The meeting of the B.O.S. (UG) in Microbiology and Biotechnology was held on 18th June, 2014 in the Department of Microbiology and Biotechnology, Bangalore University, Bangalore. At the outset, the Chairman welcomed the members and initiated the proceedings.

Agenda-1

The Credit Based Semester Scheme for B.Sc. in Microbiology and Biotechnology, the Syllabus (theory and practical) and Scheme of examination for I, II, III & IV Semesters were finalized and approved.

Agenda-2

The panel of examiners for UG Microbiology and Biotechnology (both external and internal) was modified and approved for the year 2014-15.

Agenda-3

The B.O.S. approved the list for the formation of B.O.E. (UG) in Microbiology and Biotechnology for the year 2014-15.

The meeting concluded with the Chairman thanking all the members for their co-operation.

Members present:
1. Dr. Shastri P. S
2. Dr. Jyotsna B. S
3. Dr. Bharathi
4. Smt. Pushpalatha. T
5. Dr. Vijaya. B
6. Dr. ShanthiIyer
7. Dr. S.K. Sarangi
### B.Sc. CREDIT BASED SEMESTER SCHEME
#### BIOTECHNOLOGY (PART 2)
#### SCHEME OF INSTRUCTIONS AND CREDITS

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### Internal assessment:

**Theory : (30)**

(a) Tests – 10
(b) Assignments - 15
(c) Attendance - 05

**Practical : (15)**

(a) Tests – 10
(b) Class Records - 05

Total Marks and Credits for VI semester

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**Theory : (30)**

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**Practical : (15)**

(a) Tests – 10
(b) Class Records - 05
BANGALORE UNIVERSITY, BANGALORE

Syllabus for B.Sc. BIOTECHNOLOGY
(Credit Based Semester Scheme)

SEMESTER-I

BTT 101 – CELL BIOLOGY AND GENETICS

Total hours: 52

PART A: CELL BIOLOGY

Total hours: 28

Unit 1. Cell as a Basic unit of Living Systems
   Discovery of cell, The cell Theory.
   Ultra structure of an eukaryotic cell- (Both plant and animal cells) 2 Hours

Unit 2. Surface Architecture
   Structural organization and functions of plasma membrane and cell wall of eukaryotes. 4 Hours

Unit 3. Cellular Organelles
   Vacuole, Cytosol and Cytoskeleton structures (Microtubules, Microfilaments and Intermediate filaments). 8 Hours

Unit 4. Chromosomes
   Discovery, Morphology and structural organization – Centromere, Secondary constriction, Telomere, Chromonema, Euchromatin and Heterochromatin, Chemical composition and Karyotype.
   Special type of chromosomes: Salivary gland and Lampbrushchromosomes. 7 Hours

Unit 5. Cell Division
   Cell Cycle and regulation, mitosis and meiosis. 5 Hours

Unit 7. Cell Senescence and programmed cell death 2 Hours

PART B: GENETICS

Total Hours: 24

Unit 1. Structure of DNA and RNA – a brief account 2 Hours

Unit 2. Mendelism
   Mendel’s work, Laws of heredity, Test cross, Incomplete dominance and simple Problems. 3 Hours
Unit 3. Interaction of Genes
Supplementary factors: comb pattern in fowls
Complementary genes- Flower colour in sweet peas
Multiple factors – Skin colour in human beings
Epistasis – Plumage colour in poultry
Multiple allelism: Blood groups in Human beings.

Unit 4. Sex Determination in Plants and animals
Concept of allosomes and autosomes, XX- XY, XX-XO, ZW-ZZ, ZO-ZZ types

Unit 5. Linkage and Crossing Over
Coupling and repulsion hypothesis, Linkage in maize and Drosophila, Mechanism of crossing over and its importance, chromosome mapping-linkage map in maize.

Unit 6. Chromosomal variations
A general account of structural and numerical aberrations, chromosomal evolution of wheat and cotton.

