

## GROUP-49

### (LEVEL- 10+2 with science, Diploma in Lab Technician)

1) General awareness, Reasoning, Mathematics, Science, History including Haryana related history, current affairs, literature, Geography, Civics, Environment, Culture etc.- (Weightage 20%)

2) Computer terminology, Fundamentals, word software, excel software, Power point, internet, web browsing, Communication, emails, downloading and uploading data on websites etc. - (Weightage 10%)

3) Subject related syllabus- (Weightage 70%)

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#### Physics:

**Electromagnetic waves:** Basic Idea of displacement current, Electromagnetic waves, Sources, and Characteristics of EMW, Transverse Nature of EMW (qualitative Ideas only) Electromagnetic Spectrum, (Radio waves, Microwaves, infrared visible, ultraviolet, X-rays, gamma rays). including elementary facts about their uses.

**Ray optics and optical instruments:** Ray optics: Reflection of light by spherical mirrors, Mirror formula, refraction of light, lateral shift of a ray refraction through a glass slab, real and apparent depth, Advance Sunrise and delayed sun set due to atmospheric refraction, Total internal reflection, and its applications, Optical fibre, Mirage, totally reflecting prism, Brilliancy of diamond, Refraction at convex spherical surfaces. Lenses, Refraction by a lens, Power of a lens, Combination of thin lenses and mirror in contact, lens formula lens maker's formula. Refraction and Dispersion of light through a prism, pattering of light-blue colour of sky and reddish appear of the sun at sunrise and sunset. Some Natural phenomena due to sunlight- The rainbow. Optical instruments: - Microscopes and Astronomical telescopes (reflecting and refracting) and their magnifying powers.

**Atoms:** Alpha- particle Scattering experiment. Rutherford's Model of atom, Drawbacks of Rutherford's Model. Bohr's Model of hydrogen atom- postulates, Bohr radius, Total Energy of electron in nth orbit. Energy levels of hydrogen atom The line spectra of hydrogen atom.

**Nuclei:** Atomic masses & composition of Nucleus, Size of nucleus isotopes, isobars isotones Mass energy relation, Nuclear Binding Energy and Mass Defect. Binding Energy and Mass Defect. Binding Energy Curve, Radioactivity. Law of radioactive decay, Alpha, Beta & Gamma particles/rays and their properties, nuclear fission and fusion.

#### Chemistry:

**Solution:**Types of solutions, expression of concentration of solution of solid in liquids, solubility of gases in liquids, (Henry's law) solid solutions, colligative properties- relative lowering of vapour pressure, Raoult's law, ideal and non-Ideal solutions, osmotic pressure, osmosis and it's applications, depression of freezing point, elevation of boiling point, determination of molecular masses using colligative properties, Abnormal molecular masses, Van't Hoff- factor, Van't Hoff equation for colligative properties.

**Electrochemistry:** Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, variation of conductivity with concentration, Kohlrausch's law, electrolysis and laws of electrolysis (only elementary Idea), Electrochemical cell, (construction, representation and working) dry cell- electrolytic cells, lead accumulator, Ni-cd cell, fuel cell, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, reference electrode (NHE) Relation between Gibb's free energy change and EMF of a cell, Electrochemical series and it's applications.

**Coordination compounds:**Coordination compounds- Introduction, difference between Coordination compounds and double salts, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mono nuclear Coordination compounds, bonding in complex compounds, Werner's theory, VBT and CFT: Structure and stereo isomerism, importance of Coordination compounds (In qualitative inclusion, extraction of metals and biological system).

## Biology:

### Structural Organization in Animals and Plant:

**Cell-**The Unit of Life Cell theory and cell as the basic unit of life, structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall; cell organelles - structure and function; endomembrane system, endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids, microbodies; cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); nucleus.

**Biomolecules Chemical constituents of living cells:** biomolecules, structure and function of proteins, carbohydrates, lipids, nucleic acids; Enzyme - types, properties, enzyme action. (Topics excluded: Nature of Bond Linking Monomers in a Polymer, Dynamic State of Body Constituents – Concept of Metabolism, Metabolic Basis of Living, The Living State)

**Cell Cycle and Cell Division:** Cell cycle, mitosis, meiosis and their significance

### Genetics and Evolution:

**Heredity and variation:** Mendelian inheritance; deviations from Mendelism – incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination - in humans, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorders in humans - thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

**Molecular Basis of Inheritance:** Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central Dogma; transcription, genetic code, translation; gene expression and regulation - lac operon; Genome, Human and rice genome projects; DNA fingerprinting.

**Evolution:** Origin of life; biological evolution and evidences for biological evolution (palaeontology, comparative anatomy, embryology and molecular evidences); Darwin's contribution, modern synthetic theory of evolution; mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy - Weinberg's principle; adaptive radiation; human evolution.

