STUDENT CENTRIC METHODS (2022-2023)

STUDENT CENTRIC METHODS

2022-2023

DEPARTMENT OF ECONOMICS

CASE STUDIES

AND

GROUP DISCUSSIONS

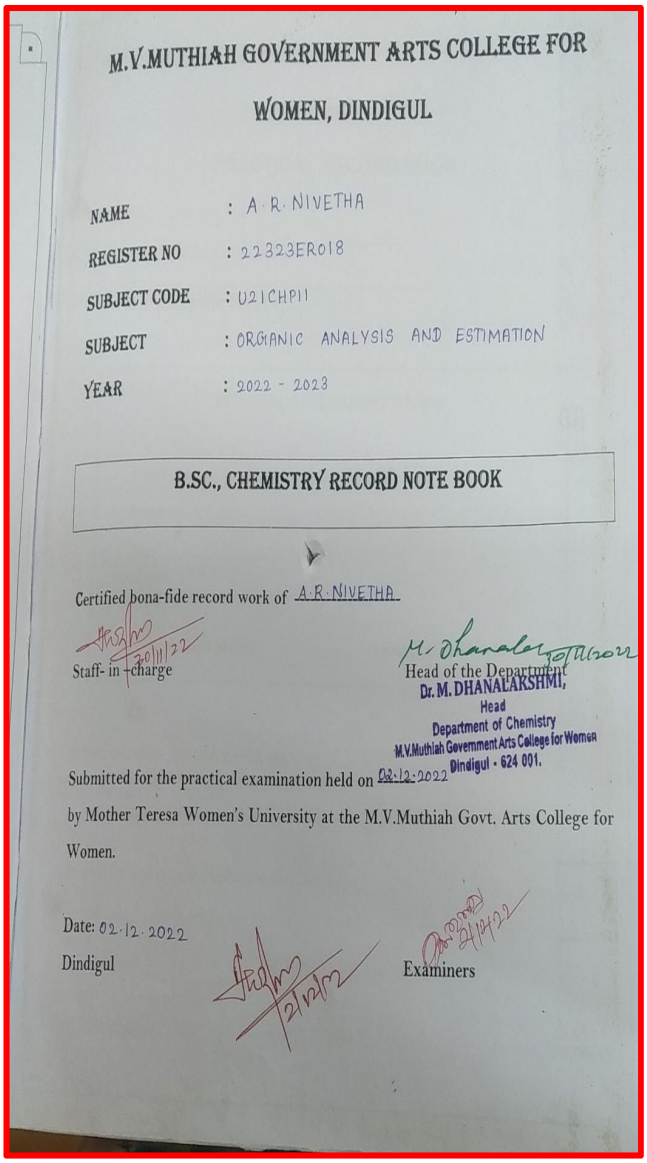

I BA Em I


II BA Em I


DEPARTMENT OF ECONOMICS


DEPARTMENT OF ECONOMICS

DEPARTMENT OF CHEMISTRY
STUDENT CENTRIC METHODS
I B.Sc. Chemistry
I Semester
U21CHP11-Organic Analysis and Estimation



M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN, DINDIGUL

NAME : A. R. NIVETHA

REGISTER NO : 22323ER018

SUBJECT CODE : U21CHP11

SUBJECT : ORGANIC ANALYSIS AND ESTIMATION

YEAR : 2022 - 2023

B.SC., CHEMISTRY RECORD NOTE BOOK

Certified bona-fide record work of A.R. NIVETHA

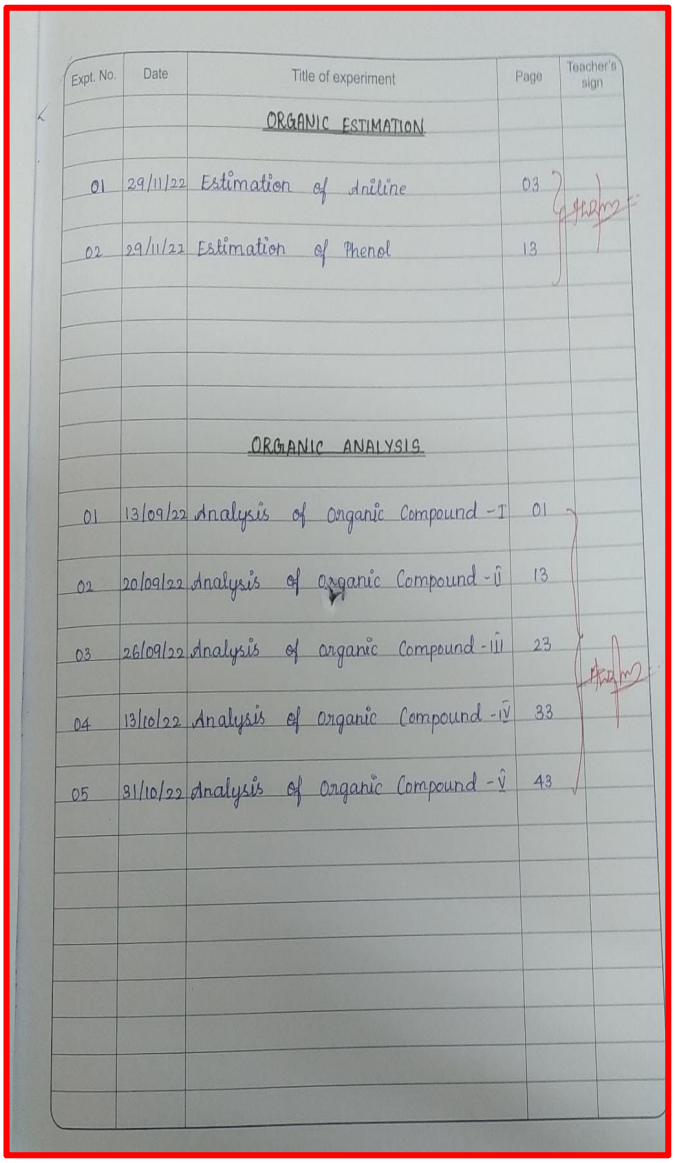
30/11/22
Staff- in -charge

Head of the Department
Dr. M. DHANALAKSHMI,
Head
Department of Chemistry
M.V.Muthiah Government Arts College for Women
Dindigul - 624 001.

Submitted for the practical examination held on 02.12.2022 by Mother Teresa Women's University at the M.V.Muthiah Govt. Arts College for Women.

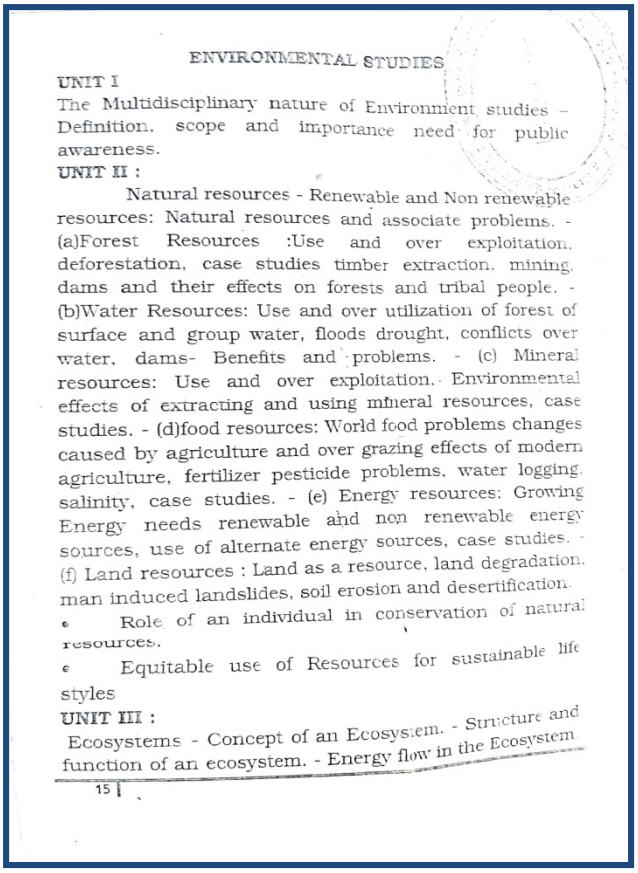
Date: 02.12.2022
Dindigul

21/12/22
Examiners



Expt. No.	Date	Title of experiment	Page	Teacher's sign
		ORGANIC ESTIMATION		
01	29/11/22	Estimation of Aniline	03	
02	29/11/22	Estimation of Phenol	13	
		ORGANIC ANALYSIS		
01	13/09/22	Analysis of Organic Compound - I	01	
02	20/09/22	Analysis of Organic Compound - II	13	
03	26/09/22	Analysis of Organic Compound - III	23	
04	13/10/22	Analysis of Organic Compound - IV	33	
05	31/10/22	Analysis of Organic Compound - V	43	

SEMESTER – I
ENVIRONMENTAL STUDIES



ENVIRONMENTAL STUDIES

UNIT I

The Multidisciplinary nature of Environment studies – Definition, scope and importance need for public awareness.

UNIT II :

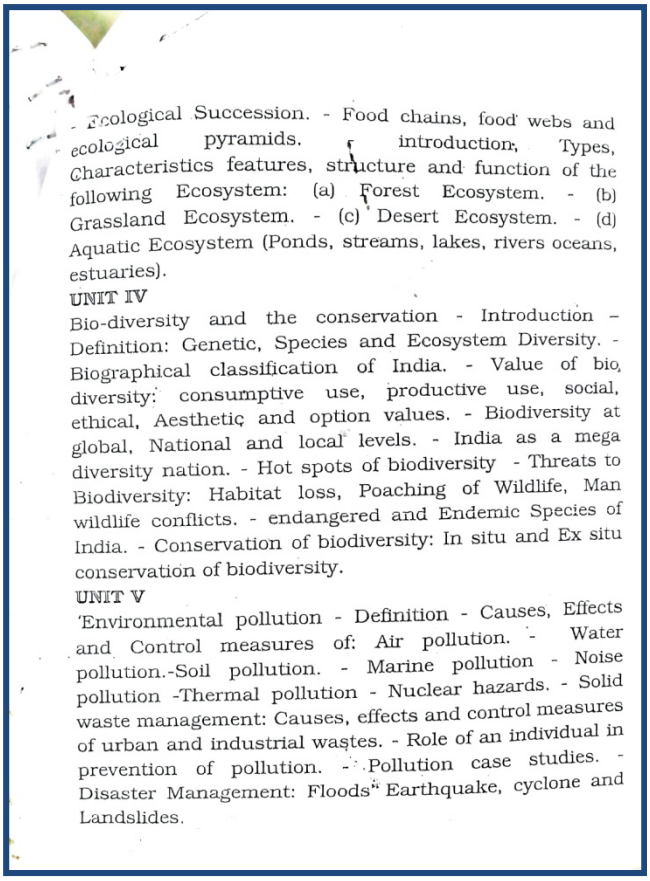
Natural resources - Renewable and Non renewable resources: Natural resources and associate problems. - (a)Forest Resources :Use and over exploitation, deforestation, case studies timber extraction, mining, dams and their effects on forests and tribal people. - (b)Water Resources: Use and over utilization of forest of surface and group water, floods drought, conflicts over water, dams- Benefits and problems. - (c) Mineral resources: Use and over exploitation. Environmental effects of extracting and using mineral resources, case studies. - (d)food resources: World food problems changes caused by agriculture and over grazing effects of modern agriculture, fertilizer pesticide problems, water logging, salinity, case studies. - (e) Energy resources: Growing Energy needs renewable and non renewable energy sources, use of alternate energy sources, case studies. - (f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of Resources for sustainable life styles

UNIT III :

Ecosystems - Concept of an Ecosystem. - Structure and function of an ecosystem. - Energy flow in the Ecosystem

15



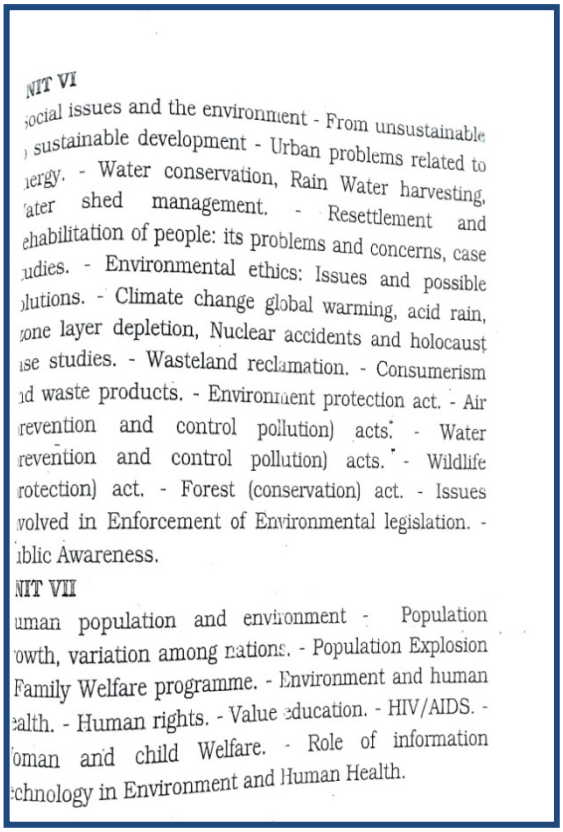
- Ecological Succession. - Food chains, food webs and ecological pyramids. - introduction, Types, Characteristics features, structure and function of the following Ecosystem: (a) Forest Ecosystem. - (b) Grassland Ecosystem. - (c) Desert Ecosystem. - (d) Aquatic Ecosystem (Ponds, streams, lakes, rivers oceans, estuaries).

UNIT IV

Bio-diversity and the conservation - Introduction – Definition: Genetic, Species and Ecosystem Diversity. - Biographical classification of India. - Value of bio diversity: consumptive use, productive use, social, ethical, Aesthetic and option values. - Biodiversity at global, National and local levels. - India as a mega diversity nation. - Hot spots of biodiversity - Threats to Biodiversity: Habitat loss, Poaching of Wildlife, Man wildlife conflicts. - endangered and Endemic Species of India. - Conservation of biodiversity: In situ and Ex situ conservation of biodiversity.

UNIT V

Environmental pollution - Definition - Causes, Effects and Control measures of: Air pollution. - Water pollution.-Soil pollution. - Marine pollution - Noise pollution -Thermal pollution - Nuclear hazards. - Solid waste management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster Management: Floods, Earthquake, cyclone and Landslides.



NIT VI

ocial issues and the environment - From unsustainable sustainable development - Urban problems related to nergy. - Water conservation, Rain Water harvesting, ater shed management. - Resettlement and ehabilitation of people: its problems and concerns, case udies. - Environmental ethics: Issues and possible olutions. - Climate change global warming, acid rain, one layer depletion, Nuclear accidents and holocaust se studies. - Wasteland reclamation. - Consumerism d waste products. - Environment protection act. - Air revention and control pollution) acts. - Water revention and control pollution) acts. - Wildlife rotection) act. - Forest (conservation) act. - Issues volved in Enforcement of Environmental legislation. - iblic Awareness.

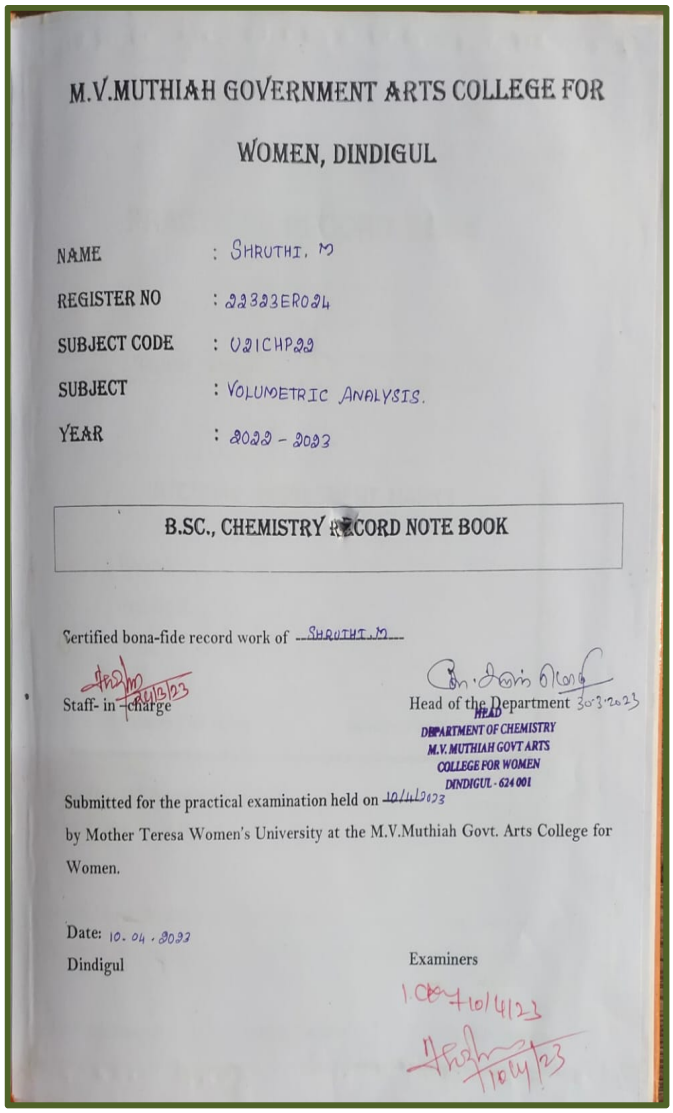
NIT VII

uman population and environment - Population owth, variation among nations. - Population Explosion Family Welfare programme. - Environment and human alth. - Human rights. - Value education. - HIV/AIDS. - oman and child Welfare. - Role of information chnology in Environment and Human Health.

I B.Sc. Chemistry

II Semester

U21CHP22-Volumetric Analy



M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR

WOMEN, DINDIGUL

NAME : SHRUTHI. M

REGISTER NO : 22333ER024

SUBJECT CODE : U21CHP22

SUBJECT : VOLUMETRIC ANALYSIS.

YEAR : 2022 - 2023

B.SC., CHEMISTRY RECORD NOTE BOOK

Certified bona-fide record work of --SHRUTHI.M---

Staff- in -charge

Head of the Department 30.3.2023

HEAD
DEPARTMENT OF CHEMISTRY
M.V. MUTHIAH GOVT ARTS
COLLEGE FOR WOMEN
DINDIGUL - 624 001

Submitted for the practical examination held on 10/4/2023

by Mother Teresa Women's University at the M.V.Muthiah Govt. Arts College for Women.

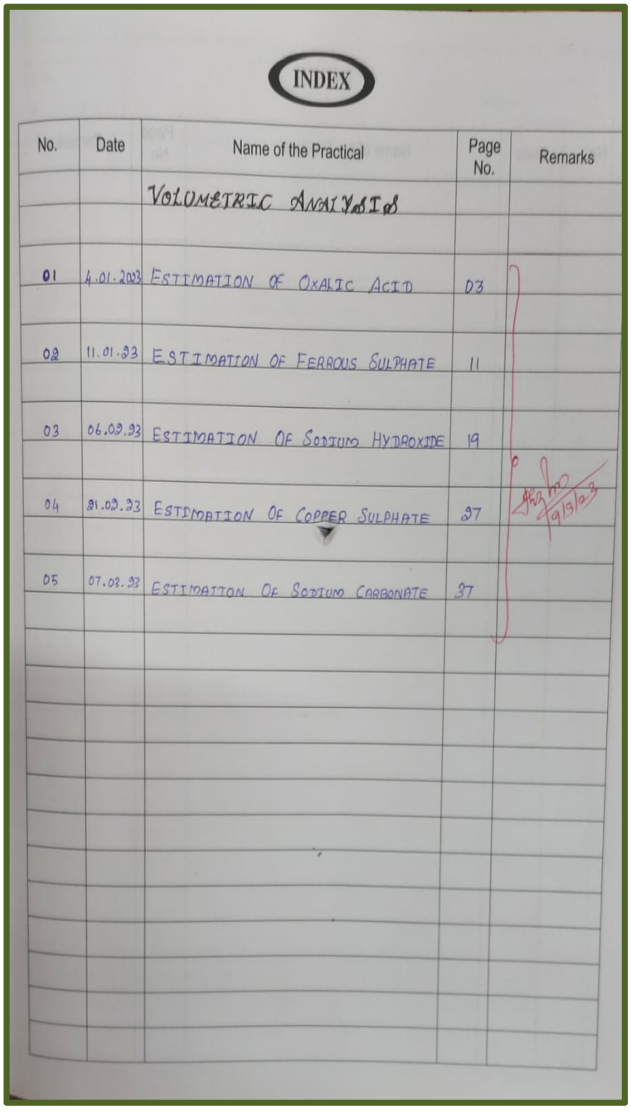
Date: 10.04.2023

Dindigul

Examiners

10/4/23

10/4/23



INDEX

SEMESTER – II
VALUE EDUCATION

VALUE EDUCATION

UNIT I

Values – Definition – value crisis – need for practicing positive values for good life – value erosion – its impact on individual, societal – cultural level – way out.

UNIT II

Family, material, human values – good health – individual and intellectual freedom – human progress – production and distribution – prosperity and peace – Aesthetic values – sense of beauty – moral ethical value – conscience – integrity – fairness.

