

B.Sc. BIOTECHNOLOGY

The Board of Studies meeting for the year 2021 – 2022 of the Department of Biotechnology, Anwarul Uloom Degree College, Mallepally, Hyderabad was held on_____ At_____ in the Department of Biotechnology, Osmania University, Hyderabad.

FOLLOWING MEMBERS WERE PRESENT:

1. Mrs. Nadeem Fatima H.O.D. Biotechnology,
Anwarul Uloom College, Hyderabad.
2. Dr H. Surekha Rani Subject Expert, University Representative
Osmania University, Hyderabad.
3. Dr Parveen Jahan Subject Expert Professor MAANU Hyd,
4. Dr Safiullah Ghori Subject expert and Assistant Professor
Anwarul uloom College of Pharmacy JNTU Hyd.
5. Mr. Mohd Asimuddin Industry Expert,
CEO, Biomarkers Lab, Hyderabad
6. Dr Mohd. Rasheeduddin Associate Professor.
Anwarul Uloom College, Hyderabad.
7. Mrs. Nikhat parveen Asst. Professor in Biotechnology,
Anwarul Uloom College, Hyderabad.
8. Miss Sanobar Sadeqa Jabeen Asst. Professor in Biotechnology,
Anwarul Uloom College, Hyderabad
9. Miss Fareesah Rasheed Asst. Professor in Biotechnology,
Anwarul Uloom College, Hyderabad
10. Mr. Owais Ul Haq Asst. Professor in Biotechnology,
Anwarul Uloom College, Hyderabad
11. Mr. Ahmedullah qureshi Ex – Student, Senior Embryologist,
Neelima Hospital, Hyderabad

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

(2021 – 2022)

Agenda of the meeting.

- 1) To approve the syllabus of all semesters
- 2) To approve the model papers of all semesters
- 3) To approve the panel of examiners for theory and practicals of all semesters.
- 4) To approve project work for B.Sc..III year students in VI semester.
- 5) Approval of AECC and SECC.
- 6) Any other matter with the permission of chair.

Anwarul Uloom College (Autonomous)

Department of Biotechnology

B. Sc (Bt. M. C)

Subject: BIOTECHNOLOGY (2021 – 2022)

No.	Year	Sem	Paper / Title	Teaching Hours /Week	Units	Credits	Marks		
							Internal assessment	Semester	Total
1	1 st Year 2021 - 2022	I	Cell Biology & Genetics -Theory	4	4	4	20	80	100
2			Cell biology & Genetics -Practical	2	–	2	–	50	50
3			Environmental science (AECC-I)	2	–	2	–	50	50
4	1 st Year 2021 - 2022	II	– Nucleic acids & Biochemistry Theory	4	4	4	20	80	100
5			Nucleic Acids & Biochemistry -Practical	2	–	2	–	50	50
6			Basic Computer Skills (AECC-II)	2	–	2	–	50	50
7	2 nd Year 2020 - 2021	III	Molecular biology & rDna Technology – Theory	4	4	4	15	35	50
8			Molecular biology & rDna Technology – Practical	2	–	1	–	25	25
9			Industrial fermentation –(SECC I)	2	2	2	–	50	50
			Immunological techniques (SECC – II)-	2	2	2	–	50	50
10	2 nd Year 2020 - 2021	IV	Biostatistics & Bioinformatics Theory	4	4	4	15	35	50
11			Biostatistics & Bioinformatics Practical	2	–	1	–	25	25
12			Molecular markers in plant breeding– (SECC- III)	2	2	2	–	50	50
			Drug designing (SECC- IV)	2	2	2	–	50	50
13	3 rd Year 2019 - 2020	V	Elective – A Plant biotechnology- Theory	4	4	4	15	35	50
14			Plant biotechnology - Practical	2	–	1	–	25	25
15			Elective – B Medical biotechnology - Theory	4	4	4	15	35	50
16			Medical biotechnology – Practical	2	–	1	–	25	25
17			Plant breeding (SECC- V)	2	2	2	–	50	50
18			Basics in biotechnology – (GE- I)	2	2	2	-	50	50
19	3 rd Year 2019 - 2020	VI	Elective – A - Animal biotechnology - Theory	4	4	4	15	35	50
20			Animal biotechnology - Practical	2	–	1	–	25	25
21			Elective – B - Environmental biotechnology - Theory	4	4	4	15	35	50
22			Environmental biotechnology – Practical	2	–	1	–	25	25
23			Intellectual property rights (SECC- VI)	2	2	2	–	50	50
24			Research methodology/ project– (GE- II)			5	-	100	100

AECC – Ability Enhancement Compulsory Course

SECC – Skill Enhancement Compulsory Course

GE – Generic Electives

Head of the Department

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

Ist Year (2021 – 2022)

Semester – I

Total Teaching hours: 60

CELL BIOLOGY AND GENETICS

Unit 1: Cell structure and Functions(15 Hours)

- Introduction to Biotechnology, History, Nature, scope and future prospective.
- Cells as basic units of living organisms – Bacterial, Fungal, Plant and Animal cells.
- Ultra structure of prokaryotic cells (Cell membrane and Plasmids, Nucleoid)
- Ultra structure of Eukaryotic cells (Cell membrane, Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi complex, Vacuoles).
- Structure of chromosome-morphology, components of chromosomes (histones and nonhistones).
- Specialized chromosomes (Polytene, Lampbrush).
- Chromosomal aberrations- Structural and numerical.

UNIT-II CELL CYCLE.(15 Hours)

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

UNIT-III MENDEL'S LAWS (15 Hours)

- Mendel's Experiments – Factors contributing to the success of Mendel's Experiments.
- Law of Segregation assortment – Monohybrid ratio; Law of Independent assortment – Dihybrids, Trihybrids.
- Derivation from Mendel's Law – Partial or Incomplete, Dominance (eg: Flower Color in *Mirabilis jalapa*), Co- dominance (eg: MN Blood groups), Non allelic interaction-types of epistasis, modification of dihybrid ratios.
- Penetrance and Expressivity (eg: Polydactyly, Waardenburg syndrome) Pleiotropism, phenocopy- microcephaly, cleft lip.
- Multiple allelism(eg: Coat color in Rabbits, eye color in *Drosophila* and ABO Blood groups)
- X-Y chromosomes – Sex determination in *Drosophila*, Birds, Man, *Bonellia*; X-linked inheritance-Hemophilia and Color Blindness; X-inactivation.
- Y- linked inheritance- Holandric genes.

UNIT-IV LINKAGE and CROSSING OVER(15 Hours)

- Linkage and Recombinant - Cytological proof of crossing over, Phases of linkage, recombination frequency, gene mapping and map distance.
- Non-Mendelian Inheritance – Maternal effect (Shell coiling in snail), variegation in leaves of *Mirabilis jalapa*.
- Cytoplasmic male sterility in Maize and *Paramecium*.
- Mitochondrial inheritance in human and poky in *Neurospora crassa*
- Chloroplast inheritance in *Chlamydomonas*.

