Syllabus

(Lower Division Clerk)

English Language: Spot the Error, Fill in the Blanks, Synonyms/ Homonyms, Antonyms, Spellings/ Detecting mis- spelt words, Idioms & Phrases, One word substitution, Improvement of Sentences, Active/ Passive Voice of Verbs, Conversion into Direct/ Indirect narration, Shuffling of Sentence parts, Shuffling of Sentences in a passage, Cloze Passage, Comprehension Passage.

General Intelligence: It would include questions of both verbal and non-verbal type. The test will include questions on Semantic Analogy, Symbolic operations, Symbolic/ Number Analogy, Trends, Figural Analogy, Space Orientation, Semantic Classification, Venn Diagrams, Symbolic/ Number Classification, Drawing inferences, Figural Classification, Punched hole/pattern-folding & unfolding, Semantic Series, Figural Pattern-folding and completion, Number Series, Embedded figures, Figural Series, Critical Thinking, Problem Solving, Emotional Intelligence, Word Building, Social Intelligence, Coding and de- coding, Numerical operations, Other sub-topics, if any.

Quantitative Aptitude:

Number Systems: Computation of Whole Number, Decimal and Fractions, Relationship between numbers.

Fundamental arithmetical operations: Percentages, Ratio and Proportion, Square roots, Averages, Interest (Simple and Compound), Profit and Loss, Discount, Partnership Business, Mixture and Allegation, Time and distance, Time and work.

Algebra: Basic algebraic identities of School Algebra and Elementary surds (simple problems) and Graphs of Linear Equations.

Geometry: Familiarity with elementary geometric figures and facts: Triangle and its various kinds of centres, Congruence and similarity of triangles, Circle and its chords, tangents, angles subtended by chords of a circle, common tangents to two or more circles.

Mensuration: Triangle, Quadrilaterals, Regular Polygons, Circle, Right Prism, Right Circular Cone, Right Circular Cylinder, Sphere, Hemispheres, Rectangular Parallelepiped, Regular Right Pyramid with triangular or square Basic. Trigonometry: Trigonometry, Trigonometric ratios, Complementary angles, Height and distances (simple problems only) Standard Identities like sin20+ Cos20-1 etc.

Statistical Charts: Use of Tables and Graphs: Histogram, Frequency polygon, Bar-diagram, Pie-chart.

General Awareness: Questions are designed to test the candidate's general awareness of the environment around him and its application to society. Questions are also designed to test knowledge of current events and of such matters of everyday observation and experience in their scientific aspect as may be expected of an educated person. The test will also include questions relating to India and its neighboring countries especially pertaining to History, Culture, Geography, Economies, General polices, General Science and scientific research. For VH candidates of 40% and above visual disability, there will be no component of Maps/Graphs/ Diagrams/ Statistical Data in the General Intelligence and Quantitative Aptitude part.

Syllabus

(Laboratory Technician)

Unit-I Anatomy & Physiology

a) Musculo-skeletal system
- Bones-types, structure, and functions

b) b) Digestive System: -
- Gross anatomy of digestive organs
- Physiology of Digestion"
- Digestive juices-Secretion, Composition and functions

c) Respiratory System:
- Gross anatomy of respiratory organs
- Physiology of respiration
- Oxygen and Carbon dioxide transport

d) Cardiovascular System: -
- Gross anatomy of heart and blood vessels

e) Excretory System: -
- Gross anatomy of excretory organs
- Function of Kidneys, mechanism of urine formation.
- Structure and function of Kidney

f) Reproductive System: -
- Gross anatomy of Male & Female reproductive organs
- Physiology of menstruation

g) Cerebro spinal fluid
- Formation, composition of CSF

h) Endocrine System: -
- Gross anatomy of endocrine organs
- Brief description of Endocrine hormone and their functions.