UNIT III

Society values – cooperative living – healthy behaviors – justice – social responsibility – free from bribery and corruption – good citizen – good society – pursuit of excellence – psychological values – self esteem and acceptance – emotional intelligence – spiritual values – devotion and self fulfillment.

UNIT IV

Bio-Ethics – definition –goals and objectives – love of life – animal use and ethics – medical ethics – negligence and wrong judgments – issues genomes on organ transplantation – donors – drugs – morality – social ethics – child labor and bonded labor.

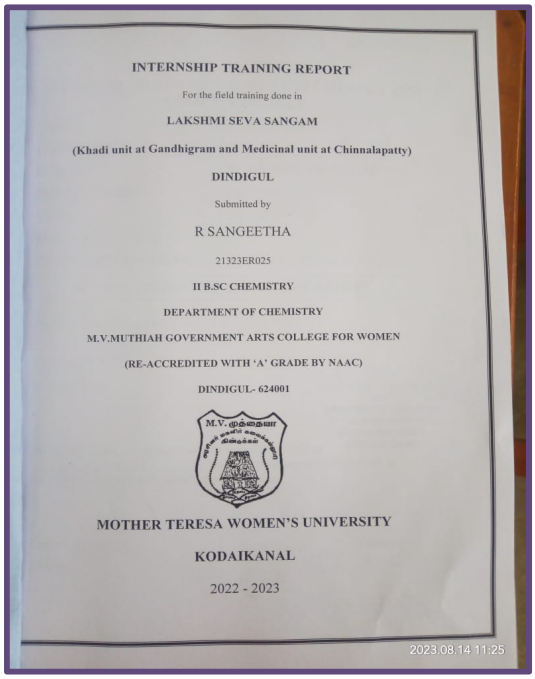
UNIT V

Women – and development – sex versus gender – women's rights – factors affecting development – violence against women – right to privacy – abortion and reproductive rights – social stigma – women empowerment – social, economic and political – government program and policies.

II B.Sc. Chemistry

IV Semester

U21CHI41-Internship Training Program



INTERNSHIP TRAINING REPORT

For the field training done in

LAKSHMI SEVA SANGAM

(Khadi unit at Gandhigram and Medicinal unit at Chinnalapatty)

DINDIGUL

Submitted by

R SANGEETHA

21323ER025

II B.SC CHEMISTRY

DEPARTMENT OF CHEMISTRY

M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN

(RE-ACCREDITED WITH 'A' GRADE BY NAAC)

DINDIGUL- 624001

MOTHER TERESA WOMEN'S UNIVERSITY

KODAIKANAL

2022 - 2023

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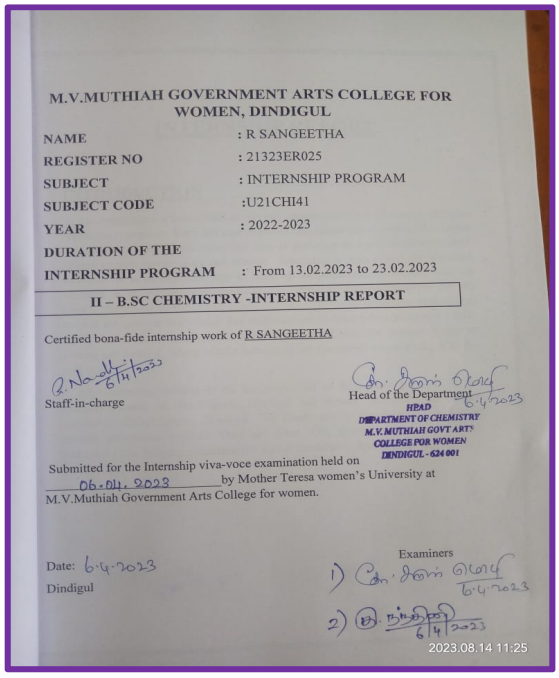


M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN, DINDIGUL

NAME : R SANGEETHA
REGISTER NO : 21323ER025
SUBJECT : INTERNSHIP PROGRAM
SUBJECT CODE :U21CHI41
YEAR : 2022-2023
DURATION OF THE INTERNSHIP PROGRAM : From 13.02.2023 to 23.02.2023

II – B.SC CHEMISTRY -INTERNSHIP REPORT

Certified bona-fide internship work of R SANGEETHA

Staff-in-charge

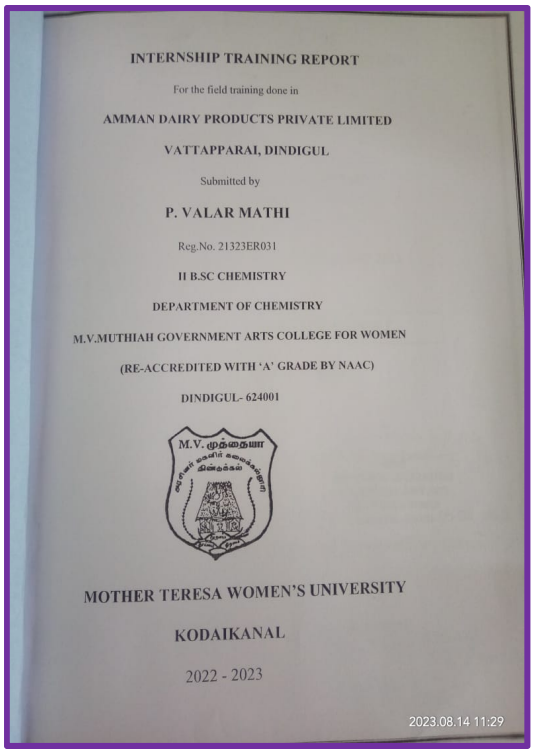
Head of the Department
HEAD
DEPARTMENT OF CHEMISTRY
M.V. MUTHIAH GOVT ARTS
COLLEGE FOR WOMEN
DINDIGUL - 624 001

Submitted for the Internship viva-voce examination held on 06.04.2023 by Mother Teresa women's University at M.V.Muthiah Government Arts College for women.

Date: 6.4.2023
Dindigul

Examiners
1)
2)

2023.08.14 11:25



INTERNSHIP TRAINING REPORT

For the field training done in

AMMAN DAIRY PRODUCTS PRIVATE LIMITED

VATTAPPARAI, DINDIGUL

Submitted by

P. VALAR MATHI

Reg.No. 21323ER031

II B.SC CHEMISTRY

DEPARTMENT OF CHEMISTRY

M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN

(RE-ACCREDITED WITH 'A' GRADE BY NAAC)

DINDIGUL- 624001

MOTHER TERESA WOMEN'S UNIVERSITY

KODAIKANAL

2022 - 2023

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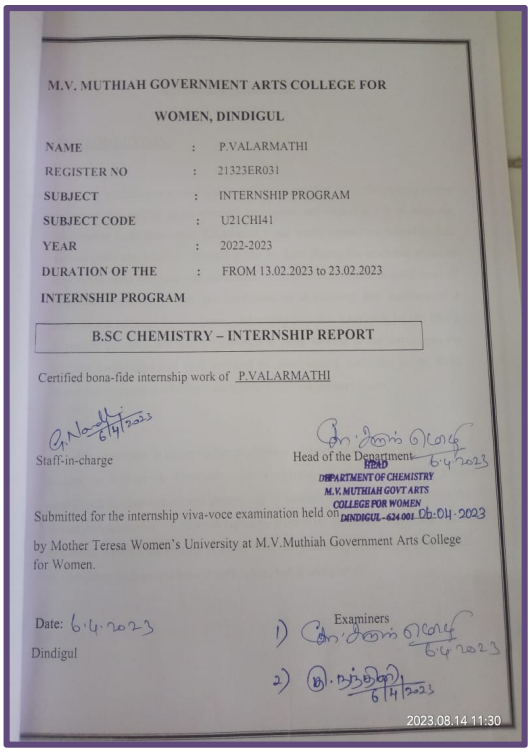

M.V. MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN, DINDIGUL

NAME : P.VALARMATHI
REGISTER NO : 21323ER031
SUBJECT : INTERNSHIP PROGRAM
SUBJECT CODE : U21CHI41
YEAR : 2022-2023
DURATION OF THE INTERNSHIP PROGRAM : FROM 13.02.2023 to 23.02.2023

B.SC CHEMISTRY – INTERNSHIP REPORT

Certified bona-fide internship work of P.VALARMATHI

Staff-in-charge

Head of the Department
HEAD
DEPARTMENT OF CHEMISTRY
M.V. MUTHIAH GOVT ARTS
COLLEGE FOR WOMEN
DINDIGUL - 624 001

Submitted for the internship viva-voce examination held on 06.04.2023 by Mother Teresa Women's University at M.V.Muthiah Government Arts College for Women.

Date: 6.4.2023
Dindigul

Examiners
1)
2)

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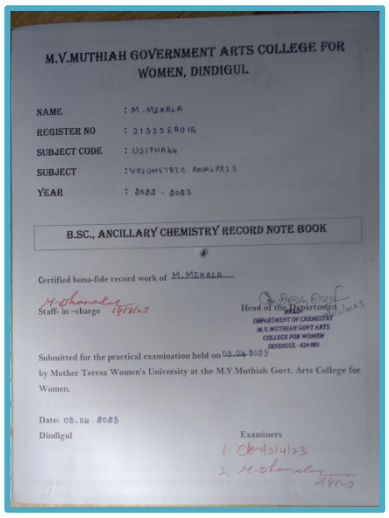
IV Semester



M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN, DINDIGUL

NAME : M. MEKALA
REGISTER NO : 21322ER016
SUBJECT CODE : U21PHA44
SUBJECT : VOLUMETRIC ANALYSIS
YEAR : 2022 - 2023

B.SC., ANCILLARY CHEMISTRY RECORD NOTE BOOK

Certified bona-fide record work of M. MEKALA

Staff-in-charge

Head of the Department

DEPARTMENT OF CHEMISTRY
M.V. MUTHIAH GOVT ARTS
COLLEGE FOR WOMEN
DINDIGUL - 624 001

Submitted for the practical examination held on 08.04.2023 by Mother Teresa Women's University at the M.V.Muthiah Govt. Arts College for Women.

Date: 08.04.2023
Dindigul

Examiners

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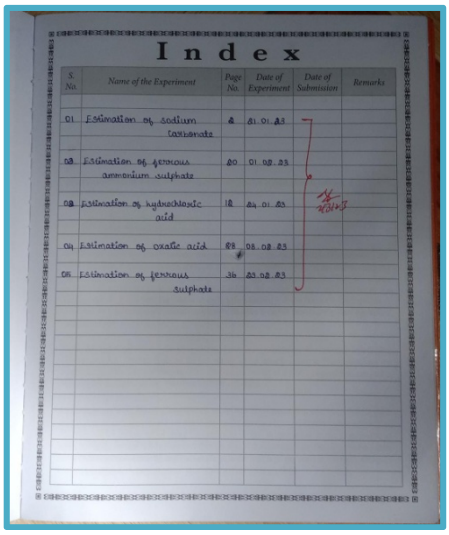
2.

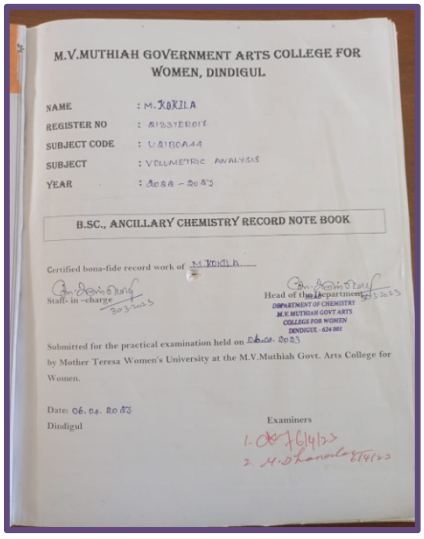


Index

S. No.	Name of the Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
01	Estimation of sodium carbonate	4	31.01.23		
03	Estimation of ferrous ammonium sulphate	10	01.02.23		
02	Estimation of hydrochloric acid	18	24.01.23		
04	Estimation of oxalic acid	28	08.02.23		
05	Estimation of ferrous sulphate	36	23.02.23		

B.Sc. Physics

B.Sc. Botany



M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN, DINDIGUL

NAME : M. KOKILA
REGISTER NO : 21337ER017
SUBJECT CODE : U21BOA44
SUBJECT : VOLUMETRIC ANALYSIS
YEAR : 2022 - 2023

B.SC., ANCILLARY CHEMISTRY RECORD NOTE BOOK

Certified bona-fide record work of M. KOKILA

Staff-in-charge

Head of the Department

DEPARTMENT OF CHEMISTRY
M.V. MUTHIAH GOVT ARTS
COLLEGE FOR WOMEN
DINDIGUL - 624 001

Submitted for the practical examination held on 06.04.2023 by Mother Teresa Women's University at the M.V.Muthiah Govt. Arts College for Women.

Date: 06.04.2023
Dindigul

Examiners

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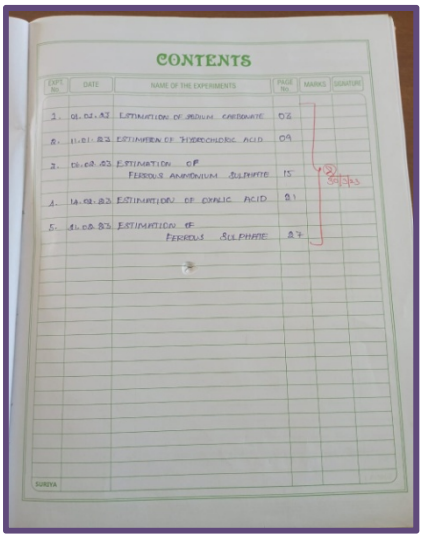
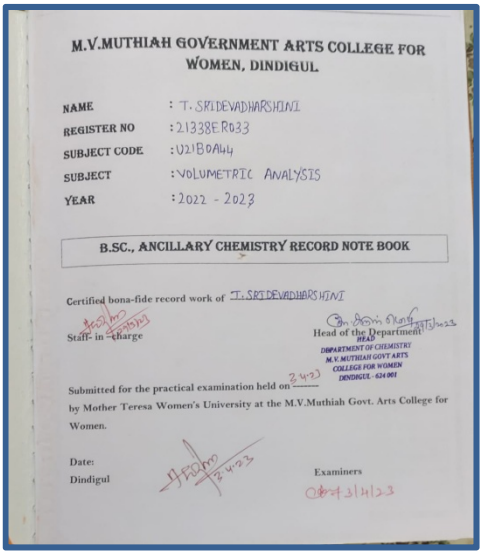
2.



CONTENTS

EXPT. No.	DATE	NAME OF THE EXPERIMENTS	PAGE No.	MARKS	SIGNATURE
1.	01.02.23	ESTIMATION OF SODIUM CARBONATE	02		
2.	11.01.23	ESTIMATION OF HYDROCHLORIC ACID	09		
3.	10.02.23	ESTIMATION OF FERROUS AMMONIUM SULPHATE	15		
4.	14.02.23	ESTIMATION OF OXALIC ACID	21		
5.	21.02.23	ESTIMATION OF FERROUS SULPHATE	27		

SURIYA



M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN, DINDIGUL

NAME : T. SRIDEVADHARSHINI
REGISTER NO : 21338ER033
SUBJECT CODE : U21BOA44
SUBJECT : VOLUMETRIC ANALYSIS
YEAR : 2022 - 2023

B.SC., ANCILLARY CHEMISTRY RECORD NOTE BOOK

Certified bona-fide record work of T. SRIDEVADHARSHINI

Staff-in-charge

Head of the Department

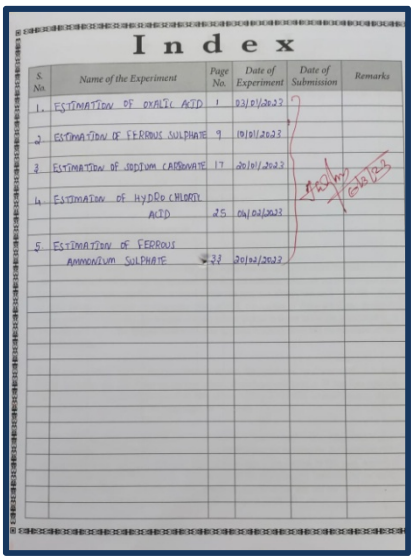
HEAD
DEPARTMENT OF CHEMISTRY
M.V. MUTHIAH GOVT ARTS
COLLEGE FOR WOMEN
DINDIGUL - 624 001

Submitted for the practical examination held on 24.03.23 by Mother Teresa Women's University at the M.V.Muthiah Govt. Arts College for Women.

Date: 24.03.23
Dindigul

Examiners

1.
2.



Index

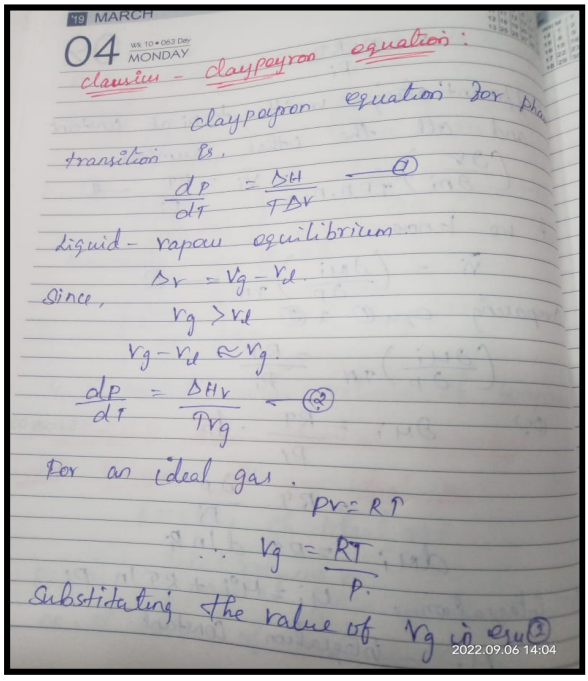
S. No.	Name of the Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
1.	ESTIMATION OF OXALIC ACID	1	03/01/2023		
2	ESTIMATION OF FERROUS SULPHATE	9	19/01/2023		
3	ESTIMATION OF SODIUM CARBONATE	17	30/01/2023		
4	ESTIMATION OF HYDRO CHLORIC ACID	25	06/02/2023		
5	ESTIMATION OF FERROUS AMMONIUM SULPHATE	33	20/02/2023		

