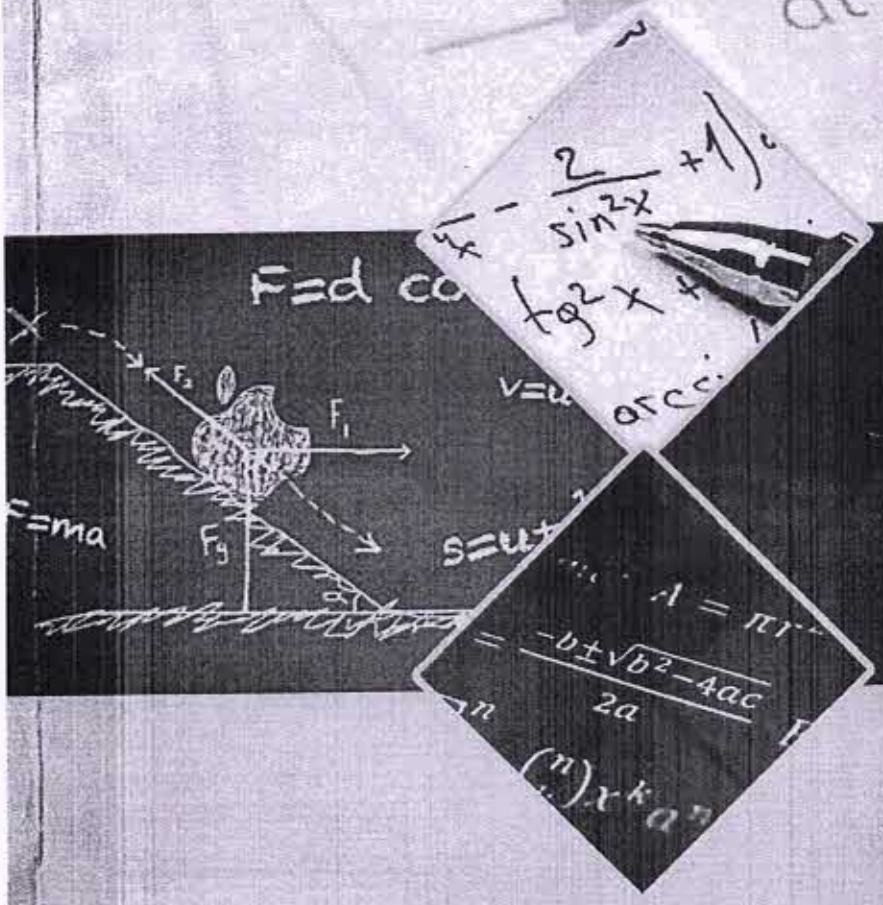
One Day National Conference on
A Glimpse of Differential Equations in Science and Engineering

2019-20



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INDEX

Sr. No.	Title of the Paper	Name of Author	Page No.
1.	PHOTOLUMINESCENCE PROCESS IN LUMINESCENT MATERIALS: AN OVERVIEW	Anurag Pandey Amit Kumar Pandey	07
2.	PHYSICAL AND THERMAL PROPERTIES OF B_2O_3-K_2O-ZNO-LI_2O-CUO GLASS SYSTEM	Dr.G.N.Devde P.L.Yesalwad	10
3.	ROLE OF LAPLACE TRANSFORM & ELZAKI TRANSFORM IN SOLVING ORDINARY DIFFERENTIAL EQUATIONS WITH VARIABLE COEFFICIENTS	Dr.H.k.Undegaonkar Dr.R.N.Ingle	15
4.	DIFFERENT TRANSFORM OF GENERALIZED MITTAG LEFFLER FUNCTION IN FRACTIONAL CALCULUS	Mohammed Mazhar-Ul-Haque Sayyed Jalil	18
5.	EXISTENCE THE SOLUTION FOR FRACTIONAL ORDER QUADRATIC FUNCTIONAL INTEGRAL EQUATION	S.N.Kondekar B.D.Karande	25
6.	INSTABILITY OF SOLUTION OF FIRST ORDER DIFFERENCE EQUATION	Pandit U Chopade Arun B Jadhav	33
7.	THE EFFECT OF MOLARITY OF REAGENTS ON BAND GAP OF CZTS THIN FILMS SYNTHESIZED BY USING SINGLE STEP CBD TECHNIQUE.	Mahewar R. B. Ravangave L. S.	39
8.	INFLUENCE OF SUBSTRATE TEMPERATURE ON STRUCTURE AND MORPHOLOGY OF SPRAY DEPOSITED ZNO THIN FILMS.	Sarika Jadhav Shaikh R. S. L. S. Ravangave	43
9.	APPLICATION OF DIFFERENTIAL EQUATION IN PHYSICS	Kunale R.A.	48
10.	ANALYTICITY OF TWO-DIMENSIONAL GENERALIZED CANONICAL SC-TRANSFORM	S.B.Chavhan	51
11.	DIELECTRIC PROPERTIES OF AMBAD SALINE SOIL AT 5.2 GHz.	Santosh Deshpande Vijayamala Ghuge.	56
12.	TIO_2 THIN NANOSHEETS ENHANCE TO THE ANTIMICROBIAL ACTIVITY TWO GRAM POSITIVE BACTERIA AND TWO GRAM NEGATIVE BACTERIA.	Shinde S. A. Kote J. R. Prof. Mane R. S.	61

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APPLICATION OF DIFFERENTIAL EQUATION IN PHYSICS

Kunale R.A.

