STATE LEVEL ELIGIBILITY TEST
LIFE SCIENCES

SUBJECT CODE : 13

PAPER II
SECTION A

1. General information on science and its interface with society to test the candidate's awareness of science, aptitude of scientific and quantitative reasoning.

2. COMMON ELEMENTARY COMPUTER SCIENCE (Applicable to all candidates offering subject areas).

i) History of development of computers, Mainframe, micro's and Super Computer systems.

ii) General awareness of computer Hardwar i.e. CPU and other peripheral devices (input/output and auxiliary storage devices)

iii) Basic knowledge of computer systems software and programming language i.e. Machine language. Assembly language and higher level language.

iv) General awareness of popular commercial software packages like LOTUS, DBASE, WORDSTAR, other Scientific application packages.

PAPER II
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: Cellcell 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: Thermo-dynamics, 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 DMA 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. Enviornmental biology: Concept and dynamics or ecosystem, components, food chain and energy flow, productivity and biogeo-chemical 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 III

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

2. Patterns of variation in morphology and life history in plants, broad outlines of classification phytes and pteridophytes; Principles of palaeobotany; Economic importance of algae, fungi and lichens.

3. Comparative anatomy and develop-mental morphology of gymnosperms and angiosperms; Histochemical and ultrastructural aspects of development; Differentiation and morphogenesis.

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

5. Plants and civlization; 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 gemination; 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 invertabrate phyla; Minor invertabrate 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 sense 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 transfer 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, learing, 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 interation, 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 genetaics.

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 Iamphrush chromosomes; Dosage compensation and sex deter-mination 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 mana-gement 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 N2-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 reponse; Lymhocytes 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 Waal's 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 RNA; 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; Energyrich 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 repaid, DNA replication, amplification and rearrangements.

29. Organization of transcriptional units; Mechanism of transcription of prokaryotes and eukaryotes; RNA procession (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 ofgene expression.

31. Biochemistry and molecular biology and cancer; Oncogenes; Chemical carcinogenesis; Genetic and metabolic disorders; Hormonal imbaiances; 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 endonucleases; Plasmids and bacteriophage base vectorsfor cDNA 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; Callue cultures; Somaclonal variation; Micropropagation; Somatic embryogenesis; Haploidy; Protoplast fusion and somatic hydridization; 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 membranes; Glycoconjugates and proteins in membrane systems, ion transport, Na/KA/Pase; Molecular basis of signal transduction in bacteria, plants and animals; Model membranes; Liposomes.

36. Principles and application oflight, 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, NMR and ESR spectroscopy; Hydrodynamic methods, Atomic absorption and plasma emission spectors copy.

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 scientillation spectrometry.

41. Principles and practice of statistical methods in biological reserach, 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.

******