SEMESTER – I

BASIC COMPUTER SKILLS

1. Course Description:

Programme: BA/B.Sc./B.Com./BMS

Course Code: U24/BCS/AECC/101

Type of course: AECC

No. of credits: 2

Max. Hours: 30

Hours per week: 2

Max. Marks: 50

2. Course Objectives:

To impart a basic level understanding of working of a computer and its usage.

3. Course Outcome:

On completion of the course the student will be able to:

CO1: ***Interpret*** basics of computers and ***Use*** word processing software (Cognitive levels – 3)

CO2: ***Define*** Internet Technologies and ***Use*** Spreadsheets and Presentation Software (Cognitive level – 3)

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4. Course Content:

MODULE I: BASICS OF COMPUTERS AND WORD PROCESSING (15 Hrs)

Understanding Of Computer: Introduction to computers - functions, features, classification; Computer Architecture - components; Computer Hardware - input devices, output devices; Computer Memory -primary memory, secondary memory, cloud; Computer Software - system software, application software, special purpose software, system utilities, open-source software, and proprietary software; Operating Systems - functions, types, real time operating systems,

Windows Ui And Word Processing: Windows desktop – icons, task bar, start menu, understanding of local system drives, folders and files – creating, viewing, renaming, deleting; MS-Word - opening , closing, saving of documents, title bar, ribbon and tabs, ruler; text creation and manipulation – insert, delete, select, cut, copy and paste, find and replace, correct errors - spell; formatting text – font size, size, colour, bold, underline, italic, changing text case, text alignment; creating first line indent of paragraphs; formatting page – inserting header and footer, page breaks; modifying page layout - changing page orientation , page size, page margins; tables – inserting, adding and deleting rows and columns, converting text to table, working with lists, using symbols as bullets, printing documents

MODULE II: INTRODUCTION TO INTERNET TECHNOLOGY, SPREADSHEETS AND PRESENTATION SOFTWARE (15Hrs)

Overview of Internet and Future Technology: Internet – advantages and disadvantages of internet; Terms related to internet – WWW, web page, website, web browser, web address and URL, blog, search engine; Services of Internet – chatting, e-mail, video- conferencing, e-learning, e-banking, e-shopping, e-reservation; Social networking sites – LinkedIn, Facebook, Instagram; Computer Security – sources of cyber-attack, malware, threats to computer security, solutions to computer security threats; Future Technology – Internet of Things(IoT), Big Data Analytics, Virtual Reality, Artificial Intelligence,

Spreadsheet and Presentation Software: Spreadsheets - Workbook, worksheet, MS Excel vs Google sheets; basics of spreadsheet – enter, select, delete, move, copy and paste data, fill numbers, text, date; adding borders to cells, functions – count, sum, average; formulas – simple, relative reference, absolute reference, printing worksheet; Presentation – introduction to slide, placeholder, notes, adding slides, changing layouts of slides, applying styles and background, adding text box and pictures, adding animations, setting slide transitions, saving single slide as image, saving presentation in different formats (ppt, pdf, video)

5. References:

1. Microsoft Office Step by Step (Office 2021 and Microsoft 365), Joan Lambert, 1st edition, 2022
2. Computer Basics with Office Automation, Archana Kumar, Wiley publications,2019
3. Introduction to Computers, Peter Norton, McGraw-Hill ,2012.
4. Fundamentals of Computers, Reema Thareja,2nd Edition 2019.

6. Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
GLOBAL DEVELOPMENT	Basic computer skills such as word processing, spreadsheets, presentations, and the internet, are essential for most jobs and are considered valuable skills in the workforce. Good computer skill aligns with an individual's career goals and enhances productivity and effectiveness in the workplace.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD, EMP	Module 1	Assignment
SD, EMP	Module 2	Skill practical test

7. Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

Formative Assessment - FA (40%)	Summative Assessment - SA (60%)
CIA-20 marks Mini project/Assignment/ Problem solving/Case studies	End Semester Exam-30 Marks

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b) Model Question Paper - End Semester Exam

BASIC COMPUTER SKILLS

Course Code: U24/BCS/AEEC/101 **Max Time: 1 Hr**
Credits: 2 **Max. Marks: 30**

Answer any 5 of the following: **5 X 6 = 30 M**

1. Explain Computer Architecture.
2. Differentiate between Primary and Secondary Memory.
3. Explain functions of an Operating System.
4. Define types of Software.
5. Write a short note on the Internet.
6. List and explain the services of the Internet.
7. Explain with example the concept of IoT.
8. Explain various threats to computer systems.

Prepared by	Checked & verified by	Approved by
Ms. Prabhmeet **Teaching Faculty**	**Ms. D. Sowjenya** **HOD**	**Dr. Uma Joseph** **Principal**

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SEMESTER-1

BIOMOLECULES

1. Course Description

Programme : B.Sc.
Course Code : U24/BIC/DSC/101
Type of course : DSC 1
No. of credits : 4

Max. Hours : 60
Hours per week: 4
Max. Marks: 100

2. Course Objectives

- To understand the basic molecules of life about the structures, properties, functions and classification.
- To elucidate the importance of knowledge on the biochemical aspects of the biomolecules in biological systems.

3. Course Outcomes

After the successful completion of the course, the student will be able to:

CO1: Recall in detail the structure, physico-chemical properties and significance of carbohydrates from monosaccharide to polysaccharides(L1)

CO2: Summarise the structures of amino acids, reactions of amino acids, protein classification, different levels of organization of proteins(L2)

CO 3: Illustrate the structure and function of lipids, fatty acids and lipoproteins(L3)

CO 4: Use knowledge on nucleic acids, different forms and denaturation of DNA and types of RNA(L3).

