CSIR-UGC NET SYLLABUS

LIFE SCIENCES

PAPER I -SECTION A

There is no such syllabus for Paper 1 Section A but the question includes from **Computer, Biology, Chemistry, Physics, Mathematics** and **Geography**. Paper 1 Section A contains 30 questions, 5 from each Subject. We are trying to provide syllabus of these subjects that is based on the last 5 year question papers and from the view of some experts.

Computer
Biology
Chemistry
Physics
Mathematics
Geography

PAPER I -SECTION B

1. **Cell Biology**: Structure and function of cells and intracellular organelles (of both prokaryotes and eukaryotes) mechanism of cell division including (mitosis and meiosis) and cell differentiation: Cell-cell interaction: Malignant growth; Immune response: Dosage compensation and mechanism of sex determination.

2. **Biochemistry**: Structure of atoms, molecules and chemical bonds; Principles of physical chemistry: Thermodynamics, Kinetics, dissociation and association constants; Nucleic acid structure, genetic code, replication, transcription and translation: Structure, function and metabolism of carbohydrates, lipids and proteins; Enzymes and coenzyme; Respiration and photosynthesis.

3. **Physiology**: Response to stress: Active transport across membranes; Plant and animal hormones: Nutrition (including vitamins); Reproduction in plants, microbes and animals.

4. **Genetics**: Principles of Mendelian inheritance, chromosome structure and function: Gene Structure and regulation of gene expression: Linkage and genetic mapping; Extrachromosomal inheritance (episomes. mitochondria and chloraplasts); Mutation: DNA damage and repair, chromosome aberration: Transposons; Sex-linked inheritance and genetic disorders; Somatic cell genetics: Genome organisation (in both prokaryotes and eukaryotes).

5. **Evolutionary Biology**: Origin of life (including aspects of prebiotic environment and molecular evolution); Concepts of evolution: Theories of organic evolution: Mechanisms of speciation; Hardyweinberg genetic equilibrium, genetic polymorphism and selection; Origin and evolution of economically important microbes, plants and animals.

6. **Environmental Biology**: Concept and dynamics or ecosystem, components, food chain and energy flow, productivity and biogeochemical cycles; Types of ecosystems, Population ecology and biological control: Community structure and organisation: Environmental pollution: Sustainable development; Economic importance of microbes, plants and animals.

7. **Biodiversity and Taxonomy**: Species concept; Biological nomenclature theories of biological classification, Structural biochemical and molecular systematics: DNA finger printing, numerical taxonomy, Biodiversity, characterization, generation maintenance and loss: Magnitude and distribution of biodiversity, economic value, wildlife biology, conservation strategies, cryopreservation

PAPER II

1. Principles of Taxonomy as applied to the systamics and Classification of Plant Kingdom: Taxonoric structure:
Biosystematics; Plant geography; Floristics.

2. Patterns of variation in morphology and life history in plants: Broad outlines of classification AND evolutionary trends among algae, fungi, bryophytes and pteridophytes; Principles of palaeobotariy; Economic importance of algae, fungi and lichens.

3. Comparative anatomy and developmental morphology of gymnosperms and angiosperms: Histochemical and ultrastructural aspects of development; Differentiation and morphogenesis.

4. Androgensis and gynogenesis; Breeding system; Pollination biology; structural arid functional aspects of pollen and pistil; Male sterility; Self and inter-specific incompatibility Fertilization Embryo and seed development.

5. Plants and civilization; Centres of origin and gene diversity; Botany, utilization, cultivation and improvement of plants of food, drug, fibre and industrial values, Unexploited plants of potential economic value; Plants as a source of renewable energy: Genetic resources and their conservation.

6. Water Relation: Mineral nutrition; Photosynthesis and photorespiration; Nitrogen, Phosphorous and Sulphur metabolism; Stomatal physiology; Source and Sink relationship.

7. Physiology and biochemistry and seed dormancy and germination; Hormonal regulation of growth and development; Photoregulation: Growth responses, Physiology of flowering: Senescence.

8. Principles of plant breeding; important conventional methods of breeding self and cross-pollinated and vegetatively propagated crops: Non conventional methods; Polyploidy: Genetic variability; Plant diseases and defensive mechanisms.