Unit–II Biochemistry

a) Introduction and scope of Biochemistry, cleaning and care of laboratory glassware and equipment's, preparation and storage of Distilled water, Analytical balance, calorimeter, spectrophotometer, pH Meter, flame photometer, S.I. unit of measurement, Preservation and disposal of biological sample, Basic statistics –mean, median, modes, SD, CV, normal reference ranges. Acid and base, pH, buffer solution, indicator, standard solution, storage of chemicals, water, electrolytes, acid base balance

b) * Carbohydrate, Lipids, Proteins – Classification, Properties, Biological importance, functions.
   - Amino acids, nucleic acids, Enzymes, Co–enzymes–Definition, classifications, Biological role/importance.

c) Glycolysis, TCA–cycle, Electron transport chain, Pentose Phosphate Pathway, Gluconeogenesis, Gluconeogenesis, Cori–cycle, Blood sugar and its regulation.

d) Fatty acid, cholesterol, lipoproteins, Purine ribonucleotide – Biosynthesis, utilization, Ketone bodies formation and its utilization.

e) Amino acids, vitamins, mineral–classification, biological role, deficiency state.
   - Transamination, Deamination, Biological importance of catecholamine, GABA, Serotonin, Histamine, Melanin.

f) * Tumour – markers – Brief history, classifications, clinical applications, Laboratory test (AFP, CEA, PSA)
   - Liver function test, renal function test.
   - Thyroid function test, Enzymes, and co–enzyme in diagnosis of the diseases, Hormone analysis.
   - Cardiac function test
   - Qualitative test for–Carbohydrates, lipids, proteins, Bence Jonce's Protein
   - Estimation of Serum electrolytes, and bicarbonates Blood sugar
   - Quantitative test for organic constituent (Urea, uric acid, creatinine) inorganic constituent (sodium, Potassium, calcium, ammonia, chloride, Phosphate, bicarbonate and sulphate in urine with clinical significance and study of abnormal constituent or urine (glucose, Protein ketone bodies, blood, bile salt, bile pigments.

g) *Radioimmune Assay(RIA)
   - Enzyme Link Immuno sorbent Assay (ELISA)
   - Chromatography (thin layer paper, gas, liquid Electrophoresis, (gel electrophoresis, liquid electrophoresis)

Unit–III Microbiology

a) * Introduction, brief history of Microbiology, origin of microbial life – theory of spontaneous generation.
*Safety measures in microbiology
- Classifications and nomenclature of bacteria(five kingdom concept)
- Sterilization–Principle, methods, antiseptic, disinfectants.
- General characteristic of Bacteria, anatomy of bacteria (shape, size, components)
- Growth and nutrition of bacteria, classification of bacteria on the basis of nutritional requirements, measurement of cell mass and factor affecting growth.
- Cultivation of microbes(Bacteria)
- Culture technique (media preparation and inoculation
- Isolation of Purecultures (streak plate, spread plate, pours plate and serial dilution)
- Identification of microbes by colony morphology.

b) Bacteriology, Normal Micro flora of human body, Germ theory of diseases, microbial infection(types, sources and transmission)
- Bacterial toxin (Endotoxin & exotoxin)
- Bacterial morphology, isolation, identification, Pathogenicity, Lab diagnosis(Culture, Biochemical test, Hanging drop method for motility, Anaerobic, aerobic culture methods of staphylococcus, streptococcus, Neisseria Gonorrhea, N.meningitidis, Clostridium tetani & C.perfringens
- E.coli, Vibrio cholera, Salmonella typhi, Shigella, Mycobacterium/ Mycobacterium tuberculosis, Spirochetes–Treponema pallidum.
- Collection, preservation, transportation of clinical specimens for microbial investigation.
- Bacteriological methods of examination of blood, faeces, pus, sputum, throat swab and urine
- Antibiotic sensitivity test(Disc diffusion and broth dilution methods)
- Hospital acquired infections and their control.
- Waste disposal and management

c) Instruments & Glassware:
- Autoclave, Incubator, Laminar Airflow,
- Hot air oven, water bath, vortex shaker,
- Petridish, testtube, screwcaptube, glasspreader/L–rods, Pasteurpipettes.

d) Medical Mycology:
- Classification and nomenclature of fungi
- General characteristics, structures, reproduction, cultivation
- Medically important Division of fungi
- Morphology, culture characteristics, Pathogenicity, Lab diagnosis of Common Pathogenic fungi, (Aspergillus Sp., Candida Sp., Cryptococcus Sp., Dermatophytes, Penicillium Sp.)

