TEST NAME: 301 – LIFE SCIENCES

1. **Cell Biology:**
   Ultrastructure of prokaryotic and eukaryotic cell, Structural differences of plant and animal cell, Structure and function of cell organelles. Cell division – Mitosis and Meiosis. Chromosomes structure, Karyotype.

2. **Genetics:**
   Mendelian and non-Mendelian principles, Segregation and independent assortment, Gene Interaction, Linkage and Crossing over, Sex determination, Sex linkage, Mutations – Genetic and chromosomal (Physical and chemical mutagenesis); Polyploidy, Somatic hybrids and cybrids, Chromosomal aberrations in humans. Recombination in prokaryotes transformation, conjugation, transduction, sexduction. Extra genomic inheritance.

3. **Molecular Biology and Genetic Engineering:**
   Central dogma, Structure of eukaryotic gene, DNA and RNA structure, DNA replication in pro and eukaryotes, Transcription and translation in pro and eukaryotes, genetic code. Regulation of gene expression in prokaryotes (operon concept), Principles of recombinant DNA technology. DNA vectors, Transgenes is. Applications of genetic engineering.

4. **Biotechnology:**
   Plant and animal cell culture, cloning, Fermenters types and process, Bio pesticides, bio fertilizers, Bioremediation, Renewable and non – renewable energy resources, Non-conventional fuels.

5. **Biomolecules:**
   Carbohydrates, proteins, amino acids, lipids, vitamins and porphyrins. Enzymes – classification and mode of action, enzyme assay, enzyme units, enzyme inhibition, enzyme kinetics, Factors regulating enzyme action. Glycolysis, Kreb's Cycle, Oxidative Phosphorylation and fermentation.

6. **Immunology:**
   Types of immunity, cells and organelles of immune system, Antigen – antibody reaction. Monoclonal antibodies, Immunotechniques, Hypersensitivity, Complement system, Vaccines.

7. **Techniques:**
   Microscopy – Light and Electron, Centrifugation, Chromatography, Eletrophoresis, Calorimetric and Spectrophotometric techniques, Blotting techniques, PCR, DNA finger printing.

8. **Ecology, Environment and Evolution:**
   Theories and evidences of organic evolution, Hardy – Weinberg law. Basic concepts of Ecology (ecosystem, ecotone, ecotype, biome and biomass), Ecological pyramids and energy flow, Biogeochemical cycles, Ecological adaptations. Climatic and edaphic and biotic factors. Ecological succession – Hydrosere and xerosere, Natural resources, Biodiversity, current environmental issues, Environmental pollution, Global warming and climate change.
9. **Physiology:**
   Structure and function of liver, kidney and heart, composition of blood, blood types, blood coagulation, Digestion and absorption, Endocrinology, Muscle and Nervous system.

10. **Metabolism:**
    Metabolism of carbohydrates, lipids, proteins, aminoacids and nucleic acids. Biological oxidation and bioenergetics.

11. **Animal Science:**
    Biology of invertebrates and chordates; Embryology of chordates, Classification of marine environment – Physical and chemical parameters, Marine, estuarine, reservoir and riverine fisheries, Cultivation of fin and shell fish. Culture practices.

12. **Plant Science:**
    Classification of cryptogams and phanerogams. General characteristics of taxonomic groups at class and family level Water relations and mineral nutrition of plants, Plant growth regulators (Phytohormones), Ethnobotany and medicinal plants, Biology of plant seed, Photosynthesis, Nitrogen fixation, Transpiration.

13. **Microbiology:**
    Microbes – Types, distribution and biology. Isolation and cultivation of bacteria and virus. Staining techniques. Bacterial growth curve, Microbial diseases – food, air and water borne, insect borne, contact diseases in humans. Microbial diseases in plants – by bacteria, fungi and virus, Plant microbe – interactions.

14. **Nutrition:**
    Types of nutrition (autotrophs and heterotrophs), Biological value of proteins, protein malnutrition, disorders, Chemistry and physiological role of vitamins and minerals in living systems.

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