### Ecology and Environment:

**Organisms and Populations:** Population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution. (Topics excluded: Organism and its Environment, Major Abiotic Factors, Responses to Abiotic Factors, Adaptations)

**Ecosystems:** Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy (Topics excluded: Ecological Succession and Nutrient Cycles)

**Biodiversity and its Conservation:** Biodiversity-Concept, patterns, importance; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, Sacred Groves, biosphere reserves, national parks, wildlife, sanctuaries and Ramsar sites.

## ANATOMY:

Introduction of Bones of the Human Body of : Upper Limb : clavicle, scapula, humerus, radius, ulna, carpus, metacarpus & phalanges Lower Limb : hipbone, femur, tibia, fibula, tarsus, metatarsus & phalanges Skull : name the bone of skull and sutures between them Thorax : ribs and their articulations Vertebral Column : Cervical, thoracic, lumbar, sacral and coccygeal vertebrae.

Surface Markings of the Body : Nine regions of the abdomen Four quadrants of the Hip

Respiratory Organs: Nasopharynx Oropharynx Larynx Trachea Bronchi Lungs (and their lobular segments) Thoracic cavity Pleura and Pleural cavity

Circulatory Organs: Anatomical position of the heart Pericardium of the heart Chambers of the heart Great vessels of the heart Valves of the heart

Digestive Organs : Tongue Teeth Oral cavity Pharynx Oesophagus Stomach Small intestine Large intestine and its colons.

Reproductive Organs: Male & Female Gonads : Testes, Epididymis, Ovary, Fallopian Tube, Uterus, Vagina etc., Introduction of male Genital Organs, Introduction of female Genital Organs.

Liver and Spleen: Introduction, Anatomical Position, Gall bladder.

Excretory Organs; Cortex and medulla of kidney, Ureter, Urinary Bladder, Urethra (male and female)

Muscles: Introduction, Origin and Insertion, Function.

## **PATHOLOGY:**

**The Cell in health and disease:** Introduction of pathology Cellular structure and metabolism Inflammation – Acute and Chronic Derangement of Body Fluids and Electrolytes, Types of shocks, Ischaemia, Infection Neoplasia – Etiology and Pathogenesis.

**Introduction of haematology:** Formation of Blood Erythropoiesis Leucopoiesis Thrombopoiesis Collection of Blood Anticoagulants Red cell count – Haemocytometer, Methods and Calculation WBC Count -- Methods Differential Leucocytes Count (DLC)-- Morphology of White Cells, Normal Values, Staining procedures Counting Methods, Principle of staining Hb estimation – Method Colorimetric, Method Chemical, Method Gas metric, Method S.G., Method Clinical Importance.

**Haematology:** ESR Methods Factors – Affecting ESR Normal Values Importance RBC – Indices WBC • Platelets.

**Body Fluids:** Urine: Method of Collection Normal Constituents, Physical Examination, Chemical Examination, Stool Examination: Method of Collection Normal Constituents and appearance, Abnormal Constituents (Ova, Cyst), C.S.F. Examination, Physical Examination, Chemical Examination Microscopy, Cell 1 Count, Staining, Semen Analysis, Collection Examination Special Tests.

**Human blood group:** antigens and antibodies, ABO Blood group systems, Sub. – group, Source of antigens and types of antibodies, Rh Blood group System, Types of Antigens, Mode of Inheritance, Types of Antibodies, Other Blood group Antigens, Blood Collection, Selection and screening of donor, Collection of blood, Various anticoagulants, Storage of Blood, Changes in Blood on Storage.

## **BIOCHEMISTRY:**

**Introduction of Biochemistry:** Elementary knowledge of inorganic chemistry: - Atomic weight, molecular weight, equivalent weight, acid, bases. Definition and preparation of solutions: Percent solution, Molar solution, Normal Solution and Buffer Solution etc. Definition and preparation of Reagent. Unit of measurement Elementary knowledge of organic chemistry Organic compounds Aliphatic and Aromatic Alcohols, Aldehydes, Ketones, Amines, Esters, Phenol etc Ph indicators: pH paper, universal and other indicators, pH measurement: different methods.

**Glassware:** Composition of Glass General Glass wares Instruments: Balance Hot Plate and Magnetic stirrer Centrifuges Incubators Constant temperature bath Colorimeter: Principle, Function Photometer Flame Photometry Aim and Scope of Biochemistry Collection and Recording of Biochemical Specimen, separation of serum/plasma preservation and disposal of biological material. Chemical examination of urine: Qualitative, Sugar, Protein, Bile Salt, Bile Pigment, Ketones Bodies Chemical examination of Stool: Occult Blood. Chemical examination of other Body Fluids: CSF, Plural Fluids, Ascitic Fluid etc. Laboratory management and Maintenance of Records. Urine Examination physical, Chemical, Microscopic, Biochemistry Stool Examination Body Fluids: Physical and chemical examination CSF, Pleural Fluids, and Ascitic fluid.