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ABSTRACT:

Differential equation gives us information about how a one of the quantities (i.e. dependent variable) changes with respect to (independent variable). The different variable used in physics are time, position, distance, acceleration, temperature, space etc. In ordinary differential equation of variation of position with respect to time contains the x, t, dx/dt, d^2x/dt and several higher order derivatives. There are different methods to solve differential equation, using that solution we get the information about how quantity changes with respect to expected variable. In physics differential equation are used to represent periodic motion for instance in simple harmonic motion to represent variation of position with respect to time i.e. dx/dt is used.

INTRODUCTION:

An equation involving derivatives or differentiation of one or more dependent variable with respect to one or more independent variable is called differential equation[1-2]. Almost all the theories of physics have expressed physical laws by using differential equation. A law is set of rules followed by particular system. Such a rules are observed by repeated experimentation. For example,Newtone's law are set of rules followed by a system possessing motion. The second law of motion is expressed in the form of second order ordinary differential equation $F(x)= m\ d^2x/d^2t$, here x is distance of a point mass at any instant 't' from point 'o' taken as origin on a straight line[3,4]. The equation of this kind is called differential equation because this equation contains d^2x/d^2y. This is a second order differential equation. The set of rules for making a law are fixed and system follows these rules under different circumstances. However, the laws can break-down in some situations, and therefore a law is true only for a subset of conditions. For example, all macroscopic systems using Newton's laws of motion one can find the exact position and momentum of an object at any instant of time whereas for quantum sized systems one cannot determine momentum and position values at any instant of time with full certainty. Another example is that of ohms law, for certain systems such as copper wire one can find linear relationship between current and voltage, whereas for systems such as transistors such relationship breakdowns.According to classical physics, all systems change continuously as time passes. A physical law expresses a permanent relationship between the state of the system at the present moment and its state immediately following that moment. Therefore, a law must define the connection between successive space-time points. As we can see in equation, Newton's second law of motion defines a relationship that connects the velocity of the body at a present space-time point with the velocity at a point in the immediate neighbourhood of

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the first space-time point. A majority of physical processes change continuously, and therefore a law must express this continuity of change in a causal chain. In a continuous process, the sequence of states assumed by a physical system forms a continuous chain, which means that the change in state of the system over an infinitesimal period of time is itself infinitesimal. The laws controlling such processes must therefore exhibit continuity of change.

APPLICATION IN WAVE MOTION OF STRING:

When we have a function y(t), we can readily define dy/dx as the slope of the plot y(x). But now consider y(x,t). In our example, this will be the displacement y of a point on a string as a function of position on the string x, and time t. So we can now think of two different derivatives. We write them differently. What we shall do here is to solve the wave equation, the equation of motion for a wave in a string[5].

$\partial y/\partial x$,think of this as dy/dx at a given constant time, t. Imagine taking a photograph (time is constant): in the image at time t, this is the slope of the y(x) shape at the instant of the photograph.

$\partial y/\partial t$. Think of this as dy/dt at a given position, x. This is just the velocity in the y direction at a particular point x on the string. (Not the velocity of the wave, by the way).

Let's take a standard example. A travelling sine wave with amplitude A, frequency $f = 2\pi\omega$ and wavelength $\lambda = 2\pi/k$ has the equation

$$y = A \sin(kx - \omega t),$$

$\partial y/\partial x = kA \cos(kx - \omega t)$,which is the slope of the string at position x and time t,

$\partial y/\partial t = -\omega A \cos(kx - \omega t)$, which is the velocity of a point on the string at x and t.

$\partial y^2/\partial x^2 = -k^2 A \sin(kx - \omega t)$,which is the rate of change in the slope of the string, as x varies,

And

$\partial y^2/\partial t^2 = -\omega^2 A \sin(kx - \omega t)$,which is the acceleration of a point on the string.

These have important physical significance: the first one is determining the curvature of the string. If $\partial y^2/\partial x^2 = 0$, then the slope is constant, so it is straight. That means that the tension T acts in opposite directions at opposite ends, giving no nett force. If a segment is curved, however ($\partial y^2/\partial x^2 \neq 0$), it has a force acting on it. For constant curvature over a small length L, the nett force is proportional to L as shown in Fig. 1.