4. Course Content –

Module I: CARBOHYDRATES **(15 hrs)**

Carbohydrates: Classification, Monosaccharides, D & L designation, open chain & cyclic structures, Stereochemistry of monosaccharaides – optical isomers, mutarotation, Reactions of carbohydrates Disaccharides – structure of maltose, sucrose, lactose. Classification of Polysaccharides Homopolysaccharides-Starch, glycogen, Cellulose, Heteropolysaccharides – Hyaluronic acid, chondroitin sulphate, Heparin. Structure, occurrence, biological importance of Bacterial cell wall polysaccharides.

Module II: PROTEINS **(15 hrs)**

Amino acids & Peptides, Amino acid classification, Structure & Stereochemistry, Optical Isomerism of Amino Acid. Reactions of amino acids. Essential & Non – essential amino acid, Non – Protein amino acid, Peptide bond. Nature & conformation.

Proteins: Classification based on solubility, structure, function & composition of proteins. Biological role of proteins. Structural organization of proteins - Primary, Secondary, Tertiary& Quaternary Structures Denaturation of protein structure. Determination of amino acid composition of protein

Module III: LIPIDS **(15 hrs)**

Classification, distribution, and general properties, Structure and biological importance of lipids - simple lipids, compound lipids and derived lipids. Fatty acids –classification, structure, nomenclature, physical and chemical properties. Saturated and Unsaturated fatty acids; Essential fatty acids and non-essential fatty acids, Saponification value, Iodine number, Acid value, Rancidity of oils and fats. General properties and structures of phospholipids, sphingolipids and cholesterol.

Lipoproteins – Types and functions.

Module IV: NUCLEIC ACIDS **(15 hrs)**

Nature of Nucleic acids. Structure of purines, pyrimidines, nucleosides, nucleotides. DNA, RNA. Stability and formation of phosphodiester linkage. Effect of acids, alkali and nucleases on DNA and RNA. Watson – Crick double helix structure.

Different forms of DNA – A, B, Z. Introduction to Circular DNA, Supercoiling, denaturation of DNA – hyperchromic effect, T_m values and their significance. Cot curves and their significance. Packaging of DNA. Different types of RNA.

5. Reference Books

1. Dr. U.Satyanarayana and U.Chakrapani Biochemistry 5th ed. (2001) Elsevier (New Delhi), Books and Allied Private Limited. ISBN: 81-87134-80-1
2. J.L.Jain : Fundamentals of Biochemistry, (2001), S. Chand & Company (New Delhi)
3. Albert L. Lehninger: Principles of Biochemistry (2013) 6th ed. Nelson, D.L. and Cox, M.M.W.H. Freeman and Company (New York)
4. Jeremy M Berg, John L Tymoczko, and LubertStryer Biochemistry, 5thedW H Freeman; (2002) ISBN-10: 0-7167-3051-0
5. Dr. A.C Deb: Fundamentals of Biochemistry, (1999), New Central Book Agency Private Limited. ISBN : 81-7381-144-X

6. Syllabus Focus

a) Relevance to Local, Regional , National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global Development needs	Understanding biomolecules have far-reaching implications, addressing global challenges and contributing to advancements in science across the world.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Reactions of amino acids	Practicals- Qualitative analysis
SD	Denaturation of protein structure. Determination of amino acid composition of protein	Explanation of the techniques used for protein sequencing
SD	Saponification value, Iodine number, Acid value, Rancidity of oils and fats.	Practicals

7. Pedagogy

S. No	Type/Description of Activity	Student Centric Methods Adopted
1.	Science Experiments	Experiential Learning
2.	Presentation/Assignment	Participative Learning
3.	Quiz	Experiential Learning

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

COs	Continuous Internal Assessments – CIA (40%)	End Semester Examination (60%)
CO1	CIA-1	End Semester examination
CO2	CIA-1	
C03	CIA-2 – Objective	
C04	CIA-2 – Assignment/ model making/ PPT	

b) Model Question Paper

BIOMOLECULES

Code : **U24/BIC/DSC/101**
Credits : **4**

Max Marks : **60 M**
Time : **2 Hrs**

I. Answer the following questions **(4x10=40M)**

1. (a) Define carbohydrates. Give their classification with suitable examples indicating their structures.

   OR

   (b) List the reactions of monosaccharides.

2. (a) Explain the forces that stabilize the tertiary & quaternary structure of proteins.

   OR

   (b) Describe the determination of N & C terminal amino acid of a peptide?

3. (a) Illustrate the structural features & functions of phospholipids.

   OR

   (b) Categorize the reactions of fatty acids & add a note on their biological importance.

4. (a) Demonstrate Watson & Crick model of DNA double helix.

   OR

   (b) Illustrate the three levels of chromatin organization in a eukaryotic cell.