TEXT AND REFERENCE BOOKS:

- 1) Fundamentals of Genetics B.D.Singh, Hanumanth Rao, PratibhaNallari, Kavi Kishore.
- 2) Text book of Genetics - B.D. Singh.
- 3) Text book of Cell Biology - C.B. Powar
- 4) Text book of Genetics - Strick Burger
- 5) Cell &Molecular Biology. - E.D.D De Robertis&E.M.F DeRobertis,
- 6) The science of Genetics, - A.G. AtherlyJ.R. Girton, J.F. Mcdonald,
Principles of Genetics by R.H. TamarinMcGrawhill
- 7) Theory &problems in Genetics -Stansfield, Schaumout line seriesMcGrawhill
- 8) Molecular Cell Biology - Lodish, H., Baltimore, D; fesk, A., Zipursky S.L.,
Matsudaride, P. and Darnel. American Scientific
Books. W.H. Freeman, New York

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

Ist Year (2021 – 2022)

Semester – I

Cell Biology and Genetics

Practical syllabus

- Microscopic observation of cells: bacteria, fungi, plant and animal.
- Preparation of different stages of Mitosis (onion root tips)
- Preparation of different stages of Meiosis (grasshopper testis)
- Preparation of Polytene chromosome from Drosophila salivary gland
- Identification, maintenance and culturing of Drosophila stock
- Monohybrid and dihybrid ratio in Drosophila
- Monohybrid and dihybrid ratio in maize
- Problems on co-dominance, epistasis, two point and three point test cross, gene mapping, Tetrad analysis

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

Ist Year (2021 – 2022)

SEMESTER – I

ABILITY ENHANCEMENT COMPULSORY COURSE - I

Environmental studies

Hours/ week – 2hrs

Credits - 2

Unit –I : Ecosystem, Biodiversity & Natural Resources

- Definition , Scope & Importance of Environmental studies
- Structure of Ecosystem – Abiotic & Biotic components Producers , Consumers ,Decomposers , Foodchain , Foodwebs , Ecological Pyramids
- Function of an Ecosystem : Energy flow in the Ecosystem (Single channel energy flow model)
- Definition of Biodiversity , Genetics ,Species & Ecosystem diversity , Hotspots of Biodiversity ,Threats to Biodiversity, Conversion of Biodiversity (Insitu&Exsitu)
- Renewable & Non – renewable resources ,Brief account of forest ,Mineral & Energy (Solar Energy & Geothermal Energy) resources
- Water Conversion , Rain water harvesting & Watershed management.

Unit –II: Environmental Pollution , Global Issues & Legislation

- Causes , Effects & control measures of Air Pollution ,Water Pollution
- Solid Waste Management
- Global warming& Ozone layer depletion
- Ill effects of Fire works
- Disaster management – floods , earthquakes & Cyclones
- Environmental legislation :-
- Wild Life Protection act (b) Forest Act (c) Water Act (d) Air act
- Human Rights
- Women and Child welfare
- Role of Information technology in environment and human health

Field Study

- Pond Ecosystem
- Forest Ecosystem

REFERENCES

- Environmental studies –from crisis to cure –by R.Rajagopalan (Third edition)
Oxford University Press
- Text book of Environmental studies for undergraduate courses (Second edition) by
ErachBharucha
- A text book of Environmental studies by Dr.D.K.Asthana and Dr . Meera Asthana

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

Ist Year (2021 – 2022)

Semester – II

Nucleic Acids & Biochemistry

Total teaching Hours: 60

Unit-I: - Nucleic Acids and Genome organization.(15 Hrs)

- DNA as the genetic material- Griffith's experiments on transformation in Streptococcus pneumonia, Hershey-Chase experiments with radio labeled T₂ bacteriophage, Avery, MacLeod and McCarty's experiments
- RNA as genetic material- Tobacco Mosaic Virus
- DNA Double helical structure
- Structure & forms of DNA (A, B and Z)
- Genome organization in Eukaryotes- C Value and C-Value Paradox
- Reassociation Kinetics-cot curve, Denaturation, Renaturation, T_m curve
- Kinetic classes of DNA – unique sequences, moderately repeated and highly repeated sequences.

Unit-II: - DNA Replication, Recombination & Repair. (15 Hrs)

- DNA replication- enzymes involved semi conservative DNA replication-Messelson and Stahl Experiment; Linear, Circular, Rolling circle, Theta, D Loop models.
- Mutation-spontaneous, induced (Frame shift, Transition, Transversion)
- Physical and chemical mutagens.
- DNA damage- intrinsic and extrinsic factors.
- DNA repair-Direct, Excision and methyl mediated mismatch, recombinational and SOS repair
- DNA recombinational-homologous, site specific recombination and NHEJ (Non-Homologous End Joining).

Unit-III: - Biomolecules

- Carbohydrates- Importance, Classification: Structure and Functions of Monosaccharides (glucose & fructose), Disaccharides (sucrose, lactose & maltose) and Polysaccharides (starch, glycogen & insulin)
- Amino acids- Importance, Classification, Structure, Physical and Chemical Properties of Amino acids: peptide bond formation
- Proteins- Importance, Structure of Proteins- primary, secondary, tertiary and quaternary
- Lipids- Importance, Classification – Simple lipids (triacylglyceride& waxes), Complex Lipids (phospholipids & glycolipids), Derived Lipids (steroids, terpenes& carotenoids)
- Nucleic acids :Structure and Chemistry of DNA (Watson and Crick) and RNA(TMV), Structure and forms of DNA (A,B and Z)
- Enzymes- Importance, Classification and Nomenclature; Michaelis-Menton Equation
- Enzyme reaction: Factors influencing enzyme reactions; enzyme inhibition (competitive, uncompetitive & mixed), co-enzymes

Unit-IV: - Bioenergetics

- Glycolysis, Tricarboxylic Acid (TCA) Cycle
- Electron Transport, Oxidative phosphorylation
- Gluconeogenesis and its significance
- Transamination and Oxidative deamination reactions of amino acids
- B-Oxidation of Fatty acids
- Glyoxalate cycle.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

Ist Year (2021 – 2022)

Semester – II

Practical syllabus

1. Isolation of DNA from plant cells
2. Isolation of DNA from Animal cells
3. Estimation of DNA by diphenylamine method
4. Estimation of RNA by orcinol method.
5. Preparation of Normal, Molal and Molar solution.
6. Preparation of buffers (Acid, Neutral and Alkaline Buffers).
7. Qualitative tests of Sugars. Amino acids & Lipids.
8. Estimation of Protein by Biuret method.
9. Estimation of total sugars by Anthrone method.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

Ist Year (2021 – 2022)

PSEMESTER – II

ABILITY ENHANCEMENT COMPULSORY COURSE - II

Basic Computer Skills

Hours/ week – 2hrs

Credits – 2

UNIT – I : Understanding Of Computer and Word Processing

- **Knowing Computer:**What is Computer, basic Applications of Computer; components of computer system, central Processing Unit (CPU), VDU, Keyboard and mouse, Other input/output Devices, computer memory, Concepts of Hardware and software; Concept of Computing, Data and information; Applications of IECT; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply
- **Operating Computer using GUI Based Operating system:** What is an Operating System; Basics of Popular Operating Systems; The user Interface, Using Mouse; Using right Button of the mouse and moving icons on the screen, Use of Common Icons, Status bar, Using Menu and menu-Selection, Running an application, Viewing of file, Folders and directories, Creating and Renaming of files and folders, Opening and closing of different windows; Using help; Creating short cuts, Basics of O.S Setup; Common utilities.
- **Understanding Word Processing:**Word Processing Basics; Opening and closing of documents; Text Creation and Manipulation; Formatting text; Table handling; Spell check, language setting and thesaurus; Printing of word document.