We know the acceleration so we can apply Newton's second law. The mass of the segment is μL, where μ is the mass per unit length μ. Writing Newton's law as a = F/m gives:

$$\partial y^2/\partial t^2 = (T/\mu)\partial y^2/\partial x^2$$

Looking back at our expressions for the two second derivatives, we see that they our original function $y = A \sin(kx - \omega t)$ is a solution to the wave equation, provided that $T/\mu = \omega^2/k^2$. We also know in wave, that ω/k is the wave speed, v. Which finally relates the wave speed to the physical properties T and μ of the string:

$$v = \sqrt{(T/\mu)}.$$

The wave speed is greater if the string is stretched more tightly, and less if the string has a high mass per unit length.

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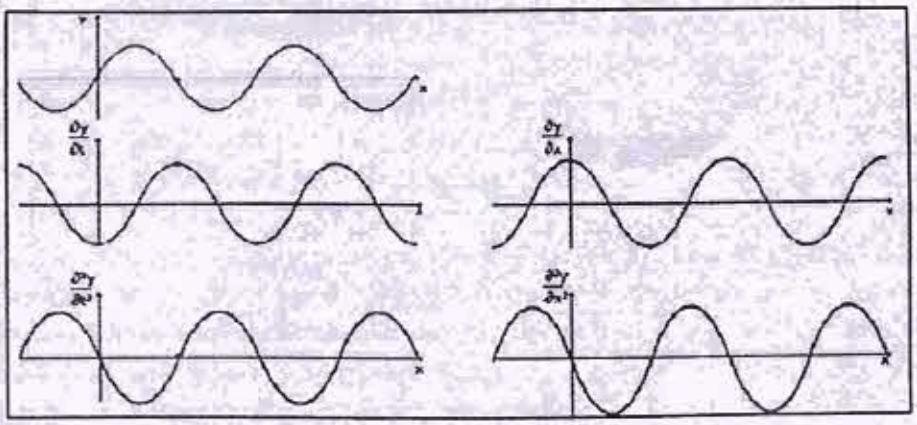

Fig.1 Variation of y, dy/dt, d^2y/dt^2, dy/dx, d^2y/dx^2 with position.

CONCLUSION:

Differential equations are used for formulation of various laws of physics for example Newton's law, wave equation of string, radioactive decay etc. Differential equations are the foundation for understanding many of the most important processes and phenomenon in nature. Technological progress in some area occurred with the solution to differential equation to guide and provide confident solution and insight.

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5. Physics UNSW, differential equation.

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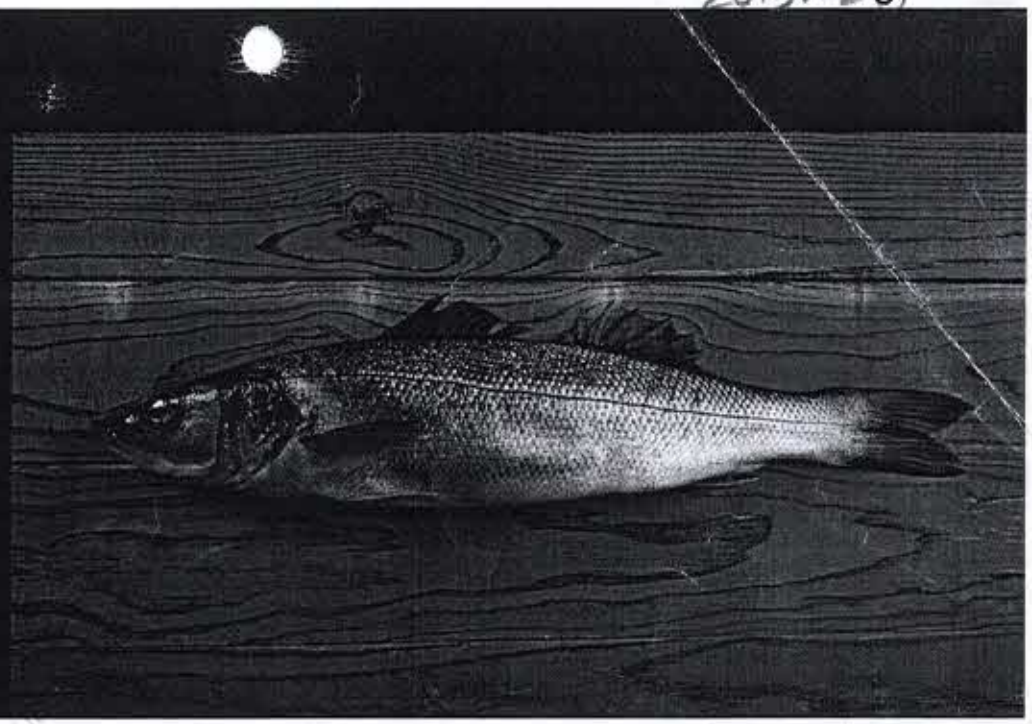
Indian major carps, riverine fishes which normally breed in rivers during the months from June to August. They normally do not breed in captivity. There is need to induce Indian major carps to breed in confined waters and thereby ensure a dependable source of quality seed to enhance the fish production and development
of fishery.
The breeding of fish in the controlled condition is very important for the production of quality fish seed in sufficient quantity. Hence, the present research works are carried out during June - August 2009 and June-August 2010. At fish breeding center, Jayakwadi, Paithan, Dist. Aurangabad in Maharashtra state, India.
A reference book on 'Induced Breeding Technique' has been written with the main objective to provide the knowledge for students, researchers, planners, fish breeders and hatchery managers. Authors are sure the book will be helpful to them.