II. Write Short notes on any 4 questions (out of 6) **(4x5=20M)**

5. Mutarotation
6. Denaturation of proteins
7. Essential amino acids
8. Iodine number
9. Cot curve
10. Super coiling of DNA

CBCS-2024

GUIDELINES FOR MODEL PAPER SETTING AS PER BLOOMS TAXONOMY LEVEL (BTL)

Semester I-Biomolecules

SECTION A - INTERNAL CHOICE (4 X 10 M = 40 M)				
Q.No.	**Question**	**Question**	**CO**	**BTL (Blooms Taxonomy Level)**
1	Module 1	Define carbohydrates. Give their classification with suitable examples indicating their structures.	CO 1	1
2	Module 1	List the reactions of monosaccharides.	CO 1	1
3	Module 2	Explain the forces that stabilize the tertiary & quaternary structure of proteins?	CO 2	2
4	Module 2	Describe the determination of N & C terminal amino acid of a peptide?	CO 2	2
5	Module 3	Illustrate the structural features & functions of phospholipids.	CO 3	3
6	Module 3	Categorize the reactions of fatty acids & add a note on their biological importance.	CO 3	4
7	Module 4	Demonstrate Watson & Crick model of DNA double helix.	CO 4	3
8	Module 4	Illustrate the three levels of chromatin organization in a eukaryotic cell.	CO 4	3
SECTION B - ANSWER ANY 4 OUT OF 6 (4Q X 5M = 20M) (To compulsorily have **ONE** question from **each** module)				
10	Module 1	Mutarotation	CO 1	1
11	Module 2	Denaturation of proteins	CO 2	2
12	Module 3	Essential amino acids	CO 3	3
13	Module 4	Iodine number	CO 4	3
14	Any Module	Cot curve	CO 4	3
15	Any Module	Super coiling of DNA	CO 4	3

BIOMOLECULES
PRACTICAL

1. Course Description:

Max. Hours: 30
Course Code: U24/BIC/DSC/101/P
Type of course: DSC 1

Hours per week: 2
No. of credits: 1
Max. Marks: 50

2. Course objective:

Introduce the basic molecules of life with respect to their isolations and qualitative estimations.

3. Course Outcome:

This course will help the students to-

CO1: Demonstrate the procedures to isolate biomolecules from food sources.

CO2: Apply the skills in qualitative identification of Sugars and lipids by following a series of tests and procedures

PRACTICAL SESSIONS

1. Isolation of starch from potato.
2. Isolation of casein from milk.
3. Qualitative Analysis of Carbohydrates. (4 sessions)
4. Qualitative Analysis of Lipids. (3 sessions)
5. Preparation of buffers & determination of pH.
6. Achromic Point
7. Determination of specific rotation of sugars (Glucose & Fructose)

MODEL QUESTION PAPER
PRACTICAL

Course Code: U24/BIC/DSC/101/P
Credits: 1

Max Time: 2 Hrs
Max. Marks: 50

Answer the following.

1. Write the schematic representation (flowchart) for the qualitative analysis of
   a. Carbohydrates
   b. Principle involved in the isolation of casein from milk. (10 M)
2. Identify the given sugars present in the given solutions **A** and **B** (10 + 10 M)
3. Extract casein from the given sample of milk (10 M)
4. Viva (5M)
5. Record (5M)

Prepared by Course Teacher [Name & Signature]	Checked &verified by HOD [Name & Signature]	Approved by the Principal
Dr. G. Sony	(S. Malathi Varma) HOD Biochemistry St. Francis College for Women Begumpet, Hyderabad-16.	

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SEMESTER - I

CELL BIOLOGY & GENETICS-THEORY

1. Course Description

Programme: B.Sc

Course Code: U24/BIT/DSC/101

Course Type: DSC-1

No. of credits: 4

Max. Hours: 60

Hours per week: 4

Max. Marks: 100

2. Course Objectives

- To outline the basics in cell biology, cell function and responses in a cell brought about by mutations.
- To apply the underlying principles of Mendelian, non-mendelian inheritance and Population Genetics.

3. Course Outcomes

On completion of the course, the student will be able to:

CO1: Define the basic concepts in cell biology, cell organelles, chromosome structures and aberrations **(REMEMBER)**

CO2: Outline the underlying principles and process of cell division and apoptosis **(REMEMBER, UNDERSTAND)**

CO3: Discuss and identify how genes are transferred from generation to generation with various types of gene interactions **(UNDERSTAND, APPLY)**

CO4: Use the skills to explain the key concepts in extra chromosomal inheritance in plants and humans, population, and evolutionary genetics **(ANALYZE)**

4. Course Content

MODULE I: CELL STRUCTURE AND FUNCTIONS (15 Hrs)

- Cell as basic unit of living organisms-bacterial, fungal, plant and animal cells
- Ultrastructure of prokaryotic cell (cell membrane and plasmids, Nucleoid)
- Ultrastructure of eukaryotic cell (cell wall, cell membrane, nucleus, mitochondria, chloroplast, endoplasmic reticulum, Golgi apparatus, vacuoles)
- Fluid mosaic model, Sandwich model, Cell membrane permeability
- Structure of chromosome-morphology, components of chromosomes (histones and non-histones), specialized chromosomes (Polytene, Lampbrush)
- Chromosomal aberrations- structural and numerical

MODULE II: CELL DIVISION AND CELL CYCLE (15 Hrs)

- Bacterial cell division
- Eukaryotic cell cycle –phases
- Mitosis - Stages (spindle assembly)-significance
- Meiosis- Stages (synaptonemal complex)-significance
- Senescence and necrosis
- Apoptosis

MODULE III: GENETICS – LAWS OF INHERITANCE (15 Hrs)

- Mendelian genetics: Terminology, Mendel's experimental design, - Pea as experimental plant
- Law of segregation & Principle of independent assortment - Monohybrid, dihybrid and Trihybrid crosses
- Test cross and Back cross
- Allelic interactions: Concept of dominance & recessiveness.
- Incomplete dominance - *Mirabilis jalapa.*
- Co-dominance – Coat colour in Horse and cattle
- Pleiotropy - Sickle cell disease, PKU.
- Multiple allele –Skin color in rodents, Blood groups
- Penetrance - Neurofibromatosis type 1
- Expressivity – Inheritance of coat color in dogs, polydactyly.
- Non allelic interactions: Interaction producing new phenotype - Complementary genes - *Lathyrusodoratus*, Seed color in maize.
- Epistasis: Dominant Epistasis - Fruit colour in summer squash & Recessive epistasis - Mouse coat colour.