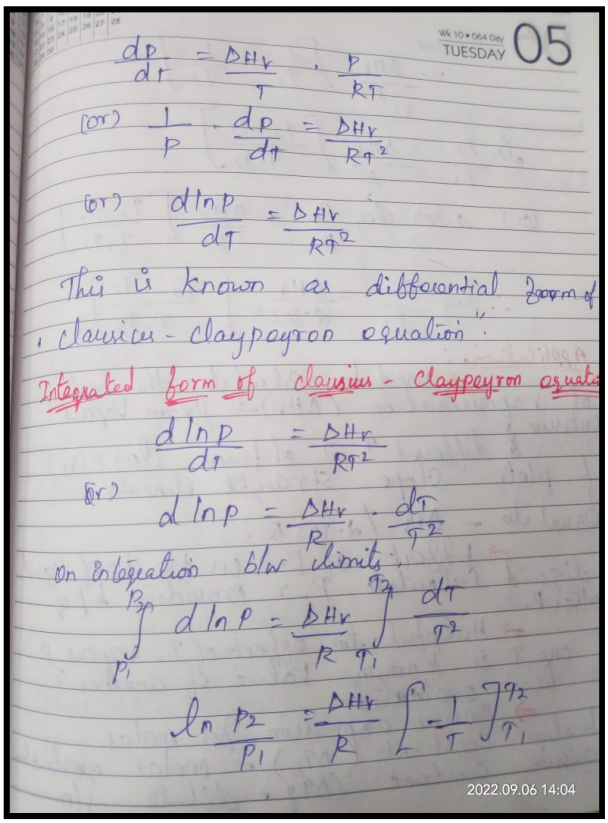
B.Sc. Zoology

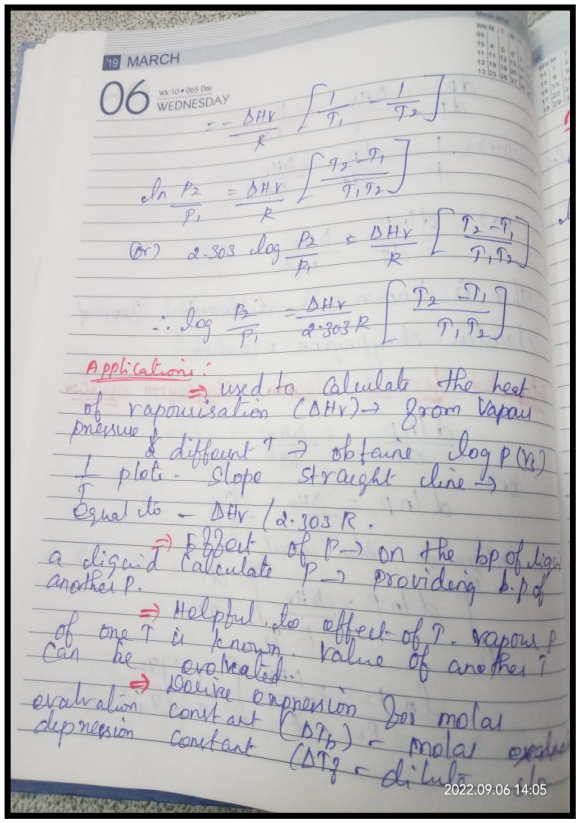
III B.Sc. Chemistry

V Semester

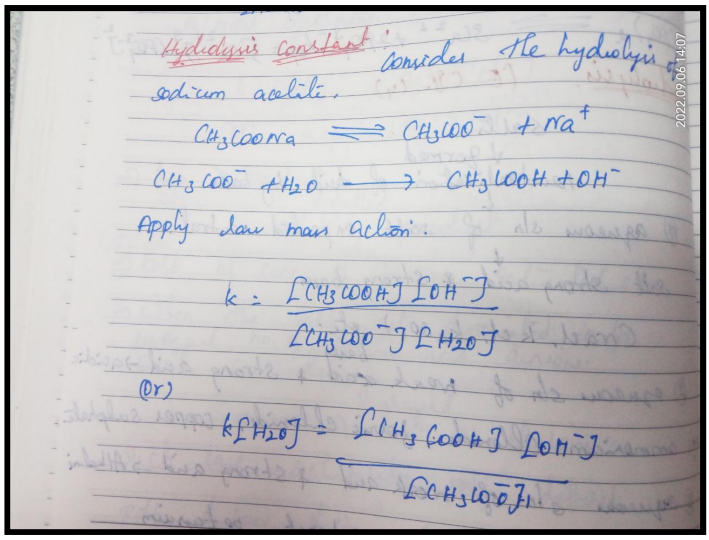
UCHT53 Physical Chemistry I

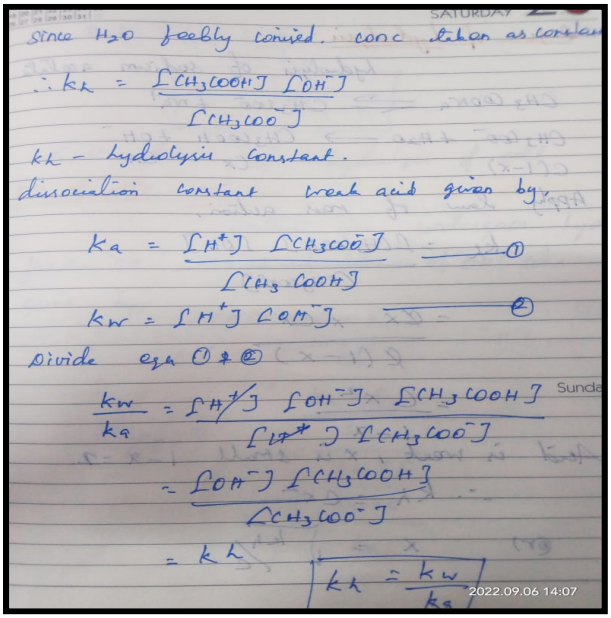


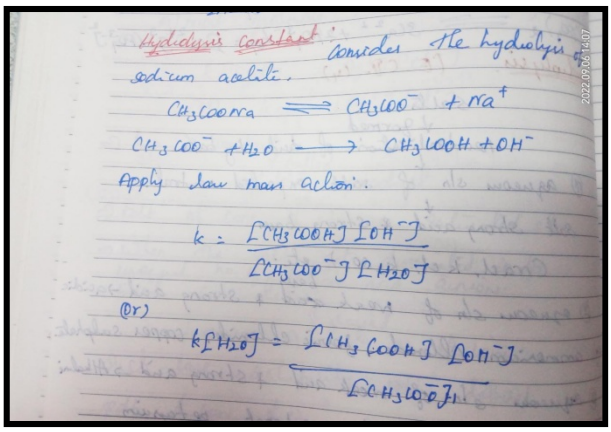




III B.Sc. Chemistry
VI Semester
UCHT62 Physical Chemistry II


Hydrolysis constant:
Consider the hydrolysis of sodium acetate.
$CH_3COONa \rightleftharpoons CH_3COO^- + Na^+$
$CH_3COO^- + H_2O \longrightarrow CH_3COOH + OH^-$
Apply law mass action.
$$k = \frac{[CH_3COOH][OH^-]}{[CH_3COO^-][H_2O]}$$
(or)
$$k[H_2O] = \frac{[CH_3COOH][OH^-]}{[CH_3COO^-]}$$


Since H_2O feebly ionised. conc taken as constant
$$\therefore k_h = \frac{[CH_3COOH][OH^-]}{[CH_3COO^-]}$$
k_h - hydrolysis constant.
dissociation constant weak acid given by,
$$k_a = \frac{[H^+][CH_3COO^-]}{[CH_3COOH]} \quad \text{---(1)}$$
$$k_w = [H^+][OH^-] \quad \text{---(2)}$$
Divide eqn (1) & (2)
$$\frac{k_w}{k_a} = \frac{[H^+][OH^-][CH_3COOH]}{[H^+][CH_3COO^-]}$$
$$= \frac{[OH^-][CH_3COOH]}{[CH_3COO^-]}$$
$$= k_h$$
$$\boxed{k_h = \frac{k_w}{k_a}}$$


Hydrolysis constant:
Consider the hydrolysis of sodium acetate.
$CH_3COONa \rightleftharpoons CH_3COO^- + Na^+$
$CH_3COO^- + H_2O \longrightarrow CH_3COOH + OH^-$
Apply law mass action.
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(or)
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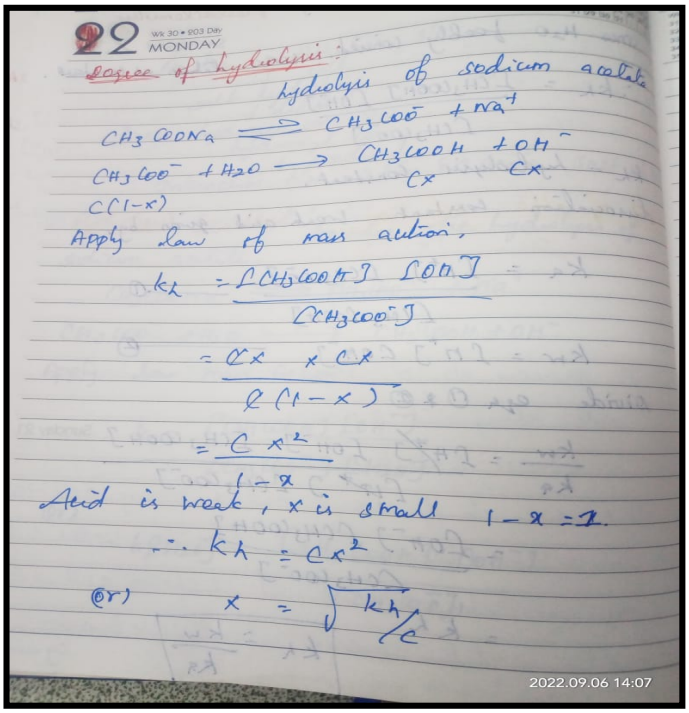
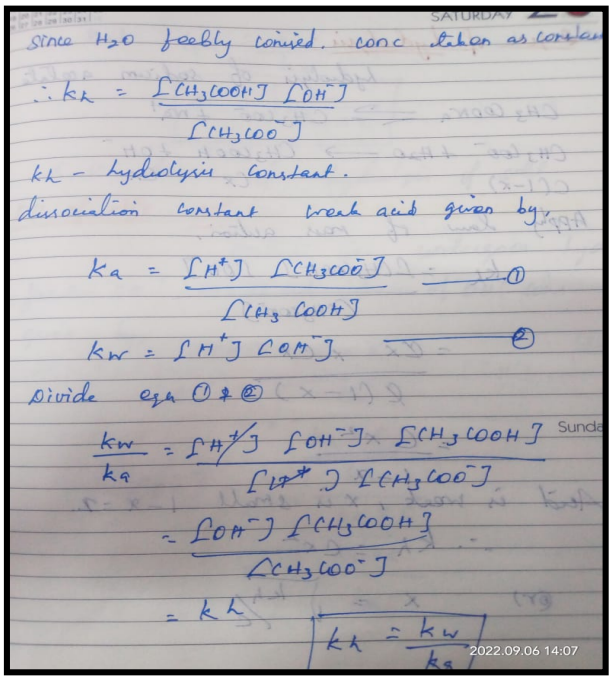
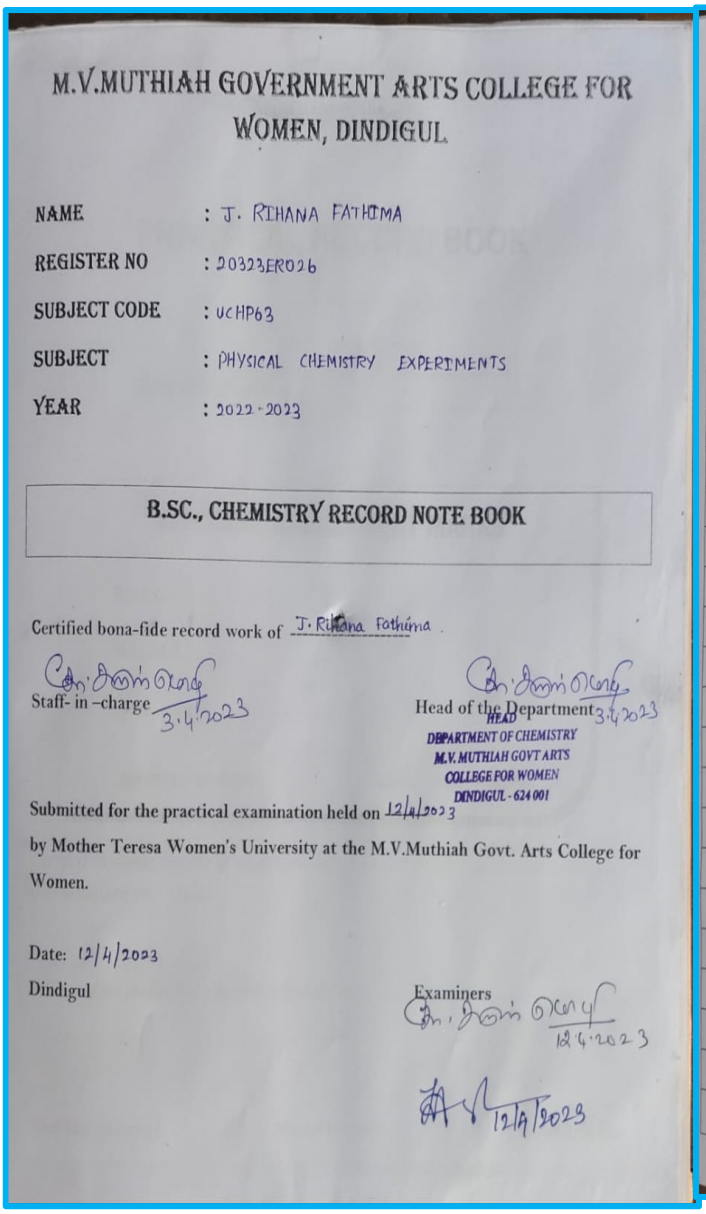

Degree of hydrolysis:
Hydrolysis of sodium acetate
$CH_3COONa \rightleftharpoons CH_3COO^- + Na^+$
$CH_3COO^- + H_2O \longrightarrow CH_3COOH + OH^-$
$C(1-x)$ Cx Cx
Apply law of mass action,
$$k_h = \frac{[CH_3COOH][OH^-]}{[CH_3COO^-]}$$
$$= \frac{Cx \times Cx}{C(1-x)}$$
$$= \frac{Cx^2}{1-x}$$
Acid is weak, x is small $1-x = 1$.
$$\therefore k_h = Cx^2$$
(or) $$x = \sqrt{k_h/C}$$


since H_2O feebly ionised. conc taken as constant
$$\therefore k_h = \frac{[CH_3COOH][OH^-]}{[CH_3COO^-]}$$
k_h - hydrolysis constant.
dissociation constant weak acid given by,
$$k_a = \frac{[H^+][CH_3COO^-]}{[CH_3COOH]} \quad \text{---(1)}$$
$$k_w = [H^+][OH^-] \quad \text{---(2)}$$
Divide eqn (1) & (2)
$$\frac{k_w}{k_a} = \frac{[H^+][OH^-][CH_3COOH]}{[H^+][CH_3COO^-]}$$
$$= \frac{[OH^-][CH_3COOH]}{[CH_3COO^-]}$$
$$= k_h$$
$$\boxed{k_h = \frac{k_w}{k_a}}$$

III B.Sc. Chemistry

VI Semester

UCHP63-Physical Chemistry



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REGISTER NO : 20323ER026

SUBJECT CODE : UCHP63

SUBJECT : PHYSICAL CHEMISTRY EXPERIMENTS

YEAR : 2022-2023

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Staff- in -charge 3.4.2023

Head of the Department 3.4.2023

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Examiners

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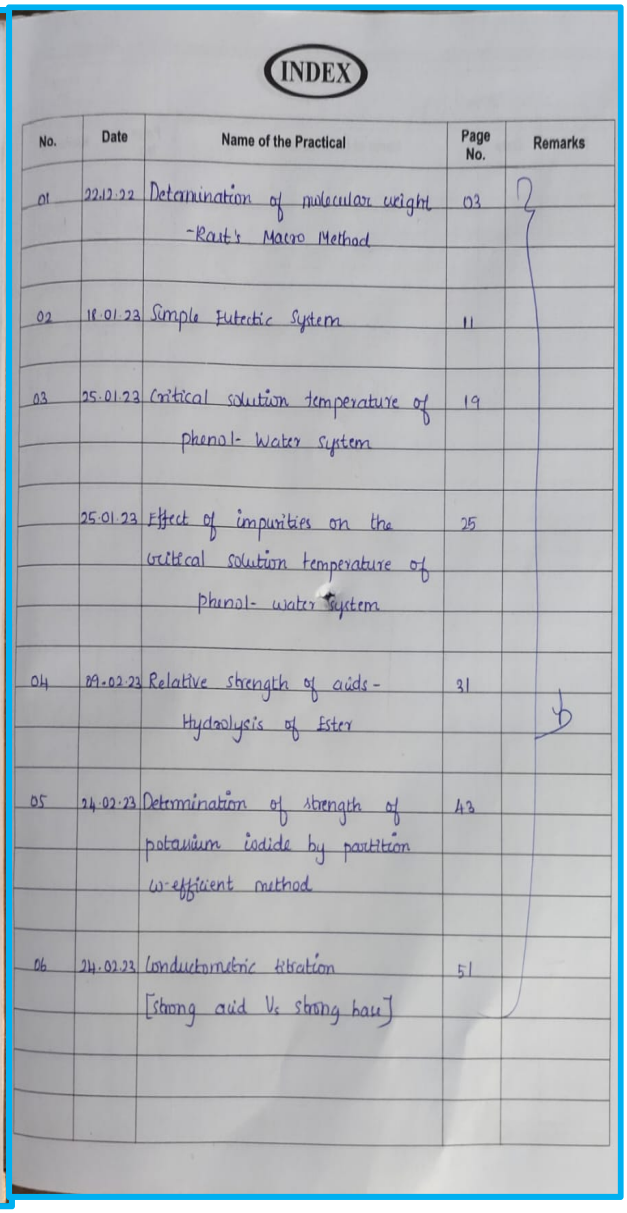
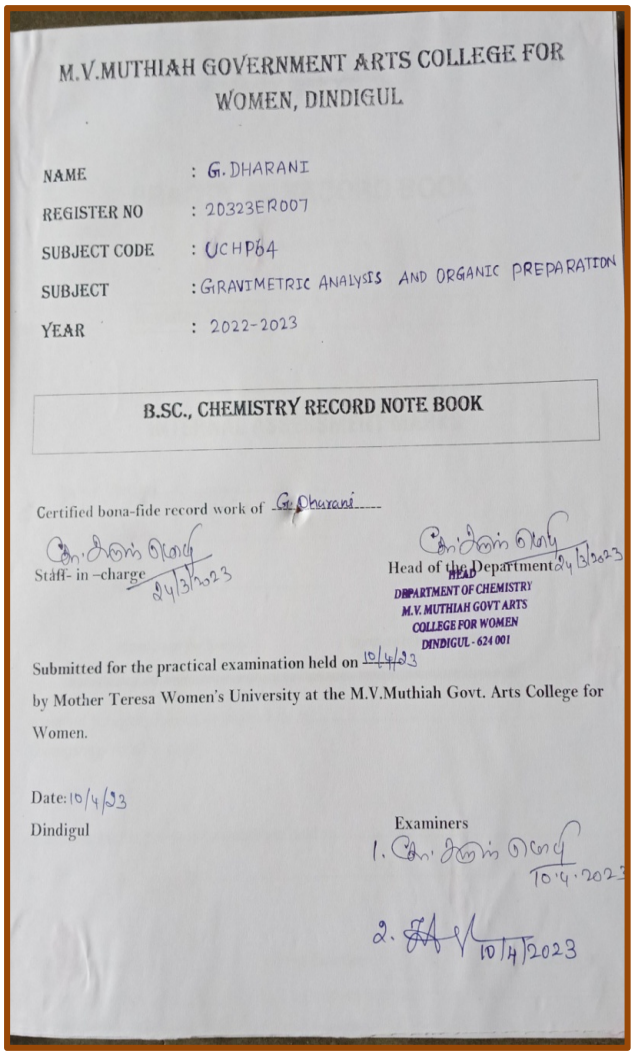


INDEX

III B.Sc. Chemistry

VI Semester

UCHP64-Gravimetric Estimation and Organic Preparation



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SUBJECT : GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATION
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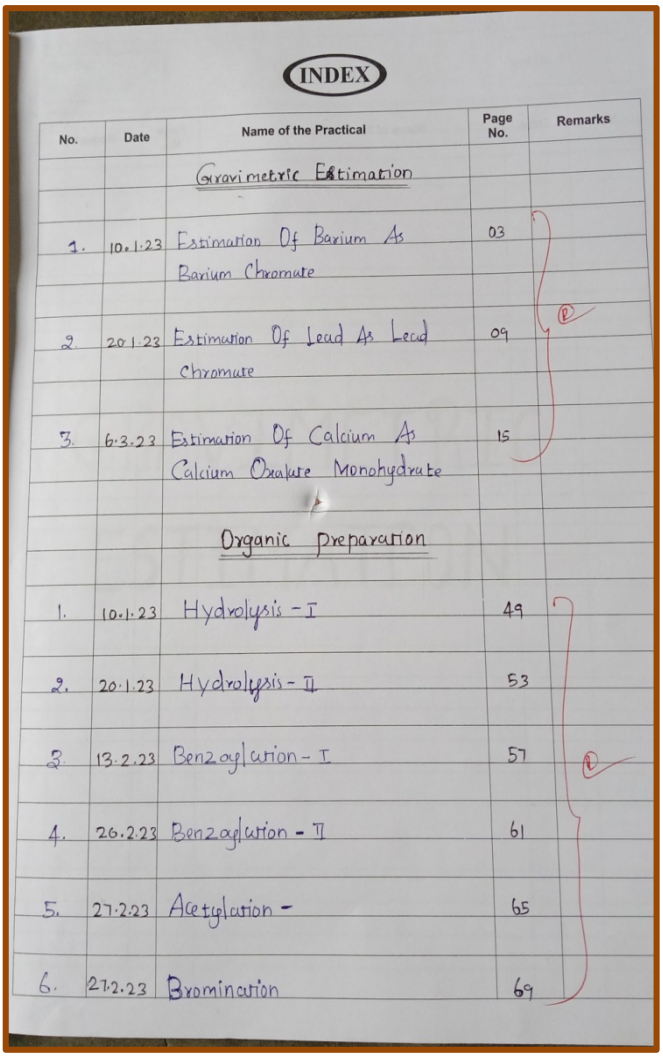
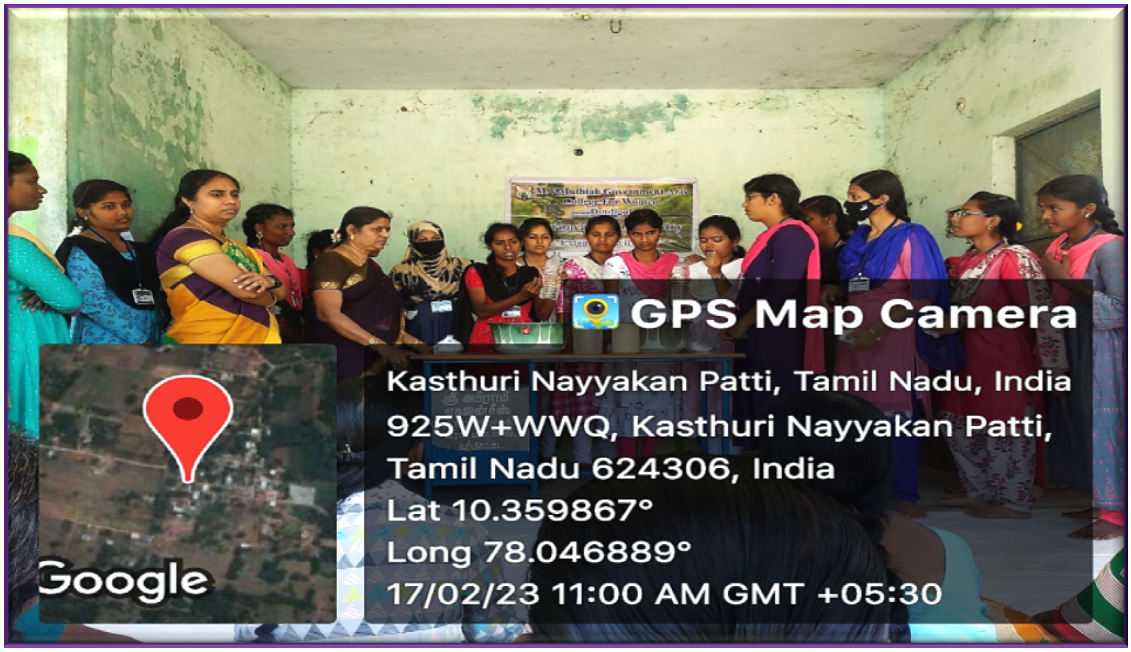