Purushottam More
Ravindra Bhandare

Induced Breeding Technique

A Reference Book

Dr. Purushottam R. More is presently working as an Assistant Professor and Head, Department of Zoology, Kai. Rasika Mahavidyalaya, Deoni. District Latur (MS) India.
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A reference book of **'Induced Breeding Technique'** will be helpful to the students, researchers, planners, fish breeders and hatchery managers.

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CONTENTS

Sr.no	Topics	Page number
1.	**Introduction**	1-4
2.	Materials and Methods 2.1. Induced Breeding 2.2. Fecundity 2.3. Gonado Somatic Index	5-10
3.	**Results** 3.1. Induced Breeding	11-15
	3.2. Fecundity	16-18
	3.3. Gonado Somatic Index	21-22
4.	**Discussion** 4.1. Induced Breeding 4.2. Fecundity 4.3. Gonado Somatic Index	27-30
5.	**Summary and Conclusion** 5.1. Induced Breeding 5.2. Fecundity 2.3. Gonado Somatic Index	28-33
6.	**References**	35-40
	Tables and Figure	
1	Table no. 1&2	I
2	Table no. 3&4	II
3	Table no. 5	III
4	Table no. 6&7	IV
5	Table no. 8&9	V
6	Table no. 10&11	23
7	Table no. 12&13	24
8	Figure no. 1&2	18
9	Figure no. 3&4	19
10	Figure no. 5&6	25
11	Figure no. 7&8	26

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A Text Book of Organic Chemistry

B.Sc. First Year
(Semester I and II)

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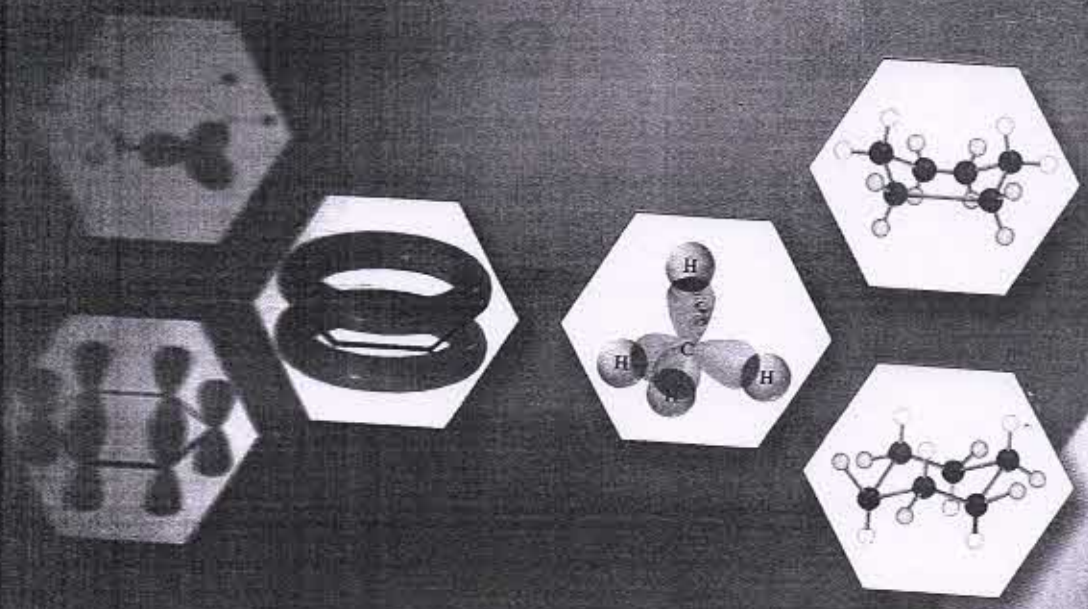
Mr. Bhaskar Ankush
Dr. Vijaykumar More



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CONTENTS

1. **Nomenclature of Organic Compounds** 07

Functional groups and types of organic compounds, Basic rules of IUPAC Nomenclature, Nomenclature of mono and bi- functional compounds on the basis of priority order of following classes of organic compounds: alkanes, alkenes, alkynes, alcohols, ethers, aldehydes, ketones, carboxylic acid, carboxylic acid derivatives (acid halides, esters, anhydrides, amides), amines; Nomenclature of aromatic compounds: Mono, di and polysubstituted benzene (with not more than two functional groups)

2. **Basic Concepts in Organic Chemistry** 39

Basic terms: Substrate and Reagents, types of reagents (Electrophilic and Nucleophilic). Notation of arrows: curved arrow, half headed arrow, double headed arrow, straight arrow. Bond fission: Homolytic and heterolytic fission. Reaction intermediates: Carbocation, Carbanion, Free radical, (Introduction, structure & Stability), carbene, nitrene & benzyne (only introduction). Electron mobility: Inductive effect (effect on acidic strength of alpha substituted acetic acid and α-chloroacetic acid), Mesomeric effect (Aniline and Nitrobenzene), Hyperconjugation (toluene).