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- Duplicate genes: Duplicate gene with cumulative effect - Fruit shape in summer squash, Duplicate dominant gene - Seed capsule of shepherd's purse & Inhibitory genes - anthocyanin pigmentation in rice.

- X-Y chromosomes - Sex determination in Drosophila, Man, X-linked inheritance – Hemophilia and Color blindness; X-inactivation.

MODULE IV: EXTRA CHROMOSOMAL INHERITANCE AND POPULATION GENETICS **(15 Hrs)**

- Extra chromosomal inheritance: Rules of extra nuclear inheritance.
- Maternal effects - Coiling direction of snail shell.
- Maternal inheritance - Variegation in 4 o' clock plant.
- Organelle heredity: Mitochondrial inheritance - Cytoplasmic male sterility in maize.
- Mitochondria in Human disease; Chloroplast –*Chlamydomonas reinhardii.*
- Genomic imprinting - Prader Willi/Angelmann syndrome.
- Hardy Weinberg law (prediction, derivation).
- Allelic and genotype frequencies.
- Deviation from HWE & Changes in allelic frequencies: mutation, selection, migration, Genetic drift.

5. Reference book

1. Cooper G.M., Hausman R.E. (2013). *The Cell, A Molecular Approach*. Sunderland (MA): Sinauer Associates.
2. Lodish H et. al. (2012). *Molecular Cell Biology*. New York: W. H. Freeman, Palgrave Macmillan.
3. Gupta P.K. (2011). *Genetics*. Meerut, India: Rastogi Publications.
4. Plopper, G. (2011). *Lewin's cells* (II Edition.). Jones & Bartlett Learning.
5. Peter J. Russell. (2009). *Genetics- A Molecular Approach* (III Edition). San Francisco, United States of America: Benjamin Cummings.
6. Singh B.D. (2009). *Genetics*. New Delhi: Kalyani Publishers
7. Snustad, D.P., Simmons, M.J. (2009*). Principles of Genetics* (V Edition). Hoboken, New Jersey, United States: John Wiley and Sons Inc.
8. Gardner, S. (2006). *Principles of Genetics* (VIII Edition). John Wiley & Sons.
9. Alberts, B. (2002). *Molecular Biology of the Cell* (VI Edition). New york, New York: Garland Science.

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6. Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global (Modules 1, 2, 3 and 4)	The global importance of cell biology and genetics is reflected in its curriculum, which empowers the students to know different aspects of cells and cellular components at molecular level which will facilitate them to understand and unravel the complex associations existing among different sub cellular organelles.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill development	Module I, III, IV	Presentation by the students on various cell biology and genetics topics. Students will be solving problems related to the laws of inheritance and Population Genetics
Employability	Module II	Students will be trained in slide preparation of cell division which makes them employable in cytogenetic laboratories

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type/Description of Activity
1.	Seminar	Participative Learning
2.	Presentation	Participative Learning
3.	Quiz	Experiential Learning
4.	Group Discussion	Participative Learning
5.	Art Projects	Experiential learning
6.	Case studies	Problem solving

8.Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	CIA1-Written Exam	Written Exam
CO2	CIA1- Quiz/ Article writing/Assignment	
CO3	CIA-2 Written Exam	
CO4	CIA-2 Presentation/ Case studies/Art projects	

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b) Model Question Paper- End Semester Exam

CELL BIOLOGY & GENETICS-THEORY

Course Code: U24/BIT/DSC/ 101 **Max marks: 60**
Credits: 4 **Time: 2 Hrs**

SECTION – A

I. Answer the following **4 x 10 = 40 M**

1. How would you describe the Fluid Mosaic model with well labeled diagrams.

OR

2. Describe the ultra-structure of a prokaryotic cell with a neat labelled diagram.
3. Illustrate the different stages of mitosis with neat labelled diagrams.

OR

4. Summarize senescence and necrosis.
5. Explain the Mendel's law of inheritance.

OR

6. Identify the different types of epistatic interactions.
7. Justify maternal Inheritance and maternal effects with examples.

OR

8. How is Hardy Weinberg law of equilibrium related to population genetics.

SECTION – B

II. Answer any <u>Four</u> of the following **4 x 5 = 20 M**

9. Describe about Lamp brush Chromosomes
10. Summarize Apoptosis
11. Explain about Pleiotropy
12. Justify the deviations of Hardy Weinberg equation.
13. List out various Numerical Chromosomal aberrations
14. Define Test Cross and Back Cross

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SEMESTER-END MODEL QUESTION PAPER

SECTION A - INTERNAL CHOICE 4 Q X 10 M = 40 M				
Question Number	**Question**	**Question**	**CO**	**BTL (Bloom's Taxonomy Level)**
1	Module 1	How would you describe the fluid mosaic model with well labelled diagrams	CO 1	I
2	Module 1	Describe the ultra structure of prokaryotic cell with neat labelled diagram	CO 1	I
3	Module 2	Illustrate the different stages of mitosis with neat labelled diagrams.	CO 2	II
4	Module 2	Summarise senescence and necrosis	CO 2	II
5	Module 3	Explain the Mendel's laws of inheritance	CO 3	II
6	Module 3	Identify the different types of epistatic interactions	CO 3	III
7	Module 4	Justify maternal inheritance and maternal effects with examples	CO 4	IV