Unit 7. Cytoplasmic Inheritance
Plastid inheritance in Mirabilis, Petite characters in yeast and Kappa particles in paramecium.

Unit 8. Mutations
Types: Spontaneous and induced, Mutagens: Physical and chemical, Mutation at the molecular level, Mutations in plants, animals and microbes for economic benefit of man.

Unit 9. Human Genetics
Karyotype in man, inherited disorders – Allosomal (Klinefelter syndrome and Turner’s syndrome), Autosomal (Down syndrome and Cri-Du-Chat Syndrome).

SEMESTER - I
BTP 102 – Cell biology and Genetics

1. Use of Micrometer and calibration, measurement of onion epidermal cells and yeast
2. Cell division: Mitotic and meiotic studies in grasshopper testes, onion root tips and flowerBuds
3. Chromosomes: Mounting of polytene chromosomes
4. Buccal smear - Barr bodies
5. Karyotype analysis - Human and Onion
6. Simple genetic problems (Problems on Interaction of genes)
7. Isolation of Mitochondria
8. Vital staining of Mitochondria  
9. RBC cell count by Haemocytometer

Each student is required to submit 5 permanent slides (mitosis & meiosis- at least two from each)

**Practical Examination Scheme**

| Major: Mitosis/Meosis/Polytene Chromosomes/Haemocytometry | (20 marks) |
| Minor: Answer any two Barr body/ Karyotype/ Blood smear differential Staining/ Genetic Problem/ Vital Staining of Mitochondria | (15 marks) |

**Record:** To be submitted

**REFERENCES:**

**CELL BIOLOGY**
9. Molecular Biology – Smith Faber & Faber Publications

**GENETICS**
1. Basic Genetics – Daniel L. Hartl, Jones &Barlett Publishers USA
2. Human Genetics and Medicine lark Edward Arnold P London
5. Genes I - Benjamin Lewin, Wiley Eastern Ltd., Delhi
7. Genes III- Benjamin Lewin, Wiley & Sons Publications
SEMESTER II

BTT 201- GENERAL MICROBIOLOGY AND BIOSTATISTICS

PART A: GENERAL MICROBIOLOGY

Unit 1. Introduction and Scope of Microbiology
Definition and history of Microbiology, contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister and Alexander Fleming. Importance of Scope of Microbiology as a modern science Branches of Microbiology. 3 Hours

Unit 2. Microscopy
Constructions and working principles of different types of microscopes – Compound, Dark field, Phase contrast, Fluorescence and Electron (Scanning and Transmission) 3 Hours

Unit 3. Microbial Techniques
A). STERILIZATION: Principles and applications of
c. Radiation Methods: UV rays and Gamma rays. 4 Hours

B). STAINS AND STAINING TECHNIQUES: Principles of staining, Types of stains- Simple Stains, Structural stains and Differential stains 3 Hours

Unit 4. Microbial Taxonomy
Concepts of Microbial species and strains, Classification of bacteria based on Morphology (Shape and flagella), Staining reaction, nutrition and extreme environment 2 Hours

Unit 5. General Account of Viruses and Bacteria
A. VIRUSES – Structure and classification Plant Viruses – CaMV
Animal Viruses – Hepatitis B
Bacterial Viruses – Lambda phage
B. BACTERIA – Ultra structure of a bacterial cell, cell wall, endospore and capsule 8 Hours

Unit 6. Eukaryotic Microorganism
Salient features, Classification and reproduction of fungi, mycoplasma and algae. 4 Hours

Unit 7. Pathogenic Microorganisms
A. Bacterial diseases of man – Tetanus, Tuberculosis, Typhoid and Cholera
B. Viral diseases: AIDS (HIV). 4 Hours
Unit 8. Microbial Metabolism
A) Respiration: EMP, HMP and ED Pathways, Kreb’s cycle, Oxidative Phosphorylation.
B) Bacterial Photosynthesis: Photosynthetic pigments in Prokaryotes, Photophosphorylation & Dark reaction.