3. **Alkanes Alkenes and alkynes** 65

3.1 Alkanes: Introduction, Preparation of alkanes from a) Hydrolysis of Grignard reagent b) Kolbe's synthesis. Chemical reaction: a) Pyrolysis (mechanism), b) aromatization.

3.2 Alkenes: Introduction, Preparation methods a) But-1-ene from but-1-yne b) But-2-ene from butan-2-ol. Chemical reactions with mechanism: a) Electrophilic addition of Br_2 to ethene b) Electrophilic addition of HBr to propene c) Free radical addition of HBr to propene (Peroxide effect).

3.3 Alkynes: Introduction, Preparation of ethyne from a) Iodoform, b) Hydrolysis of calcium carbide. Chemical reactions: Electrophilic addition of HBr and Br_2 to ethyne (with mechanism)

4. **Cycloalkanes, Cycloalkenes and Dienes** 81

4.1 Cycloalkanes: Introduction, Preparation of cycloalkanes from a) Adipic acid b) Aromatic hydrocarbon. Baeyer strain theory and Saches Mohr theory. Ring opening reaction with H_2 and HI.

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4.2 **Cycloalkenes:** Introduction, preparation methods: a) Dehydration of cyclohexanol, b) Dehydrohalogenation of halocyclohexane. Chemical reactions: a) Epoxidation of cyclohexene, b) Allylic halogenations.

4.3 **Dienes:** Introduction, classification & Resonance structures. Preparation methods of 1,3-butadiene from- a) 1,4-dibromobutane, b)1,4-butanediol. Chemical reactions: a) addition of Br_2 and HBr to 1,3-butadiene, b) addition of ethene to 1,3-butadiene (Diel's- Alder reaction).

Semister - II

5. Aromatic Hydrocarbons and Aromaticity 93

Introduction, Nomenclature, kekule and resonance structure of benzene, stability, Orbital picture of benzene. Aromaticity and antiaromaticity by Huckel's Rule (Benzene, Napthalene, Anthracene, Pyrrrole, Furan, Thiophene, Pyridine, Cyclopentadienyl cation and anion, Cyclopropenyl cation). Electrophilic Substitution reaction of benzene (with mechanism): Nitration, Halogenation, Friedel Craft alkylation and acylation. Orientation effect: Effect of activating and deactivating groups (-OH, NO_2, CH_3, Cl) on aromatic electrophilic (Nitration) substitution reaction (with mechanism)

6. Phenols 125

Introduction, classification and acidic character of phenol (compare with ethanol). Chemical reactions with mechanism: Reimer-Tiemann reaction, Acetylation, Fries rearrangement, Kolbe's carboxylation reaction.

7. Haloalkenes and Haloarenes 140

7.1 Haloalkenes

a) **Vinyl Chloride:** synthesis of vinyl chloride from 1) 1, 2- dichloroethane 2) ethene Chemical reactions: Addition reaction with HBr, polymerization reaction.

b) **Allyl Iodide:** synthesis of allyl iodide from 1) allyl chloride 2) glycerol and HI. Chemical reactions: reaction with NaOH, KCN, & Br_2

7.2 Haloarenes:

Introduction, Synthesis of halobenzene from 1) Hunsdiecker reaction 2) Gattermann reaction. Chemical reactions (with mechanism): Ullamann biaryl synthesis. Resonance & Relative reactivity of alkyl halides v/s vinyl and aryl halides towards nucleophilic substitution reactions.

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8. **Carboxylic acid derivatives**

8.1 Acid Chlorides 152

Introduction, preparation methods: 1) From acetic acid and thionyl chloride, 2) From acetic acid and phosphorous pentachloride. Chemical reactions: (Hydrolysis, Action with alcohol, Action with amines).

8.2 Acid anhydrides

Introduction, preparation methods: 1) From acetyl chloride and carboxylic acid, 2) From acetyl chloride and sodium acetate. Chemical reactions: (Hydrolysis, Action with alcohol, Action with amines).

8.3 Esters

Introduction, preparation methods: 1) From ethyl alcohol and acetic acid , 2) From ethyl alcohol and acetyl chloride. Chemical reactions: (Hydrolysis, Action of amines, Reduction).

8.4 Amides

Introduction, preparation methods: 1) From ammonia and acetyl chloride 2) From ammonia and acetic anhydride. Chemical reaction: (Hydrolysis, Action of nitrous acid).

9. **Alcohols and epoxides**

9.1 Alcohols 168

Introduction and Classification

a) **Dihydric alcohol (ethylene glycol):** Preparation methods: (Hydroxylation of alkene and From 1,2-dihaloalkane). Chemical reactions: [Reaction of ethylene glycol with, 1) $Pb(OAC)_4$, 2) $P_2O_5/ZnCl_2$].

b) **Trihydric alcohol (Glycerol):** Preparation methods from: 1) Oils and fats 2) Propene. Chemical reactions: [Reactions of glycerol with, 1) Nitric acid, 2) Acetyl chloride].