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8	Module 4	How is Hardy Weinberg law of equilibrium related to population genetics.	CO 4	IV
SECTION B - ANSWER ANY 4 OUT OF 6 **4 Q X 5 M = 20 M** (To compulsorily have **ONE** question from **each** module)				
9	Module 1	Describe about lamp brush chromosomes	CO 1	I
10	Module 2	Summarize apoptosis	CO 2	I
11	Module 3	Explain about pleiotropy	CO 3	II
12	Module 4	Justify the deviations of Hardy Weinberg equation	CO 4	I
13	Any Module	List out various Numerical Chromosomal aberrations	CO2	II
14	Any Module	Define Test Cross and Back Cross	CO3	I

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SEMESTER – I

CELL BIOLOGY & GENETICS- PRACTICAL

Programme: B.Sc.

Course Code: U24/BIT/DSC/101/P

Course Type: DSC-1

No. of credits: 1

Max. Hours: 30

Hours per week: 2

Max. Marks: 50

Course objective:

- To learn fundamental laboratory techniques for studying cellular structures and processes.
- To gain proficiency in understanding various mendelian and non mendelian inheritance patterns

Course Outcomes:

CO1: Recall and analyze various stages of Mitosis and Meiosis (**REMEMBER, ANALYSE**)

CO2: Interpret and apply skills in solving problems based on Mendelian inheritance, Epistasis and Population Genetics (**UNDERSTAND, APPLY**)

CO3: Analyze and evaluate various stages in Life cycle of Drosophila (**ANALYSE, EVALUATE**)

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PRACTICAL SESSIONS

1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis.
2. Study of various stages of meiosis using permanent slides.
3. Preparation of temporary slide to show the presence of Barr body in human female blood cells/cheek cells.
4. Problems based on Mendelian deviations in Monohybrid, dihybrid cross.
5. Preparation of culture media for Drosophila to study different stages of life cycle.
6. Problems on Epistasis.
7. Problems on population genetics.
8. Problems on maternal inheritance

Spotters:

1. Prokaryotic cell (Bacteria)
2. Mitochondria
3. Chloroplast
4. Polytene chromosomes
5. Test cross
6. Blood grouping
7. Haemophilia pedigree
8. Crossing-over
9. Synaptonemal complex
10. Nucleosome model

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SEMESTER-I

CELL BIOLOGY & GENETICS-PRACTICAL

Course Code: U24/BIT/DSC/101/P **Max. Marks: 50**

Credits: 1 **Time: 2Hrs**

I. MAJOR: (20M)

Prepare a temporary slide using onion root tips and identify different stages of mitosis under the microscope. Write the principle and procedure of the experiment. Report the results.

II. MINOR: (10M)

Solve the given problems on epistasis.

III. IDENTIFY THE GIVEN SPOTTERS: (10M)

IV. VIVA (5M)

V. RECORD (5M)

Prepared by	Checked & verified by	Approved by
04/3/24 (Dr. A. S. Pooja) Name and Signature of the teaching faculty	4/3/24 (Shouri Niveditha) Name and Signature of HoD	Name and Signature of Principal

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SEMESTER - I

CHEMISTRY PAPER - I

1. Course Description

Programme: B.Sc. Max. Hours: 60Hrs

Course Code: U24/CHE/DSC/101 Max. Marks: 100

Course Type: DSC - 1 Hours per week: 4Hrs

No. of credits: 4

2. Course Objectives ·

- To help the students acquire knowledge on the basic principles of Quantum mechanics and chemical bonding
- To understand the nature and properties of different states of matter. • · To learn the structures of basic organic molecules, the types of reactions they undergo and methods of preparation and reactivity of hydrocarbons with mechanisms • · To foster acquisition of knowledge on the concepts of colligative properties and Quantitative analysis

3. Course Outcomes

On completion of the course the student will be able to:

CO1: Understand and explain the structure of an atom using quantum mechanics and Chemical bonding

CO2: Understand the properties of gases, liquid crystals and crystalline solids.

CO3: Acquire a fundamental understanding of the relationships between molecular structure and reaction mechanisms. Interpret and familiarize with the various types of aliphatic reactions.

CO4: Apply knowledge in quantitative analysis and study about Colligative properties

Chairperson
Board of Studies in Chemistry
Dept of Chemistry
Osmania University, Hyd-07.

4. Course Content

Module I: INORGANIC CHEMISTRY — 15 Hrs

Atomic Structure and Elementary Quantum Mechanics — **8 Hrs**

Limitations of Classical Mechanics, Black body radiation, Rayleigh Jeans Law, Planck's radiation law, photoelectric effect, Compton effects, De Broglie's hypothesis, Heisenberg's uncertainty principle, sinusoidal wave equation, Hamiltonian operator, Schrodinger equation in Cartesian and spherical polar coordinates (no derivation) Physical significance of terms involved, equation applied to H-atom. Atomic Orbitals, Radial and angular wave functions, Shape of atomic orbitals (Quantitative treatment) based on angular wave functions). Probability distribution curves - Quantum numbers and their importance.

Chemical bonding **7Hrs**

Ionic solids- lattice and solvation energy, solubility of ionic solids, Fajan's rule, Polarity and polarizability of ions, covalent nature of ionic bonds. Covalent bond- VB theory and common hybridization and shapes of molecules.