UNIT – II: Spread Sheet, Presentation software & Introduction to Internet, WWW and Web Browsers:

- **Using Spread Sheet:**Basics of spreadsheet; Manipulation of cells; Formulas and functions; Editing of spread sheet, printing of spread sheet.
- **Basics of presentation software:** Creating Presentation; Preparation and presentation of slides; slideshow; Taking printouts of presentation/handouts.
- **Introduction to Internet, WWW and Web Browsers:**
- **Introduction to Internet:**Basic of Computer networks; LAN, WAN; Concept of Internet; Applications of Internet; connecting to internet; what is ISP; Knowing the internet; Basics of internet connectivity related troubleshooting.
- **World Wide Web:**Search engines; Understanding URL; Domain name; IP address; Using e-governance website.
- **Web Browsing:**software, communications and collaboration; Basics of electronic mail; getting an email account; sending and receiving emails; accessing sent emails; using emails; document collaboration; instant messaging; netiquettes.

SUGGESTED READING:

1. **INTRODUCTION TO Computers, Peter Norton, Mc GrawHill, 2012**
2. **Using information Technology, Brain K Williams, Stacey C. sawyer, Tata Mc Graw Hill.**

Web Resources:

1. <https://online.stanford.edu/courses/soe-yescs101-sp-computer-science-101>
2. [https://www.extension.harvard.edu/open-learning-initiative/intensive-introduction-computer-science.](https://www.extension.harvard.edu/open-learning-initiative/intensive-introduction-computer-science)

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. - I year (I & II Semester)

B.Sc. Biotechnology (2021 – 2022)

Model Paper

Time: 3Hrs

Max/Min Marks: 80/32

Section A

Short Answers/Concept based Questions.

Answer all questions

5x4=20m

1. Unit-I
2. Unit-II
3. Unit-III
4. Unit-IV
5. Choose one from any one unit

Section- B

(Essay Type Questions)

Answer all questions

12 x 5= 60m

6. Unit-I
OR
Unit-I
7. Unit-II
OR
Unit-II
8. Unit-III
OR
Unit-III
9. Unit-IV
OR
Unit-IV
10. Choose one from any one unit
OR
Choose one from any one unit

Anwarul Uloom College (Autonomous)

B.Sc. Biotechnology (2021 – 2022)

I year (I & II Semester)

Practical Model Paper

Time: 3 hrs.

Max Marks: 50m

- | | |
|-------------------|-----------|
| 1. Major Question | 15 Marks. |
| 2. Minor Question | 10 Marks. |
| 3. Spots/Problem | 15 Marks. |
| 4. Record | 5 Marks |
| 5. Viva | 5Marks. |

Anwarul Uloom College (Autonomous)

B.Sc. Biotechnology (2021 – 2022)

I year (I & II Semester)

Model Paper (Internals).

Marks = 20m

- 1) Choose the correct answer (10 X ½ = 5m)
- 2) Fill in the Blanks (10 X ½ = 5m)
- 3) Answer in one sentence (5 X 1 = 5m)
- 4) Assignments (1 X 5 = 5m)

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

(2021 – 2022)

Minutes of the meeting.

The Board of Studies meeting for the year 2021 – 2022 of the Department of Biotechnology, Anwarul Uloom Degree College, Mallepally, Hyderabad was held on_____ At_____ in the Department of Biotechnology, Osmania University, Hyderabad.

- 1) The syllabus of I & II semesters was approved
- 2) The model papers of I & II semesters were approved
- 3) The panel of examiners for theory and practicals of I & II semesters was approved.
- 4) Certificate course in Medical Lab Technology was approved.
- 5) AECC courses for I & II semesters was approved.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

(2021 – 2022)

Agenda of the meeting.

- 1) To approve the syllabus of III & IV semesters
- 2) To approve the model papers of III & IV semesters
- 3) To approve the panel of examiners for theory and practicals of III & IV semesters.
- 4) Approval of SECC I, II, III & IV.
- 5) Any other matter with the permission of chair.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

II nd Year (2021 – 2022)

Semester – III

MOLECULAR BIOLOGY AND rDNA TECHNOLOGY

Unit-I:-Genome organization and DNA Replication (15 Hours)

- DNA as genetic material:- Griffith's experiments on transformation in Streptococcus pneumonia, Hershey-Chase experiments with radio labeled T₂ bacteriophage, Avery, MacLeod and McCarty's experiments
- RNA as genetic material- Tobacco Mosaic Virus
- DNA Double helical structure
- Structure & forms of DNA (A, B and Z)
- Genome organization in Eukaryotes- C Value and C-Value Paradox
- Genome Organization in Prokaryotes.
- Reassociation Kinetics-cot curve, Denaturation, Renaturation, T_m curve
- Kinetic classes of DNA – unique sequences, moderately repeated and highly repeated sequences.

Unit-II:-Gene Expression in Prokaryotes and Eukaryotes.

- Structure of Prokaryotic Genes
- Structure of Eukaryotic Genes.
- Structure and Function of Prokaryotic RNA polymerase sub units.
- Transcriptional machinery in Eukaryotes(RNAPolymerases) and their structural and functional features.
- Genetic Code: Properties of Genetic Code, Wobble hypothesis.
- Transcription in Prokaryotes.
- Translation in Prokaryotes.

Unit-III: rDNA Technology. (15 Hours)

- Introduction to Genetic Engineering.
Molecular Tools of Genetic Engineering
- Enzymes useful in molecular cloning: Restriction endonuclease, DNA ligases, Polynucleotide kinase, Klenow enzyme, DNA Polymerase I, reverse transcriptase, Alkaline phosphatase, terminal nucleotidyltransferase
- Vectors for cloning: Lambda phage, Cosmids, BAC, YAC, Shuttle Vectors.
- Plasmids as cloning vehicles-pBR322, pUC and Pet,
- Hosts used in rDNA technology.

Unit:IV:rDNA Technology

- Methods of Gene transfer: Physical Chemical and Biological methods.
- Selection of recombinant Clones-colony hybridization and library Screening.
- Polymerase Chain Reaction and its applications
- Blotting techniques: Southern Blotting, Northern Blotting, Western and Dot Blotting
- Autoradiography.
- Preparation of cDNA library.