INDEX

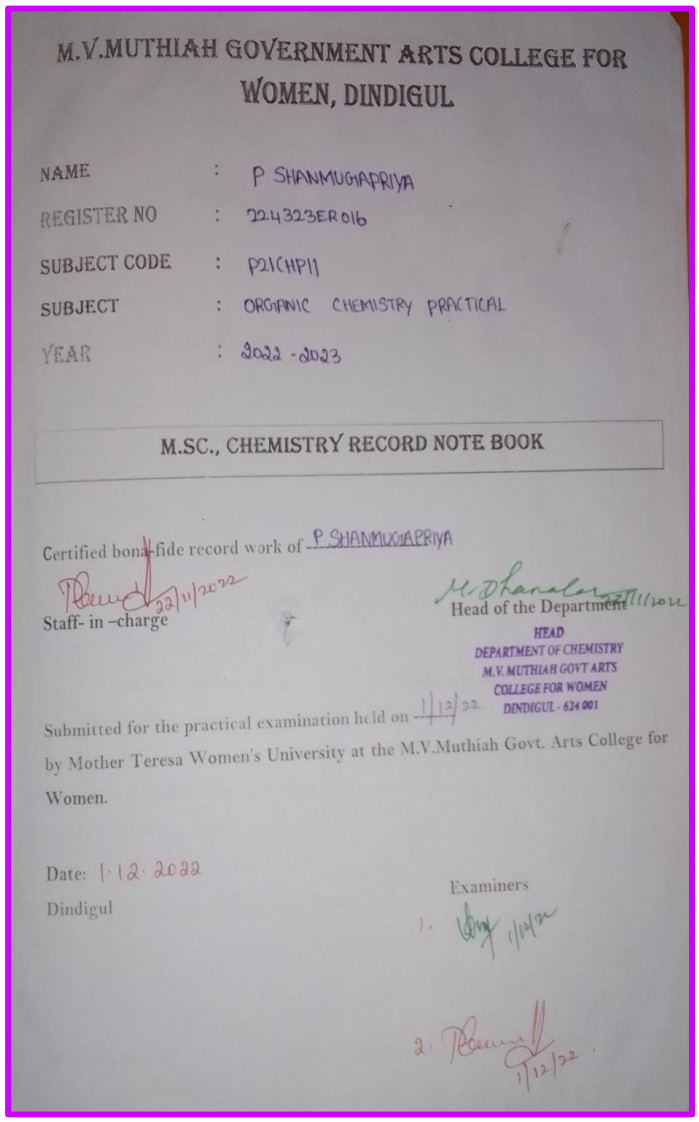
No.	Date	Name of the Practical	Page No.	Remarks
		Gravimetric Estimation		
1.	10.1.23	Estimation Of Barium As Barium Chromate	03	
2.	20.1.23	Estimation Of Lead As Lead Chromate	09	
3.	6.3.23	Estimation Of Calcium As Calcium Oxalate Monohydrate	15	
		Organic Preparation		
1.	10.1.23	Hydrolysis - I	49	
2.	20.1.23	Hydrolysis - II	53	
3.	13.2.23	Benzoylation - I	57	
4.	26.2.23	Benzoylation - II	61	
5.	27.2.23	Acetylation -	65	
6.	27.2.23	Bromination	69	

III B.Sc. Chemistry
VI Semester
UEAS61 Extension Activity



I M.Sc. Chemistry
I Semester

P21CHP11-Organic Chemistry Practical



M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN, DINDIGUL

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SUBJECT : ORGANIC CHEMISTRY PRACTICAL

YEAR : 2022 - 2023

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Submitted for the practical examination held on 1/12/22

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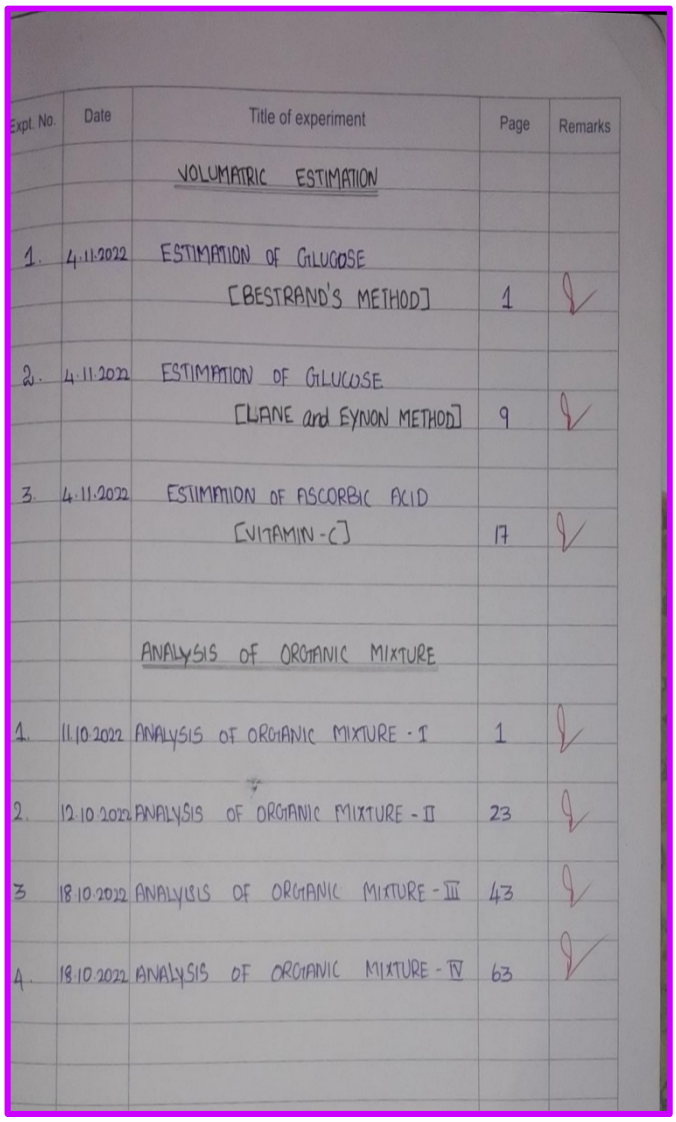
2. 1/12/22

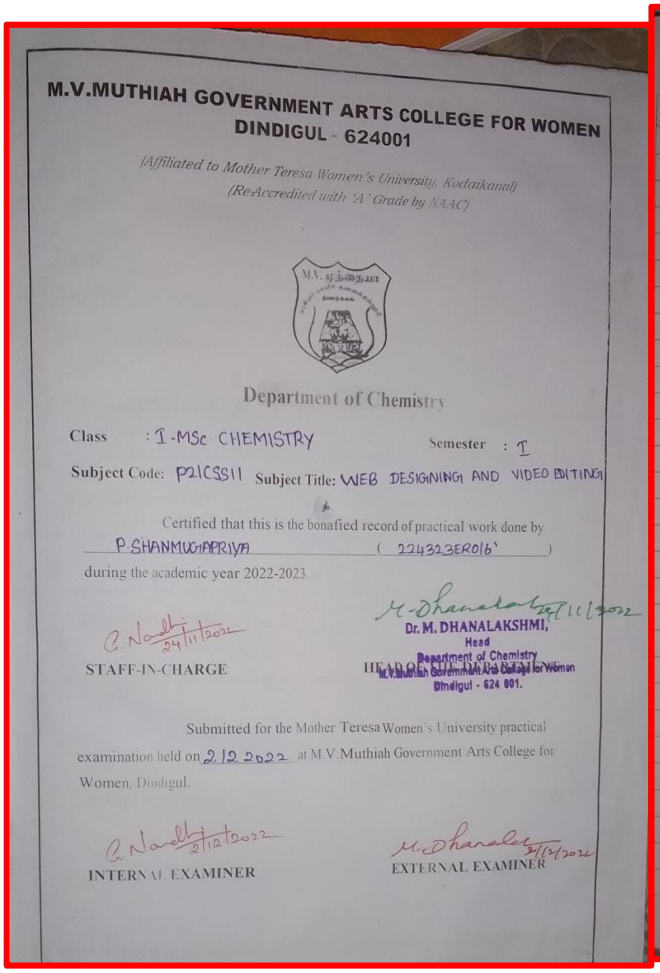


Expt. No.	Date	Title of experiment	Page	Remarks
		VOLUMATRIC ESTIMATION		
1.	4.11.2022	ESTIMATION OF GLUCOSE [BESTRAND'S METHOD]	1	
2.	4.11.2022	ESTIMATION OF GLUCOSE [LANE and EYNON METHOD]	9	
3.	4.11.2022	ESTIMATION OF ASCORBIC ACID [VITAMIN-C]	17	
		ANALYSIS OF ORGANIC MIXTURE		
1.	11.10.2022	ANALYSIS OF ORGANIC MIXTURE - I	1	
2.	12.10.2022	ANALYSIS OF ORGANIC MIXTURE - II	23	
3	18.10.2022	ANALYSIS OF ORGANIC MIXTURE - III	43	
4.	18.10.2022	ANALYSIS OF ORGANIC MIXTURE - IV	63	

I M.Sc. Chemistry

I Semester

P21CSS11-Computer Skills for Web Designing and Video Editing



M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN
DINDIGUL - 624001

(Affiliated to Mother Teresa Women's University, Kodaikanal)
(Re-Accredited with 'A' Grade by NAAC)

Department of Chemistry

Class : I-MSc CHEMISTRY Semester : I

Subject Code: P21CSS11 Subject Title: WEB DESIGNING AND VIDEO EDITING

Certified that this is the bonafied record of practical work done by
P.SHANMUGAPRIYA (224323ER016)
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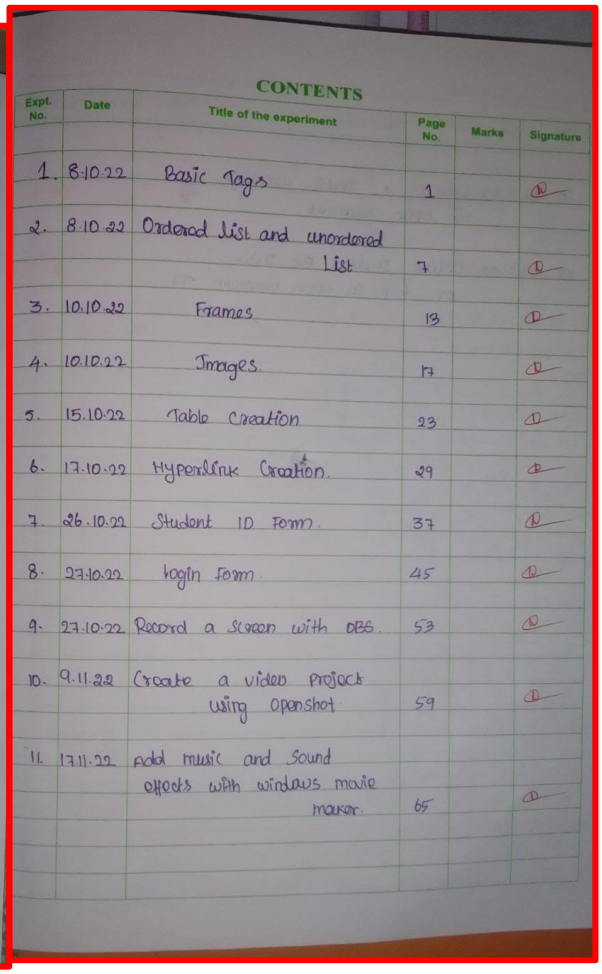
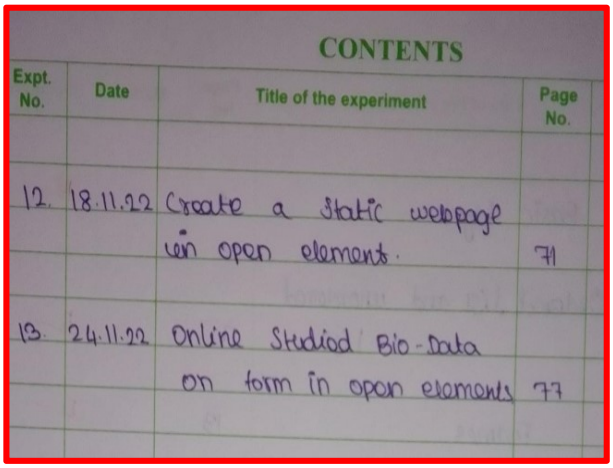
2/12/2022
INTERNAL EXAMINER

2/12/2022
EXTERNAL EXAMINER



CONTENTS

Expt. No.	Date	Title of the experiment	Page No.	Marks	Signature
1.	8.10.22	Basic Tags	1		
2.	8.10.22	Ordered list and unordered List	7		
3.	10.10.22	Frames	13		
4.	10.10.22	Images.	17		
5.	15.10.22	Table Creation	23		
6.	17.10.22	Hyperlink Creation.	29		
7.	26.10.22	Student ID Form.	37		
8.	27.10.22	login form.	45		
9.	27.10.22	Record a screen with OBS.	53		
10.	9.11.22	Create a video project using openshot	59		
11.	17.11.22	Add music and sound effects with windows movie maker.	65		



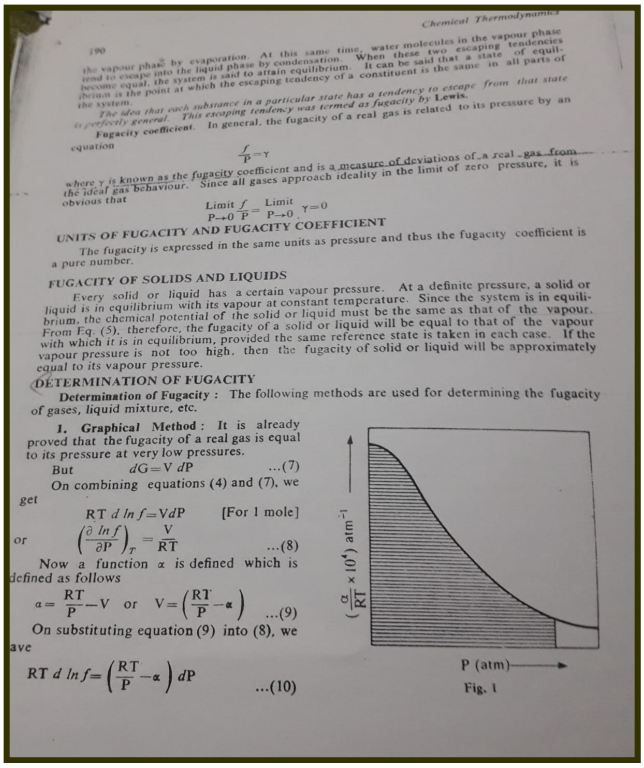
CONTENTS

Expt. No.	Date	Title of the experiment	Page No.
12.	18.11.22	Create a static webpage in open element.	71
13.	24.11.22	Online Studiod Bio-Data on form in open elements	77

I M.Sc. Chemistry

I Semester

P21CHT13 Physical Chemistry - I



Chemical Thermodynamics

190

the vapour phase by evaporation. At this same time, water molecules in the vapour phase tend to escape into the liquid phase by condensation. When these two escaping tendencies become equal, the system is said to attain equilibrium. It can be said that a state of equilibrium is the point at which the escaping tendency of a constituent is the same in all parts of the system.

The idea that each substance in a particular state has a tendency to escape from that state is perfectly general. This escaping tendency was termed as fugacity by **Lewis.**

Fugacity coefficient. In general, the fugacity of a real gas is related to its pressure by an equation

$$\frac{f}{P}=\gamma$$

where γ is known as the fugacity coefficient and is a measure of deviations of a real gas from the ideal gas behaviour. Since all gases approach ideality in the limit of zero pressure, it is obvious that

$$\underset{P\to 0}{\text{Limit}}\ \frac{f}{P}=\underset{P\to 0}{\text{Limit}}\ \gamma=0$$

UNITS OF FUGACITY AND FUGACITY COEFFICIENT

The fugacity is expressed in the same units as pressure and thus the fugacity coefficient is a pure number.

FUGACITY OF SOLIDS AND LIQUIDS

Every solid or liquid has a certain vapour pressure. At a definite pressure, a solid or liquid is in equilibrium with its vapour at constant temperature. Since the system is in equilibrium, the chemical potential of the solid or liquid must be the same as that of the vapour. From Eq. (5), therefore, the fugacity of a solid or liquid will be equal to that of the vapour with which it is in equilibrium, provided the same reference state is taken in each case. If the vapour pressure is not too high, then the fugacity of solid or liquid will be approximately equal to its vapour pressure.

DETERMINATION OF FUGACITY

Determination of Fugacity : The following methods are used for determining the fugacity of gases, liquid mixture, etc.

1. Graphical Method : It is already proved that the fugacity of a real gas is equal to its pressure at very low pressures.

But $dG=V\,dP$ ...(7)

On combining equations (4) and (7), we get

$$RT\,d\ln f=V\,dP \qquad \text{[For 1 mole]}$$

or $$\left(\frac{\partial \ln f}{\partial P}\right)_T=\frac{V}{RT} \qquad ...(8)$$

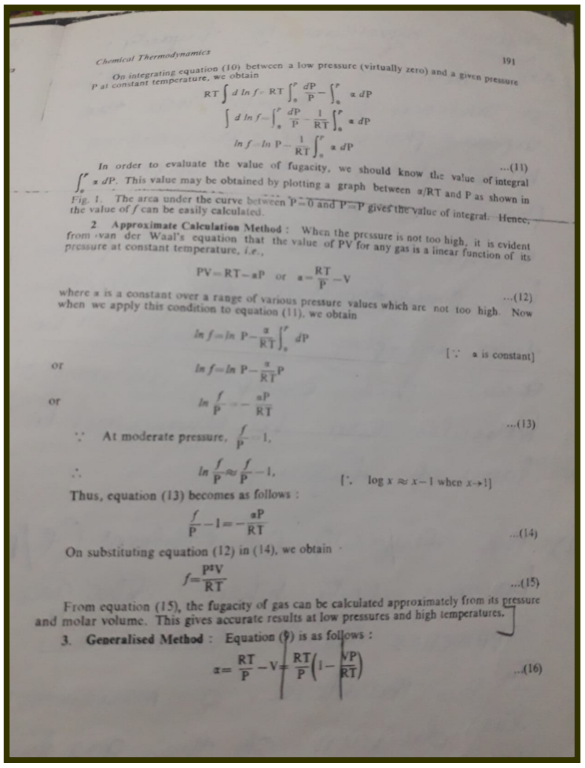
Now a function α is defined which is defined as follows

$$\alpha=\frac{RT}{P}-V \quad \text{or} \quad V=\left(\frac{RT}{P}-\alpha\right) \qquad ...(9)$$

On substituting equation (9) into (8), we have

$$RT\,d\ln f=\left(\frac{RT}{P}-\alpha\right)dP \qquad ...(10)$$

Fig. 1



Chemical Thermodynamics 191

On integrating equation (10) between a low pressure (virtually zero) and a given pressure P at constant temperature, we obtain

$$RT\int_{\ln 0}^{\ln f} d\ln f=RT\int_0^P\frac{dP}{P}-\int_0^P\alpha\,dP$$

$$\int_{\ln 0}^{\ln f} d\ln f=\int_0^P\frac{dP}{P}-\frac{1}{RT}\int_0^P\alpha\,dP$$

$$\ln f-\ln P=\frac{1}{RT}\int_0^P\alpha\,dP \qquad ...(11)$$

In order to evaluate the value of fugacity, we should know the value of integral $\int_0^P\alpha\,dP$. This value may be obtained by plotting a graph between α/RT and P as shown in Fig. 1. The area under the curve between P = 0 and P = P gives the value of integral. Hence, the value of f can be easily calculated.

