



**Department of Biochemistry**  
**M.Sc. Medical Biotechnology Course**  
**Pt. J.N.M. Medical College, Raipur (C.G.)**

No./MCR/Bioch./MBT/2025/...627..

Raipur, Dated 02/8/2025.

To,

The Registrar  
Pt. Deendayal Upadhyay memorial health Science &  
Ayush Univeristy of Chhattisgrah,  
Atal Nagar, Nawa Raipur.

Sub:- Submission of Medical Biotechnology syllabus for Ph.D. entrance test.

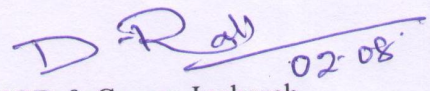
Ref.: Your letter No./239/DUHS/2025 dated 18-07-2025.

Sir,

Please find the proposed syllabus for Medical Biotechnology Ph.D. entrance test as enclosed.

Enclosure.- Ph.D. entrance test syllabus.

Thanking you,

  
HOD & Course Incharch  
M.Sc. Medical Biotechnology Course,  
Department of Biochemistry,  
Pt. J.N.M. Medical College, Raipur (C.G.)



# Syllabus for Ph.D. Entrance Test

## Subject: Medical Biotechnology

### Cell Biology

Structure and function of plasma membrane, transport of macromolecules across plasma membrane, Extracellular matrix, cell organelle, ribosome, Endoplasmic reticulum, golgi complex, lysosomes, mitochondria, plastids, peroxisomes, cytoskeleton, cell junctions, nucleus, cell cycle, cell division, cell cycle control, cell signalling, protein sorting, cancer.

### Biochemistry

Amino acids and proteins, nucleic acids, Carbohydrates, lipids, vitamins, enzymes, bioenergetics, metabolism of carbohydrates, amino acids, lipids, nucleic acid), respiration, glycolysis, Krebs cycle, oxidative phosphorylation, pentose phosphate pathway,

### Bioinformatics/Statistics

Major bioinformatics resources (NCBI, EBI, ExPASy); Sequence and structure databases and analysis.

Statistics: Descriptive statistics, Measures of Central Tendency and dispersion, Correlation and regression, Hypothesis Testing, Concepts of precision and accuracy in experimental measurements, Probability theory, Distributions: Binomial, Poisson and Gaussian distributions ANOVA, Parametric and Non-Parametric tests.

### Techniques in Biotechnology

Microscopy: Bright field, phase contrast, fluorescence, confocal, and electron microscopy.

Biochemical Methods: Chromatography: Ion exchange, Gel Filtration and Affinity chromatography.

Electrophoresis: agarose gel electrophoresis, Pulse field gel electrophoresis, Native and SDS-PAGE. Isoelectric focusing. 2D-PAGE and its applications,

UV/Vis spectrophotometry. Beer-Lambert's law and its use in determination of protein/nucleic acid concentration, IR spectroscopy, Raman spectroscopy, Mass spectrometry

Fluorescence Spectroscopy: Basic concepts of excitation and emission. Quenching, Stern-Volmer Plots.

Theory and applications of FRET and fluorescence lifetime measurements.

Fundamentals of CD, IR and Raman spectroscopy and their use in the study of biomolecular conformation.

Flow cytometry, phage display, two hybrid system. FISH, DNA sequencing. biosensors

Centrifugation: Basic concepts of centrifugation. Calculation of g value from RPM. Density gradient centrifugation. Sedimentation velocity and Sedimentation equilibrium. Separation of sub-cellular components and macromolecules using high speed and ultracentrifugation.

Immunogenetics, ELISA, Blotting techniques, pre natal diagnosis, chorionic villi sampling, amniocentesis.

Quality control, good manufacturing practices (GMP), Good laboratory practices (GLP)

Anath  
02/08/25

V. Bhang  
02/08/25

D. Ravi  
H.O.D. Biochemistry & Course Incharge  
M. Sc. Medical Biotechnology  
Pt. J.N.M. Medical College, Raipur (C.G.)