Reference books:

1. Molecular Biology of the cell by Alberts, B; Bray, D Lewis, J. Raff, Roberts, K and Watson, J.D Garland publishers, Oxford.
2. Molecular biology of the gene by Watson, Hopkins, Gobertz, Steitz and Weiner (Pearson Education)
3. Text book of Biotechnology by H. K Das (Wiley Publications)
4. Gene Structure and Expressions by J.D Hawkins, Publ: Cambridge
5. Text book of Molecular Biology by K. S Sastry, G Padmanabhan & C Subramanyan, Publ: Macmillan India
6. Principles of gene manipulation by R.W. Old and S.B. Primrose, Publ: Blackwell
7. Genes by B. Lewin – Oxford Univ. Press
8. Molecular Biology and Biotechnology by H.D Kumar, Publ: Vikas
9. Methods for General and Molecular Bacteriology by P. Gerhadf et al., Publ: ASM
10. Molecular Biotechnology by G.R Click and J.J. Pasternak, Publ: Panima
11. Genes and Genomes by Maxine Singer and Paul Berg

12. Molecular Biology by D. Freifelder, Publ: Narosa
13. Molecular Biology by F. Weaver. WCB/McGraw Hill
14. Gene, Genomics and Genetic Engineering by Irfan Ali Khan and AtiyaKhanum
(Ukaaz Publications)

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

II nd Year (2021 – 2022)

Semester – III

MOLECULAR BIOLOGY AND rDNA TECHNOLOGY

Practicals:

1. Isolation of DNA from bacterial cells.
2. Isolation of plasmid DNA.
3. Agarose gel electrophoresis of DNA.
4. Quantification of DNA by Spectrophotometer.
5. Separation of proteins by SDS-PAGE.
6. Polymerase Chain Reaction.
7. Restriction digestion of DNA.
8. Bacterial transformation.

Spotters:

1. PCR.
2. RNA Polymerase.
3. Okazaki fragments.
4. Plasmid vector map.
5. Prokaryotic gene.
6. Eukaryotic gene.
7. Splicing.
8. Post transcriptional modification.
9. Point mutations.
10. Lac operon.
11. Tryptophan operon.
12. Post translational modification (PTMS).

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IInd Year (2021 – 2022)

Semester – III

SKILL ENHANCEMENT COURSE -1 (SEC-I)

INDUSTRIAL FERMENTATION

UNIT I: Production of industrial chemicals, biochemicals, chemotherapeutic products and purification of proteins.

- Propionic acid, butyric acid, 2-3 butanediol, gluconic acid, itaconic acid
- Biofuels: biogas, ethanol, butanol, hydrogen, biodiesel.
- Microbial insecticides: microbial flavours and fragrances, newer antibiotics.
- Anti cancer agents, amino acids.
- Upstream and downstream processing, solids and liquid handling.
- Centrifugation, filtration of fermentation broth and anaerobic fermentation.

UNIT II: Microbial products of pharmacological interest

- Steroid fermentations and transformations
- Metabolic engineering of secondary metabolism for highest productivity
- Enzyme and cell immobilization techniques in industrial processing
- Rate equations for enzyme kinetics- Simple and complex reactions
- Enzymes in organic synthesis, proteolytic enzymes, hydrolytic enzymes, glucose isomerise
- Enzymes in food technology/organic synthesis

REFERENCE BOOKS:

1. Patel. A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.
2. Cassida, L.E. (1968). Industrial Microbiology, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
3. Singh, R.P. (2007). Applied Microbiology. Kalyani Publishers, New Delhi.
4. Demain, A.L. & Davies, J.E.(1999). Manual of Industrial Microbiology & Biotechnology, ASM Press , Washington, D.C., USA.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

II nd Year (2021 – 2022)

Semester – III

**SKILL ENHANCEMENT COURSE -2 (SEC- 2)
IMMUNOLOGICAL TECHNIQUES**

Unit 1: Antibody assays- Principle, Methodology & Applications

- Precipitation & Agglutination reactions
- Immuno diffusion & Radial diffusion
- Immunoelectrophoresis
- Western blotting & ELISA
- RIA & Immunofluorescent assay
- Immunohistochemistry

Unit 2: Cellular Assays- Principle, Methodology & Applications

- Total and differential count in human peripheral blood
- Separation of mononuclear cells from human peripheral blood
- Lymphocyte transformation assay
- Micro cytotoxicity assay for HLA typing
- Enumeration of T & B-cells from human peripheral blood
- Cell mediated cytotoxicity

REFERENCE BOOKS

1. Essential Immunology - By I. Roitt, Publ: Blackwell
2. Immunology - By G. Reeve & I. Todd, Publ: Blackwell
3. Abbas AK, Lichtman AH, Pillai S. Cellular and Molecular Immunology. Saunders Publication, Philadelphia
4. Goldsby RA, Kindt TJ, Osborne BA. Kuby's Immunology. W.H. Freeman and Company, New York

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IInd Year (2021 – 2022)

Semester – IV

BIOINFORMATICS AND BIOSTATISTICS.

Total Teaching Hours: 60

UNIT I Introduction to Bioinformatics and Biological database.(15Hours)

- Bioinformatics- Definition, History Scope and applications
- Bioinformatics tools and Resources-Internet basics, role of internet, free online tools, downloadable free tools.
- Bioinformatics web portals-NCBI,EBL, ExPASy.
- Biological Database: Classification of Data bases-Primary(Gene bank) Secondary(PIR) And Tertiary or Composite (KEGG) databases.
 - Sequence Database- DNAsequence databases(ENA and DDBJ)
 - ProteinSequenceDatabase(Swissport and PROSITE)

Unit II: Sequencealignment

- Basics of Sequence alignment-Match, Mismatch gaps, gap penalties, Scoring alignment.
- Types of Sequence alignment-Pair wise and multiple alignments, Local and Global alignment.
- Dot Matrix-Comparision of Sequence.
- Scoring matrices-PAM. Blosum.
- Pair wise sequence similarity search by BLAST and FASTA.
- Concept of Phylogeny-Distance based(NJ method) character based(ML method) Tree construction method.

Unit III: Descriptive Statistics & Probability Distribution

- Sampling-
Samplingprocedure,homogenizationofsamples,samplessize,Selectionof
Random sample, Limitation of analytical methods,
- classification of errors,

measurement of averages and variation, minimization of errors.

- Types of data, Frequency distribution, Measure of central values- Mean, median and mode,
 - Measures of dispersion-range, mean deviation, standard deviation, coefficient of variation, moment, Skewness and kurtosis;
 - Graphical representation of Data, Histogram, Frequency polygon, Pie Chart
-
- Probability, Concept of Probability Theory, Events, Trials, Mutually exclusive events, Favourable events, exhaustive events, Bayesian theorem of Probability, Addition theorem, Multiplication theorem
 - Binomial distribution, Normal distribution, Poisson distribution & their applications.

Unit IV: Statistical Inferences of Qualitative & Quantitative Variables

- Concept of Test of hypothesis, Null & Alternative hypothesis, level of significance, Chi-square test & its applications
- Large Sample Tests-Z-test of Means & Proportions
- Small sample test-T-test for Means, Paired T-test
- Analysis of Variance and Co-variance, One-Way ANOVA, Two-way ANOVA
- Simple regression and correlation
- Test of regression coefficient and correlation Coefficient

Recommended Books

1. Khan and Khanum (2004), Fundamentals of Biostatistics, II Revised Edition, Ukaaz Publication
2. Bailey, N.T.J, Statistical methods in Biology, Cambridge Univ. Press
3. Fundamentals of Biostatistics, P. Hanmanth Rao and K. Janardhan
4. Danial, W. W, Biostatistics, Wiley
5. Introduction to Bioinformatics by Aurthur M lesk
6. Developing Bioinformatics computer skills by Cynthia Gibas, Per Jambeck
7. Bioinformatics second edition by David M mount
8. Essential Bioinformatics by JinXiong
9. Bioinformatics Computing by Bryan Bergeron
10. Bioinformatics: Concepts, Skills, & Applications by R.S. Rastogi
11. Queen, J. P., Quinn, G. P., & Keough, M.J. (2002). Experimental design and data analysis for biologists. Cambridge University Press
12. Mahajan, B.K. (2002). Methods in biostatistics. Jaypee Brothers Publishers

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IInd Year (2021 – 2022)

Semester – IV

BIOINFORMATICS AND BIOSTATISTICS.