2. Approximate Calculation Method : When the pressure is not too high, it is evident from van der Waal's equation that the value of PV for any gas is a linear function of its pressure at constant temperature, *i.e.*,

$$PV=RT-aP \quad \text{or} \quad \alpha=\frac{RT}{P}-V \qquad ...(12)$$

where α is a constant over a range of various pressure values which are not too high. Now when we apply this condition to equation (11), we obtain

$$\ln f-\ln P=\frac{\alpha}{RT}\int_0^P dP \qquad [\because\ \alpha \text{ is constant}]$$

or $$\ln f-\ln P=\frac{\alpha}{RT}P$$

or $$\ln\frac{f}{P}=\frac{aP}{RT} \qquad ...(13)$$

$\because$ At moderate pressure, $\frac{f}{P}=1$,

$\therefore$ $$\ln\frac{f}{P}\approx\frac{f}{P}-1, \qquad [\because\ \log x\approx x-1 \text{ when } x\to 1]$$

Thus, equation (13) becomes as follows :

$$\frac{f}{P}-1=-\frac{aP}{RT} \qquad ...(14)$$

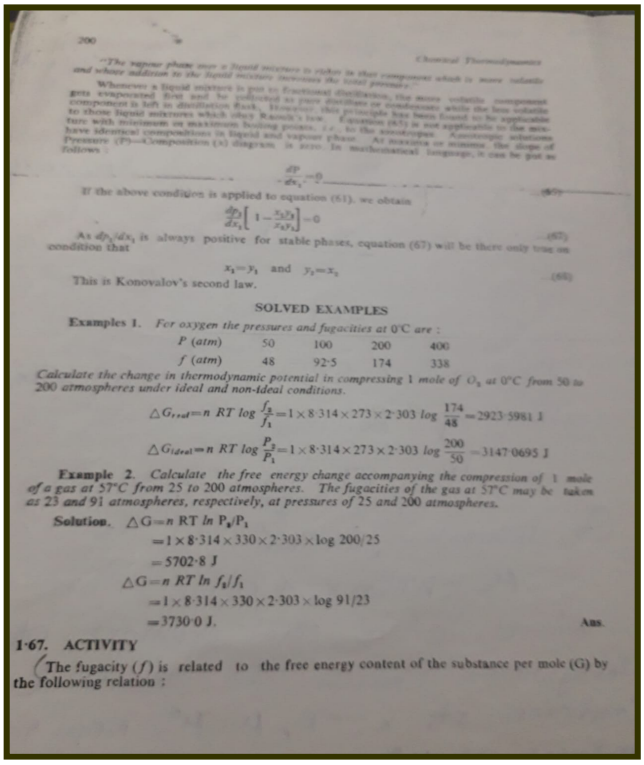
On substituting equation (12) in (14), we obtain

$$f=\frac{PV}{RT} \qquad ...(15)$$

From equation (15), the fugacity of gas can be calculated approximately from its pressure and molar volume. This gives accurate results at low pressures and high temperatures.

3. Generalised Method : Equation (9) is as follows :

$$\alpha=\frac{RT}{P}-V=\frac{RT}{P}\left(1-\frac{VP}{RT}\right) \qquad ...(16)$$



200

Chemical Thermodynamics

"The vapour phase over a liquid mixture is richer in that component which is more volatile and whose addition to the liquid mixture increases the total pressure."

Whenever a liquid mixture is put to fractional distillation, the more volatile component gets evaporated first and be collected as pure distillate or condensate while the less volatile component is left in distillation flask. However, this principle has been found to be applicable to those liquid mixtures which obey Raoult's law. Equation (67) is not applicable to the mixture with minimum or maximum boiling points, *i.e.*, to the azeotropes. Azeotropic solutions have identical compositions in liquid and vapour phase. At maximum or minimum, the slope of Pressure (P)—Composition (x) diagram is zero. In mathematical language, it can be put as follows :

$$\frac{dP}{dx_1}=0$$

If the above condition is applied to equation (61), we obtain

$$\frac{dP_2}{dx_1}\left[1-\frac{x_2y_2}{x_2y_2}\right]=0$$

As dP_2/dx_1 is always positive for stable phases, equation (67) will be there only true on condition that

$$x_1=y_1 \quad \text{and} \quad y_2=x_2$$

This is Konovalov's second law.

SOLVED EXAMPLES

Examples 1. *For oxygen the pressures and fugacities at 0°C are :*

P (atm)	50	100	200	400
f (atm)	48	92·5	174	338

Calculate the change in thermodynamic potential in compressing 1 mole of O_2 at 0°C from 50 to 200 atmospheres under ideal and non-ideal conditions.

$$\Delta G_{real}=n\,RT\log\frac{f_2}{f_1}=1\times 8{\cdot}314\times 273\times 2{\cdot}303\log\frac{174}{48}=2923{\cdot}5981\ \text{J}$$

$$\Delta G_{ideal}=n\,RT\log\frac{P_2}{P_1}=1\times 8{\cdot}314\times 273\times 2{\cdot}303\log\frac{200}{50}=3147{\cdot}0695\ \text{J}$$

Example 2. *Calculate the free energy change accompanying the compression of 1 mole of a gas at 57°C from 25 to 200 atmospheres. The fugacities of the gas at 57°C may be taken as 23 and 91 atmospheres, respectively, at pressures of 25 and 200 atmospheres.*

Solution. $\Delta G=n\,RT\ln P_2/P_1$

$=1\times 8{\cdot}314\times 330\times 2{\cdot}303\times\log 200/25$

$=5702{\cdot}8\ \text{J}$

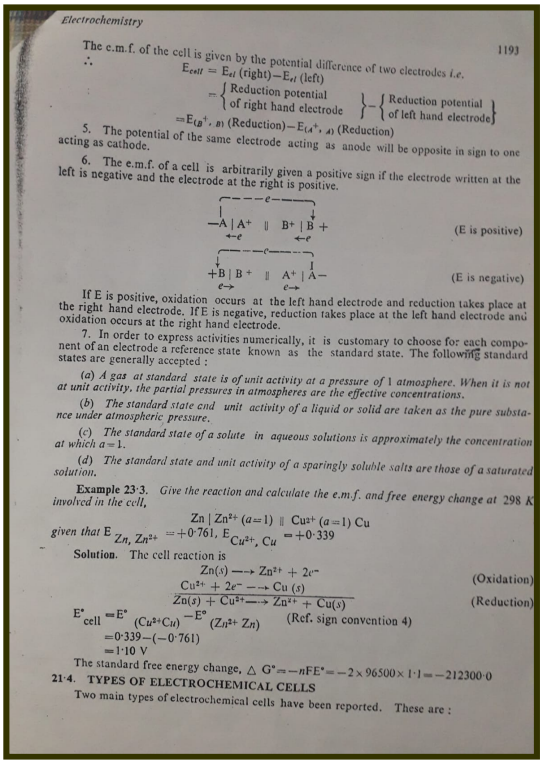
$\Delta G=n\,RT\ln f_2/f_1$

$=1\times 8{\cdot}314\times 330\times 2{\cdot}303\times\log 91/23$

$=3730{\cdot}0\ \text{J}.$ Ans.

1·67. ACTIVITY

The fugacity (f) is related to the free energy content of the substance per mole (G) by the following relation :



Electrochemistry

1193

The e.m.f. of the cell is given by the potential difference of two electrodes *i.e.*

$\therefore$ $E_{cell}=E_{el}\text{ (right)}-E_{el}\text{ (left)}$

$=\left\{\begin{matrix}\text{Reduction potential}\\ \text{of right hand electrode}\end{matrix}\right\}-\left\{\begin{matrix}\text{Reduction potential}\\ \text{of left hand electrode}\end{matrix}\right\}$

$=E_{(g^+,\,B)}\text{ (Reduction)}-E_{(A^+,\,A)}\text{ (Reduction)}$

5. The potential of the same electrode acting as anode will be opposite in sign to one acting as cathode.

6. The e.m.f. of a cell is arbitrarily given a positive sign if the electrode written at the left is negative and the electrode at the right is positive.

$$-\text{A}\,|\,\text{A}^+\ \|\ \text{B}^+\,|\,\text{B}+ \qquad \text{(E is positive)}$$

$$+\text{B}\,|\,\text{B}^+\ \|\ \text{A}^+\,|\,\text{A}- \qquad \text{(E is negative)}$$

If E is positive, oxidation occurs at the left hand electrode and reduction takes place at the right hand electrode. If E is negative, reduction takes place at the left hand electrode and oxidation occurs at the right hand electrode.

7. In order to express activities numerically, it is customary to choose for each component of an electrode a reference state known as the standard state. The following standard states are generally accepted :

(*a*) *A gas at standard state is of unit activity at a pressure of* 1 *atmosphere. When it is not at unit activity, the partial pressures in atmospheres are the effective concentrations.*

(*b*) *The standard state and unit activity of a liquid or solid are taken as the pure substance under atmospheric pressure.*

(*c*) *The standard state of a solute in aqueous solutions is approximately the concentration at which* $a=1$.

(*d*) *The standard state and unit activity of a sparingly soluble salts are those of a saturated solution.*

Example 23·3. *Give the reaction and calculate the e.m.f. and free energy change at* 298 *K involved in the cell,*

$$\text{Zn}\,|\,\text{Zn}^{2+}\,(a=1)\ \|\ \text{Cu}^{2+}\,(a=1)\,\text{Cu}$$

given that $E_{Zn,\,Zn^{2+}}=+0{\cdot}761$, $E_{Cu^{2+},\,Cu}=+0{\cdot}339$

Solution. The cell reaction is

$$\text{Zn}(s)\longrightarrow\text{Zn}^{2+}+2e^- \qquad \text{(Oxidation)}$$

$$\text{Cu}^{2+}+2e^-\longrightarrow\text{Cu}\,(s) \qquad \text{(Reduction)}$$

$$\text{Zn}(s)+\text{Cu}^{2+}\longrightarrow\text{Zn}^{2+}+\text{Cu}(s)$$

$E^\circ_{cell}=E^\circ_{(Cu^{2+}Cu)}-E^\circ_{(Zn^{2+}\,Zn)}$ (Ref. sign convention 4)

$=0{\cdot}339-(-0{\cdot}761)$

$=1{\cdot}10\ \text{V}$

The standard free energy change, $\Delta G^\circ=-nFE^\circ=-2\times 96500\times 1{\cdot}1=-212300{\cdot}0$

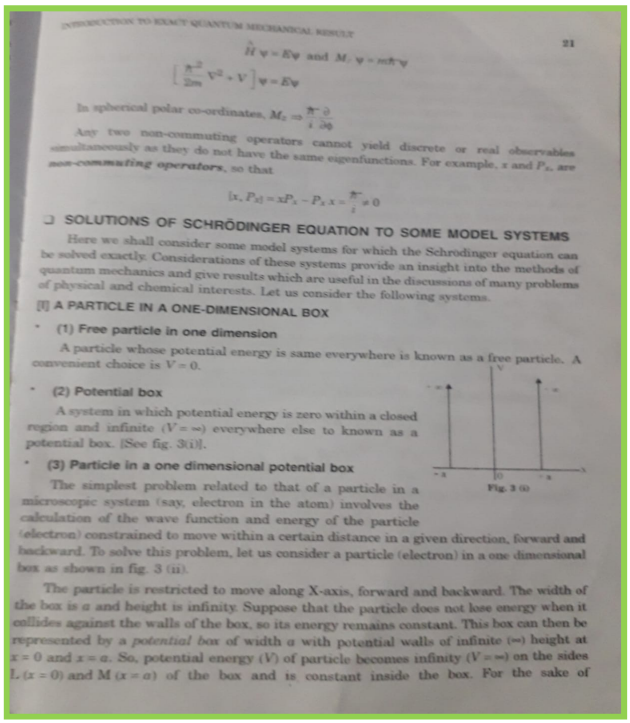
21·4. TYPES OF ELECTROCHEMICAL CELLS

Two main types of electrochemical cells have been reported. These are :

I M.Sc. Chemistry

II Semester

P21CHT23 Physical Chemistry - II



INTRODUCTION TO EXACT QUANTUM MECHANICAL RESULT 21

$$\hat{H}\Psi = E\Psi \text{ and } M_z\Psi = m\hbar\Psi$$

$$\left[-\frac{\hbar^2}{2m}\nabla^2 + V\right]\Psi = E\Psi$$

In spherical polar co-ordinates, $M_z \Rightarrow \frac{\hbar}{i}\frac{\partial}{\partial\phi}$

Any two non-commuting operators cannot yield discrete or real observables simultaneously as they do not have the same eigenfunctions. For example, x and P_x, are ***non-commuting operators***, so that

$$[x, P_x] = xP_x - P_x x = \frac{\hbar}{i} \neq 0$$

SOLUTIONS OF SCHRÖDINGER EQUATION TO SOME MODEL SYSTEMS

Here we shall consider some model systems for which the Schrodinger equation can be solved exactly. Considerations of these systems provide an insight into the methods of quantum mechanics and give results which are useful in the discussions of many problems of physical and chemical interests. Let us consider the following systems.

[I] A PARTICLE IN A ONE-DIMENSIONAL BOX

- **(1) Free particle in one dimension**

A particle whose potential energy is same everywhere is known as a free particle. A convenient choice is $V = 0$.

- **(2) Potential box**

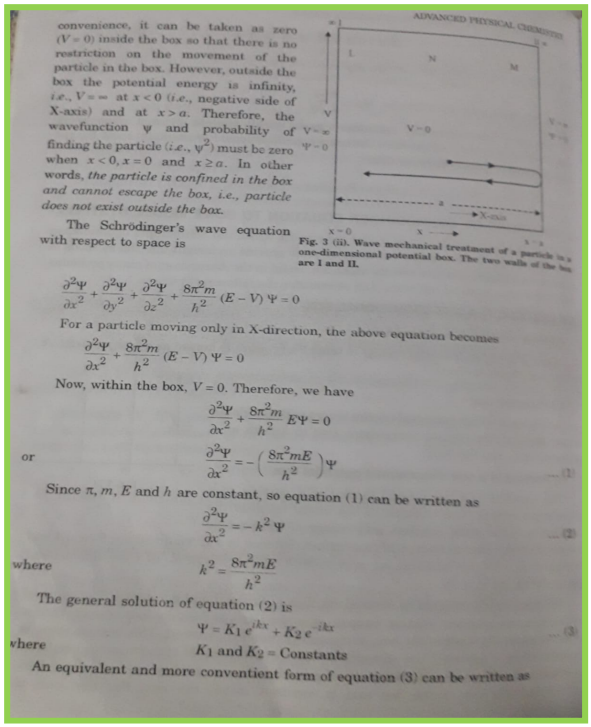
A system in which potential energy is zero within a closed region and infinite ($V = \infty$) everywhere else to known as a potential box. [See fig. 3(i)].

- **(3) Particle in a one dimensional potential box**

Fig. 3 (i)

The simplest problem related to that of a particle in a microscopic system (say, electron in the atom) involves the calculation of the wave function and energy of the particle (electron) constrained to move within a certain distance in a given direction, forward and backward. To solve this problem, let us consider a particle (electron) in a one dimensional box as shown in fig. 3 (ii).

The particle is restricted to move along X-axis, forward and backward. The width of the box is a and height is infinity. Suppose that the particle does not lose energy when it collides against the walls of the box, so its energy remains constant. This box can then be represented by a *potential box* of width a with potential walls of infinite (∞) height at $x = 0$ and $x = a$. So, potential energy (V) of particle becomes infinity ($V = \infty$) on the sides L ($x = 0$) and M ($x = a$) of the box and is constant inside the box. For the sake of



convenience, it can be taken as zero ($V = 0$) inside the box so that there is no restriction on the movement of the particle in the box. However, outside the box the potential energy is infinity, *i.e.*, $V = \infty$ at $x < 0$ (*i.e.*, negative side of X-axis) and at $x > a$. Therefore, the wavefunction ψ and probability of finding the particle (*i.e.*, ψ^2) must be zero when $x < 0, x = 0$ and $x \geq a$. In other words, *the particle is confined in the box and cannot escape the box, i.e., particle does not exist outside the box.*

The Schrödinger's wave equation with respect to space is

Fig. 3 (ii). Wave mechanical treatment of a particle in a one-dimensional potential box. The two walls of the box are I and II.

$$\frac{\partial^2\Psi}{\partial x^2} + \frac{\partial^2\Psi}{\partial y^2} + \frac{\partial^2\Psi}{\partial z^2} + \frac{8\pi^2 m}{h^2}(E - V)\Psi = 0$$

For a particle moving only in X-direction, the above equation becomes

$$\frac{\partial^2\Psi}{\partial x^2} + \frac{8\pi^2 m}{h^2}(E - V)\Psi = 0$$

Now, within the box, $V = 0$. Therefore, we have

$$\frac{\partial^2\Psi}{\partial x^2} + \frac{8\pi^2 m}{h^2}E\Psi = 0$$

or

$$\frac{\partial^2\Psi}{\partial x^2} = -\left(\frac{8\pi^2 mE}{h^2}\right)\Psi \quad \ldots(1)$$

Since π, m, E and h are constant, so equation (1) can be written as

$$\frac{\partial^2\Psi}{\partial x^2} = -k^2\Psi \quad \ldots(2)$$

where

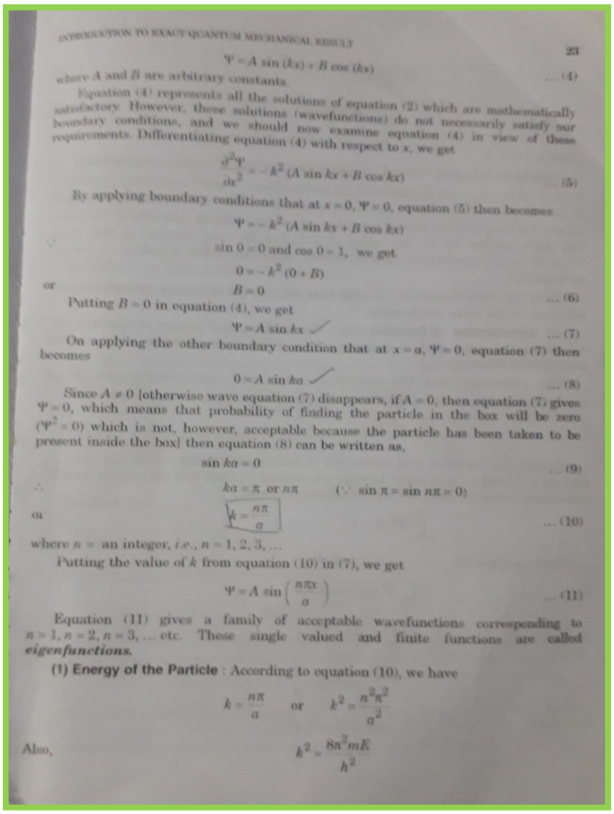
$$k^2 = \frac{8\pi^2 mE}{h^2}$$

The general solution of equation (2) is

$$\Psi = K_1 e^{ikx} + K_2 e^{-ikx} \quad \ldots(3)$$

where K_1 and K_2 = Constants

An equivalent and more conventient form of equation (3) can be written as



INTRODUCTION TO EXACT QUANTUM MECHANICAL RESULT 23

$$\Psi = A\sin(kx) + B\cos(kx) \quad \ldots(4)$$

where A and B are arbitrary constants.