9.2 Epoxides

Introduction and nomenclature. Preparation methods: a) Oxidation of ethene in presence of Ag catalyst , b) Oxidation of ethene with per acetic acid. Chemical reactions: (Ring opening reactions of propylene oxide a) in acidic b) and basic medium/reagent.

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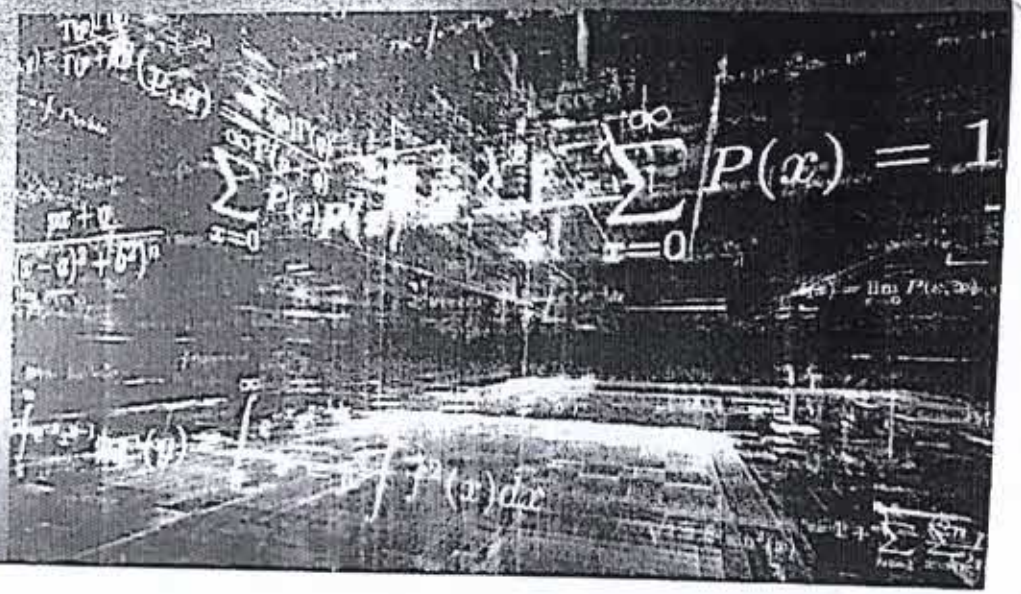
In this book some basic programming approach of MATLAB has been given, following are contents which is focused in this book.
- Create Matrices and it's operations, plotting graphs using MATLAB.
- Plotting multiple graphs as well Transcendental graphs using MATLAB.
- Introduction to symbolic methods and solving problems.
- Working with Partial Differential Equations using mathematical software like MATLAB, maple etc.
- Solving problems in Numerical Analysis using mathematical software.



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Mathematical Programming

using MATLAB/Maple

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Contents

Introduction to MATLAB 2
Basic Commands 2
Arithmetical operations using MATLAB 2
Variables 3
Trigonometric Functions 4
Vectors 5
Transpose 7
Arithmetic with vector 8
Practical Problem using MATLAB – B.Sc. F.Y. 10
linsolve 21
charpoly 24
Functions for Plotting Line Graphs: 33
Colors, Line Styles, and Markers 33
Specifying the Color and Size of Lines 33
Practical Problem using MATLAB – B.Sc. S.Y. 34
Adding Plots to an Existing Graph 36
LineStyleOrder 39
Plotting with two Y axes 41
Using Multiple X- and Y-Axes 42
Basic 3D Plotting 43
Symbolic Variables: 45
Symbolic Functions : 46
Matrix of Symbolic Variables : 46
Partial Differential Equation by using maple 51
- **Solution of Equation by Direct Integrations** 51
- **Linear Homogeneous Partial Differential Equations of nth Order with constant coefficients** 52
- **Method of Separation of Variables** 53
- **One Dimensional Heat Flow** 54

Numerical Analysis problem using MATLAB 55
Trapz : Trapezoidal numerical integration 63
References: 66

