

SEMESTER – I
BACTERIOLOGY AND SYSTEMATICS - THEORY

1. Course Description:

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

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

2. Course Objectives:

- To recognize, identify and differentiate the internal and external structures of bacterial cell.
- To enable the student to learn morphology, ecology, genetics and biochemistry of bacteria as well as many other aspects related to them.

3. Course Outcomes:

- CO 1:** Understand the Scope, importance of different branches of microbiology and diversity of microbial world to differentiate between Prokaryotes and Eukaryotes. (L II)
- CO 2:** Understand Bacterial taxonomy and general characters of different groups of microorganism. (L II)
- CO 3:** Apply the principles and handling of microscope to identify and differentiate between Gram Positive and Gram negative bacterial cell structure. (L III)
- CO 4:** Analyse different types of media and sterilization techniques. (L IV)


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4. Course Content:**MODULE I - HISTORY OF MICROBIOLOGY:****(15 Hrs)**

Scope and importance of Microbiology, Different branches of Microbiology, importance of microorganisms in human welfare, spontaneous generation- biogenesis theory, Germ theory of diseases. Important contributions of Beijernick, Winogradsky, Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch, Ivanowski, Edward Jenner. Diversity of microbial world- concepts of Whittaker and Carl Woese, Differences between Prokaryotes and Eukaryotes.

MODULE II - GENERAL CHARACTERS AND SYSTEMATICS:**(12Hrs)**

Principles of bacterial taxonomy & classification, Numerical taxonomy, Outlines of bacterial classification (as per Bergey's manual of systematic bacteriology).

General characters and classification of the following groups: Eubacteria, Archaeobacteria, Mycoplasma, Rickettsia and Chlamydia.

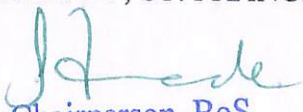
MODULE III - BACTERIAL CELL STRUCTURE AND MICROSCOPY:**(16 Hrs)**

Bacterial Cell size, shape and arrangement, glycocalyx, capsule, flagella, fimbriae and pili. Cell-wall: Composition and detailed structure of Gram-positive and Gram-negative cell walls, Archaeobacterial cell wall, sphaeroplasts, protoplasts, and L-forms, Cytoplasm: ribosomes, mesosomes, inclusion bodies, nucleoid, and plasmids.

Bright field Microscope, Dark field Microscope, Phase contrast Microscope, Fluorescence Microscope, Scanning and Transmission Electron Microscope, Introduction to Confocal Microscope.

MODULE IV- CULTURE MEDIA AND STERILIZATION :**(17 Hrs)**

Culture media: Components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, enriched, enrichment media and transport media. General methods of sterilization & disinfection: Physical methods-moist heat, boiling, autoclaving, pasteurization and tyndallisation. Dry heat – Hot air oven, incineration, inflammation, sunlight, filtration methods. Chemical methods: Phenol and phenolic alcoholic compounds, halogen, heavy metals and their compounds, dyes. Pure culture isolation: Streaking, serial and plating methods, cultivation, Maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria.


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5. Resources:

Text books:

1. Joanne M. Willey, Linda M Sherwood, Christopher J Wooolverton (2011).
2. Prescott's Microbiology. 8th edition, McGrawHill, publishers.
3. Black JG. (1999), Principles and Explorations- 4th edition. Microbiology Prentice Hall.
4. S. SundaraRajan (2003), Text Book of Microbiology – 1st edition, Vardana publishers.
5. R.P Singh (2005), General Microbiology - 1st edition, Kalyani publishers.

Reference Books:

1. Madigan MT and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
2. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology. 5th edition Tata McGraw Hill.
3. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.
4. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education.
5. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited.
6. Gopal Reddy *et al.*, (2006), Laboratory experiments in Microbiology, 2nd Edition, Himalaya publishers.
7. Prescott, Harley and Klein Wim (2002), Laboratory Exercises in Microbiology, 5th edition, Mc Graw Hill Publishers.
8. R.C Dubey, D.K Maheshwari (2006), Practical Microbiology, S Chand and Company, New Delhi.

Online Resources:

1. <https://www.cliffsnotes.com/study-guides/biology/microbiology/introduction-to-microbiology/a-brief-history-of-microbiology>
2. [https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_\(Boundless\)/01%3A_Introduction to Microbiology](https://bio.libretexts.org/Bookshelves/Microbiology/Microbiology_(Boundless)/01%3A_Introduction_to_Microbiology)
3. <https://www.biologydiscussion.com/microbial-taxonomy/notes-on-microbial-taxonomy-major-characteristics-and-principles/86773>
4. <https://openstax.org/books/microbiology/pages/1-2-a-systematic-approach>
5. <https://www.onlinebiologynotes.com/bacterial-cell-structure>
6. <https://www.biosciencenotes.com/sterilization-of-culture-media/>
7. <https://microbenotes.com/types-of-culture-media>

6. Syllabus Focus:**a) Relevance to Local, Regional, National and Global Development Needs**

Local/Regional/National /Global Development Needs	Relevance
Local needs	Sterilization techniques are valuable tools used by Bacteriologist, epidemiologists, doctors, forensic scientists, farmers etc
Global Development Needs	It holds Global need to apply Sterilization techniques which destroys or eliminates pathogenic microbial life and is carried out in health-care facilities by physical or chemical methods.


