUASAR: EXPANSION OF UNIVERSE, FUTURE”**

*Project Report Submitted to*

**DEPARTMENT OF PHYSICS CHRIST COLLEGE  
(AUTONOMOUS), IRINJALAKUDA**



*In partial fulfilment of the requirement for the award of the degree of*

**BACHELOR OF SCIENCE IN PHYSICS**

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**MAY 2023**

## **DECLARATION**

**I MAHESH MENON (CCAUSPH015)** hereby declares that the project entitled "QUASARS:EXPANSION OF UNIVERSE,FUTURE" is a record of independent and Bonafide project work done under the supervision and guidance of Dr. Edwin Jose, Department of Physics, Christ College (Autonomous), Irinjalakuda.

The information and data given in the report is authentic to the best of my knowledge. The report has not been previously submitted for the award of any Degree, Diploma, Associateship or other similar title of any other university or institute.

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MAHESH MENON (CCAUSPH015)



**CHRIST COLLEGE (AUTONOMOUS),  
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**DEPARTMENT OF PHYSICS**

**CERTIFICATE**

This is to certify that the project report entitled, “**QUASARS: EXPANSION OF UNIVERSE, FUTURE**” is a Bonafide record of project work done by, **MAHESH MENON (CCAUSPH015)** under my guidance and supervision in partial fulfilment of the requirement for the award of the degree of **BACHELOR OF SCIENCE IN PHYSICS** and it has not previously formed the basis for any Degree, Diploma and Associateship or Fellowship.

Irinjalakuda

May 2023

Edwin Jose

(Project Guide)

## **ACKNOWLEDGEMENT**

I express my sincere gratitude to Dr. EDWIN JOSE, Assistant Professor of Physics Department, whose guidance and support throughout the training period helped me to complete this work successfully.

I am thankful to Dr. K.Y SHAJU, Head of Department, for providing proper help and encouragement in the preparation of this report.

I would like to express my sincere obligation to Rev.Fr. Dr. JOLLY ANDREWS CMI, Principal, Christ College Irinjalakuda for providing various facilities.

I would like to express my preferred gratitude to all the faculties of the department for their interest and cooperation in this regard.

I express my sincere thanks to my friends and family for their support in completing this report successfully.

I would like to take the opportunity to express my gratitude to all people who have helped me with sound advice and valuable guidance.

## **ABSTRACT**

In this review project our aim is to study about quasar and how it helps in understanding the expansion of universe .We started by looking the intriguing historical events that unfold; the important ones that finally led to discovery of quasar. We then took a quick glance at the different properties of quasars and parameters related to it. We obtained data from the program that was already available on the SDSS site under the project quasar. Using this data we plotted the graph and had a detailed analysis.

# Table of Contents

## CHAPTER-1

INTRODUCTION .....	6
1.1 WHAT IS A QUASAR? .....	6
1.2 HISTORY OF QUASAR .....	9
1.3 POWER SOURCE OF QUASAR .....	14
1.4 PHYSICAL STRUCTURE OF QUASAR .....	16
1.5 TYPES OF QUASARS .....	17
1.6 SURVEY SITES .....	24

## CHAPTER-2

LITERATURE REVIEW .....	28
2.1 MAGNITUDE OF QUASARS .....	28
2.2 COLOUR OF QUASAR .....	29
2.3 REDSHIFT OF QUASARS .....	31

## CHAPTER-3

PLOTTING AND ANALYSIS OF DATA .....	32
3.1 DATA COLLECTION .....	32
3.2 ANALYSIS OF DATA .....	36

## CHAPTER-4

CONCLUSION .....	37
REFERENCE .....	38

# OPTICAL STUDIES OF SAMARIUM DOPED PVA MATRICES

*Project Report Submitted to*

**DEPARTMENT OF PHYSICS CHRIST COLLEGE  
(AUTONOMOUS), IRINJALAKUDA**



*In partial fulfilment of the requirement for the award of  
the degree of*

**BACHELOR OF SCIENCE IN PHYSICS**

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# CERTIFICATE

This is to certify that the work presented in the thesis entitled 'OPTICAL STUDIES OF SAMARIUM DOPED PVA MATRICES' is a bonafide record of Under Graduate Project work done by Ashik Johnson P, student, department of physics, Christ College Irinjalakuda, for the award of degree of bachelor of science in Physics. The project work is carried out under my supervision.