Practicals:

1. Exploring we portals – NCBI, EBI & ExPASy
2. Literature search through Pubmed and Pubmed Central
3. Sequence retrieval from Genbank, ENA, Swissprot
4. Pairwise homology search by BLAST and FASTA
5. Calculation of mean, median, mode, standard deviation, variance, standard error and coefficient of variance
6. Construction of bar diagram, pie diagram, line diagram and histogram
7. Problems on hypothesis testing using using Z-test, t-test and Chi-square test
8. Problem on probability and probability distribution

Spotters

1. Line diagram, bar diagram and pie diagrams
2. Histogram, Frequency polygon and Frequency curve
3. Normal probable curve
4. Genbank
5. DDBJ
6. SWISS-PROT
7. PROSITE
8. PIR
9. BLAST
10. Pairwise alignment
11. Multiple sequence alignment
12. PAM and BLOSUM
13. Phylogenetic tree

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIInd Year (2021 – 2022)

Semester – IV

**SKILL ENHANCEMENT COURSE- III (Sec- III)
MOLECULAR MARKERS IN PLANT BREEDING**

Unit I: Molecular markers in Plant Breeding

- Types of markers- morphological, cytological, biochemical and genetic markers
- Development of molecular markers – scope in plant breeding, criteria for ideal molecular markers
- Type of molecular markers
- Hybridization based molecular markers- RFLP
- PCR based molecular markers – RAPD , SSRs, AFLP
- Sequence based molecular markers – SNPs and DArTs

Unit II: Applications of Molecular markers in Plant Breeding

- Segregating populations – backcross, double haploid, F2 and F3 families, RILs
- Linkage mapping and QTL mapping
- Marker assisted selection (MAS) – procedure and applications
- Map based cloning of genes
- Fingerprinting – fingerprinting genotypes, assessment of genetic similarity among genotypes, conservation, evaluation and use of genetic resources
- Hybrid testing

Reference Books

1. Gupta PK. 2010. Plant Biotechnology. Rastogi Publications.
2. Chawla HS. 2011. Introduction to Plant Biotechnology. Oxford and IBH Publishing Co. Pvt Ltd.
3. Chittaranjan K. 2006-07. Genome Mapping and Molecular Breeding in Plants. Vols. I-VII. Springer.16
4. Newbury HJ. 2003. Plant Molecular Breeding. Blackwell Publ. Weising K, Nybom H, Wolff K & Kahl G. 2005. DNA Fingerprinting in Plants: Principles, Methods and Applications. Taylor & Francis.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IInd Year (2021 – 2022)

Semester – IV

SKILL ENHANCEMENT COURSE -1V (SEC-1V)

DRUG DESIGNING

UNIT 1 : Introduction to Drug Discovery

- Drug discovery process : Historical perspective and challenges
- Drug targets : Protein receptors, ion channels or transporters, DNA gene specific inhibitors of transcription
- Drug target identification & Validation : Genetic approaches to identify target candidates such as mapping disease loci, role of bio informatics in analysis of nucleic acid sequence , protein sequence & structure
- Structural Bioinformatics : Prediction of 3D structure of protein using homology modeling , threading & ab - initio approach
- Structure based drug design: Active site detection, docking, binding energy calculation
- Ligand based drug design : Computational methods to screen data bases for new leads

UNIT 2: Strategies of Drug Development

- Strategies of drug designing : Lead generation through combinational chemistry
- Preparation of active compounds – natural products, synthetic compounds, semi-synthetic compounds
- Lead identification : High through put screening & hit generation small molecule-drugs, large molecule drugs.
- Lead optimization : Properties of druggable compounds lipinski rule.
- Pharmacokinetics and pharmacodynamics
- Screening of lead molecules from phase I-V to final drug molecule.

- Pharmacogenomics : It's role in drug development and optimization

REFERENCE BOOKS:

1. Drug discovery & development technology in transition by Raymond G Hill, Churchill Livingstone, 2nd edition (2012).
2. Real world drug discovery: A chemist's guide to to biotech & pharmaceutical research by Robert M Rydzewski, Elsevier Science, 1st edition(2008) .
3. Burger's Medicinal Chemistry & Drug Discovery , 6th Edition, Vol. 1. Principles & Practice , edited by M.E. Wolff . John Wiley & Sons; New York 2003.

AnwarulUloom College (Autonomous)

B.Sc. - II year (III & IV Semester)

B.Sc. Biotechnology (2021 – 2022)

Model Paper

Time: 2Hrs

Max/Min Marks: 35/14

Section A

Short Answers/Concept based Questions.

Answer all questions

5x3=15m

1. Unit-I
2. Unit-II
3. Unit-III
4. Unit-IV
5. Choose one from any one unit

Section- B

(Essay Type Questions)

Answer all questions

4x5=20m

6. Unit-I
OR
Unit-I
7. Unit-II
OR
Unit-II
8. Unit-III
OR
Unit-III
9. Unit-IV
OR
Unit-IV

AnwarulUloom College (Autonomous)

B.Sc. - II year (III & IV Semester)

B.Sc. Biotechnology (2021 – 2022)

Practical Model Paper

Time: 3 hrs.

Max Marks: 25m

- | | |
|--------------------|-----------|
| 1. Major Question | 10 Marks. |
| 2. Minor Question | 5 Marks. |
| 3. Spots/Problem | 5 Marks. |
| 4. Record and Viva | 5Marks. |

AnwarulUloom College (Autonomous)

B.Sc. Biotechnology

(2021 – 2022)

B.Sc. - II year (III & IV Semester)

Model Paper (Internals).

Marks = 15m

1) Choose the correct answer (10 X ½ = 5m)

2) Fill in the Blanks (10 X ½ = 5m)

3) Assignments (1 X 5 = 5m)

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

(2021 – 2022)

Minutes of the meeting.

The Board of Studies meeting for the year 2021 – 2022 of the Department of Biotechnology, Anwarul Uloom Degree College, Mallepally, Hyderabad was held on_____ At_____ in the Department of Biotechnology, Osmania University, Hyderabad.

- 1) The syllabus of III & IV semesters was approved
- 2) The model papers of III & IV semesters were approved
- 3) The panel of examiners for theory and practicals of III & IV semesters was approved.
- 4) SECC I, II, III & IV were approved.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIIrd Year (2021 – 2022)

Semester – V (Elective-A)

Plant Biotechnology

UNIT – I Fundamentals of Plant tissue Culture

- Introduction to plant tissue culture, totipotency of plant cells (De differentiation, redifferentiation and regeneration)
- Nutritional requirements for plant tissue culture; nutrient media : macronutrients and micro nutrients, media additives (carbon source, vitamins, amino acids) types of media.
- Plant growth regulators; auxins, cytokinins and gibberellins
- Preparation of media, sterilization, selection and surface sterilization of explants, inoculation, incubation and culture of plant tissue in vitro.
- Induction of callus cultures and cell suspension cultures.
- Organogenesis and somatic embryogenesis.