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b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Module IV	Students will be provided with the opportunity to prepare different types of media by aseptic means and hands on training in operating various instruments in the lab.

7. Pedagogy:

S. No	Type / Description of Activity	Student Centric Methods Adopted
1.	Interactive class session	Participative Learning
2.	Quiz	Experiential Learning
3.	Group Discussion	Participative 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	
CO3	CIA-2 Presentation, Quiz	
CO4	CIA-2 Assignment	


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b) Question Paper Pattern:**BACTERIOLOGY AND SYSTEMATICS
MODEL QUESTION PAPER-THEORY**

Course Code: U24/MIC/DSC/101
Credits: 4

Max Marks: 60
Time: 2 Hrs

SECTION –A**I. Answer the following****4x10=40 M**

1. Describe the significance of microbiology in healthcare, including the diagnosis, treatment, and prevention of infectious diseases. Provide examples of how microbiologists contribute to the development of vaccines, antibiotics, and diagnostic tests.
(OR)
2. Illustrate the contributions of Louis Pasteur and Robert Koch.
3. Explain general characters of Rickettsia and its classification.
(OR)
4. How would you summarize the Ecological and Morphological identification of bacteria ?
5. Organize the detail structure of Gram positive and Gram negative bacterial cell wall.
(OR)
6. How would you apply the principle and working mechanism of TEM microscopy you had learnt?
7. How can you make a distinction between differential media, selective media and transport media ?
(OR)
8. Distinguish between Physical and chemical methods of sterilization.

SECTION –B**II. Answer any FOUR****4x5=20 M**

9. Explain five kingdom classification
10. Outline the contribution of Louis pasteur
11. What is Numerical Taxonomy
12. Describe Archaeobacteria cell wall
13. How would you identify bacteria under Dark field microscope
14. List out Phenol and phenolic compounds

SECTION A - INTERNAL CHOICE**4Q X 10 M = 40 M**

Question Number	Module	Question	CO	BTL (Blooms Taxonomy Level)
1	Module 1	Describe the significance of microbiology in healthcare, including the diagnosis, treatment, and prevention of infectious diseases. Provide examples of how microbiologists contribute to the development of vaccines, antibiotics, and diagnostic tests.	CO 1	Level II
2	Module 1	Illustrate the contributions of Louis Pasteur and Robert Koch	CO 1	Level II
3	Module 2	Explain general characters of Rickettsia and its classification	CO 2	Level II
4	Module 2	How would you summarize the Ecological and Morphological identification of bacteria	CO 2	Level II
5	Module 3	Organize the detail structure of Gram positive and Gram negative bacterial cell wall	CO 3	Level III
6	Module 3	How would you apply the principle and working mechanism of TEM microscopy you had learnt.	CO 3	Level III
7	Module 4	How can you make a distinction between differential media, selective media and transport media	CO 4	Level IV
8	Module 4	Distinguish between Physical methods of sterilization.	CO 4	Level IV

SECTION B - ANSWER ANY 4 OUT OF 6**4 Q X 5M = 20M**(To compulsorily have **ONE** question from **each** module)

9	Module 1	Explain five kingdom classification	CO 1	Level II
10	Module 1	Outline the contribution of Louis pasteur	CO 1	Level II
11	Module 2	What is Numerical Taxonomy	CO 2	Level II
12	Module 2	Describe Archaeobacteria cell wall	CO 2	Level II
13	Module 3	How would you identify bacteria under Dark field microscope	CO 3	Level III
14	Module 4	List out Phenol and phenolic compounds	CO 4	Level IV

SEMESTER I
BACTERIOLOGY & SYSTEMATICS – PRACTICAL

1. Course Description:**Course Code:** U24/MIC/DSC/101/P**Max. Hours:** 30**Course Type:** DSC**Hours per week:** 2**No. of credits:** 1**Max. Marks:** 50**2. Course Objectives:**

- To make students to understand as how to use different instruments in microbiology lab and to demonstrate basic laboratory skills and techniques related to the cultivation, isolation, staining, and identification of microorganisms.

3.Course Outcomes:**CO 1:** Understand importance of different medias to isolate and identify bacteria.**CO 2:** Evaluate different cultivation and staining technique to detect microbes.