Molecular orbital theory- shapes and sign convention of atomic orbital, modes of overlapping, concepts of sigma and pi bonds, criteria forming molecular orbital from atomic orbital. LCAO concept. Types of molecular orbitals, bonding and anti-bonding and non-bonding. MOED of homonuclear - H_2, N_2, O_2, O_2^-,O_2^{2-}, F_2, (unhybridized diagram only) and heteronuclear diatomic molecules CO, CN^-, NO, $NO^+$and HF. Bond order, stability and magnetic properties.

Module II: PHYSICAL CHEMISTRY — 15 Hrs

States of Matter

Gaseous State — **7 Hrs**

Deviation of real gases from ideal behavior, Vander Waal's equation of state. Critical phenomena: PV-isotherms of real gases, continuity of state, Andrew's isotherms of carbon dioxide. The Vander Waals equation and the critical state, Derivation of relationship between critical constant and Vander Waals constants. Experimental determination of critical constants. The law of corresponding states, reduced equation of state. Joule -Thomson effect and inversion temperature of a gas. Liquefaction of gases: (i) Linde's method based on Joule Thomson effect. (ii) Claude's method based on adiabatic expansion of a gas.

Liquid State — **3 Hrs**

Inter molecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state: Classification of liquid crystals into Smectic and Nematic, differences between liquid crystal and solid/liquid. Application of liquid crystals as LCD devices.

Solid State — **5 Hrs**

Laws of crystallography (i) Law of Constancy of interfacial angles (ii) law of symmetry, symmetry elements in crystals. (iii) Law of rationality of indices. Definition of space lattice, unit cell. Bravais lattices and seven crystals systems. X-ray diffraction of crystals: Deviation of

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Bragg's equation, determination of structure of NaCl (Bragg's method and powder method).

Defects in crystals: Stoichiometric and non-Stoichiometric defects. Band theory of semiconductors: Extrinsic and Intrinsic Semiconductors, n-type and p-type and their applications in photo voltaic cells.

MODULE III ORGANIC CHEMISTRY 15 Hrs

Structural Theory of Organic Molecules 7 Hrs

Cleavage of bonds (homolysis and heterolysis), Electrophiles, Nucleophiles (including neutral molecules like H_2O, BF_3, NH_3 and $AlCl_3$). Reactive intermediates: carbocations, carbanions and free radicals.

Electronic Displacements

Inductive effect. Application of inductive effect to a) Basicity of amines b) Acidity of Carboxylic acids and c) Stability of carbocations. Resonance or Mesomeric effect. Application to a) Acidity of phenol and (b) acidity of carboxylic acids .Hyper-conjugation and its application to stability of carbocations, Free radicals and alkenes.

Types of organic reactions (mechanism not required)

Addition – Electrophilic, nucleophilic and free radical. Substitution – Electrophilic, Nucleophilic and Free radical. Elimination and Rearrangement Reactions – examples.

Aliphatic Hydrocarbons 8Hrs

Aliphatic Hydrocarbons

Alkanes – Methods of preparation: Corey-House reaction, Wurtz reaction, from Grignard reagent, Kolbe synthesis. Chemical reactivity - inert nature, free radical substitution, Halogenation example- reactivity, selectivity and orientation.

Alkenes – Preparation of alkenes (with mechanism) (a) by dehydration of alcohols (b) dehydro-halogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides, Zaitsev's rule. Properties: Addition of Hydrogen – heat of hydrogenation and stability of alkenes. trans addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H_2O, HOX, H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti – Markonikov's addition). Oxidation (cis – additions) – hydroxylation by $KMnO_4$, OsO_4, trans addition- peracids (via epoxidation), hydroboration, ozonolysis – location of double bond. Dienes – Types of dienes, reactions of conjugated dienes – 1,2 and 1,4 addition of HBr to 1,3 -butadiene and Diels – Alder reaction.

Alkynes – Preparation by dehydrohalogenation of vicinal dihalides, dehalogenation of tetrahalides. Physical Properties: Acidity of terminal alkynes (formation of metal acetylides) preparation of higher alkynes, Chemical reactivity – electrophilic addition of X_2, HX, H_2O (tautomerism), Oxidation (formation of enediol, 1,2 diones and carboxylic acids) and reduction (Metal-ammonia reduction, catalytic hydrogenation).

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MODULE IV: GENERAL CHEMISTRY — 15 Hrs

Theory of Quantitative Analysis — 7Hrs

Principles of volumetric analysis: Introduction, standard solution, indicators, endpoint, titration error. Types of titrations: i) Neutralization titrations- principle, titration curves and selection of indicators- strong acid-strong base, strong-acid- weak base, weak acid-strong base, weak acid-weak base. ii) Redox titrations-principles, detection of endpoint, redox indicators. iii) Precipitation titrations-principle, detection of endpoint, indicators. iv) Complexation titrations-principle, metal ion indicators.

Principles of gravimetric analysis – Introduction, nucleation, precipitation, growth of precipitate, filtration and washing, drying and incineration of precipitate. Co-precipitation and post-precipitation. Explanation with suitable examples.

Evaluation of analytical data — 3 Hrs

Significant figures, accuracy and precision. Errors-classification of errors- determinate and indeterminate errors, absolute and relative errors, propagation of errors in mathematical operations – addition, subtraction, division and multiplication (with respect to determinate errors).

Colligative Properties — 5 Hrs

Colligative Properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis - laws of osmotic pressure, its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point.