UNIT – II Application of Plant Tissue Culture

- Meristem culture, micro propagation and their applications
- Encapsulation and production of synthetic seeds and their application.
- Cell suspension cultures (batch and continuous cultures) and applications.
- Protoplast isolation, culture and fusion; development of somatic hybrids and cybrids and their applications.
- Somaclonal variations and its applications
- Anther and pollen culture for production of haploids and their applications.
- Cryopreservation ; conservation of plant germplasm.

UNIT – III Production of Transgenic plants

- Direct gene transfer techniques; physical methods: microinjection, particle bombardment (gene gun) and electroporation and chemical methods.
- Molecular mechanism of agro bacterium infection and features of Ti plasmid.
- Agrobacterium mediated gene transfer using binary and cointegrate vectors.
- Viral vectors for gene transfer into plants.
Selection of transgenic plants using reporter and selection marker genes.
- Genome editing; CRISPR cas 9 Technology

UNIT – IV Application of Transgenic Plants

- Herbicide resistance in transgenic plants; glyphosate tolerance.
- Insect resistant transgenic plants; Bt cotton proteinase inhibitors, lectins

- Virus, bacterial and fungal resistant transgenic plants.
- Abiotic stress tolerance; drought, heat and salinity stress tolerant plants
- Transgenic plants with enhanced nutritional value; vitamin A, oil, amino acids.
- Transgenic plants as bioreactors; edible vaccines, antibody production, biodegradable plastics.

REFERENCE BOOKS

1. Plant Tissue Culture and its Biotechnological Applications - W.Barz, E. Reinhard, M.H.Zenk
2. Plant Tissue Culture - AkioFujiwara
3. Frontiers of Plant Tissue Culture --- Trevor A.Thorpe
4. In vitro Haploid Production in Higher Plants - S. Mohan Jain, S.K. Sopory, R.E.Veilleux
5. Plant Tissue Culture :Theory and Practice - S.S. Bhojwaniand A.Razdan
6. Plant Cell, Tissue and Organ Culture, Applied and Fundamental Aspects - Y.P.S.Bajaj and A. Reinhard

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIIrd Year (2021 – 2022)

Semester – V (Elective-A)

Plant Biotechnology

Practical:-

- Preparation of media for plant tissue culture
- Sterilization methods of explants
- Establishments of callus culture – from carrot/rice
- Preparation of synthetic seeds
- Meristem culture
- Cell suspension cultures
- Protoplast isolation and culture
- Agrobacterium mediated transformation

Spotters:-

- Callus cultures
- Sterilization techniques- autoclave and hot air oven
- Somatic embryos
- Synthetic seeds
- Meristem culture
- Plant regeneration
- Cell suspension cultures
- Isolation of protoplast
- Particle bombardment (gene gun)
- Binary or co integrate vectors
- Gus gene expression in transgenic plant tissue
- Golden rice

B.Sc. Biotechnology

IIIrd Year (2021 – 2022)

Semester – V (Elective-B)

Medical Biotechnology

UNIT – I Inheritance of Human diseases and karyotyping

- Inheritance patterns; pedigree analysis of autosomal traits
- Inheritance patterns; pedigree analysis of allosomal traits
- Factors affecting pedigree pattern; penetrance, expressivity
- Genetic heterogeneity; allele and locus heterogeneity
- Karyotyping of human chromosomes
- Chromosome staining; G , Q, R and C banding techniques

UNIT – II Genetic basis of human disorders

- Chromosomal disorders caused due to structural chromosomal abnormalities (deletions, duplications, translocations and inversions)
- Chromosomal disorders caused due to numerical chromosomal abnormalities (euploidy, aneuploidy, autosomal and allosomal)
- Monogenic disorders (autosomal and X – Linked diseases)
- Mitochondrial diseases; LHON, MERRF
- Multi factorial disorders; diabetes and hypertension
- Cancer; types of cancer, genetic basis of cancer (oncogenes, tumor suppressor genes)

UNIT – III Techniques for Diagnosis of Human diseases

- Prenatal diagnosis; invasive techniques; amniocentesis, chorionic villi sampling(Down's syndrome); Non – invasive techniques; ultrasonography (neural tube defects)
- Diagnosis using enzyme markers; Guthrie test (phenyl ketonuria)
- Diagnosis using monoclonal antibodies; ELISA (HIV)
- DNA/RNA based diagnosis; HBV
- PCR based genotyping techniques for diagnosis; RFLP (MTHFR C677T mutation)
- Chip based diagnosis and application; colon cancer

UNIT – IV Therapeutic approaches for human diseases

- Recombinant proteins; human growth hormone, insulin
- Gene therapy; ex vivo and in vivo gene therapy
- Stem cells; potency definitions, embryonic and adult stem cells
- Application of stem cell based therapies and regenerative medicine

- DNA based vaccines, subunit vaccines; herpes simplex virus, recombinant attenuated vaccines, cholera vaccine
- Applications of monoclonal antibodies

REFERENCEBOOKS:

1. Introduction to Human Molecular Genetics- J.JPasternak, JohnWiley Publishers
2. Human Molecular Genetics- Tom Strachen and A P Read, Bios Scientific Publishers
3. Human Genetics Molecular Evolution- McConkey
4. Recombinant DNA Technology- AEHEmery
5. Principles and Practice of Medical Genetics, I,II,III Volumes by AEHE dts.Emery
6. Medical Biotechnology- Pratibha Nallari, V. Venugopal Rao-Oxford Press
7. Medical Biotechnology1stEdition- Judit pongracz,MaryKeen
8. Medical Biotechnology by Bernard R. Glick, Terry L .Delovitch ,CherylL. Pattern. ASM press ,2014
9. Molecular Biotechnology - Principles and Applications of Recombinant DNA- 4th Edition by Bernard R. Glick ,JacJ. Paste rnack,CherylL.Pattern

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIIrd Year (2021 – 2022)

Semester – V (Elective-B)

Medical Biotechnology

PRACTICALS

1. Karyotyping of normal and abnormal human chromosome sets
2. Human pedigree analysis
3. Estimation of C-reactive protein
4. Dot ELISA
5. Genotyping of candidate genes for diseases by RFLP
6. Detection of DNA damage by comet assay
7. Encapsulation of mammalian cells
8. Stem cell culture
9. Cell culture techniques.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIIrd Year (2021 – 2022)

Semester – V

BASICS IN BIOTECHNOLOGY

GENERAL ELECTIVE

UNIT I : Agricultural Biotechnology

- Plant tissue culture- media, sterilization, culture types
- Micropropagation, synthetic seeds, somatic hybrids & haploid plants
- Transgenic plants – direct & indirect method of gene transfer
- Applications of transgenic plants – improving productivity & nutritional quality
- Application of transgenic plants – stress tolerant plants & molecular farming
- Biofertilizers & biopesticides

UNIT II – Microbial & Industrial Biotechnology

- Exploitation of microorganisms & their products
- Isolation, screening & selection of microorganisms for industrial products
- Preservation of microorganisms
- Strain development & improvement, strategies of strain improvement selection & recombination
- Production of recombinant DNA vaccine, amino acids, vitamins
- Single cell protein, dairy products, penicillin & streptomycin production

