

IBS :: INSTITUTE FOR BIOLOGICAL STUDIES

The Complete EXAM Preparations Program FOR

[CSIR-UGC NET JRF] [SET] [GATE] [DBT-JRF] [ICAR-NET] [ICMR JRF] [GRE]

M.Sc. & Integrated Ph.D. [JAM-IIT , JNU, TIFR, IISC]

GATE Biotechnology Syllabus

UNIT : 1

BIOLOGY : Properties of amino acids, 10, 2°, 3°, 4° structures of protein, physical interactions, protein metabolism and urea cycle, heme and chlorophyll biosynthesis, protein related diseases. Enzymes and their kinetics, inhibitions, Allosteric Chromatography, mass spectroscopy, electrophoresis. Macro and micro nutrients- related diseases. Vitamins and their chemistry Biochemical thermodynamics, Enzyme kinetics NMR. ESR

CHEMISTRY: Atomic Structure Nuclear Chemistry

PHYSICS: motion in one, two and three dimension

MATHS: Number system, Permutations & Combinations

UNIT : 2

BIOLOGY : CARBOHYDRATE Structure of mono, di and polysaccharides and their chemical reactions carbohydrate metabolism- glycolysis, gluconeogenesis, HMP, glycogen metabolism, TCA, oxidative phosphorylation, Regulation of glucose metabolism . Diabetes case studies. GAGs. Glycoproteins.

LIPIDS Digestion, Absorption. Secretion. Transport through blood. Lipid biosynthesis, oxidation. Specialized fatty acids, ketone bodies. Phospholipid metabolism , Glycolipid metabolism,. Cholesterol and steroid metabolism

CHEMISTRY: Periodic Properties

PHYSICS: Newtons law of motion, Work power and Energy

MATHS: Probability- I & II

UNIT : 3

BIOLOGY : Membrane Alteration and dialysis Biomembranes and sub cellular organization of eukaryotic cells . transport across cell membranes, activity of neurons and synapse, major neurotransmitters Protein sorting- mitochondria and chloroplast protein synthesis and targeting, Peroxisomal protein, ER, Golgi . Post translational modification, exocytosis and endocytosis

CHEMISTRY: Chemical Bonding, Ionic Solids, Weak Interactions

PHYSICS: Uniform circular motion, rotatory motion of rigid bodies

MATHS: Complex Numbers, Logarithms

UNIT : 4

BIOLOGY : Cytoskeleton- actin , myosin, intermediate filament, cell locomotion, muscles , microtubules and their dynamics, Cilia and flagella. Cell cycle and its control in eukaryotes. molecular mechanism - yeast and mammalian cell. cell to cell interaction Important viral and bacterial diseases of plants, animal and Human.

CHEMISTRY: S-Block Element, P-Block Elements, Chemistry of Noble Gases, Chemistry of Elements of First Transition Series

PHYSICS: Gravitation, simple harmonic motion

MATHS: Binomial Theorem, Progressions

UNIT : 5

BIOLOGY : Classification of microbes and virus , Microscopy, N₂ fixation Microbial fermentation, antibiotics, organic acid and vitamins production . Important fungal viral and bacterial diseases of plants, animal and Human

CHEMISTRY: Chemistry of Elements of Second and Third Transition Series, Coordination Compounds, Thermodynamic and Kinetic Aspects of Metal Complexes, Magnetic Properties of Transition Metal Complexes, Electron Spectra of Transition Metal Complexes, Metal-Ligand Bonding in Transition Metal complexes

PHYSICS: Archimedes principle, elasticity surface tension, viscosity and Bernoulli principle, kinetic theory of gases

MATHS: Quadratic equations, Linear equations, Inequalities

UNIT : 6

BIOLOGY : Component of immune system- cells and organs, antigens / antibodies- structures and types. Ag/Ab reactions. B- cell maturation, Activation and Differentiation, Ag processing and presentation. T-cell maturation, Activation, Differentiation. immunological methods Complement system, cytokines, leukocyte migration, and inflammation, hypersensitive reactions, vaccines, Autoimmunity , AIDS, immune response to infectious diseases, transplantation, immunology