5. References

1. Puri, B.R., Sharma L.R., and Pathania, M.S. (2003). *Elements of Physical Chemistry.* Jalandhar, Delhi: Vishal Publishing Co.
2. Bahl, A., &Tuli. (2009). *Essentials of physical chemistry: A textbook for B. Sc. classes as per UGC model syllabus* (Rev. multicolored.). New Delhi: S. Chand.
3. Bahl, A. and Bahl, B.S. (2011). *A Textbook of Organic Chemistry.* Ram Nagar, New Delhi: S. Chand and Company.
4. Jain, M.K., and Sharma, S.C. (2011). *Modern Organic Chemistry.* Jalandhar, Delhi: Vishal Publishing Co.
5. Sharma, Y. R. (2012). *A TextBook of Complete Organic Chemistry*. Bangalore: Kalyani Publishers.
6. Principles of Inorganic Chemistry by Puri, Sharma and Kalia. Vishal Publications 1996.
7. Concise Inorganic Chemistry by J.D. Lee 3rd edn.

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CHEMISTRY PAPER-I

MODEL QUESTION PAPER

THEORY

Course Code: U24/CHE/DSC/101 **Time: 2hrs**

Credits: 4 **Max. Marks: 60**

SECTION –A

I. Answer the following **4QX10M=40 Marks**

1. Write the Schrodinger wave equation and explain the significance of ψ and ψ^2 and draw shapes of p and d atomic orbitals 10M **L1**

OR

2. Write postulates of MOT. Explain MOED of O2. 8M **L1**

3. Explain Critical phenomenon and derive relationship between Van der Waals constants and critical constant. 10M **L2**

OR

4. Explain (a) Frenkel defect (b) Schottky defect (c) Metal excess defect (d) Metal deficiency defect 10M **L2**

5. a) What is the Mesomeric effect? How does it explain the acidity of phenols? 5M **L1**

b) Give the order of basicity of the following amines by applying the concept of Inductive effect CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$ 5M **L1**

OR

6. a) Explain Acidity of terminal Alkynes 5M **L2**

b) Write any two methods of preparation of Alkanes. 5M **L1**

7. Explain the principle involved in redox titration? Write a short note on detection of endpoints. 10M **L2**

OR

8. What is molal depression constant? Derive the relation between depression of freezing point and molecular weight of the solute. 10M **L1**

SECTION –B

II. Answer any Four 4Qx5M=20 Marks

9. State and explain Heisenberg's uncertainty principle. Calculate the uncertainty in the position of a particle when the uncertainty in the momentum is 0.01 gm.cm/ sec. (h= 6.625x 10^{-27} erg.sec). 5M(CO1) **L3**

10. Differentiate between Smectic, Nematic liquid crystals and give their application. 5M (CO2)**L3**

11. What are dienes? Explain 1,2- and 1,4- addition of HBr on 1,3-Butadiene. 5M (CO 3)

12. Define the term accuracy and precision with examples. 5M (CO 4) **L1**

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13. Explain Andrew Isotherm of CO_2 at different temperatures 5M (CO 2) **L2**
14.. Explain Markonikoff's rule with examples. 5M (CO 3) **L2**

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
An Autonomous College Affiliated To Osmania University
FACULTY OF SCIENCE- DEPARTMENT OF CHEMISTRY
PRACTICAL SYLLABUS CBCS-2024
SEMESTER -I
QUANTITATIVE ANALYSIS 1
(Volumetric and Gravimetric Analysis)

Program: B.Sc.
Course Code: U24/CHE/DSC/101/ P
Course: DSC-1
No. of Credits: 1

Max. Hours: 30 Hrs
Max. Marks: 50
Hours per week: 3 Hrs

Course Objective

- To learn the principles involved in volumetry and gravimetry

Course Outcome

CO 1: Acquire knowledge in standardizing and estimating unknown samples quantitatively.

CO 2: Analyse possible market samples based on the principles involved in volumetry and compare with standards.

Volumetric Analysis

1. Estimation of sodium carbonate.
2. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
3. Estimation of oxalic acid by titrating it with $KMnO_4$.
4. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$.
5. Estimation of carbonate in washing soda.
6. Estimation of Acetic Acid in Vinegar.
7. Estimation of alkali content in antacids using HCl.

Gravimetric Analysis:

8. Estimation of chromate as lead chromate.

References:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.

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6. Syllabus Focus

a. Relevance to Local, Regional, National and Global Development Needs

Local/Regional/National /Global Development Needs	Relevance
Local	Knowledge of the basic principles of Chemistry to help in day-to-day life.
Regional	Learn about the concepts of structure of atoms and their bonding.
National	Understand the basics of structure of organic molecules, preparation and reactivity of aliphatic and aromatic hydrocarbons.
Global	Application of quantitative Analysis, evaluation of analytical data and Colligative Properties.

b. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Module I	Deriving equations, solving theoretical problems and interpreting results.
ED	Module II	JAM: Students pick up a topic and speak about it for a minute.
SD	Module III	Assignment/Mechanism: Students write an assignment/Illustrate the steps involved in the mechanism of reactions.
EMP	Module IV	Quantitative analysis is used extensively in Analytical research laboratories

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7. **Pedagogy**

S. No.	Student Centric Methods Adopted	Type / Description of Activity
1	Participative Learning	Assignment
2	Participative Learning	Collage/ Quiz/ JAM

8. **Course Assessment Plan**
   a. **Weightage of Marks in Continuous Internal Assessments and End Semester Examination**

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	**CIA-1-** Written Exam	Written Exam
CO2	**CIA-2 Collage/Quiz/JAM**	
CO3	**CIA-1 -** Written Exam	
CO4	**CIA-2 Assignment**	

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b. Model Question Paper - End Semester Exam

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
(An Autonomous College Affiliated to Osmania University)
Faculty of Science – Department of Chemistry
MODEL PAPER
B.SC. I YEAR SEMESTER -I