e) Immunology

- Introduction, Antigens (Types and properties) Antibodies/ Immunoglobin types and properties)
- Antigen – antibody reactions and their applications (Agglutination, precipitation, complement fixation and neutralization tests)
- Immunity(Innate & Acquired)
- Hypersensitivity
- Immunodeficiency diseases

f) Serology
- Quality control measures in serology
- Common serological technique and their applications (VDRL, Widal, RA test, ASO, Pregnancy test, Hbs Ag and HCV, HIV, Mantoux test)

g) Medical Virology
- Classification, nomenclature, general characteristics (Morphology, chemical, biological properties and multiplication)
- Cultivation of viruses (chick embryo, cell culture and animals)
- Bacteriophages (lyticandlysogeniccycles)
- Morphology, cultural characteristics, Pathogenicity and Laboratory diagnosis of the following viruses
    - ❖ Poliomyelitis
    - ❖ Mumps
    - ❖ Measles
    - ❖ Hepatitis A, B, C
    - ❖ Cytomegalovirus
    - ❖ Rabies
    - ❖ HIV/AIDS

h) Molecular Biology
- Introduction
- DNA &RNA
- Isolation of DNA (Genomic & Plasmid)
- Plasmids(types and Importance)

i) Principles, methods and application of
- ELISA, Immuno fluorescence test, Western Blot
- PCR

Unit–IV Parasitology

a) Introduction, classification, characteristics of human parasites
   - Collection, storage and transportation of specimens, preservation of parasites
   - Morphology, transmission, lifecycle, Pathogenicity and Lab. Diagnosis of:–
     - ❖ Entamoebahistolytica, Giadia Lamblia, Trichomonasvaginalis, Leishmaniadonovani and L. tropica. Plasmodia species, Toxoplasma gondii, nematodes–Intestinal flukes, Blood flukes, Lung flukes, Liver fluke.

b) Common vectors of human diseases (mosquito, flies, ticks and fleas)

Unit–V: Pathology&ClinicalPathology, BasicLab.Techniques&Instruments

(a) Pathology–definition, Branches
   - Acute and Chronic inflammation (definition, characteristics)
   - Subacute, granulomatous inflammation (definition, characteristics)
   - Changes in inflammation
   - Chemical mediators of inflammation

(b) Cell Injury
   - definition, causes, Ischaemia, necrosis
   - apoptosis, degeneration, dehydration

(c) cellular adaptation of growth and differentiation (Atrophy, Hypertrophy, Hyperplasia, Metaplasia, Dysplasia, Anaplasia)

(d) Neoplasia (Benign and Malignant, definition, characteristics, etiology, spread)

(e) Cell of Immune System (B&T lymphocytes, macrophage, dendritic and langerhan's cells, NK Cells)

(f) Laboratory organization, role of laboratory technicians and responsibilities, safety measures, instruments, reporting and recording, common laboratory accidents and its preventions, handling of infectious materials, preventions and disposal, reagents and its storage.

(g) Types of solution (isotonic, hypotonic, hypertonic) quality control – (Principles and types

(h) Routine examination and clinical significant of–
   - Urine
   - Stool
   - Body fluids (Ascitic fluid, pleural fluids, pericardial fluid, synovial fluids, CSF seminal fluids, sputum)
   - Medico legal importance of semen analysis and abnormal morphology of sperm

Unit–VI:(i)Haematology

(a)

* Introduction to haematology
* Blood–components, collection, anticoagulants, preparation of smears & quality
* Haemoglobin, TLC, DLC with absolute count, WBC, Red cell indices, Reticulocytes (methods of estimation, clinical significant)
* Erythropoiesis, Granulopoiesis, Megakaryopoiesis (normal, abnormal & clinical significant)
* Bloodparasites, bonemarrow smears

(b) *Haemoglobin (normal and abnormal, Biosynthesis, Haemoglobin opathies and its investigation)

(c) RBC–structure, erythropoietin, functions

(d) WBC–Physiology, pathological variation

(e) Platelets–functions, purpuras, investigation of disorders, thrombo cytosis, thrombo cytopaenia

(f) Haemostasis (Coagulation)–Normal mechanism, abnormal, investigation of abnormal haemostasis)

* Thrombosis–definition, causes

(g) Leukaemia – definition, classification (FAB), Acute & Chronic leukaemias, Lab. features of Acute & Chronicleukaemia (AML, ALL, CML, CLL) Aleukaemic Leukaemia, Leukaemoid reaction, Myelodysplastic syndrome(definition Lab. features)