CHEMISTRY: Structure and Bonding, Mechanism of Organic Reactions, Stereochemistry of Organic Compounds, Optical Isomerism, Geometric Isomerism, Conformational isomerism

PHYSICS: Thermometry, calorimetry, expansion of solids, liquids and gases

MATHS: Trigonometry- Plane trigonometry, Solutions of triangle, Trigonometric equations

UNIT : 7

BIOLOGY : Mendel laws and their applications, genetic counseling, genetic interaction, multiple alleles, linkage analysis , crossing over , sex determination , sex - limited and sex - linked, chromatin structure and function .chromosome mutation, concept of gene, concept of gene, organelle genome, nuclear genome mutation and selection , gene transfer in bacteria.

CHEMISTRY: Alkanes and Cycloalkanes, Alkenes, Cycloalkenes, Dienes and Alkynes, Arenes and Aromaticity, Aromaticity, Aromatic electrophilic substitution

PHYSICS: thermodynamics, isothermal, adiabatic changes, transmission of heat

MATHS: Inverse Trigonometry, Heights & Distances

UNIT : 8

BIOLOGY : Southern , northern western south western hybridization , colony hybridization , Dot blot technique, PCR and its application, real time PCR, Molecular probes, Electrophoresis-agarose and SDS-PAGE Restriction endonuclease , selection of recombinant clones radioactivity. autoradiography. sedimentation.

CHEMISTRY: Alkyl and Aryl Halides, Polyhalogen compounds

PHYSICS: Wave motion, superposition of waves (beats, interference and stationary waves),

MATHS: Coordinate Geometry, The Point (2-D), Straight line

UNIT : 9

BIOLOGY : Nucleic acid structure ($1^\circ, 2^\circ, 3^\circ$) nucleic acid binding properties, recombination , Replication - initiation, priming, termination and regulation, DNA sequencing. PCR and its application . gene expressing and regulation, two hybrid system, Operon model . Processing of transcript, t-RNA genetic code, protein synthesis , DNA methylation multigene families . mobile genetic element, mutagenesis and DNA repair mechanism, Plasmid , recombinant DNA and molecular cloning, cloning vectors , gene libraries analysis and use of cloned DNA

CHEMISTRY: Alcohols, Monhydric Alcohols, Ethers and Epoxides, Phenols

PHYSICS: vibration of columns and strings, Doppler effect

MATHS: Circles, Conic sections

UNIT : 10

BIOLOGY : Origin of life . Concept of evolution . molecular evolution . Theories of organic evolution . Variability, isolation , selection , genetic drift , speciation . Population genetics , adaptation , mimicry geological distribution of animals , evolution of man , insular fauna

CHEMISTRY: Aldehydes and Ketones

PHYSICS: Reflection at plane and spherical surface, refraction at plane surface, refraction through spherical surface

MATHS: Sets, Relations and Functions, Limits and Continuity

UNIT : 11

BIOLOGY : Concept and dynamics of ecosystem, its components, types of ecosystem, food chain and energy flow, productivity and biogeological cycles, biological control, community structure and organization, Environmental pollution

CHEMISTRY: Carboxylic Acid, Carboxylic Acid Derivatives

PHYSICS: Eye optical instrument aberration and defect of vision, wave nature of light, photometry

MATHS: Differentiation, Higher Order Derivative.

UNIT: 12

BIOLOGY : Biological nomenclature , theories of biological classification , structural biochemical and molecular systematics , numerical taxonomy , biodiversity characterization generation maintenance and loss , magnitude and

distribution of biodiversity, concept of origin, economic value, wildlife biology, conservation strategies, cryopreservation

CHEMISTRY: Organic Compounds of Nitrogen

PHYSICS: Electric field and potential

MATHS: Application to derivatives - Rate Measure, Tangents & Normals, Increasing & Decreasing, Maxima & Minima.