Course Code: U24/CHE/DSC/101 **Time: 2 Hrs**
Credits: 4 **Max. Marks: 60**

SECTION –A (Essay Questions)

I. Answer the following **4X10M=40 Marks**

1. Write the Schrodinger wave equation and explain the significance of ψ and ψ^2 and draw shapes of p and d atomic orbitals. (CO1) **LI** 10M

OR

2. Write postulates of MOT. Explain MOED of O2. (CO1) **L1** 8M
3. Explain Critical phenomenon and derive relationship between Van der Waals constants and critical constant. (CO2) **L2** 10M

OR

4. Explain (a) Frenkel defect (b) Schottky defect (c) Metal excess defect (d) Metal deficiency defect. (CO2) **L2** 10M
5. a) What is the Mesomeric effect? How does it explain the acidity of phenols? (CO3) **L1** 5M
   b) Give the order of basicity of the following amines by applying the concept of Inductive effect CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$ (CO3) **L1** 5M

OR

6. Write the mechanism for Friedel Crafts alkylation and acylation of benzene. (CO3) **L1** 10M

7. Explain the principle involved in redox titration? Write a short note on detection of endpoints. (CO4) **L2** 10M

OR

8. What is molal depression constant? Derive the relation between depression of freezing point and molecular weight of the solute. (CO4) **L1** 10M

SECTION –B (Short Answer Questions)

II. Answer any Four **4x5=20 Marks**

9. State and explain Heisenberg's uncertainty principle. Calculate the uncertainty in the position of a particle when the uncertainty in the momentum is 0.01 gm.cm/ sec. ($h = 6.625 \times 10^{-27}$ erg. sec). (CO1) **L3**
10. Differentiate between Smectic, Nematic liquid crystals and give their application. (CO2) **L3**
11. What are dienes? Explain 1,2- and 1,4- addition of HBr on 1,3-Butadiene. (CO 3) **L1**
12. Define the term accuracy and precision with examples. (CO 4) **L1**
13. Explain Andrew Isotherm of CO_2 at different temperatures. (CO 2) **L2**
14. Explain Markonikoff's rule with examples. (CO 3) **L2**

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c. Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO1	2	10	1	5
2	15	CO2	2	10	2	10
3	15	CO3	2	10	2	10
4	15	CO4	2	10	1	5

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions (Hrs)
1	1	Understand	15
2	2	Analyse	15
3	1	Remember	15
4	2	Apply	15

Prepared by	Checked & verified by	Approved by
Name and Signature of the teaching faculty Ms. Karuna. K.S Dr. E.V.L. Madhuri	Name and Signature of the HoD Dr. D. Sumalatha	Name and Signature of Principal Dr. Uma Joseph

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b. Model Question Paper - End Semester Exam

St. FRANCIS COLLEGE FOR WOMEN, BEGUMPET, HYDERABAD-500016
(An Autonomous College Affiliated to Osmania University)
Faculty of Science – Department of Chemistry
B.Sc. I YEAR SEMESTER -I

Time: 2 Hrs **Course Code: U24/CHE/DSC/101**
Max. Marks: 60 **Credits: 4**

SECTION A - INTERNAL CHOICE			**4 X 10 M = 40M**	
Question Number	**Question**		**CO**	**BTL**
1	**Module 1**	Write the Schrodinger wave equation and explain the significance of ψ and ψ^2 and draw shapes of p and d atomic orbitals. 10M **OR**	**CO1**	**Level 1**
2	**Module 1**	Write postulates of MOT. Explain MOED of O2. 8M	**CO1**	**Level I**
3	**Module 2**	Explain Critical phenomenon and derive relationship between Van der Waals constants and critical constant. 10M **OR**	**CO2**	**Level 2**
4	**Module 2**	Explain (a) Frenkel defect (b) Schottky defect (c) Metal excess defect (d) Metal deficiency defect. 10M	**CO2**	**Level 2**
5	**Module 3**	a) What is the Mesomeric effect? How does it explain the acidity of phenols? 5M b) Give the order of basicity of the following amines by applying the concept of Inductive effect CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$ 5M **OR**	**CO3**	**Level 1**
6	**Module 3**	Write the mechanism for Friedel Crafts alkylation and acylation of benzene. 10M	**CO3**	**Level 1**
7	**Module 4**	Explain the principle involved in redox titration? Write a short note on detection of endpoints. 10M **OR**	**CO4**	**Level 2**

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8	**Module 4**	What is molal depression constant? Derive the relation between depression of freezing point and molecular weight of the solute. 10M	**CO4**	**Level 2**
SECTION B – (Short answer questions) **ANSWER ANY 4 OUT OF 6**				**4 X 5M = 20 M**
9	**Module 1**	State and explain Heisenberg's uncertainty principle. Calculate the uncertainty in the position of a particle when the uncertainty in the momentum is 0.01 gm.cm/ sec. (h= 6.625x 10^{-27} erg. sec).	**CO1**	**Level 3**
10	**Module 2**	Differentiate between Smectic, Nematic liquid crystals and give their application.	**CO2**	**Level 3**
11	**Module 3**	What are dienes? Explain 1,2- and 1,4-addition of HBr on 1,3-Butadiene.	**CO3**	**Level 1**
12	**Module 4**	Define the term accuracy and precision with examples. (CO 4) **L1**	**CO4**	**Level 1**
13	**Module 2**	Explain Andrew Isotherm of CO_2 at different temperatures. (CO 2) **L2**	**CO2**	**Level 2**
14	**Module 3**	Explain Markonikoff's rule with examples.	**CO3**	**Level 2**

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