PART B-BIOSTATISTICS

Unit 1. Importance and application
Tabulation and classification of data, Frequency distribution and Graphical distribution of data.

Unit 2. Measures of Central Tendencies
Mean, Median, Mode and their properties

Unit 3. Measures of Dispersion
Mean deviation, Variance, Standard deviation and Coefficient of Variation

Unit 4. Hypothesis Testing
Student t and Chi-square test

Unit 5. Probability and Distribution
Concepts and problems on probability, Binomial, Poisson, Normal Distribution and their applications

BTP 202-GENERAL MICROBIOLOGY

1. Safety measures in microbiology laboratory 1 Unit
2. Cleaning and sterilization of glass wares 1 Unit
3. Study of instruments: Compound microscope, Autoclave, Hot air oven, pH meter, Laminar airflow and centrifuge. 3 Unit
4. Staining Techniques: Simple, Negative staining, Gram staining, Endospore staining, fungal Staining, Bacterial mobility by hanging drop method. 2 Unit
5. Media preparation: Nutrient agar, MRBA and Nutrient broth. 2 Unit
6. Isolation of bacteria and fungi from soil, air, and water- dilution and pour plate methods. 2 Unit
7. Estimation of microorganisms - Total Count (haemocytometer) 1 Unit
8. Antibiotic sensitivity test – paper disc method 1 Unit
9. Biochemical tests – starch hydrolysis, catalase & gelatin liquefaction. 1 Unit
10. Study of Rhizobium from root nodules of legumes. 1 Unit
Practical Examination Scheme

(35 marks)

Major: 20 Marks
Gram Staining & Endospore Staining/ Haemocytometry or Gram Staining/ Endospore staining

Minor: 15 Marks
Answer any two of the following
Instruments (any one)/ culture media / components (any one)
Biochemical tests (any one)
AST

Records: To be submitted

REFERENCES:

MICROBIOLOGY:

1. Microbiology-Pelzer, Chan, Krieg Tata McGraw Hill Publications
3. Fundamentals of Microbiology –Furbisher, Saunders & Toppan Publications
4. Microbiology –Ronald M. Atals
6. Industrial Microbiology-Casual Wiley Eastern Ltd.
7. Fundamentals of Bacteriology - Salley

BIOSTATISTICS:

SEMESTER III  
BTT 301- BIOCHEMISTRY AND BIOPHYSICS  
Total Hours: 52

PART-A: BIOCHEMISTRY  
Total Hours: 35

Unit 1. Amino acids  
Classification and properties due to intra, centre and side chain, titration against acid and base.  

4 Hours

Unit 2. Proteins  
Classification based on structure and functions, structural organization of proteins (Primary, secondary, tertiary and quaternary structure)  

6 Hours

Unit 3. Enzymes  
Introduction, classification, enzyme kinetics, factors influencing enzyme activity, co-Enzymes and co-factors.  

8 Hours

Unit 4. Carbohydrates  
Structure, properties and classification with examples, Carbohydrates as a source of Energy.  

5 Hours

Unit 5. Lipids  
Structure, properties and classification and functions.  

5 Hours

Unit 6. Vitamins  
Water Soluble and fat-soluble vitamins, Dietary source.  

4 Hours

Unit 7. Hormones  
Steroid hormones- structure O, E2, P4, Glucocortocoid hormones. mechanism of steroid hormone action.  

3 Hours

PART-B: BIOPHYSICS  
Total Hours: 17

Unit 1. Introduction and scope of Biophysics.  

Unit 2. pH and buffer concepts.  

1 Hour


2 Hours
Unit 4. Analytical techniques
  Principles and applications of
  a) Chromatography (Paper, thin – layer, column, GLC and HPLC)
  b) Centrifugation (RPM and G, Ultra centrifugation)  

Unit 5. Spectroscopic techniques
  Principles and applications of UV, Visible spectroscopy, X-ray crystallography, NMR, IR, fluorescence & atomic absorption.