Equation (4) represents all the solutions of equation (2) which are mathematically satisfactory. However, these solutions (wavefunctions) do not necessarily satisfy our boundary conditions, and we should now examine equation (4) in view of these requirements. Differentiating equation (4) with respect to x, we get

$$\frac{\partial^2\Psi}{\partial x^2} = -k^2(A\sin kx + B\cos kx) \quad \ldots(5)$$

By applying boundary conditions that at $x = 0$, $\Psi = 0$, equation (5) then becomes

$$\Psi = -k^2(A\sin kx + B\cos kx)$$

$\because$ $\sin 0 = 0$ and $\cos 0 = 1$, we get

$$0 = -k^2(0 + B)$$

or

$$B = 0 \quad \ldots(6)$$

Putting $B = 0$ in equation (4), we get

$$\Psi = A\sin kx \quad \ldots(7)$$

On applying the other boundary condition that at $x = a$, $\Psi = 0$, equation (7) then becomes

$$0 = A\sin ka \quad \ldots(8)$$

Since $A \neq 0$ [otherwise wave equation (7) disappears, if $A = 0$, then equation (7) gives $\Psi = 0$, which means that probability of finding the particle in the box will be zero ($\Psi^2 = 0$) which is not, however, acceptable because the particle has been taken to be present inside the box] then equation (8) can be written as,

$$\sin ka = 0 \quad \ldots(9)$$

$\therefore$ $ka = \pi$ or $n\pi$ ($\because$ $\sin\pi = \sin n\pi = 0$)

or

$$k = \frac{n\pi}{a} \quad \ldots(10)$$

where n = an integer, *i.e.*, $n = 1, 2, 3, \ldots$

Putting the value of k from equation (10) in (7), we get

$$\Psi = A\sin\left(\frac{n\pi x}{a}\right) \quad \ldots(11)$$

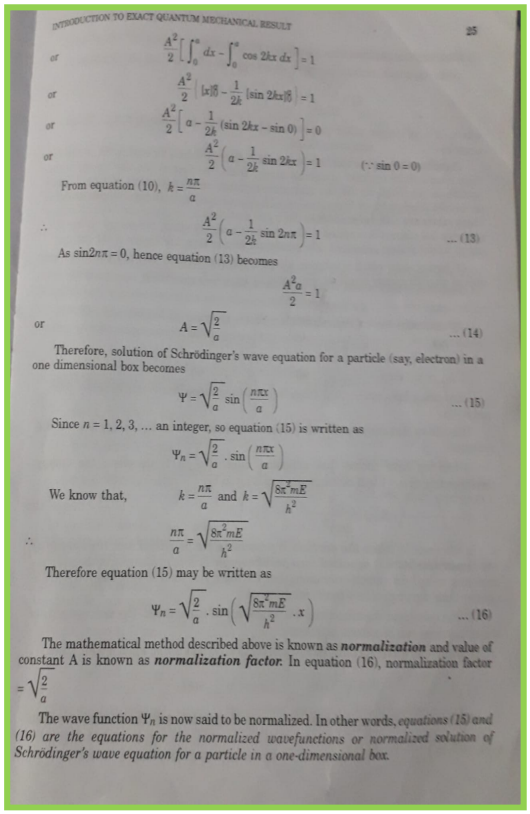
Equation (11) gives a family of acceptable wavefunctions corresponding to $n = 1, n = 2, n = 3, \ldots$ etc. These single valued and finite functions are called ***eigenfunctions.***

(1) Energy of the Particle : According to equation (10), we have

$$k = \frac{n\pi}{a} \quad \text{or} \quad k^2 = \frac{n^2\pi^2}{a^2}$$

Also,

$$k^2 = \frac{8\pi^2 mE}{h^2}$$



INTRODUCTION TO EXACT QUANTUM MECHANICAL RESULT 25

or

$$\frac{A^2}{2}\left[\int_0^a dx - \int_0^a \cos 2kx\, dx\right] = 1$$

or

$$\frac{A^2}{2}\left[|x|_0^a - \frac{1}{2k}|\sin 2kx|_0^a\right] = 1$$

or

$$\frac{A^2}{2}\left[a - \frac{1}{2k}(\sin 2ka - \sin 0)\right] = 0$$

or

$$\frac{A^2}{2}\left(a - \frac{1}{2k}\sin 2ka\right) = 1 \quad (\because \sin 0 = 0)$$

From equation (10), $k = \frac{n\pi}{a}$

$\therefore$

$$\frac{A^2}{2}\left(a - \frac{1}{2k}\sin 2n\pi\right) = 1 \quad \ldots(13)$$

As $\sin 2n\pi = 0$, hence equation (13) becomes

$$\frac{A^2 a}{2} = 1$$

or

$$A = \sqrt{\frac{2}{a}} \quad \ldots(14)$$

Therefore, solution of Schrödinger's wave equation for a particle (say, electron) in a one dimensional box becomes

$$\Psi = \sqrt{\frac{2}{a}}\sin\left(\frac{n\pi x}{a}\right) \quad \ldots(15)$$

Since $n = 1, 2, 3, \ldots$ an integer, so equation (15) is written as

$$\Psi_n = \sqrt{\frac{2}{a}}\cdot\sin\left(\frac{n\pi x}{a}\right)$$

We know that,

$$k = \frac{n\pi}{a} \text{ and } k = \sqrt{\frac{8\pi^2 mE}{h^2}}$$

$\therefore$

$$\frac{n\pi}{a} = \sqrt{\frac{8\pi^2 mE}{h^2}}$$

Therefore equation (15) may be written as

$$\Psi_n = \sqrt{\frac{2}{a}}\cdot\sin\left(\sqrt{\frac{8\pi^2 mE}{h^2}}\cdot x\right) \quad \ldots(16)$$

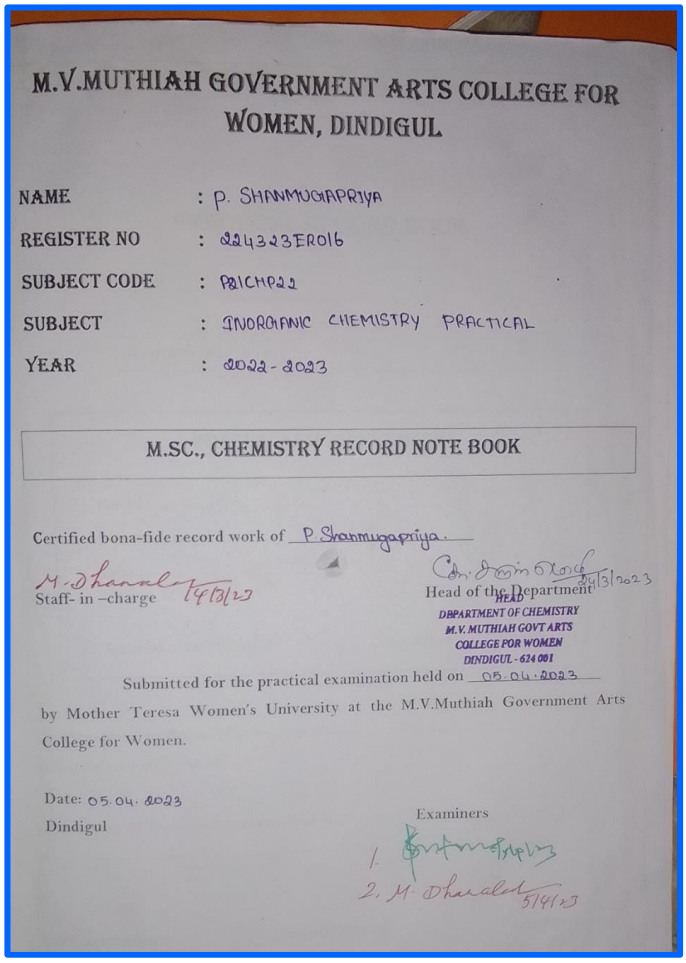
The mathematical method described above is known as ***normalization*** and value of constant A is known as ***normalization factor.*** In equation (16), normalization factor $= \sqrt{\frac{2}{a}}$

The wave function Ψ_n is now said to be normalized. In other words, *equations (15) and (16) are the equations for the normalized wavefunctions or normalized solution of Schrödinger's wave equation for a particle in a one-dimensional box.*

I M.Sc. Chemistry

II Semester

P21CHP22-Inorganic Chemistry Practical



M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN, DINDIGUL

NAME : P. SHANMUGAPRIYA

REGISTER NO : 224323ER016

SUBJECT CODE : P21CHP22

SUBJECT : INORGANIC CHEMISTRY PRACTICAL

YEAR : 2022-2023

M.SC., CHEMISTRY RECORD NOTE BOOK

Certified bona-fide record work of P. Shanmugapriya.

Staff- in –charge 4/4/23

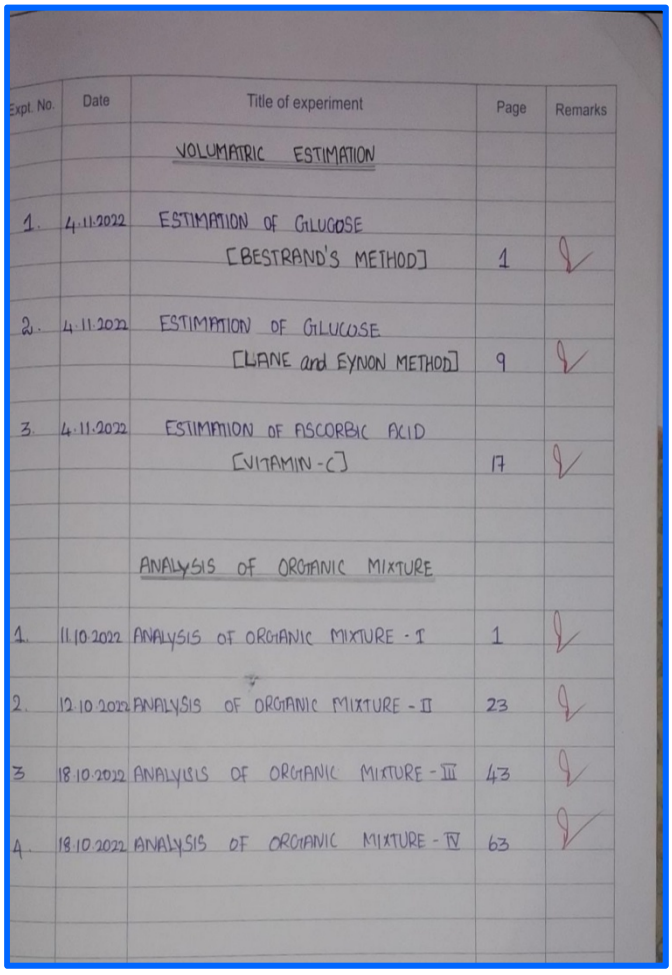
Head of the Department 3/4/2023

HEAD
DEPARTMENT OF CHEMISTRY
M.V. MUTHIAH GOVT ARTS
COLLEGE FOR WOMEN
DINDIGUL - 624 001

Submitted for the practical examination held on 05.04.2023 by Mother Teresa Women's University at the M.V.Muthiah Government Arts College for Women.

Date: 05.04.2023
Dindigul

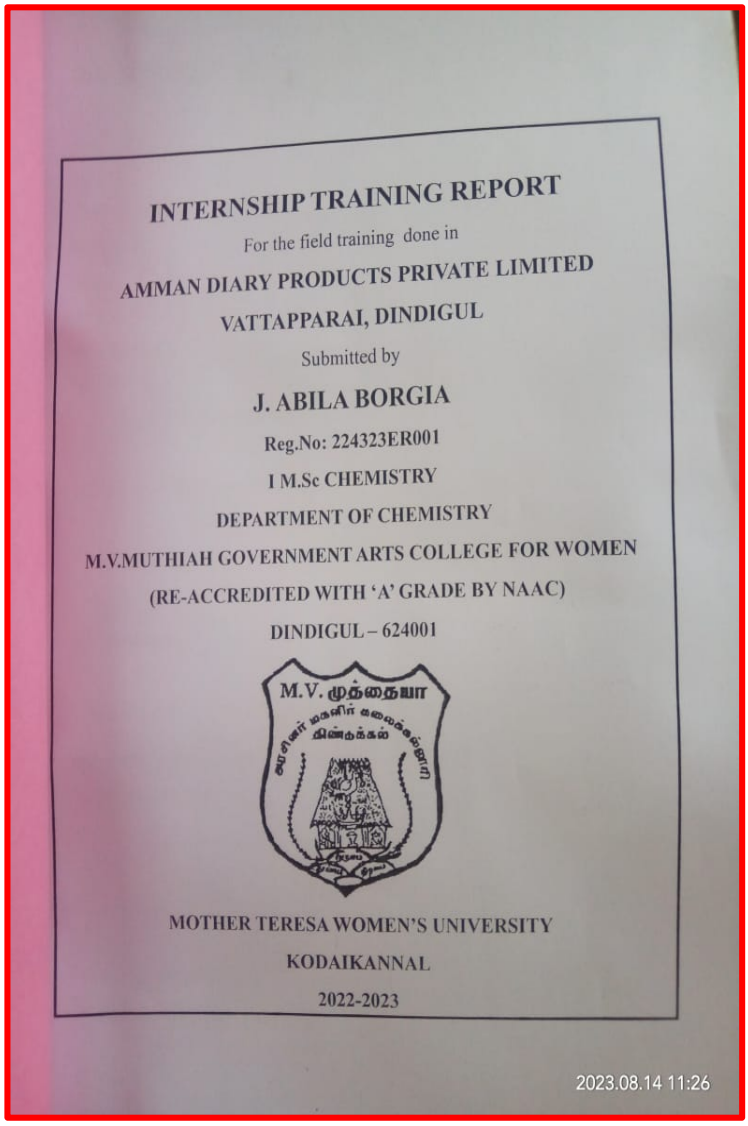
Examiners
1.
2. M. Dharalak 5/4/23



Expt. No.	Date	Title of experiment	Page	Remarks
		VOLUMATRIC ESTIMATION		
1.	4.11.2022	ESTIMATION OF GLUCOSE [BESTRAND'S METHOD]	1	
2.	4.11.2022	ESTIMATION OF GLUCOSE [LANE and EYNON METHOD]	9	
3.	4.11.2022	ESTIMATION OF ASCORBIC ACID [VITAMIN-C]	17	
		ANALYSIS OF ORGANIC MIXTURE		
1.	11.10.2022	ANALYSIS OF ORGANIC MIXTURE - I	1	
2.	12.10.2022	ANALYSIS OF ORGANIC MIXTURE - II	23	
3	18.10.2022	ANALYSIS OF ORGANIC MIXTURE - III	43	
4.	18.10.2022	ANALYSIS OF ORGANIC MIXTURE - IV	63	

I M.Sc. Chemistry
II Semester

P21CHI21-Internship Industrial Training



INTERNSHIP TRAINING REPORT

For the field training done in

AMMAN DIARY PRODUCTS PRIVATE LIMITED

VATTAPPARAI, DINDIGUL

Submitted by

J. ABILA BORGIA

Reg.No: 224323ER001

I M.Sc CHEMISTRY

DEPARTMENT OF CHEMISTRY

M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN

(RE-ACCREDITED WITH 'A' GRADE BY NAAC)

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MOTHER TERESA WOMEN'S UNIVERSITY

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2022-2023

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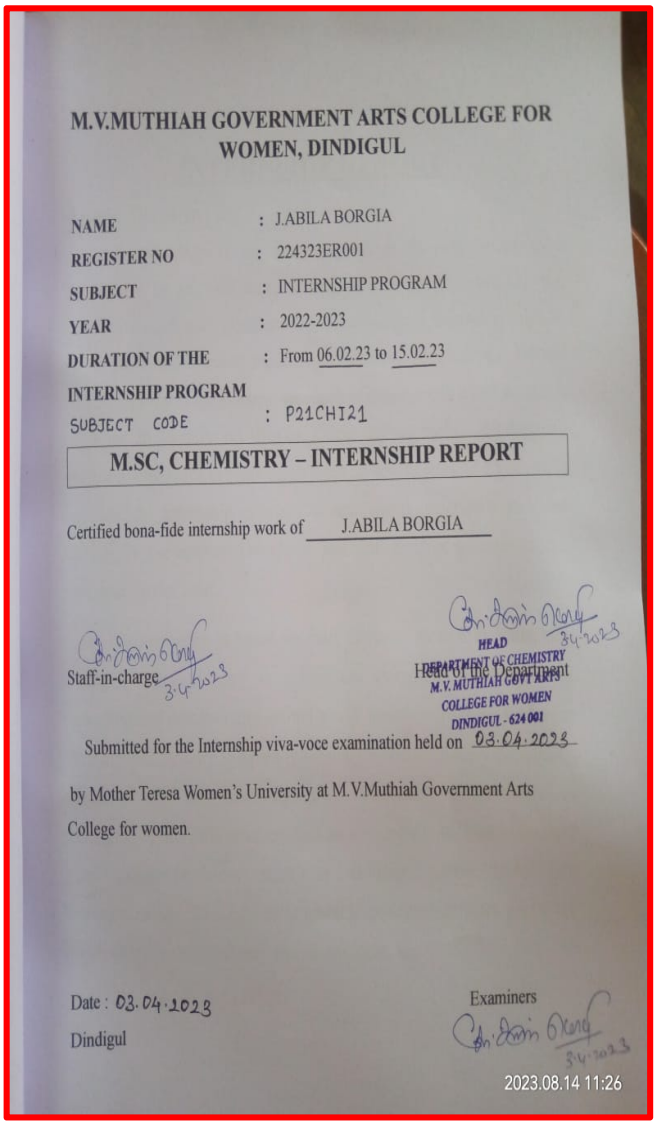

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NAME : J.ABILA BORGIA

REGISTER NO : 224323ER001

SUBJECT : INTERNSHIP PROGRAM

YEAR : 2022-2023

DURATION OF THE INTERNSHIP PROGRAM : From 06.02.23 to 15.02.23

SUBJECT CODE : P21CHI21

M.SC, CHEMISTRY – INTERNSHIP REPORT

Certified bona-fide internship work of J.ABILA BORGIA

Staff-in-charge 3.4.2023

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Head of the Department 3.4.2023

Submitted for the Internship viva-voce examination held on 03.04.2023

by Mother Teresa Women's University at M.V.Muthiah Government Arts College for women.

Date : 03.04.2023

Dindigul

Examiners 3.4.2023

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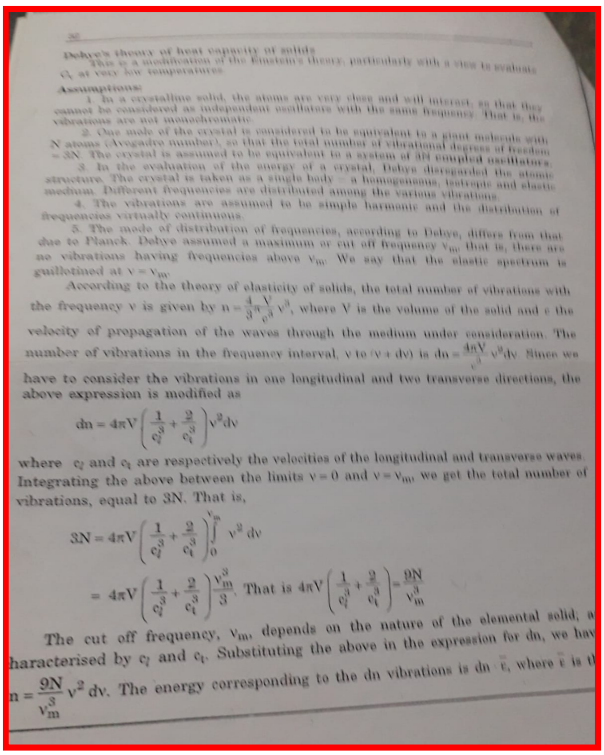
II M.Sc. Chemistry

III Semester

PCHT33 Physical Chemistry - III



Debye's theory of heat capacity of solids

This is a modification of the Einstein's theory, particularly with a view to evaluate C_v at very low temperatures.

Assumptions:

1. In a crystalline solid, the atoms are very close and will interact, so that they cannot be considered as independent oscillators with the same frequency. That is, the vibrations are not monochromatic.
2. One mole of the crystal is considered to be equivalent to a giant molecule with N atoms (Avogadro number), so that the total number of vibrational degrees of freedom = 3N. The crystal is assumed to be equivalent to a system of 3N coupled oscillators.
3. In the evaluation of the energy of a crystal, Debye disregarded the atomic structure. The crystal is taken as a single body – a homogeneous, isotropic and elastic medium. Different frequencies are distributed among the various vibrations.
4. The vibrations are assumed to be simple harmonic and the distribution of frequencies virtually continuous.
5. The mode of distribution of frequencies, according to Debye, differs from that due to Planck. Debye assumed a maximum or cut off frequency ν_m, that is, there are no vibrations having frequencies above ν_m. We say that the elastic spectrum is guillotined at $\nu = \nu_m$.