9. Principles of taxonomy as applied to the systematics and classification of the animal kingdom; Classification and interrelationship amongst the major invertebrate phyla; Minor invertebrate phyla, Functional anatomy of the nonchordates; larval forms and their evolutionary significance.

10. Classification and comparative anatomy of protochordates and chordates; Origin, evolution and distribution of chordates groups: Adaptive radiation.

11. Histology of mammalian organ systems, nutrition, digestion and absorption; Circulation (open and closed circular, lymphatic systems, blood composition and function); Muscular contraction and electric organs; Excretion and osmoregulation: Nerve conduction and neurotransmitters; major se  nse organs and receptors; Homeostatis (neural and hormonal); Bioluminiscence; Reproduction.

12. Gametogenesis in animals: Molecular events during fertilization, Cleavage patterns and fate maps, Concepts of determination, competence and induction, totipotency and nuclear tiansfer experiments: Cell

differentiation and differential gene activity: Morphogenetic determinants in egg cytoplasm; Role of maternal contributions in early embryonic development; Genetic regulations of early embryonic development in Drosophila; Homeotic genes.

13. Feeding, learning, social and sexual behavior of animals; Parental care; Circadian rhythms; Mimicry; Migration of fishes and birds; Sociobiology; Physiological adaptation at high altitude.

14. Important human and veterinary parasites (protozoans and helminths); Life cycle and biology of Plasmodium, Trypanosoma, Ascaris, Wuchereria, Fasciola, Schistosoma and Leishmania; Molecular, cellular and physiological basis of host - parasite interactions.

15. Arthropods and vectors of human diseases (mosquitoes, lice, flies and ticks); Mode of transmission of pathogens by vectors; Chemical, biological and environmental control of anthropoid vectors; Biology and control of chief insect pests of agricultural importance; Plant host-insect interaction, insect pest management; useful insects: Silkworm

16. The law of DNA constancy and C-value paradox; Numerical, and structural changes in chromosomes; Molecular basis of spontaneous and induced mutations and their role in evolution; Environmental mutagenesis and toxicity testing; Population genetics

17. Structure of pro-and eukaryotic cells: membrane structure and function: Intracellular compartments, proteinsorting, secretory and endocytic pathways; Cytoskeleton; Nucleus; Mitochondria and chloroplasts and their genetic organisation; cell cycle; Structure and organisation of chromatin, polytene and lampbrush chromosomes; Dosage compensation and sex determination and sex-linked inheritance.

18. Interactions between environment and biota: Concept of habitat and ecological niches; Limiting factor; Energy flow, food chain, food web and tropic levels; Ecological pyramids and recycling, biotic community-concept, structure, dominance, fluctuation and succession; N.P.C. and S cycles in nature.

19. Ecosystem dynamics and management; Stability and complexity of ecosystems; Speciation and extinctions; environmental impact assessment; Principles of conservation; Conservation strategies; sustainable development.

20. Physico-chemical properties of water; Kinds of aquatic habitats (fresh water and marine); Distribution of and impact of environmental factors on the aquatic biota; Productivity, mineral cycles and biodegradation in different aquatic ecosystems; Fish and Fisheries of India with respect to the management of estuarine, coastal water systems and man-made reservoirs; Biology and ecology of reservoirs.

21. Structure, classification, genetics, reproduction and physiology of bacteria and viruses (of bacteria, plants and animals); Mycoplasma protozoa and yeast (a general accounts).

22. Microbial fermentation; Antibiotics, organic acids and vitamins; Microbes in decomposition and recycling processes; Symbiotic and asymbiotic N**2**-fixation; Microbiology of water, air, soil and sewage: Microbes as pathological agents in plants, animals and man; General design and applications of a biofermenter, Biofertilizer.

23. Antigen; Structure and functions of different clauses of immunoglobulins; Primary and secondary immune response; Lymphocytes and accessory cells; Humoral and cell mediated immunity; MHC; Mechanism of immune response and generation of immunological diversity; Genetic control of immune response, Effector mechanisms; Applications of immunological techniques.

24. Enzyme Kinetics (negative and positive cooperativity); Regulation of enzymatic activity; Active sites; Coenzymes Activators and inhibitors, isoenzymes, allosteric enzymes; Ribozyme and abzyme.