UNIT III- Animal & Medical Biotechnology

- Cell Culture technique & it's applications
- Animal breeding (selective breeding & cross breeding) & its limitations
- InVitro techniques in animal improvement , InVitro fertilization & microinjection
- Genetically modified animals , transgenic, & knock out
- Mouse models of disease cancer & diabetes
- Biotechniques, Gel Electrophoresis & PCR

UNIT IV: Computer applications in Biotechnology

- Scope of computer applications in Biotechnology
- Biotechnology tool & resources – role of Internet , free online tools, downloadable free software
- Biotechnology web portals –NCBI, EBL, EXPASy
- Biological databases – classification of databases – the primary (Genbank), Secondary (PIR) databases
- Sequence databases- DNA sequence databases (ENA & DDBJ)
- Protein sequence databases (SWISSPORT & PROSITE)

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

III Year (2021 – 2022)

Semester – V

**SKILL ENHANCEMENT COURSE- (SECC - V)
MOLECULAR MARKERS IN PLANT BREEDING**

Unit I: Molecular markers in Plant Breeding

- Principles of plant breeding : Breeding methods for self and cross pollinated crops
- Limitations of conventional breeding
- Development of molecular markers (RFLP, RAPD, SSRs, ISSRs, SNPs)
- Construction of molecular maps and linkage analysis
- Mapping populations for QTLs using molecular markers
- Use of molecular markers in plant breeding

Unit II: Applications of Molecular markers in Plant Breeding

- Selection of traits and markers for MAS
- Marker – trait association
- Marker assisted backcrossing and recurrent selection
- Marker assisted hybrid breeding
- Marker assisted gene pyramiding
- Improved varieties/ germplasm using MAS

Reference Books

1. Gupta PK. 2010. Plant Biotechnology. Rastogi Publications.
2. Chawla HS. 2011. Introduction to Plant Biotechnology. Oxford and IBH Publishing Co. Pvt Ltd.
3. Chittaranjan K. 2006-07. Genome Mapping and Molecular Breeding in Plants. Vols. I-VII. Springer.16
4. Newbury HJ. 2003. Plant Molecular Breeding. Blackwell Publ. Weising K, Nybom H, Wolff K & Kahl G. 2005. DNA Fingerprinting in Plants: Principles, Methods and Applications. Taylor & Francis.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIIrd Year (2021 – 2022)

Semester – VI (Elective-A)

Animal Biotechnology

UNIT – I Animal cell culture; principles and applications

- Cell culture techniques; cell culture media, sterilization techniques
- Characteristic features of cell lines and cell line maintenance
- Methods of isolation and separation of various cell types and establishment of cell lines
- Properties and types of stem cells, culturing of embryonic stem cells and adult stem cells.
- Manipulation of cells; electroporation, tranfection, transduction and microinjection
- Application of cell culture; manufacturing, toxicity testing and tissue engineering

UNIT – II In vitro techniques in animal improvement

- Principles of animal breeding; selective breeding, cross breeding and their limitations
- Super ovulation, collection of semen and ova
- In vitro maturation of oocytes, artificial insemination
- In vitro fertilization, embryo collection and embryo sexing
- Somatic cell nuclear transfer, cloning of animals (DOLLY)
- Applications of in vitro techniques in animal improvement

UNIT – III Molecular Markers in animal genetics

- Development in livestock genomics (estimated breeding values EBV)
- Molecular markers; types and characteristics
- RFLP and RAPD
- SNPs and their application in genotyping
- Identification and isolation of desired genes of interest
- Marker assisted selection

UNIT – IV Genetically modified organisms

- Animal model and their significance in scientific research

- Mouse models for cancer
- Generation of transgenic mouse
- Generation of gene Knock out mouse
- Genetically modified mice as disease models
- Applications of genetically modified animals in understanding diseases biology and drug development

REFERENCEBOOKS:

1. Practical animal breeding. Blackwell Science.
2. Houdebine L.M .Animal transgenesis and cloning. Wiley Publishers.
3. R. Ian Freshney. Culture of animal cells: a manual of basic technique and specialized applications.
4. Akano I E. DNA technology. IAP Academic Press.
5. Micklos D A, Fryer GA & Crotty D A .DNA science .Cold Spring Harbour.
6. Setlow J K. Genetic Engineering- Principles and methods. Springer.
7. Hare WCD & Elizabeth L Singh. Cytogenetics in animal reproduction .CABI.
8. Stine G J. The new human genetics. Wm C Brown Publ.
9. Summer A T& Chandley A C. Chromosome today. Chapman & Hall.
10. Falconer D S & Mackay TFC. An introduction to quantitative genetics .Longman.
11. Jain J P .Statistical techniques in quantitative genetics. Tata McGraw-Hill.
12. Pirchner F. Population genetics in animal breeding. S.Chand.
13. Plumer. Practical biochemistry.

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIIrd Year (2021 – 2022)

Semester – VI (Elective-B)

Environment Biotechnology

UNIT – I Environmental pollution

- Introduction to environment and pollution
- Types of pollution; air, water and soil pollution
- Types of pollutants; inorganic and organic and biotic
- Sources of pollution; domestic waste, agricultural waste, industrial effluents and municipal waste
- Green house gases, global warming and climate change
- Measurement methods of environmental pollution; BOD and COD

UNIT – II Biomass and biofuels

- Renewable and non renewable energy resources
- Fossil fuels as energy source and their impact on environment
- Biomass of source of energy (Bioenergy)
- Types of biomass; plant, animal and microbial biomass
- Production of biofuels; bioethanol and biodiesel
- Production of biohydrogen and biomethane

UNIT – III Biofertilizers and Biopesticides

- Chemical fertilizers and their impact on environment (eutrophication)
- Concepts of biofertilizers
- Type of biofertilizers; bacterial, fungal and algal biofertilizers
- Pesticides and their impact on environment
- Concepts of biopesticides; types of biopesticides
- Uses of biofertilizers and biopesticides

UNIT – IV Bioremediation of environmental pollution

- waste Water treatment; sewage and industrial effluents (aerobic and anaerobic methods)
- bioremediation; concepts and types (in situ and ex situ bioremediation)
- bioremediation of toxic metal ions – biosorption and bioaccumulation
- composting of organic waste
- microbial remediation of pesticides and xenobiotic compounds
- phytoremediation; concepts and application.