According to the theory of elasticity of solids, the total number of vibrations with the frequency ν is given by $n = \frac{4}{3}\frac{V}{c^3}\pi^3\nu^3$, where V is the volume of the solid and c the velocity of propagation of the waves through the medium under consideration. The number of vibrations in the frequency interval, ν to $(\nu + d\nu)$ is $dn = \frac{4\pi V}{c^3}\nu^2 d\nu$. Since we have to consider the vibrations in one longitudinal and two transverse directions, the above expression is modified as

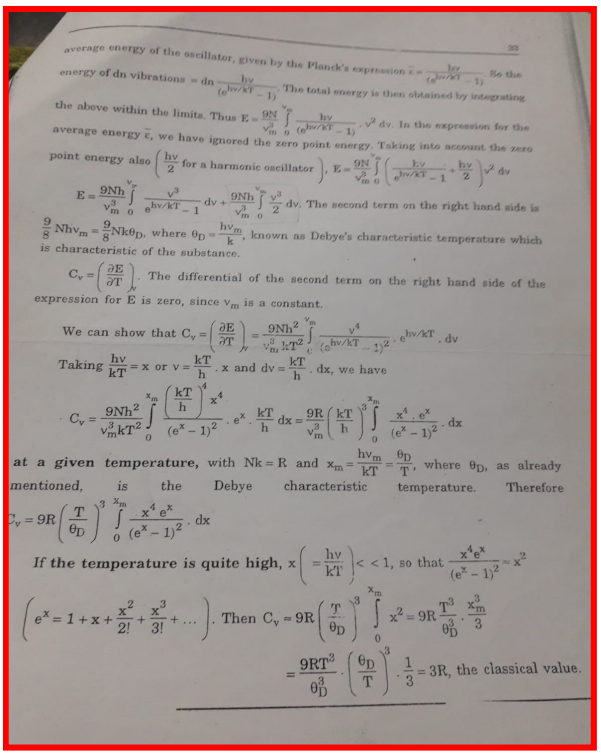
$$dn = 4\pi V\left(\frac{1}{c_l^3} + \frac{2}{c_t^3}\right)\nu^2 d\nu$$

where c_l and c_t are respectively the velocities of the longitudinal and transverse waves. Integrating the above between the limits $\nu = 0$ and $\nu = \nu_m$, we get the total number of vibrations, equal to 3N. That is,

$$3N = 4\pi V\left(\frac{1}{c_l^3} + \frac{2}{c_t^3}\right)\int_0^{\nu_m} \nu^2\, d\nu$$

$$= 4\pi V\left(\frac{1}{c_l^3} + \frac{2}{c_t^3}\right)\frac{\nu_m^3}{3}. \text{ That is } 4\pi V\left(\frac{1}{c_l^3} + \frac{2}{c_t^3}\right) = \frac{9N}{\nu_m^3}$$

The cut off frequency, ν_m, depends on the nature of the elemental solid; a haracterised by c_l and c_t. Substituting the above in the expression for dn, we hav $n = \frac{9N}{\nu_m^3}\nu^2 d\nu$. The energy corresponding to the dn vibrations is $dn \cdot \bar{\varepsilon}$, where $\bar{\varepsilon}$ is t



average energy of the oscillator, given by the Planck's expression $\bar{\varepsilon} = \frac{h\nu}{(e^{h\nu/kT} - 1)}$. So the energy of dn vibrations $= dn\frac{h\nu}{(e^{h\nu/kT} - 1)}$. The total energy is then obtained by integrating the above within the limits. Thus $E = \frac{9N}{\nu_m^3}\int_0^{\nu_m} \frac{h\nu}{(e^{h\nu/kT} - 1)} \cdot \nu^2\, d\nu$. In the expression for the average energy $\bar{\varepsilon}$, we have ignored the zero point energy. Taking into account the zero point energy also $\left(\frac{h\nu}{2}\text{ for a harmonic oscillator}\right)$, $E = \frac{9N}{\nu_m^3}\int_0^{\nu_m}\left(\frac{h\nu}{e^{h\nu/kT} - 1} + \frac{h\nu}{2}\right)\nu^2\, d\nu$

$E = \frac{9Nh}{\nu_m^3}\int_0^{\nu_m} \frac{\nu^3}{e^{h\nu/kT} - 1}\, d\nu + \frac{9Nh}{\nu_m^3}\int_0^{\nu_m}\frac{\nu^3}{2}\, d\nu$. The second term on the right hand side is $\frac{9}{8}Nh\nu_m = \frac{9}{8}Nk\theta_D$, where $\theta_D = \frac{h\nu_m}{k}$, known as Debye's characteristic temperature which is characteristic of the substance.

$C_v = \left(\frac{\partial E}{\partial T}\right)_V$. The differential of the second term on the right hand side of the expression for E is zero, since ν_m is a constant.

We can show that $C_v = \left(\frac{\partial E}{\partial T}\right)_V = \frac{9Nh^2}{\nu_m^3 kT^2}\int_0^{\nu_m} \frac{\nu^4}{(e^{h\nu/kT} - 1)^2} \cdot e^{h\nu/kT} \cdot d\nu$

Taking $\frac{h\nu}{kT} = x$ or $\nu = \frac{kT}{h} \cdot x$ and $d\nu = \frac{kT}{h} \cdot dx$, we have

$$C_v = \frac{9Nh^2}{\nu_m^3 kT^2}\int_0^{x_m} \left(\frac{kT}{h}\right)^4 \frac{x^4}{(e^x - 1)^2} \cdot e^x \cdot \frac{kT}{h}\, dx = \frac{9R}{\nu_m^3}\left(\frac{kT}{h}\right)^3 \int_0^{x_m} \frac{x^4 \cdot e^x}{(e^x - 1)^2} \cdot dx$$

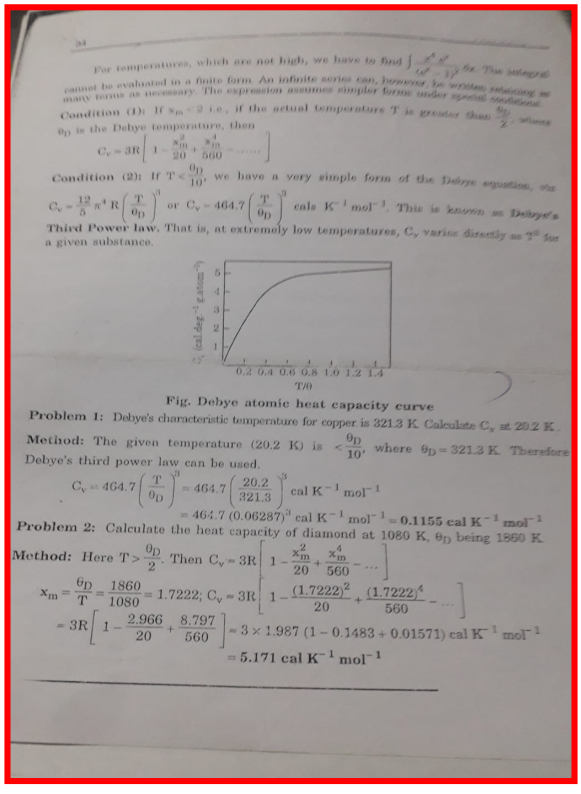
at a given temperature, with $Nk = R$ and $x_m = \frac{h\nu_m}{kT} = \frac{\theta_D}{T}$, where θ_D, as already mentioned, is the Debye characteristic temperature. Therefore

$$C_v = 9R\left(\frac{T}{\theta_D}\right)^3 \int_0^{x_m} \frac{x^4 e^x}{(e^x - 1)^2} \cdot dx$$

If the temperature is quite high, $x\left(= \frac{h\nu}{kT}\right) << 1$, so that $\frac{x^4 e^x}{(e^x - 1)^2} \approx x^2$

$\left(e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots\right)$. Then $C_v \approx 9R\left(\frac{T}{\theta_D}\right)^3 \int_0^{x_m} x^2 = 9R\frac{T^3}{\theta_D^3} \cdot \frac{x_m^3}{3}$

$$= \frac{9RT^3}{\theta_D^3} \cdot \left(\frac{\theta_D}{T}\right)^3 \cdot \frac{1}{3} = 3R, \text{ the classical value.}$$



For temperatures, which are not high, we have to find $\int \frac{x^4 e^x}{(e^x - 1)^2} dx$. The integral cannot be evaluated in a finite form. An infinite series can, however be written retaining as many terms as necessary. The expression assumes simpler forms under special conditions.

Condition (1): If $x_m < 2$ i.e., if the actual temperature T is greater than $\frac{\theta_D}{2}$, where θ_D is the Debye temperature, then

$$C_v = 3R\left[1 - \frac{x_m^2}{20} + \frac{x_m^4}{560} - \ldots\ldots\right]$$

Condition (2): If $T < \frac{\theta_D}{10}$, we have a very simple form of the Debye equation, viz.

$C_v = \frac{12}{5}\pi^4 R\left(\frac{T}{\theta_D}\right)^3$ or $C_v = 464.7\left(\frac{T}{\theta_D}\right)^3$ cals K^{-1} mol^{-1}. This is known as **Debye's Third Power law.** That is, at extremely low temperatures, C_v varies directly as T^3 for a given substance.

Fig. Debye atomic heat capacity curve

Problem 1: Debye's characteristic temperature for copper is 321.3 K. Calculate C_v at 20.2 K.

Method: The given temperature (20.2 K) is $< \frac{\theta_D}{10}$, where $\theta_D = 321.3$ K. Therefore Debye's third power law can be used.

$$C_v = 464.7\left(\frac{T}{\theta_D}\right)^3 = 464.7\left(\frac{20.2}{321.3}\right)^3 \text{ cal } K^{-1}\, mol^{-1}$$

$$= 464.7\,(0.06287)^3 \text{ cal } K^{-1}\, mol^{-1} = \mathbf{0.1155 \text{ cal } K^{-1}\, mol^{-1}}$$

Problem 2: Calculate the heat capacity of diamond at 1080 K, θ_D being 1860 K.

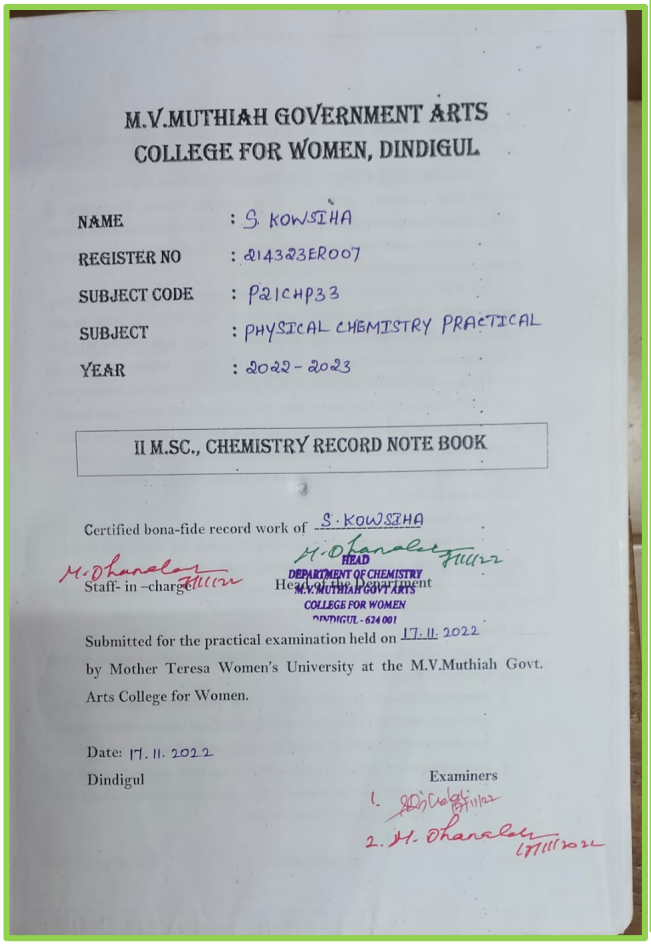
Method: Here $T > \frac{\theta_D}{2}$. Then $C_v = 3R\left[1 - \frac{x_m^2}{20} + \frac{x_m^4}{560} - \ldots\right]$

$$x_m = \frac{\theta_D}{T} = \frac{1860}{1080} = 1.7222;\ C_v = 3R\left[1 - \frac{(1.7222)^2}{20} + \frac{(1.7222)^4}{560} - \ldots\right]$$

$$= 3R\left[1 - \frac{2.966}{20} + \frac{8.797}{560}\right] = 3 \times 1.987\,(1 - 0.1483 + 0.01571) \text{ cal } K^{-1}\, mol^{-1}$$

$$= \mathbf{5.171 \text{ cal } K^{-1}\, mol^{-1}}$$

II M.Sc. Chemistry
III Semester
P21CHP33-Physical Chemistry Practical



M.V.MUTHIAH GOVERNMENT ARTS
COLLEGE FOR WOMEN, DINDIGUL

NAME : S. KOWSIHA
REGISTER NO : 214323ER007
SUBJECT CODE : P21CHP33
SUBJECT : PHYSICAL CHEMISTRY PRACTICAL
YEAR : 2022 - 2023

II M.SC., CHEMISTRY RECORD NOTE BOOK

Certified bona-fide record work of S. KOWSIHA

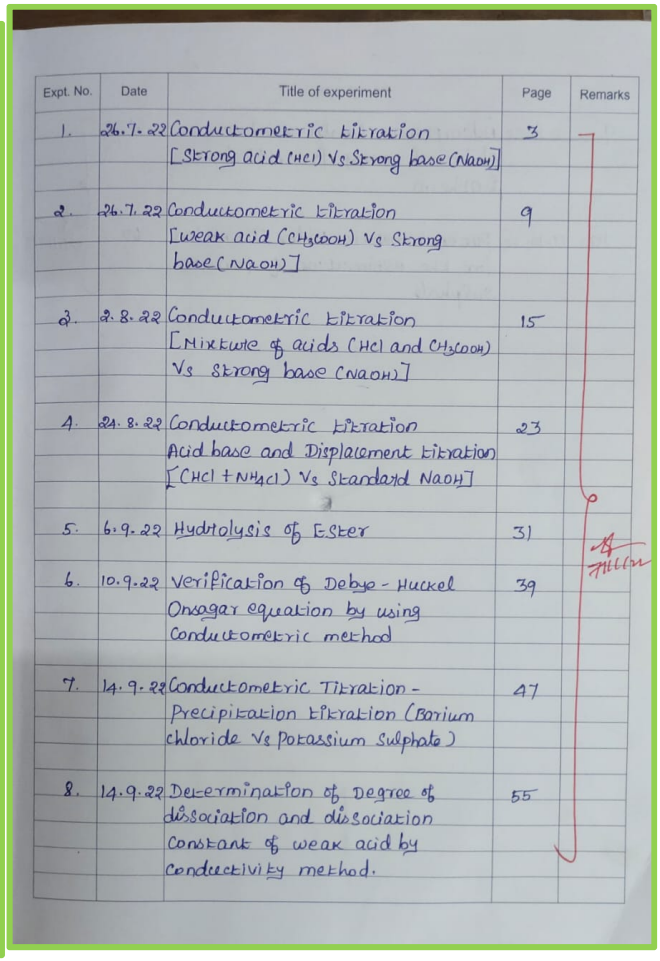
Staff- in -charge

Head of the Department
HEAD
DEPARTMENT OF CHEMISTRY
M.V. MUTHIAH GOVT. ARTS
COLLEGE FOR WOMEN
DINDIGUL - 624 001

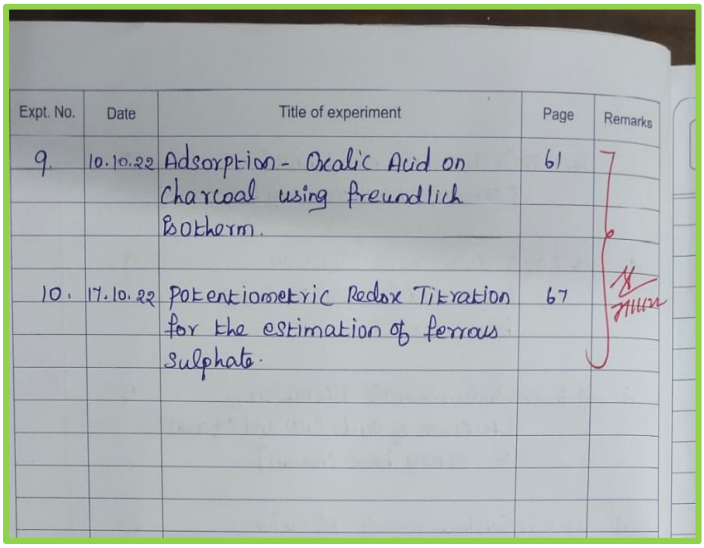
Submitted for the practical examination held on 17.11.2022 by Mother Teresa Women's University at the M.V.Muthiah Govt. Arts College for Women.

Date: 17.11.2022
Dindigul

Examiners
1.
2. M. Dhanalakshmi

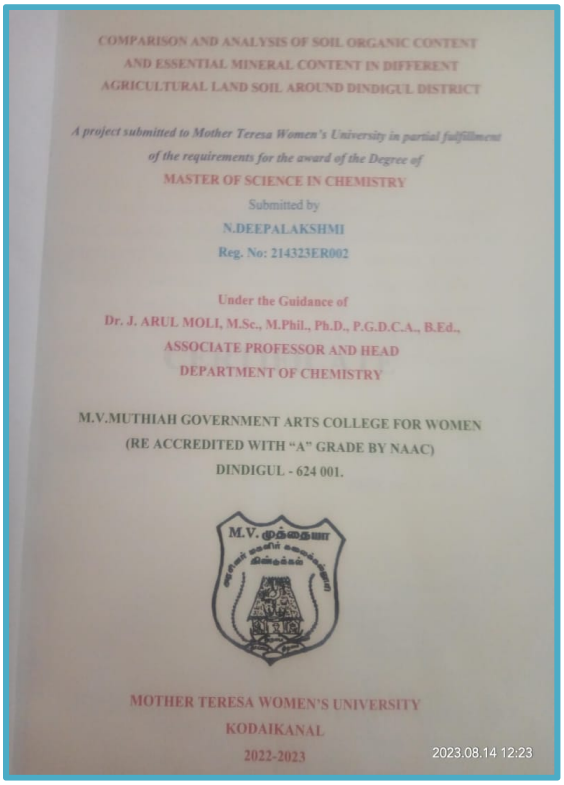


Expt. No.	Date	Title of experiment	Page	Remarks
1.	26.7.22	Conductometric titration [Strong acid (HCl) Vs Strong base (NaOH)]	3	
2.	26.7.22	Conductometric titration [Weak acid (CH_3COOH) Vs Strong base (NaOH)]	9	
3.	2.8.22	Conductometric titration [Mixture of acids (HCl and CH_3COOH) Vs Strong base (NaOH)]	15	
4.	21.8.22	Conductometric titration Acid base and Displacement titration [(HCl + NH_4Cl) Vs Standard NaOH]	23	
5.	6.9.22	Hydrolysis of Ester	31	
6.	10.9.22	Verification of Debye - Huckel Onsagar equation by using Conductometric method	39	
7.	14.9.22	Conductometric Titration - Precipitation titration (Barium chloride Vs Potassium Sulphate)	47	
8.	14.9.22	Determination of Degree of dissociation and dissociation constant of weak acid by Conductivity method.	55	



Expt. No.	Date	Title of experiment	Page	Remarks
9.	10.10.22	Adsorption - Oxalic Acid on Charcoal using freundlich Isotherm.	61	
10.	17.10.22	Potentiometric Redox Titration for the estimation of ferrous Sulphate.	67	

II M.Sc. Chemistry
IV Semester
P21CHR41-Project Work



COMPARISON AND ANALYSIS OF SOIL ORGANIC CONTENT AND ESSENTIAL MINERAL CONTENT IN DIFFERENT AGRICULTURAL LAND SOIL AROUND DINDIGUL DISTRICT

A project submitted to Mother Teresa Women's University in partial fulfillment of the requirements for the award of the Degree of

MASTER OF SCIENCE IN CHEMISTRY

Submitted by

N.DEEPALAKSHMI

Reg. No: 214323ER002

Under the Guidance of

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M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN

(RE ACCREDITED WITH "A" GRADE BY NAAC)

DINDIGUL - 624 001.

MOTHER TERESA WOMEN'S UNIVERSITY

KODAIKANAL

2022-2023

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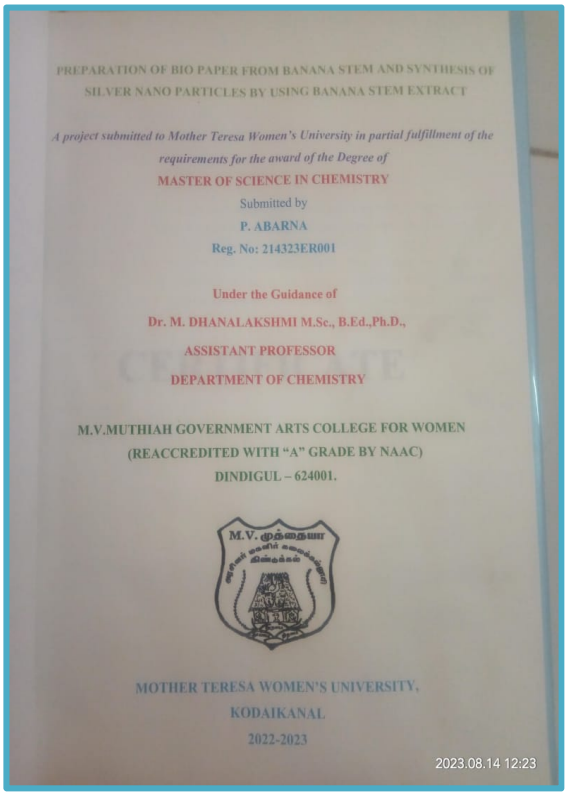

PREPARATION OF BIO PAPER FROM BANANA STEM AND SYNTHESIS OF SILVER NANO PARTICLES BY USING BANANA STEM EXTRACT

A project submitted to Mother Teresa Women's University in partial fulfillment of the requirements for the award of the Degree of

MASTER OF SCIENCE IN CHEMISTRY

Submitted by

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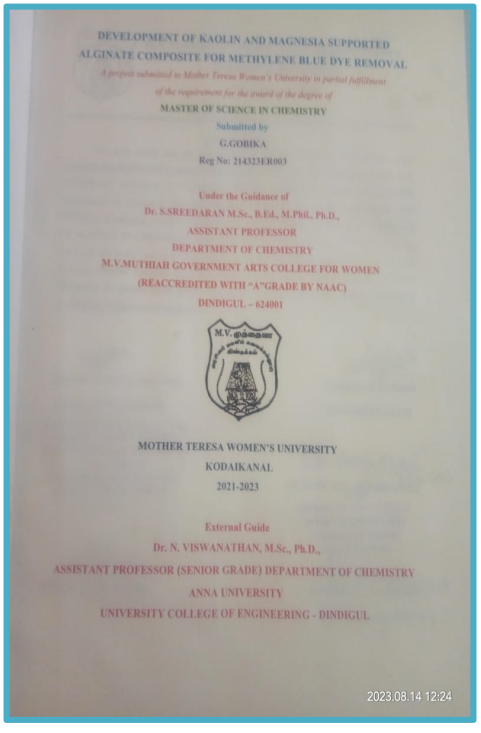
2022-2023

2023.08.14 12:23



DEVELOPMENT OF KAOLIN AND MAGNESIA SUPPORTED ALGINATE COMPOSITE FOR METHYLENE BLUE DYE REMOVAL

A project submitted to Mother Teresa Women's University in partial fulfillment of the requirement for the award of the degree of

MASTER OF SCIENCE IN CHEMISTRY

Submitted by

G.GOBIKA

Reg No: 214323ER003

Under the Guidance of

Dr. S.SREEDARAN M.Sc., B.Ed., M.Phil., Ph.D.,

ASSISTANT PROFESSOR

DEPARTMENT OF CHEMISTRY

M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN

(REACCREDITED WITH "A"GRADE BY NAAC)

DINDIGUL – 624001

MOTHER TERESA WOMEN'S UNIVERSITY

KODAIKANAL

2021-2023

External Guide

Dr. N. VISWANATHAN, M.Sc., Ph.D.,

ASSISTANT PROFESSOR (SENIOR GRADE) DEPARTMENT OF CHEMISTRY

ANNA UNIVERSITY

UNIVERSITY COLLEGE OF ENGINEERING - DINDIGUL

2023.08.14 12:24

M. V. MUTHIAH. GOVT. ARTS COLLEGE FOR WOMEN, DINDIGUL

DEPARTMENT OF GEOGRAPHY

B.Sc Degree Examination

S. kayathri.

Practical - I

FUNDAMENTALS OF MAP MAKING AND RELEIF REPRESENTATION

Register. No 22327.ERD13 Class B.Sc.Geo(CE/IM)

Semester ....I..... Subject Geography...