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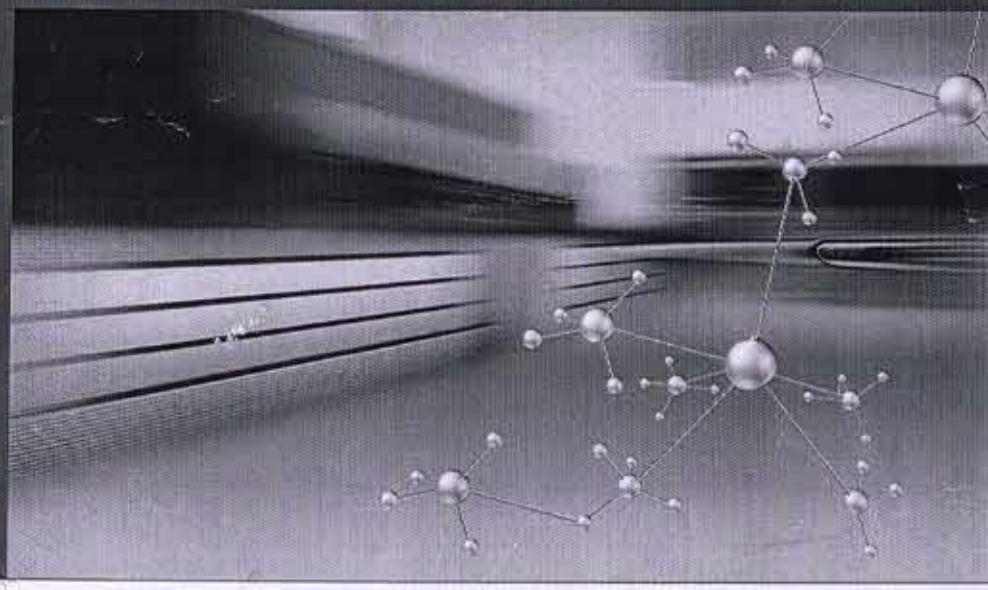
This book explains the basic aspects of inorganic chemistry with a primary emphasis on facts; then uses the students growing factual knowledge as a foundation for discussing the important principles. This book contains separate chapters on periodic table and their properties, s-blocks elements, p-blocks elements, noble gas chemistry, acids and bases, chemical bonding and oxidation reduction. Each and every Concept has been explained with simple and suitable example. Sufficient number of multiple choice questions is given at the end of every topic. This book can be prove helpful to the graduation and under graduation students, researchers, academicians and all the scientific community interested in chemistry of inorganic materials.



Vijaykumar Shivdasrao More

Basic Aspects Of Inorganic Chemistry

For Degree Students

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2019-20

AA & GG AUDITS AND OTHER QUALITY MEASURES IN HIGHER EDUCATION INSTITUTIONS

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15. Effective Leadership and Academic Audit for the Quality Enhancement and Sustenance in Higher Education Institutions in India-
Ms. Sheetal V. Gunjate & Dr. Kamlakar Gavane 92

16. Tokenistic Inclusion: Gaps in Gender Audit
Dr.C. Dhanabal , Dr.A.Sheeba Princess 105

17. Green Sense at a Delhi College: Eco–Audit and Best Practices for Sustainable Development
Sakshi Kabra,, Monica Gupta, Sailaja Modem 113

18. Preserving the Environment Within the Campus in School and Colleges-
Reddy P.S, Hangarge R.G & Bhosle R.R 129

19. Importance of Green/Environmental Audit as an Academic Practice
Dr.Vijaykumar Bhanje 133

20. Green Audit in HEI's – A Step towards Sustainable Environment Development.
Shirshi U.K. and Niture S. D 140

21. Academic and Administrative Audit (AAA): A Tool for Continuous Quality Improvement
Omprabha A. Lohakare 147

22. Maintenance of Gender Balance" A Case Study of Facilities in Nutan Mahavidyalaya, Selu
Dr. Nirmala S. Padmavat 152

23. Significance of Academic and Administrative Audit in *Higher Education*
Dr. D. B. Konale 157

24. Academic Audit: The Gateway of Excellence-
Dr.Ramkishan M. Manjre 161

25. Academic and Administrative Audit: Tools for Quality improvement
Mr. Tenkale M.N 167

26. ISO Certification to Enhance the Quality of Educational Institutions
Daxa Thakor 171

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ACADEMIC AND ADMINISTRATIVE AUDIT: TOOLS FOR QUALITY IMPROVEMENT

Mr. Tenkale M.N
Assistant professor, Dept. of English
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Abstract: Today's age is known as the age of competition in every walks of life. Education is one of the field where the changes are taking place day by day. Academic and Administrative audits are to update and enhance the quality of educational institute. These are the tools by which an institute come up with their strength and weaknesses. These audits helps the institute to make improvement in their academic and administrative process. IQAC is an internal quality instrument established according to the guidelines of NAAC in the institute to plan and monitor the whole system. IQAC plays vital role in academic and administrative Audit.

Keywords: IQAC, Academic and Administrative audit

Academic and Administrative Audit: Tools for Quality improvement

Introduction -Education plays a vital role in the developments of any nation. It provides skilled professionals who leads their country on the top. Education is a growing sector where changes are taking place after every minutes. To compete with this change and to be update we need to revise the education system as per its need. Academic and administrative audit are the tools by which we can update and sustain our educational quality. Academic and administrative audit can be done internally and externally. Internal audit done by IQAC of the institution while external audit is done by university or by private agencies. In some state it is conducted by state agencies. In Gujarat knowledge construction of Gujrat has developed a very good model of academic and administrative audit.

Academic Audit - B.L. Gupta defines 'Academic audit is a systematic and scientific process of designing, implementing, monitoring and reviewing the quality of academic systems' It is related to quality assurance and enhancing the quality of academic activities in HEIs.