25. Van der Waalls, electrostatic, hydrogen bonding and hydrophobic interaction; Primary structure and proteins and nucleic acids; Conformation of proteins and polypeptides (secondary, Tertiary, quaternary and domain structure); Reverse turns and Ramachandran plot; Structural polymorphism of DNA, RNA and three dimensional structure of tRNA; Structure of carbohydrates, polysaccharides, glycoproteins and peptido-glycans; Helixcoil transition; Energy terms in biopolymer conformational calculation.

26. Glycolysis and TCA cycle; Glycogen breakdown and synthesis; Gluconeogenesis; Interconversion of hexoses and pentoses; Amino acid metabolism; Coordinated control of metabolism; Biosynthesis of purines and pyrimidines; Oxidation of lipids; Biosynthesis of fatty acids; Triglycerides; Phospholipids; Sterols.

27. Energy metabolism (concept of free energy); Thermodynamic principles in biology; Energy rich bonds; Weak interactions; Coupled reactions and oxidative phosphorylations; Group transfer Biological energy transducers; Bioenergietics.

28. Fine structure of gene, Eukaryotic genome organisation (structure of chromatin, coding and non-coding sequences, satellite DNA); DNA damage and repair, DNA replication, amplification and rearrangements.

29. Organization of transcriptional units; Mechanism of transcription of prokaryotes and eukaryotes; RNA processing (capping. polyadenylation, splicing, introns and exons); Ribonucleoproteins, structure of mRNA; Genetic code and protein synthesis.

30. Regulation of gene expression in pro and eukaryotes; Attenuation and antitermination; Operon concept; DNA methylation: Heterochromatization; Transposition; Regulatory sequences and transacting factors; Environmental regulation of gene expression.

31. Biochemistry and molecular biology of cancer; Oncogenes; Chemical carcinogenesis; Genetic and metabolic disorders; Hormonal imbalances; Drug metabolism and detoxification; Genetic load and genetic counseling.

32. Lysogeny and lytic cycle in bacteriophages; Bacterial transformation; Host cell restriction; Transduction; Complementation; Molecular recombination; DNA ligases; Topoisomerases; Gyrases; Methylases; Nucleases;
Restriction enctonucleases; Plasmids and bacteriophage base vectors for cDNA and genomic libraries.

33. Principles and methods of genetic engineering and Gene targeting; Applications in agriculture, health and industry.

34. Cell and tissue culture in plants and animals; Primary culture; Cell line; Cell clones; Callus cultures; Somaclonal variation; Micropropagation; Somatic embryogenesis; Haploidy; Protoplast fusion and somatic hybridization; Cybrides; Genetransfer methods in plants and in animals; Transgenic biology; Allopheny; Artificial seeds; Hybridoma technology.

35. Structure and organisation of membranes; Glycoconjugates and proteins in membrane systems; Ion transport, Na+IK+ATPase; Molecular basis of signal transduction in bacteria, plants and animals; Model membranes; Liposomes.

36. Principles and application of light phase contrast, fluorescence, scanning and transmission electron microscopy, Cytophotometry and flow cytometry, fixation and staining.

37. Principles and applications of gel-filtration, ion-exchange and affinity chromatography; Thin layer and gas chromatography; High pressure liquid (HPLC) chromatography; Electrophoresis and electrofocussing; Ultracentrifugation (velocity and buoyant density).

38. Principles and techniques of nucleic acid hybridization and Cot curves; Sequencing of Proteins and nucleic acids; Southern, Northern and South-Western blotting techniques; Polymerase chain reaction; Methods for measuring nucleic acid and protein interactions.

39. Principles of biophysical methods used for analysis of biopolymer structure, X-ray diffraction, fluorescence, UV, ORD/CD, Visible. NMA and ESA spectroscopy: Hydrodynamic methods: Atomic absorption and plasma emission spectroscopy.

40. Principles and applications of tracer techniques in biology; Radiation dosimetry: Radioactive isotopes and half life of isotopes; Effect of radiation on biological system: Autoradiography; Cerenkov radiation; Liquid scintillation spectrometry.

41. Principles and practice of statistical methods in biological research, samples and populations; Basic statistics average, statistics of dispersion. Coefficient of variation: Standard error; Confidence limits: Probability distributions (biomial, Poisson and normal); Tests of statistical significance: Simple correlation of regression; Analysis of variance.