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May 2023

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# DECLARATION

I affirm that the thesis entitled "OPTICAL STUDIES OF SAMARIUM DOPED PVA MATRICES", being submitted in partial fulfilment for the award of degree of Bachelor of science in Physics, is the original work carried out by me under the supervision of Dr. Xavier Joseph, Associate Professor, Department of Physics, Christ College, Irinjalakuda. This work has not been submitted elsewhere for the award of any degree.

Irinjalakuda

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May 2023

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# ACKNOWLEDGEMENT

This thesis would not have been completed without the help and support of many people. First and foremost, I owe my sincere gratitude to my project guide DR.XAVIER JOSEPH, Department of Physics, Christ College, Irinjalakuda, for his constant support, guidance and enthusiasm throughout the work. I am extremely grateful to PROF. SUDHEER SEBASTIAN, Head of the Department of physics, Christ College, Irinjalakuda, for his valuable advices throughout the course. I am deeply thankful to my friends and family for their wholehearted cooperation and prayers for the successful completion of my work. Above all, I thank God Almighty for always being with me and showering his blessings upon me.



# ABSTRACT

Polymers are considered as good materials because they can be designed to yield a variety of bulk physical properties and they normally exhibit long terms stability and possess flexible reprocess-ability. They can be processed easily, which is an advantage in the fabrication of optical devices. Rare earth ions-containing polymers have attracted much attention for their potential applications for luminescence devices, laser systems and optical communication components. Polymer host make it possible to incorporate rare earth ions, preventing concentration quenching at higher concentration. Poly vinyl alcohol (PVA) films can be used in manufacture of fibre, moisture barriers, in the food industries as a binding and coating agents to tablets, capsules, and other forms to which film coatings are applied.

The first chapter gives a brief idea about the general properties and applications of materials used in the present work. A brief description of polymers which given, with emphasis on poly vinyl alcohol. Samarium, the rare earth element is discussed in detail along with spectroscopic properties and applications of rare earth ions.

The second chapter includes the method of preparation of samarium doped poly vinyl alcohol samples at different concentration. The spectroscopic method and instruments used are described.

The third chapter is the core of the project as this contains the analysis of the samples prepared. Samarium doped PVA samples are prepared and analysed using absorption and emission spectrum. The transition from  ${}^6\text{H}_{5/2}$  level to various levels have been detected. Colorimetric study indicates that light emission from the sample corresponds to yellowish orange.

# Contents

Chapter 1 .....	6
GENERAL INTRODUCTION .....	6
1.1 POLYMERS .....	6
1.1.1 POLYMER PROPERTIES .....	6
1.1.2 APPLICATIONS OF POLYMERS.....	7
1.2 PVA (poly vinyl alcohol) .....	9
1.3 RARE EARTH METALS 12	
1.3.1 RARE EARTH SPECTROSCOPY.....	13
1.3.2 ENERGY LEVELS OF RARE EARTH IONS .....	14
1.3.3 SAMARIUM .....	16
Chapter 2.....	18
EXPERIMENTAL TECHNIQUES.....	18
2.1 SAMPLE PREPARATION .....	18
2.2 OPTICAL SPECTROSCOPY.....	18
<i>Continuous spectrum</i> .....	21
<i>Band Spectrum</i> .....	21
CHAPTER 3.....	28
3.1 OPTICAL STUDIES .....	28
3.1.2 EMISSION SPECTRUM.....	31
3.1.3 EXCITATION SPECTRUM .....	34
3.2 COLORIMETRIC STUDIES .....	38
CONCLUSION .....	40