UNIT:13

BIOLOGY : Study of Non-chordates (up to class level) and chordates (up to subclass level) :- Type study of Amoeba, Entamoeba, paramecium, trypanosome, plasmodium, leucosolenia, hydra, obelia, taenia solium, Ascaris, Pheritima, Periplanata Major disease caused by nonchordates to Man and Animals

CHEMISTRY: Heterocyclic Compounds

PHYSICS: Capacity and condenser

MATHS: Integration

UNIT:14

BIOLOGY : Study of major plant groups- fungi and lichens, algae, bryophytes, pteridophytes, gymnosperm and their economic importance

CHEMISTRY: Carbohydrates, Amino Acids, Peptides, Proteins and Nucleic Acids, Fats, Oils and Detergents Synthetic and Natural Polymers

PHYSICS: Electric conduction and heating effect of current, simple circuits

MATHS: Definite integration, Area bounded region

UNIT: 15

BIOLOGY : Plant development megasporogenesis and microsporogenesis, fertilization development of plant embryo development of seedling, root, shoot, leaf and flower. Classification of Angiosperms and study of important families:- Brassicaceae, Malvaceae, Fabaceae, Compositae, liliaceae, Graminae, Ranunculaceae

CHEMISTRY: Electromagnetic Spectrum : An introduction

PHYSICS: chemical effect of current and thermo-electricity

MATHS: Differential equations

UNIT:16

BIOLOGY : Physiology of skin, Digestion, Respiration, Circulation, Working of heart, Excretion

CHEMISTRY: Gaseous States, Molecular velocities, Liquid State, Solid State, Laws of crystallography

PHYSICS: Electromagnetism and magnetism, meters

MATHS: Matrix, Determinants

UNIT: 17

BIOLOGY : CNS & PNS, Sensory organs:- Eyes, Ear, Endocrinology. Reproductive organs and their physiology.

CHEMISTRY: Chemical Kinetics and Catalysis, Experimental methods of chemical kinetics, Theories of chemical kinetics

PHYSICS: Electromagnetic induction, alternating current

MATHS: 3- Dimensional Geometry, D.C, D.R, Plane

UNIT:18

BIOLOGY : Photosynthesis:- Light Reaction. C₃, C₄ cycle, CAM pathway, photorespiration, physiological and anatomical adaptations, absorption spectroscopy, fluorescence spectroscopy Phytochrome, blue light receptors

CHEMISTRY: Thermodynamics-I, First Law of Thermodynamics, Thermochemistry, Thermodynamics-II Second Law of Thermodynamics, Concept of Entropy, Third law of thermodynamics, Gibbs and Helmholtz functions

PHYSICS: Universe, diode and triode valves and semi-conducting devices,

MATHS: Vectors

UNIT: 19

BIOLOGY : Plant water relation, osmosis, diffusion, ascent of sap, respiration Major plant hormones:- Auxin Gibberellin, Cytokinin, ABA, ethylene and others

CHEMISTRY: Chemical Equilibrium, Acid and Bases, Hard and Soft Acids and Bases (HSAB), Non-aqueous Solvents, Solutions, Dilute Solutions and Colligative Properties, Colloidal State - Liquids in solids (gels)

PHYSICS: Solids, atomic models and spectra, radio-activity, nuclear structure and nuclear energy

MATHS: Statistics- Mean, Median, Mode, Standard deviation, Variance

UNIT : 20

BIOLOGY : Basic concept, cell fate and commitment, its mechanism mosaic and regulative development, maintenance of differentiation, pattern formation and compartmentalization Sex gametes formation, molecular biology of fertilization, gastrulation in invertebrates and vertebrates(Drosophila) and (chick) cell lineage. Axis specification in invertebrates and vertebrates fate of ectoderm, mesoderm and endoderm, cell differentiation mechanism and factors affecting it. Organogenesis in invertebrates and vertebrates, programmed cell death, aging and senescence

CHEMISTRY: Electrochemistry-I, Electrochemistry-II

PHYSICS: Cathode rays and positive rays, photo-electric effect, X-rays, Matter waves

MATHS:Miscellaneous Topics Hyperbolic Functions, Mensuration, Allegation.

Institute for Biological Studies

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