Certified that this is a bonafide record of work done by the above student during the year 2022-2023

Staff - in - charge

Head of the Department

Submitted for the practical examination held on 2.12.2022 by Mother Teresa Women's University at M.V.M. Government Arts College for Women, Dindigul.

Internal Examiner

External Examiner

HEAD
Department of Geography

எம்.வி.முத்தையா அரசினர் மகளிர் கலைக் கல்லூரி

திண்டுக்கல்

புவியியல் துறை

இளமறிவியல் தேர்வு

SBE – செய்முறைதாள் - I

புவியியலில் கணினியின் பயன்பாடு - (U21MSS31)

பதிவு எண் 213221TR036 வகுப்பு II B.Sc. Geo TM

பருவம் III பாடம் புவியியல்

இச்செய்முறைப் பதிவேடு மேற்குறிப்பிட்ட மாணவியால் 2022-2023 கல்வியாண்டில் செய்து முடிக்கப்பட்டது என சான்றளிக்கப்படுகிறது

பொறுப்பாசிரியர்

துறைத்தலைவர்

Department of Geography
M.V.Muthiah Government Arts College (W)
Dindigul-624001.

அன்னைதெரசா மகளிர் பல்கலைக்கழக இளமறிவியல் செய்முறைத் தேர்வுக்காக எம்.வி.முத்தையா அரசினர் மகளிர் கலைக் கல்லூரி திண்டுக்கல் 12.11.2022 நாளில் சமர்ப்பிக்கப்படுகிறது.

12.11.22

அகமதிப்பீட்டாளர்

HEAD
Department of Geography
M.V.Muthiah Government Arts College (W)
Dindigul-624001.

பறமதிப்பீட்டாளர்

எம்.வி.முத்தையர். அரசினர் மகளிர் கலைக் கல்லூரி, திண்டுக்கல்

புவியியல் துறை

இளமறிவியல் தேர்வு

SBE – செய்முறைதாள் – III

புவியியலில் புள்ளியியல் முறைகளின் பயன்பாடு

பதிவெண்: 20527TR005 வகுப்பு: முதலாம் ஆண்டு

பருவம் : V பாடம்: புவியியல் (தொழில் வழி)

இச்செய்முறைப் பதிவேடுமேற்குறிப்பிட்டமாணவியால் ..2022.....கல்வியாண்டில் செய்துமுடிக்கப்பட்டது என சான்றளிக்கப்படுகிறது.

பொறுப்பாசிரியர் 17/11/22

தலைத்தலைவர்
HEAD 17/11/22
Department of Geography
M.V.Muthiah Government Arts College (W)
Dindigul - 624 001.

அன்னைதெரேஸா மகளிர் பல்கலைக்கழக இளமறிவியல் செய்முறைத் தேர்வுக்காக எம். வி. முத்தையா அரசினர் மகளிர் கலைக் கல்லூரி திண்டுக்கலில் 17.11.2022.... நாளில் சமர்ப்பிக்கப்படுகிறது

அகமதிப்பீட்டாளர் 17.11.22

புறமதிப்பீட்டாளர் 17/11/22

HEAD
Department of Geography
M.V.Muthiah Government Arts College (W)
Dindigul - 624 001.

எம்.வி.முத்தையர் அரசினர் மகளிர் கலைக் கல்லூரி
திண்டுக்கல்

புவியியல் துறை

இளமறிவியல் தேர்வு

செய்முறைதாள் –III

வரைபடம் மற்றும் படிமங்கள் விவரணம் செய்தல் - UGEP63

பதிவஎண்: 20327R2005 வகுப்பு: III B.Sc.....

பருவம்: VI..... பாடம்: புவியியல் தொழில்

இச்செய்முறைப் பதிவேடு மேற்குறிப்பிட்ட மாணவியால் 2022-2023 கல்வியாண்டில் செய்து முடிக்கப்பட்டது என சான்றளிக்கப்படுகிறது.

பொறுப்பாசிரியர் 10/4/2023

துறைத்தலைவர்

HEAD
PG and Research Department of Geography
M.V.Muthiah Govt. Arts College (W)
DINDIGUL-624 001.

அன்னை தெரஸா மகளிர் பல்கலைக கழக இளமறிவியல் செய்முறைத் தேர்வுக்காக எம்.வி. முத்தையர் அரசினர் மகளிர் கலைக் கல்லூரி திண்டுக்கலில் ..12.04...2023.... நாளில் சமர்ப்பிக்கப்படுகிறது

10.4.23

அகமதிப்பீட்டாளர்

புறமதிப்பீட்டாளர்

HEAD
PG and Research Department of Geography
M.V.Muthiah Govt. Arts College (W)
DINDIGUL-624 001.

எம்.வி.எம் அரசினர் மகளிர் கலைக் கல்லூரி, திண்டுக்கல்.

புவியியல்துறை

இளமறிவியல் தேர்வு

செய்முறைதாள்- IV

வரைப்படம் தயாரித்தலின் அடிப்படை கோட்டுச்சட்டம்

(UGEP64)

பதிவுஎண் 20327TR005 வகுப்பு மூன்றாம் ஆண்டு

பருவம் VI பாடம் புவியியல் இயற்கை வழி

இச்செய்முறைப் பதிவேடு மேற்குறிப்பிட்ட மாணவியால் 2023 -ம்கல்வியாண்டில் செய்து முடிக்கப்பட்டது என சான்றளிக்கபடுகிறது

பொறுப்பாசிரியர் 10/4/23

துறைத்தலைவர்

PG and Research Department of Geography
M.V.Muthiah Govt. Arts College (W)
DINDIGUL-624 001.

அன்னை தெரசா மகளிர் பல்கலைகழக இளமறிவியல் செய்முறைத் தேர்வுக்காக எம்.வி.எம் அரசினர் மகளிர் கலைக் கல்லூரி, திண்டுக்கலில் 11.04.2023 நாளில்சமர்ப்பிக்கபடுகிறது

11.4.23.

அகமதிப்பீட்டாளர்

புறமதிப்பீட்டாளர்

PG and Research Department of Geography
M.V.Muthiah Govt. Arts College (W)
DINDIGUL-624 001.

M.V.M GOVT ARTS COLLEGE (W), DINDIGUL

DEPARTMENT OF GEOGRAPHY

M.Sc., DEGREE EXAMINATION

PRACTICAL – I

TERRAIN MAPPING AND CLIMATIC DATA ANALYSIS

REGISTER NO : 224227ER002 CLASS : I.M.Sc.....

SEMESTER : ..... I..... SUBJECT : ..Geography....

Certified that this is a bonafied record of work done by the above student during in the year : ..2022 – 2023...

Staff – In - Charge

Head of the Department

HEAD
Department of Geography
M.V.Muthiah Government Arts College(W)
Dindigul-624001.

Submitted for the practical Examination held on :..... By Mother Therasa Women's University at M.V.M. Govt Arts College (w)., Dindigul

02/12/2022

INTERNAL EXAMINAR

30/11/22

EXTERNAL EXAMINER

HEAD
Department of Geography
M.V.Muthiah Government Arts College(W)
Dindigul-624001.

M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN
DINDIGUL – 624001

(Affiliated to Mother Teresa Women's University, Kodaikanal)
(Re-Accredited with 'A' Grade by NAAC)

Department of Geography

Class : M.Sc Geography **Semester** : I

Subject Title: Computer Skills in Web Designing & Video Editing **Subject Code:** P21CSS11

Certified that this is the bonafied record of practical work done by

P. Mathavi (21432TER015)

during the academic year 2021-2022.

M. vijayalakshmi
STAFF-IN-CHARGE

09/02/2022
HEAD OF THE DEPARTMENT

Department of Geography
M.V.M. Govt. Arts College
Dindigul

Submitted for the Mother Teresa Women's University practical examinationheld on 26/02/2022 at M.V.Muthiah Government Arts College for Women, Dindigul.

M. vijayalakshmi
INTERNAL EXAMINER

26/2/22
EXTERNAL EXAMINER

M. V. MUTHIAH. GOVT. ARTS COLLEGE FOR WOMEN, DINDIGUL

DEPARTMENT OF GEOGRAPHY

M.Sc Degree Examination

Practical – I

VALUE ADDED COURSE

THEMATIC CARTOGRAPHY

Register. No .224327ER002 Class .M:Sc.....

Semester .....F..... Subject ...Geography

Certified that this is a bonafide record of work done by the above student during the year ..2022-2023

30/11/2022

Staff - in - charge Head of the Department

Submitted for the practical examination held on ..... by Mother Teresa Women's University at M.V.M. Government Arts College for Women, Dindigul.

02/12/2022

Internal Examiner External Examiner

30/11/2022

Department of Geography
M.V.Muthiah Government Arts College(W)
Dindigul-624 001.

M. V. MUTHIAH. GOVT. ARTS COLLEGE FOR WOMEN, DINDIGUL

DEPARTMENT OF GEOGRAPHY

M.Sc Degree Examination

Practical - II

SOCIO ECONOMIC DATA ANALYSIS

Register. No 224307ER002 Class M.Sc Geography

Semester II Subject Socio Economic data Analysis

Certified that this is a bonafide record of work done by the above student during the year 2022-2023

Lecturer - in - charge

HEAD
Head of Research Department of Geography
PG and Research Department of Geography
M.V.Muthiah Govt. Arts College (W)
DINDIGUL - 624 001.

Submitted for the practical examination held on 10.4.23 by Mother Teresa Women's University at M.V.M. Government Arts College for Women, Dindigul.

10.4.23

Internal Examiner

10/04/2023

External Examiner

HEAD
PG and Research Department of Geography
M.V.Muthiah Govt. Arts College (W)

M. V. MUTHIAH. GOVT. ARTS COLLEGE FOR WOMEN, DINDIGUL

DEPARTMENT OF GEOGRAPHY

M.Sc Degree Examination

SUPPORTIVE COURSE – PRACTICAL – II

APPLICATIONS OF GIS & GPS

Register. No 22432TER002 Class M.Sc. Geography

Semester II Subject Application of GIS & GPS

Certified that this is a bonafide record of work done by the above student during the year 2022-2023

Staff - in - charge

HEAD
Head of the Department
Department of Geography
M.V.Muthiah Government Arts College (W)
Dindigul - 624 001.

Submitted for the practical examination held on 11.4.23 by Mother Teresa Women's University at M.V. Muthiah Government Arts College for Women, Dindigul

Internal Examiner

HEAD
Department of Geography
M.V.Muthiah Government Arts College (W)

External Examiner

M.V.M GOVT ARTS COLLEGE (W), DINDIGUL

DEPARTMENT OF GEOGRAPHY

M.Sc., DEGREE EXAMINATION

PRACTICAL – III

CARTOGRAPHY AND GEO INFORMATION

CLASS :...II..M.Sc..... SUBJECT :..GEOGRAPHY...

REGISTER NO :21H327GR018... SEMESTER :.....III.....

Certified that this is a bonafied record of work done by the above student during in the year : ...2022..2023....

Lecture in Charge

Head of the Department

Department of Geography
M.V.Muthiah Government Arts College (W)
Dindigul - 624 001.

Submitted for the practical Examination held on :.16.11.2022 By Mother Therasa Women's University at M.V.M. Govt Arts College (w)., Dindigul

16.11.22

INTERNAL EXAMINAR

EXTERNAL EXAMINER

Department of Geography
M.V.Muthiah Government Arts College (W)
Dindigul - 624 001.

M. V. MUTHIAH. GOVT. ARTS COLLEGE FOR WOMEN,

DINDIGUL

DEPARTMENT OF GEOGRAPHY

M.Sc Degree Examination

Practical – Value Added – II

APPLICATION OF SPSS IN GEOGRAPHY

Register. No 214327ER018 Class ..II.-.MSc.....

Semester .....IV..... Subject ..Geography....

Certified that this is a bonafide record of work done by the above studen

during the year ..2022.-.2023....

Lecturer - in - charge

HEAD 10/04/23
Department of Geography
M.V.Muthiah Government Arts College (W)
Dindigul - 624 001.

Head of the Department

Submitted for the practical examination held on ..11.03.2023..... I

Mother Teresa Women's University at M.V.M. Government Arts College f

Women, Dindigul.

HEAD 11/04/23
Department of Geography
M.V.Muthiah Government Arts College (W)
Dindigul - 624 001.

Internal Examiner

External Examiner

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

2022-2023

EXPERIMENTAL LEARNING

M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN

(Affiliated to Mother Teresa Women's University, Kodaikanal)

(Re-Accredited with 'A' Grade by NAAC)

DINDIGUL – 624001

PG and Research Department of Computer Science

Class : I M.Sc. CS **Semester: I**

Subject Code : P21CSP11

Subject Title : Advanced Java Programming and Data Structures and Algorithms

Certified that this is the bonafied record of practical work done by

V. Gowthami (224326ER004)

during the academic year 2022-2023).

STAFF-IN-CHARGE **HEAD OF THE DEPARTMENT**

Submitted for the Mother Teresa Women's University Practical Examination held on 03/12/22 at M.V.Muthiah Government Arts College for Women, Dindigul.

3/12/22

INTERNAL EXAMINER **EXTERNAL EXAMINER**

M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN

(Affiliated to Mother Teresa Women's University, Kodaikanal)

(Re-Accredited with 'A' Grade by NAAC)

DINDIGUL – 624001

PG and Research Department of Computer Science

Class : I M.Sc. CS **Semester: I**

Subject Code : P21CSV11

Subject Title : Big Data Analytics Lab

Certified that this is the bonafied record of practical work done by V. Gowthami (224326ER004) during the academic year 2022-2023).

STAFF-IN-CHARGE **HEAD OF THE DEPARTMENT**

Submitted for the Mother Teresa Women's University Practical Examination held on 02/12/22 at M.V.Muthiah Government Arts College for Women, Dindigul.

INTERNAL EXAMINER **EXTERNAL EXAMINER**

M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN

(Affiliated to Mother Teresa Women's University, Kodaikanal)

(Re-Accredited with 'A' Grade by NAAC)

DINDIGUL – 624001

PG and Research Department of Computer Science

Class : I M.Sc. CS **Semester: II**

Subject Code : P21CSP22

Subject Title : PYTHON PROGRAMMING & OPERATING SYSTEM LAB

Certified that this is the bonafied record of practical work done by

V. Gowthami (224326ER004)

during the academic year 2022-23).

STAFF-IN-CHARGE **HEAD OF THE DEPARTMENT**

Submitted for the Mother Teresa Women's University Practical Examination held on 03/04/23 at M.V.Muthiah Government Arts College for Women, Dindigul.

INTERNAL EXAMINER **EXTERNAL EXAMINER**

M.V.Muthiah Government Arts College for Women, Dindigul

(Affiliated to Mother Teresa Women's University, Kodaikanal)

(Re-Accredited with 'A' Grade by NAAC)

Department Of Computer Science

Class: I- M.Sc. Computer Science **Semester :** II

Subject Title: Web Programming Lab **Subject Code: P21CSS22**

Certified that this is the bonafied record of practical work done by

V. Gowthami (224326ER004) during the academic year 2022-2023.

STAFF-IN-CHARGE **HEAD OF THE DEPARTMENT**

Submitted for the Mother Teresa Women's University Practical Examination held on 05/04/23 at M.V.Muthiah Government Arts College for Women, Dindigul.

8/4/23

INTERNAL EXAMINER **EXTERNAL EXAMINER**

M.V.MUTHIAH GOVERNMENT ARTS COLLEGE FOR WOMEN

(Affiliated to Mother Teresa Women's University, Kodaikanal)
(Re-Accredited with 'A' Grade by NAAC)
DINDIGUL - 624001

PG and Research Department of Computer Science

Class : II M.Sc (CS) **Semester: IV**

Subject Code : P21CSE422 **Subject Title : Soft Computing Lab**

Certified that this is the bonafied record of practical work done by

A. Yasmin Izzath (21432bER024)

during the academic year 2022-2023.

STAFF-IN-CHARGE HEAD OF THE DEPARTMENT

Submitted for the Mother Teresa Women's University Practical Examination held on 01/04/2023 at M.V.Muthiah Government Arts College for Women, Dindigul.

1/4/2023

INTERNAL EXAMINER EXTERNAL EXAMINER

M.V.Muthiah Government Arts College for Women, Dindigul

(Affiliated to Mother Teresa Women's University, Kodaikanal)

(Re-Accredited with 'A' Grade by NAAC)

PG & Research Department of Computer Science

Class : III B.Sc. Computer Science **Semester** : VI

Subject Title : Java and Internet Programming Lab **Subject Code.** : UCSP63

Certified that this is the bonafied record of practical work done by AAFRIN. A (20326ER001) during the academic year 2022-2023.

STAFF-IN-CHARGE

HEAD OF THE DEPARTMENT

Submitted for the Mother Teresa Women's University Practical Examination held on 03.04.23 at M.V.Muthiah Government Arts College for Women, Dindigul.

INTERNAL EXAMINER

EXTERNAL EXAMINER

M.V.Muthiah Government Arts College for Women, Dindigul

(Affiliated to Mother Teresa Women's University, Kodaikanal)

(Re-Accredited with 'A' Grade by NAAC)

Department Of Computer Science

Class : III B.Sc. Computer Science **Semester** : V

Subject Title : Python Lab **Subject Code** : UCSS53

Certified that this is the bonafied record of practical work done by

AAFRIN A (20326ERD01)

during the academic year 2022-2023.

27/10/2022

STAFF-IN-CHARGE **HEAD OF THE DEPARTMENT**

Submitted for the Mother Teresa Women's University practical examination held on 18.11.2022 at M.V.Muthiah Government Arts College for Women, Dindigul.

INTERNAL EXAMINER **EXTERNAL EXAMINER**

13:23

M.V.Muthiah Government Arts College for Women, Dindigul

(Affiliated to Mother Teresa Women's University, Kodaikanal)

(Re-accredited with 'A' Grade by NAAC)

PG & Research Department of Computer Science

Class : **III. B.Sc.(CS) - A** **Semester** : **V**

Subject Title :**Visual Programming Lab** **Subject Code** : **UCSE53**

Certified that this is the bonafide record of practical work done by

AAFRIN A (20326ERD01)

during the academic year 2022-2023.

28/10/22

STAFF-IN-CHARGE

HEAD OF THE DEPARTMENT

HEAD
DEPT. OF COMPUTER SCIENCE
M.V.MUTHIAH GOVT ARTS COLLEGE FOR WOMEN
DINDIGUL

Submitted for the Mother Teresa Women's University practical examination held on 22-11-22 at M.V.Muthiah Government Arts College for Women, Dindigul.

INTERNAL EXAMINER

EXTERNAL EXAMINER

M.V.Muthiah Government Arts College for Women, Dindigul

(Affiliated to Mother Teresa Women's University, Kodaikanal)

(Re-Accredited with 'A' Grade by NAAC)

PG & Research Department of Computer Science

Class : III B.Sc. Computer Science **Semester** : VI

Subject Title : WEB TECHNOLOGY LAB **Subject Code** : UCSP64

Certified that this is the bonafied record of practical work done by

AAFRIN . A (20326ER001)

during the academic year 2022-2023.

STAFF-IN-CHARGE **HEAD OF THE DEPARTMENT**

Submitted for the Mother Teresa Women's University Practical Examination held on 5/4/2023 at M.V.Muthiah Government Arts College for Women, Dindigul.

INTERNAL EXAMINER **EXTERNAL EXAMINER**