# **SIZE ANALYSIS OF GOLD NANOPARTICLES AT DIFFERENT CITRATE SOLUTIONS**

PROJECT REPORT SUBMITTED TO  
**DEPARTMENT OF PHYSICS CHRIST COLLEGE (AUTONOMOUS),  
IRINJALAKUDA**



IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF  
**BACHELOR OF SCIENCE IN PHYSICS**

SUBMITTED BY  
**NUHA SAVAD NALAKATH- CCAUSPH042**

UNDER THE SUPERVISION OF  
**MISS. IRENE JOY V**  
FACULTY DEPARTMENT OF PHYSICS  
CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA  
MAY 2023

**CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA**  
**CALICUT UNIVERSITY**  
**DEPARTMENT OF PHYSICS**

**CERTIFICATE**

This is to certify that the project report entitled, "Size Analysis Of Gold Nanoparticles At Different Citrate Solutions"" is a Bonafide record of project work done by Nuha Savad Nalakath (CCAUSPH042) under my guidance and supervision in partial fulfilment of the requirement for the award of the degree of BACHELOR OF SCIENCE IN PHYSICS and it has not previously formed the basis for any Degree, Diploma and Associateship or Fellowship.

Irinjalakuda

May 2023

Irene Joy V

(Project guide)

## **DECLARATION**

I Nuha Savad Nalakath (CCAUSPH042) hereby declare that the project entitled “Size Analysis Of Gold Nanoparticles At Different Citrate Solutions” is a group project done under the supervision and guidance of Miss. Irene Joy V, Department of Physics, Christ College (Autonomous), Irinjalakuda. The information and data given in the report is authentic to the best of our knowledge. The report has not been previously submitted for the award of any Degree, Diploma, Associateship or other similar title of any other university or institute.

Irinjalakuda

May 2023

Nuha Savad Nalakath

(CCAUSPH042)

## **ACKNOWLEDGEMENT**

I express our sincere gratitude to Miss Irene Joy V, Faculty of Physics Department, whose guidance and support throughout the training period helped us to complete this work successfully. We are thankful to Dr. Sudheer Sebastian, Head of Department, for providing proper help and encouragement in the preparation of this report. We are thankful to our Class teacher, Dr. Edwin Jose, Professor of Physics Department for providing proper help and encouragement in the preparation of this report. We would like to express our sincere obligation to Rev. Fr. Dr. Jolly Andrews CMI, Principal, Christ College Irinjalakuda for providing various facilities. We express our preferred gratitude to all the faculties of the department for their interest and cooperation in this regard. Our sincere thanks to all our friends and family for their support in completing this project successfully.

## **Abstract**

Nanoparticles have a great impact in changing the entire perspective of molecular science. This project is centred upon the property of gold nanoparticles- Surface Plasmon Resonance, the varying nature of the particle due to varying concentrations and the inferences gathered from the graphical analysis of different concentrations of gold nanoparticles. Gold shows different properties at a nanoscale level and these properties are of great scientific importance. Different concentrations of gold solutions was analysed and their absorbance graphs were plotted. The various reasons for the different peak intensities of the graph were analysed. Various applications of gold nanoparticles were also explored.

# Table of Contents

<b>Chapter 1 - Introduction</b> .....	3
1.1 Gold Nano Particles .....	4
1.2 Properties Of Gold Nano Particles .....	4
1.3 Surface Plasmon Resonance .....	5
<b>Chapter 2 - UV Spectroscopy</b> .....	7
2.1 UV Spectrophotometer .....	8
<b>Chapter 3 - Synthesis Of Gold Nano Particles</b> .....	9
3.1 Sodium Citrate As A Reducing Agent .....	9
3.2 Reaction Process .....	9
<b>Chapter 4 - Size Determination and Analysis</b> .....	11
4.1 Mie's Theory.....	11
4.2 Size Determination Using UV-vis Spectroscopy And Mie Theory.....	11
4.3 Analysis From The Graph.....	14
4.4 Effect Of Concentration Of Sodium Citrate On Gold Nanoparticles .....	16
<b>Chapter 5 - Application</b> .....	18
<b>Chapter 6 - Conclusion</b> .....	22
6.1 References.....	23
6.2 Image References .....	23