REFERENCEBOOKS:

1. Textbook of biotechnology by H.K.Das (Wiley Publications)
2. Biotechnology by H.J.Rehman and G.Reed.(VIH Publications ,Germany)
3. Biogas Technology By Nijaguna
4. Biotechnology by K.Trehan
5. Industrial Microbiology By L.E.Casida
6. Food Microbiology by M.R.Adams and M.O.Moss
7. Introduction to biotechnology by P. K. Gupta
8. Essentials of biotechnology for students by Satya N.Das
9. Bioethics- readings and cases by B.A. Brody and H.T. Engelhardt.
Jr.(Pearson Education)
10. Biotechnology, IPRs and biodiversity by M.B.Rao and Manjula
Guru(Pearson Education)

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIIrd Year (2021 – 2022)

Semester – VI (Elective-B)

Environment Biotechnology

Practical:-

- Estimation of BOD in polluted water samples
- Estimation of COD in polluted water samples
- Estimation of total dissolved solids in waste water sample
- Determination of quality of water sample (coliform test)
- Isolation of microorganisms from polluted soil/ industrial effluents
- Production of hydrogen or biogas
- Identification and characterization of bioremediation microorganisms
- Production of microbial biofertilizers

Spotters:-

- Air/ water/ soil pollution
- Municipal waste
- Industrial effluents
- Algal blooms
- Green house effect
- Plant biomass
- Waste water treatment plant
- Organic composting
- Biogas plant
- Xenobiotic degrading bacteria
- Phytoremediation
- Microbial biofertilizers

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIInd Year (2021 – 2022)

Semester – VI

SKILL ENHANCEMENT COMPULSORY COURSE (SECC – VI)

INTELLECTUAL PROPERTY RIGHTS

Unit I: Introduction to Intellectual Property Rights

- Intellectual property rights (IPR): genesis and scope.
- Types of Intellectual property rights: patent, trademarks, copyright, design registration, trade
- secret, geographical indicators, plant variety protection.
- Patents- objectives, rights, procedure of obtaining and working of patents, infringement.
- Copyrights - works protected under copyright law, rights, transfer of copyright.
- Trademarks - protection of good will, defenses, domain name.
- Geographical indications – International position, multilateral treaties, national level, Indian position
- International organizations – World Trade Organization (WTO), Trade-Related Aspects of Intellectual Property Rights (TRIPS), General Agreement on Tariffs and Trade (GATT).

Unit II: Biotechnology and Intellectual Property Rights

- Plant varieties protection- Rights of farmers, breeders and researchers, National gene bank, International union for the protection of new varieties of plants (UPOV), protection of plant varieties and farmers' rights act, 2001

- Animal breeder's rights, patenting animal breeds: Example of Animal patents (Dolly the cloned sheep, Super-salmon, Sex-selection in Animals, genetically manipulated dairy cows)
- Patenting microbes and organisms - Novelty, International Depository Authorities (IDAs), submitting details of the deposit.
Patenting genes - Pros and cons, ethics, examples
- Patenting markers and variants - examples
- Product vs process patent - Product life cycle and process design.

REFERNCE BOOKS

1. An Introduction to Ethical, Safety and Intellectual Property Rights Issues in Biotechnology"by Padma Nambisan
2. IPR, Biosafety and Bioethics" by Goel and Parashar
3. Genetically Modified Crops and Agricultural Development (Palgrave Studies in Agricultural Economics and Food Policy)" by MatinQaim
4. Biosafety and Bioethics" by Rajmohan Joshi
5. Bioethics and Biosafety in Biotechnology" by V Sree Krishna
6. Biotechnology, IPRs and Biodiversity - By M.B. Rao and Manjula Guru (Pearson Education)
7. Text Book of Biotechnology- By H.K. Das (Wiley Publications)
8. Biotechnology-By H.J. Rehm and G. Reed. VIH Publications, Germany

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

IIIrd Year (2021 – 2022)

Semester – VI

GENERAL ELECTIVE (GE - II)

- **Research methodology**

OR

- **Project work**

Anwarul Uloom College (Autonomous)

B.Sc. Biotechnology (2021 – 2022)

IIIrd year (V & VI Semester)

Model Paper

Time: 2Hrs

Max/Min Marks: 35/14

Section A

Short Answers/Concept based Questions.

Answer all questions

5x3=15m

10. Unit-I

11. Unit-II

12. Unit-III

13. Unit-IV

14. Choose one from any one unit

Section- B

(Essay Type Questions)

Answer all questions

4x5=20m

15. Unit-I

OR

Unit-I

16. Unit-II

OR

Unit-II

17. Unit-III

OR

Unit-III

18. Unit-IV

OR

Unit-IV

Anwarul Uloom College (Autonomous)

B.Sc. Biotechnology (2021 – 2022)

IIIrd year (V & VI Semester)

Practical Model Paper

Time: 3 hrs.

Max Marks: 25m

- | | |
|--------------------|-----------|
| 5. Major Question | 10 Marks. |
| 6. Minor Question | 5 Marks. |
| 7. Spots/Problem | 5 Marks. |
| 8. Record and Viva | 5Marks. |

Anwarul Uloom College (Autonomous)

B.Sc. Biotechnology (2021 – 2022)

IIIrd year (V & VI Semester)

Model Paper (Internals).

Marks = 15m

4) Choose the correct answer (10 X ½ = 5m)

5) Fill in the Blanks (10 X ½ = 5m)

6) Assignments (1 X 5 = 5m)

ANWARUL ULOOM COLLEGE (AUTONOMOUS)

B.Sc. Biotechnology

(2021 – 2022)

Minutes of the meeting.

The Board of Studies meeting for the year 2021 – 2022 of the Department of Biotechnology, Anwarul Uloom Degree College, Mallepally, Hyderabad was held on_____ At_____ in the Department of Biotechnology, Osmania University, Hyderabad.

- 1) The syllabus of I, II & III year theory was approved
- 2) The syllabus of I, II & III year practicals was approved
- 2) The model papers of I, II & III year were approved
- 3) The panel of examiners for theory and practicals of was approved.
- 4) SECC I, II, III, IV, V & VI were approved.

ANWARUL-ULOOM DEGREE COLLEGE (AUTONOMOUS)
B.Sc BIOTECHNOLOGY

PAPER SETTING AND VALUATION:

- | | |
|--------------------------|---|
| 1. Mrs. K.Archana | Annie Besant College. Hyderabad. |
| 2. Dr.A. Bhavani | Kasturba Gandhi women's college Hyderabad |
| 3. Mrs K.S.N. Jyoti. | Koti Women's College Hyderabad |
| 4. Mr. Hemanth kumar | Govt. City College, Hyderabad. |
| 5. Mrs. Syeda Salma. | Shadan Degree College, Hyderabad |
| 6. MsAdeeba khanum. | Shadan Degree College, Hyderabad |
| 7 .MrsAmena kausar. | Koti women's college Hyderabad. |
| 8. Mrs Nadeem Fatima. | Anwarululoom College, Hyderabad |
| 9. Mrs Khadija Al Khadir | Mumtaz College Hyderabad. |
| 10. Mrs. Farheen Ayesha | City College Hyderabad |
| 11. Miss. Saleah afreen | Koti women's college Hyderabad |

EXTERNAL EXAMINER:-

- | | |
|-------------------------|----------------------------------|
| • Mrs.Amena kausar. | Koti women's college Hyderabad. |
| • Mrs. Syeda Salma | Shadan Degree College Hyderabad. |
| • Mrs. K. Archana. | Annie Besant College Hyderabad. |
| • Mr. Hemanth Kumar | City College Hyderabad. |
| • Mr. Munawwar Khan | Mumtaz College Hyderabad. |
| • Mr Minallah Alvi | Mumtaz College Hyderabad. |
| • Mrs Khadija Al Khadir | Mumtaz College Hyderabad. |
| • Mrs. Farheen Ayesha | City College Hyderabad |
| • Miss. Saleah afreen | Koti women's college Hyderabad |

