Choice Based Credit System (CBCS)
Fifth Semester- Bachelor Of Science (MICRO-BIOLOGY)
Subject-CHEMISTRY
Code-BSCMB-501A

UNIT-I

Organic Compounds of Nitrogen: preparation, properties and chemical reactions of nitro alkanes and nitroarenes. Mechanism of nucleophilic substitution in nitroarenes and their reduction in acidic neutral and alkaline media, picric acids.Halonitroarenes; structure and nomenclature, and their activity. Amines structure, and nomenclature, physical properties and Stereochemistry, separation of mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines.

UNIT-II

Carbohydrates: Classification and nomenclature, monosaccharide, mechanism of osazone formation, chain lengthening and chain shortening of aldoses, epimerization, configuration of monosaccharide,erythro, threo diasterioisomers. Formation of glycosides, ethersand esters, determination of ring size of monosaccharide, cyclicstructure of D (+) glucose, mechanism of mutarotation.Structure of ribose and deoxyribose.

UNIT-III

Photochemistry: Electromagnetic radiation, range of different regions of the spectrum, different expression units for energy, wavelength and frequency Interaction of radiation with matter, difference between thermal and photochemical process. Laws of photochemistry – Grotthus-Draper law, Stark-Einstein law, Beer-Lambert law. Electronic transitions, JablonskiSdiagram depicting various quantum yield.

UNIT-IV

Bioinorganic Chemistry – I Essential and trace elements in biological processes, metalloporphyrins with special reference to hemoglobin and myoglobin, Biological role of alkali and alkaline earth metal ions with special reference to Ca2+.**Bioinorganic Chemistry – II-** Role of metal ions in biological process, nitrogen fixation, oxygen-uptake proteins, cytochromes and ferredoxins.

UNIT –V

Hard and Soft Acids and Bases (HSAB)of acids and bases as hard and soft, Pearson'HSAB concept, symbiosis.**Inorganic Polymers:** Introduction and scope of inorganic polymers, special characteristics, classification and their applications. Structure and nature of bonding in Silicones and triphosphonitrilic chloride.

Recommended Books:

1. Physical Chemistry-Puri, Sharma and Pathania, Vikas Publications, New Delhi
2. Physical Chemistry -G.M. Barrow, International Student Edition, McGraw Hill.
3. Inorganic Chemistry – J.D. Lee, John Wiley
4. Inorganic Chemistry – Cotton and Wilkinson, John Wiley

CHEMISTRY

PAPER: PRACTICAL

Inorganic Chemistry
Analysis of inorganic mixture containing five radicals with at least one interfering radical or typical combination
Gravimetric analysis Barium as barium sulphate.

Organic Chemistry
1. Acetylation.
2. Benzoylation
3. Meta-Dinitrobenezene
4. Picric Acid

Choice Based Credit System (CBCS)
Fifth Semester- Bachelor of Science (Microbiology)
Subject -Reproductive Biology of Angiosperms
BOTANY
Code-BSCMB 502A

UNIT I

Introduction : History ,contributions of G.B. Amici, W. Hofmeister, E. Strasburger, S.G. Nawaschin, P. Maheshwari, B.M. Johri, W.A. Jensen, J. Heslop-Harrison) and scope.

UNIT II

Reproductive development, Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects

UNIT III

Anther and pollen biology, Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Micro gametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia.

UNIT IV

Ovule (structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female gametophyte– megasporogenesis (monosporic, bisporic and tetrasporic) and mega gametogenesis (details of Polygonum type); Organization and ultrastructure of mature embryo sac. Pollination and fertilization, Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization

UNIT V

Self incompatibility, Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); Methods to overcome self- incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and in vitro pollination; Modification of stigma surface, parasexual hybridization; Cybrids, in vitro fertilization. Polyembryony and apomixes, Introduction; Classification; Causes and applications

Suggested Readings

1. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, Vikas Publishing House. Delhi. 5th edition
2. Shivanna, K.R. (2003). Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt. Ltd. Delhi. 38
3. Raghavan, V. (2000). Developmental Biology of Flowering plants, Springer, Netherlands.

BOTANY

Practical

1 Anther: Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation.

2. Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, psuedomonads, polyads, pollinia (slides/photographs, fresh material), ultrastructure of pollen wall(micrograph);Pollen viability: Tetrazolium test.germination: Calculation of percentage germination in differentmedia using hanging drop method.