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Administrative Audit -M. Rajendra defines administrative audit ' A method of assessing the efficiency and effectiveness of the operating system of administrative procedures, policies, decision making authorities and functionaries , strategies, process, feedback, control mechanism and so on' The AA would certainly make the functionaries to ascertain the strength and weakness of the operating system in general and pin out the areas in particular, and to ascertain where the function is stagnated and affected, and where special attention is required along with man and material resources" (P. 54)

Objectives of Academic and administrative audit

- It makes awareness to the institution of its strengths and weaknesses and suggests the mechanism for improvement.
- It helps to identify the problems in the present administrative process and find out the opportunities of improvement in the system.
- It helps to continuous improvement and sustain the quality.
- To setup the academic and administrative standards.
- To encourage the faculty to revise their educational quality methods.

Purpose of academic and administrative audit - The purpose of the academic and administrative audit is to evaluate and examine the educational institution and suggests the institute their achievements and pitfalls for further improvement. After the assessment of the institution the committee gives suggestion on the following points.

1. Availability of teaching and non-teaching faculty.
2. Infrastructural facilities available for carrying out academic and administrative activities.
3. Efforts taken for curricular development.
4. Teacher quality.
5. Teaching methods adopted and use of ICT in teaching, learning process.
6. Feedback mechanism used for assessing the performance of teachers by students and for curricular development.
7. Faculty development programs implemented by the department.
8. Strengths, Weaknesses. Opportunities and Challenges of the department.
9. Research facilities and research output in the form of publications and patents.

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10. Computer, internet andlibrary facilities available.
11. Mentoring system, introduction of Remedial classes, Bridge courses, guidance for NET/SET and competitive examinations.
12. Skill development and personality development programmes.
13. Generation of funds and optimum utilization.
14. Evaluation methods adopted for internal and external examinations.
15. Future plans of the department.

METHODOLOGY - NAAC has not given any specific methodology or guidelines for conducting Academic and Administrative audit but its general process is that IQAC committee of the institution prepares the plan to conduct academic and administrative audit. IQAC asks the departments to provide the data given or prepared by IQAC committee. The data should be related to all the aspects as per NAAC criteria. The data include the academic, curricular, co-curricular and extra-curricular activities conducted by the departments, achievements of the faculty and students in seminar, conferences and workshop at different level. The departments should provide and keep all the related information which are given in the format in NAAC under departmental evaluation section. After the preparation and collection of all the necessary documents IQAC should make the documentation properly and asks the academic and administrative committee for assessment. The periodicity is not fix some of the HIE's done it on regular basis and other are done it once in three years or five years. But the internal audit yearly and external audit once in three years or five years is good activity. The peer team or accessing agencies evaluate the institute as per its preparation and gives the outcome of the assessment to the institute.

CONCLUSION - Thus academic and administrative audit plays a vital role in the evaluation process of the institution. These aspects are very important as per NAAC has given the different gradation on which the institute's status are calculated and, on the gradation, further things are dependent. All the UGC and RUSA's funding system are depend on the gradation of institutions status. For that academic and administrative audit is very important to achieve certain desired aims.

In this way academic and administrative audit evaluate the institute and give their suggestions for further improvement. These are the scientific and systematic process by which the quality of academic process in the institution are reviewed. These parameters ensure the

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quality assurance and helps to enhance the the quality of academic and overall the procedures in HEI's.

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Editors: Dr. Arvind M. Nawale and Dr. Vinayak A. Jadhav

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The present work was carried out during the period of two year from Apr 2009 to March 2011. During this investigation 17 physico-chemical parameters were studied such as Atmospheric temperature, Water Temperature, pH, Dissolved Oxygen, Total Solids (TS, TDS and TSS), Total Alkalinity, Phosphate, Nitrate, Calcium, Magnesium, Sulphate, Chloride, Sodium, Potassium, Electric Conductivity, Turbidity and Salinity. Similarly, during this study some Water Heavy Metals were studied such as Copper (Cu), Zinc (Zn), Iron (Fe), Lead (Pb) and Cadmium (Cd).

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Hydrochemistry of Lonar Meteoritic Crater (MS) India

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Table of Contents

1. HYDROCHEMISTRY 1
1.1 Introduction 1
1.2 Materials and Methods 1
ATMOSPHERIC TEMPERATURE 1
WATER TEMPERATURE 1
DISSOLVED OXYGEN (DO) 2
TOTAL SOLIDS (TS, TDS AND TSS) 2
TOTAL DISSOLVED SOLIDS (TDS) 3
TOTAL SUSPENDED SOLIDS (TSS) 3
TOTAL ALKALINITY 3
PHOSPHATES 4
NITRATE 4
CALCIUM 4
MAGNESIUM 5
SULPHATE 5
CHLORIDE 6
SODIUM AND POTASSIUM 6
ELECTRIC CONDUCTIVITY 6
TURBIDITY 6
SALINITY 7
STATISTICAL ANALYSIS 7
HEAVY METAL OF WATER 7
1.3 RESULT AND DISCUSSION 8
References 61

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