List of Practicals

1. Preparation of different media: -Nutrient agar, Czapek Dox agar, Potato Dextrose Agar Media
2. Simple staining
3. Negative staining
4. Gram's staining
5. Acid fast staining-permanent slide only
6. Capsule staining
7. Endospore staining
8. Isolation of pure cultures of bacteria by streaking, spread plate and pour plate techniques
9. Isolation of soil bacteria by dilution plate technique
10. Isolation of bacteria from air by impingement method.
11. Motility by hanging drop method

MODEL QUESTION PAPER – PRACTICAL

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

Max Marks: 50
Time: 2 Hrs

I. MAJOR**20M**

1. Perform Gram staining and interpret the results with neat labeled diagrams.

II. MINOR**10 M**

2. Demonstrate the pure culture isolation technique by performing spread plate method.

(OR)

3. Calculate the CFU of the given plates.

III. Identify the given spots (A-E) and write few significant points

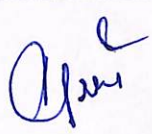
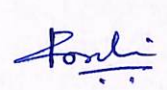
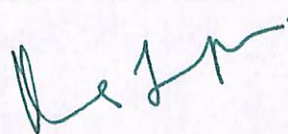
5x2=10 M

IV. Record

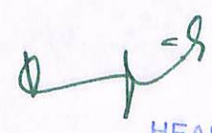
5M

V. Viva

5M

Prepared by Faculty	Checked & Verified by HoD	Approved by the Principal
 Dr. Arsheen Tabassum	 Dr. P. Roselin	 Dr. Uma Joseph


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SEMESTER – I
BASIC COMPUTER SKILLS

1. Course Description:**Programme: BA/B.Sc./B.Com./BMS****Max. Hours: 30****Course Code: U24/BCS/AECC/101****Hours per week: 2****Type of course: AECC****Max. Marks: 50****No. of credits: 2****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
Credits: 2

Max Time: 1 Hr
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 - 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)**

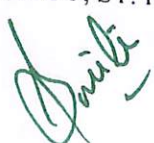
- Cell as basic unit of living organisms-bacterial, fungal, plant and animal cells
- Ultrastructure of prokaryotic cell (cell membrane and plasmids, Nucleoid)
- Ultrastructure of eukaryotic cell (cell wall, cell membrane, nucleus, mitochondria, chloroplast, endoplasmic reticulum, Golgi apparatus, vacuoles)
- 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 - *Lathyrus odoratus*, Seed color in maize.
- Epistasis: Dominant Epistasis - Fruit colour in summer squash & Recessive epistasis - Mouse coat colour.



- 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 reinhardtii*.
- 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.




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

Credits: 4

Max marks: 60

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 Four 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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CELL BIOLOGY & GENETICS- PRACTICAL**Programme: B.Sc.****Max. Hours: 30****Course Code: U24/BIT/DSC/101/P****Hours per week: 2****Course Type: DSC-1****Max. Marks: 50****No. of credits: 1****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




Prof. SMITA C. PAWAR
Department of Genetics
T.S.

SEMESTER-I

CELL BIOLOGY & GENETICS-PRACTICAL

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

Max. Marks: 50

Credits: 1

Time: 2Hrs

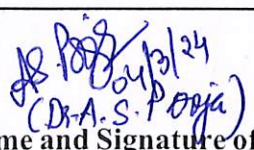
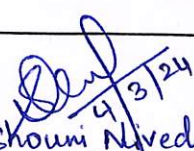
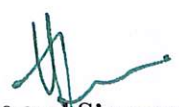
I. MAJOR: (20M)

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
 Name and Signature of the teaching faculty	 Name and Signature of HoD	 Name and Signature of Principal




Prof. SMITA C. PAWAR
Department of Genetics
Osmania University
Hyderabad-500 007. T.S.

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

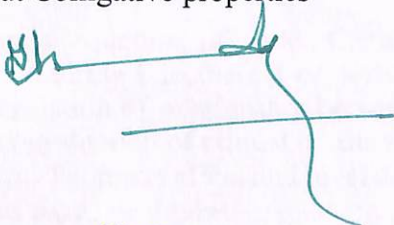
On completion of the course the student will be able to:

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



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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^{-} , 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

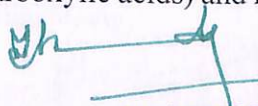
8Hrs

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 , $(\text{CH}_3)_2\text{NH}$, $(\text{CH}_3)_3\text{N}$ 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. ($h = 6.625 \times 10^{-27}$ 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. at different temperatures 5M (CO 2) L2

14.. Explain Markonikoff's rule with examples. 5M (CO 3) L2



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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

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(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

Credits: 4

Time: 2 Hrs

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) L1 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 CH₃NH₂, (CH₃)₂NH, (CH₃)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 CO₂ at different temperatures. (CO 2) L2
14. Explain Markonikoff's rule with examples. (CO 3) L2


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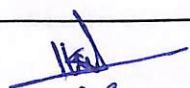
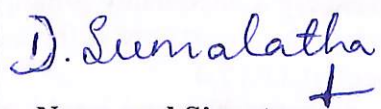
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UCS, Osmania University
Hyderabad-500 007.

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

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

Max. Marks: 60

Course Code: U24/CHE/DSC/101

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 O ₂ . 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 ₃ NH ₂ , (CH ₃) ₂ NH, (CH ₃) ₃ N 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

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. ($h = 6.625 \times 10^{-27}$ 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, 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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