3 Ovule: Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmic, bitegmic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs)

4. Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus

5. Intra-ovarian pollination; Test tube pollination through photographs

6. Endosperm: Dissections of developing seeds for endosperm with free-nuclear haustoria

Choice Based Credit System (CBCS)
Fifth Semester- Bachelor of Science (MICROBIOLOGY)

PAPER- : INDUSTRIAL MICROBIOLOGY
CODE-BSCMB503C

UNIT I

Introduction to industrial microbiology, Brief history and developments in industrial microbiology

UNIT II

Isolation of industrially important microbial strains and fermentation media No.of Hours: Sources of industrially important microbes and methods for their isolation, preservation and maintenance of industrial strains, strain improvement, Crude and synthetic media; molasses, cornsteep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates

UNIT III

Types of fermentation processes, bio-reactors and measurement of fermentation Types of fermentation processes - Solid-state and liquid-state (stationary and submerged) fermentations; batch, fed-batch (eg. baker's yeast) and continuous fermentations Components of a typical bio-reactor, Types of bioreactors-Laboratory, pilot- scale and production fermenters, constantly stirred tank and air-lift fermenters, Measurement and control of fermentation parameters - pH, temperature, dissolved oxygen, foaming and aeration

UNIT IV

Down-stream processing: Cell disruption, filtration, centrifugation, solvent extraction, precipitation, lyophilization and spray

UNIT V

Microbial production of industrial products (micro-organisms involved, media, fermentation conditions, downstream processing and uses) : Citric acid, ethanol, penicillin, glutamic acid, Vitamin B12 Enzymes (amylase, protease, lipase) Wine, beer

Enzyme immobilization . Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase)

SUGGESTED READINGS

1 Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited

2 Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited.

3. Waites M.J., Morgan N.L., Rockey J.S. and Higton G. (2001). Industrial Microbiology: An Introduction. 1st edition. Wiley – Blackwell

INDUSTRIAL MICROBIOLOGY

(PRACTICAL)

1.Study different parts of fermenter ,

2. Microbial fermentations for the production and estimation (qualitative and quantitative) of: (a) Enzymes: Amylase and Protease (b) Amino acid: Glutamic acid (c) Organic acid: Citric acid (d) Alcohol: Ethanol

3 A visit to any educational institute/industry to see an industrial fermenter, and other downstream processing operations.

Choice Based Credit System (CBCS)
Fifth Semester- Bachelor of Science (Microbiology)

Subject- FOOD FERMENTATION TECHNIQUES

Code-BSCMB505A

UNIT I

Fermented Foods Definition, types, advantages and health benefits

UNIT II

Milk Based Fermented Foods, Dahi, Yogurt, Buttermilk (Chach) and cheese: Preparation of inoculums, types of microorganisms and production process

UNIT III

Rain Based Fermented Foods : Soy sauce, Bread, Idli and Dosa: Microorganisms and production process

UNIT IV

Vegetable Based Fermented Food ; Pickels, Saeurkraut: Microorganisms and production process

UNIT V

Fermented Meat and Fish No of Hours: 4 Types, microorganisms involved, fermentation process Probiotic Foods: Definition, types, microorganisms and health benefits

Suggested Readings

1. Hui YH, Meunier-Goddik L, Josephsen J, Nip WK, Stanfield PS (2004) Handbook of food and fermentation technology, CRC Press

2. Holzapfel W (2014) Advances in Fermented Foods and Beverages, Woodhead Publishing.

3. Yadav JS, Grover, S and Batish VK (1993) A comprehensive dairy microbiology, Metropolitan 4. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer

Choice Based Credit System (CBCS)
Fifth Semester- Bachelor of Science (Microbiology)

SUBJECT- BIOFERTILIZERS AND BIOPESTICIDES

Code-BSCMB505B

UNIT I

General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.

UNIT II

Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. *Azotobacter*: classification, characteristics – crop response to *Azotobacter* inoculum, maintenance and mass multiplication.

UNIT III

Cyanobacteria (blue green algae), *Azolla* and *Anabaena azollae* association, nitrogen fixation, factors affecting growth, blue green algae and *Azolla* in rice cultivation.

UNIT IV

Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

UNIT V

Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.

Suggested Readings

1. Dubey, R.C., 2005 A Text book of Biotechnology S.Chand & Co, New Delhi.
2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay _Publication, New Delhi.
4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
5. Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New _Delhi.
6. Vayas,S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic _Farming Akta Prakashan, Nadiad