**Carbohydrates:** - Introduction, Importance, Classification, Properties, Estimation of Glucose, Clinical Significance.

**Protein :** - Introduction and Physiological importance, Amino acids, Essential amino acids, Classification, Denaturation of Proteins, Estimation of Total protein, Albumin, Globulin, A/G Ratio Introduction, Properties and function of important hormones.

**Enzymes and Co-enzymes;** Introduction and difference, Functions, Estimation of important enzymes, SGOT (AST), SGPT (ALT), Alkaline Phosphatase, Acid Phosphatase, Amylase, lactate dehydrogenase, CPK, CPK-MB.

**Lipids:** - Introduction and functions, Classification Steroids, Metabolism Estimation: Total lipids, HDL, LDL, VLDL, Total cholesterol, Triglyceride, Clinical significance, Principal of Assay procedures for biological material and estimation of kidney function tests. Urea, Uric acid, Creatinine.

**Electrolytes:** Function Properties Estimation of Essential electrolytes: Sodium, potassium, calcium, chloride and Phosphorus etc. Clinical Importance Genetics DNA, RNA Structure Gene coding Transcription & Translation Genetic Disorders.

## **MICROBIOLOGY:**

**Introduction of brief history of Microbiology:** Historical Aspect Relationship of Micro-organism to men, Micro-organism in Disease and Health, Requirement and uses of common Laboratory Equipment, Incubator, Hot Air Oven, Water Bath Anaerobic Jar, Centrifuge, Autoclave Microscope Glassware – Description of Glassware, its use, handling and care Sterilization : Definition Classification and General Principal of Sterilization Autoclave – its structure, functioning, control and indicator, Definition, Types Mode of Action Uses Collection, Transportation and processing of clinical samples for Microbiological Investigations.

**Bacteriology:** Definition Bacteria – General characteristics of Bacteria Classification and morphology of Bacteria Structure of Cell, Capsule, Flagella, and Spore Growth of Bacteria Nutrition of Bacteria.

**Virology:** Definition General Introduction of Virus Physiochemical characteristic of Viruses Diseases caused by different Virus and mode of infection.

**Parasitology:** Definition General Characteristics of Parasite Classification of Parasite Mode of transmission.

**Fungus:** Definition Structure Classification.

**Staining of Bacteria:** Composition and preparation of staining Principal and Procedure of Bacteriological stain Gram's Stain Ziehl-Neelsen Stain Albert Stain Spore and Negative Stain.

**Cultivation of Micro-organism:** Introduction and uses of culture Classification of culture media Composition of common of Laboratory culture media Special media and preparations Techniques of inoculation and isolation antimicrobial sensitivity Anaerobic cultivation techniques.

**Isolation of Viruses in Laboratory by tissue culture:** Cell and tissue culture technology, Embryonated Egg, Principles of animal cell culture and their use in Virology, Different staining techniques used in Virology, Principle of different serological test used in Virology, Mode of Transmission of Viral agents, Prevention of Viral disease Immunity in Viral infection.

**Immunology:** Definition, Immunity: Definition and Classification Antigen Antibodies – Immunoglobulin, Antigen and antibody, reaction and clinical importance, Structure and function of immune system, Immune response Hypersensitivity.

**Principal & Procedure of Serological Tests:** BICAL, CRP, Brucella, Agglutination, ASO Cold agglutination, VDRL, TPHA Advanced techniques in Microbiology ELISA, RIA etc. Epidemiological Markers of Micro-organism serotyping Preparation & Standardization of Antigen and Antisera Preparation & Standardization of vaccine and immunization.

**General Introduction, life cycle, mode of transmission, pathogenicity, and lab diagnosis of various Protozoa:** Entamoeba Histolytica, Entamoeba coli, Giardia lamblia, Trichomonas vaginalis, Leishmania Donovan.

**Cestodes or Tapeworms:** Taenia solium, Taenia saginata, Hymenolepis nana, Echinococcus granulosus.

**Trematodes of Flukes:** Fasciola hepatica, Fasciola gigantica, Gastrodiscoides hominis.

**Nematodes:** Trichinella spiralis, Trichuris trichiura, Ancylostoma duodenale, Enterobius vermicularis, Ascaris lumbricoide.

## **PHYSIOLOGY:**

**The important physico-chemical laws applied to physiology:** Diffusion, Osmosis, Bonding, Filtration, Dialysis, Surface Tension, Adsorption Colloid.

**Fundamentals of different Organ Systems:** Cardiovascular System, Respiratory System, Digestive System, Excretory System, Reproduction System, Endocrine System, Lymphatic System.

**Blood:** Definition, Composition, Function, Formation of different type of blood cells; Erythrocytes, Leucocytes, Thrombocytes, Mechanism of Blood Clotting; Cerebrospinal Fluid Formation, Composition, Function, Special Senses; Hearing, Taste, Smell, Touch, Sight.

**Important Note: The Weightage as mentioned against the syllabus is tentative & may vary.**