Unit 6. Isotopes
  Types, their importance in biological studies, measure of radioactivity, GM counters and Scintillation counting.

BTP 302- Biochemistry and Biophysics
Total units : 15

1. Preparation of Buffers-Citrate and Phosphate.  1 Unit
2. Estimation of reducing sugars (Glucose, Maltose and Lactose) by DNS and Somoji’s Methods.  4 Units
3. Estimation of Protein by Biuret method and Lowry’s method  3 Units
4. Assay of enzyme activity- Amylase.  2 Units
5. Separation of Sugars by TLC.  2 Units
6. Estimation of Amino acids by ninhydrin method.  2 Units
7. Estimation of inorganic phosphate by Subba row method  1 Unit

Practical Examination Scheme
(35 marks)

Major:  (20 marks)
  a) Estimate the amylase enzyme activity of the given sample, write the principle and Procedure
  b) Write the principle of TLC/Ninhydrin
     Or
     Comment on preparation of Citrate buffer/Phosphate buffer

Minor:  (15 marks)
  Estimation of Reducing sugar/Protein/Inorganic PO₄

Record: To be submitted

REFERENCES:
BIOCHEMISTRY
4. Fundamentals of Biochemistry J.L. Jain S.Chand and company
5. Biochemistry, Prasaranga, Bangalore University
6. Fundamental of Biochemistry-Dr. A.C. Deb

**BIOPHYSICS**


**SEMESTER IV**

**BTT- 401 – MOLECULAR BIOLOGY**

Total Hours:  52

**Unit 1. Molecular basis of life** – an introduction RNA and DNA as genetic material, experimental proof of DNA as genetic material.  
3 Hours

**Unit 2. Nucleic Acids**

- Structure and functions of DNA and RNA
- Watson and Crick model of DNA and other forms of DNA (A and Z)
- Functions of DNA and RNA including ribozymes  
5 Hours

**Unit 3. DNA Replication**

- Prokaryotic and Eukaryotic – Enzymes and proteins involved in replication, Theta model and Rolling circle model.  
4 Hours

**Unit 4. DNA Repair**

4 Hours

**Unit 5. Recombination in prokaryotes**

- Transformation, Conjugation and Transduction  
5 Hours

4 Hours
Unit 7. Transcription in Prokaryotes and Eukaryotes
Mechanisms, Promoters and RNA polymerase, transcription factors, Post transcriptional modifications of eukaryotic mRNA.

5 Hours

Unit 8. Translation
Mechanism of translation in prokaryotes and Eukaryotes, Post translational modification of Proteins.

7 Hours

Unit 9. Regulation of Gene Expression
Regulation of Gene expression in Prokaryotes – Operan concept (Lac and Tryp)
Regulation of Gene expression in Eukaryotes – transcriptional activation, galactose metabolism in yeast.

8 Hours

Unit 10. Gene organization and expression in Mitochondria and chloroplasts.

3 Hours

Unit 11. Insertional elements and transposons.
Transposable elements in Maize and Drosophila.

4 Hours

BTP 402 – Molecular Biology

Total Units: 15

1. Preparation of DNA model
2. Estimation of DNA by DPA method.
3. Estimation of RNA by Orcinol method
4. Column chromatography – gel filtration (Demo)
5. Extraction and partial purification of protein from plant source by Ammonium sulphate precipitation.
6. Extraction and partial purification of protein from animal source by organic solvents.
7. Protein separation by Polyacrylamide Gel Electrophoresis (PAGE)
8. Charts on- Conjugation, Transformation and Transduction

Practical Examination Scheme

(35 Marks)

Major:
Extraction and estimation of protein by salt precipitation method/organic solvent method
(Plant and animal source)

20 Marks

Minor:
Estimation of DNA/RNA
and
Comment on PAGE/Column chromatography/conjugation/transformation/transduction

15 Marks

Records: To be submitted
REFERENCES:
MOLECULAR BIOLOGY