## Immunology

Immune cells, B cells and antibodies, Immunoglobulin genes, Monoclonal antibodies, Antibody engineering, Antigen antibody interactions, T cell receptors, Complement-system, Toll-like receptors, Cell-mediated effector functions, Inflammation, Hypersensitivity and autoimmune diseases, tolerance, Hypersensitivity and autoimmunity, Congenital and acquired immunodeficiencies, Vaccines, Immunotherapy, Immunological techniques: ELISA, RIA, Immunoprecipitation.

## Genetics

Classical genetics, Mendelian genetics, concept of gene, multiple alleles, gene interactions, Chromosomal basis of inheritance, genetic linkage, polygenic traits, extranuclear inheritance and maternal effect, pleiotropy, sex determination, population genetics: Hardy-Weinberg principle, cytogenetics, human genome project, autosomal and X-linked genetic disorder, pedigree analysis, genetic counselling, aneuploidy in human beings, chromosomal aberration, mobile DNA elements, ethics in human genetics, pharmacogenomics and toxicogenomics, cancer genetics, hemoglobinopathies,

## Molecular Biology

Evidence that DNA is the genetic material, cot curve, complexity of genome,  $T_m$ , Eukaryotic chromatin and chromosome, polytene chromosomes, lampbrush chromosomes, packaging of DNA into chromosome, histone modification, DNA replication, DNA mutation, dynamic mutation, Ames test, DNA repair, recombination, Transcription, post transcription regulation in prokaryotes, lac operon, trp operon, transcription switch in bacteriophage lambda, post transcription regulation in eukaryotes, RNA interference, genetic code, protein synthesis, post translation modifications.

## Biotechnology

Enzymes for DNA manipulation, genetic material isolation, purification and quantification, horizontal gene transfer, Nucleic acid hybridization, nucleic acid labelling, genomic and cDNA library, cloning and expression vectors, selection and screening of recombinant clones, genetic marker: RFLP, RAPD, AFLP, DNA fingerprinting, microarray technology, genomic mapping, Polymerase chain reaction, site directed mutagenesis, positional and functional cloning, Blotting techniques, transgenic animals, somatic and germ line gene therapy, Animal cell culture, cryopreservation, somatic cell hybridization, hybridoma technology, regenerative medicine & transplantation technology, stem cell

## Development Biology

Spermatogenesis, oogenesis, ovulation and hormonal control in mammals, molecular and cellular biology of fertilization: acrosome reaction and signal transduction, monospermy and species specificity, capacitation, implantation, placenta in mammal, gastrulation in mammals- formation of primitive streak, organogenesis and foetal development, lens development- fibre differentiation, programmed cell death, ageing, neuro developmental disorders, Genetic control of embryonic development in Drosophila, genetic control of vulva development in C. elegans.

Anath  
02/08/25

2  
Vishal  
02/08/25

H.O.D. Biochemistry & Course Incharge  
M. Sc. Medical Biochemistry  
Pt. J.N.M. Medical College, Raipur (C.G.)



## Medical Microbiology

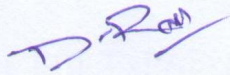
Methods of microbial culture: media preparation, sterilization, culture techniques, staining techniques, fermentation technology, mechanisms of actions of antibiotics, antibiotic resistance.

Bacterial toxins, prions, viroids.

Production of microbial metabolites: drugs, vaccines, antibiotics,

Transmission and pathogenesis of infectious diseases: viral diseases, bacterial diseases, fungal diseases, parasitic diseases.

Diagnosis of microbial diseases.



H.O.D. Biochemistry & Course Incharge  
M. Sc. Medical Biotechnology  
Pt. J.N.M. Medical College, Raipur (C.G.)



02/08/25

Anth  
02/08/25