(h) Anaemias (Normochromic, Normocytic, Megaloblastic, Microcytic hypochronic, Anaemia of infections, Haemolytic Anaemias) – Definition, classification, causes, laboratory features and investigations)

(i) Thalassaemia (Trait, Minor, Major)

–Sideroblastic Anaemia

–Pancytopaenia, Aplastic Anaemias, Pure red cells aplasia (Definition, causes, lab.investigationetc)

(j) *Coagulation disorders, lab.diagnosis, causes, haemophillia, DIC

* lymphoma–definition, causes, classification, lab.features/diagnosis
* Myeloma–definition, causes, classification, lab.features/diagnosis
* Polycythaemia–definition, causes, classification, lab.features/diagnosis
* Purpuras–definition, causes, classification, lab.features/diagnosis

(k) Staining – Leishman's stain, MGG, Giemsa's, PAS, Sudan B–Black, Iron, Fats, NAP, AcidPhosphatase, Esterase(Principle, composition, methods&results)

(ii) Blood Banking & Immuno Haematology

(a) Introduction
- Bloodbank organization, equipments, donor registration
- Blood groups–types, technique of grouping
- Donor's selection, collection of blood
- Preservatives(storage), laboratory screening of blood for transfusion

(b) *Crossmatching, compatibility testing
* Coomb'stest
* Transfusion reaction
* Antigens, Antibodies (properties, production), Complements, Sensitization, Agglutination, Haemolysis, Neutralization, Precipitation, Complement fixation, Immune response.

(c) Diseases transmitted through blood and their screening, Haemolytic diseases ofnewborn.

(d) Blood component preparation and its uses, Haemaphereis, Massive transfusion, Autologous transfusion, exchange transfusion.

Unit–VII: Histopathology–Basic & Technique

(a) *Cellsandtissues–definition, cells and its organelles, function, cell cycle, mitosis meiosis
* Epithelial tissues, definition, classifications & functions
* Connective tissues(bone&cartilage)
* Muscle tissues
* Nerve tissues

(b) Histology of different systems & organs – Respiratory system, Alimentary system, Excretory systems, Reproductive system(male&female), Endocrine system.

(c) Histopathology technique–
- Sample reception, registering, labeling.
- Fixative & fixation, (definition, classification, details of fixative, aims & object, fixation and preservation)
- Decalcification (d efinition, methods & test of end point decalcification)
- Grossing (definition, material required)
- Processing of tissues (manual & automatic)
- Waxes (types of waxes)
- Microtomies (types of microtomes, knives, honing & stropping)
- Dehydration, clearing, impregnation, embedding or blocking (definition, chemicals used etc.)
- Section cutting, mounting, labeling.

(d) Demonstration of (staining)
- Nucleic acids
- Lipids
- Proteins
- Nerve cells
- Muscels
- Bone
- Carbohydrates

- Amyloid
- Pigments
- Microorganism & parasites

(e) Biopsies of
- Renal biopsy, Lymphnode biopsy
- Liver biopsy, muscle biopsy
- Kidneys, nerves fibers, skin biopsy
  (Processing, fixation, blocking, staining)

(f) Museum technique

(g) Immuno histochemistry (definition, purposes)

(h) Staining
- Theory, progressive & regressive, metachromasia, mordants, Accentators
- Staining preparation, procedures of–
  Haematoxylene and Eosinstain
  MGGstain, connective tissue stains,
  Giemsa's stain, mucicarmine stains
  Z.N.stain
  PASstain

Unit–VIII:Cytopathology(Basic, technique)

Definition of cytology, material for operation and establishment of cytology laboratory, role of cytology in the diagnosis, branches of cytology

(a) *Reception, registration, numbering and supply of material for collecting specimens.
*Preparation of cytological smears
* Cytological fixation–aims&objects, chemical use for cytological fixation& methods of fixation
* Progressive changes of the cells
* Nuclear criteria of malignancy

(b) *Exfoliative cytology–definition, source of samples for exfoliative cytology
*Body cavity fluid(Pleural effusion, Pericardial effusion, Ascitic fluids, sputum, urine, synovial fluids, CSF, Pus and Abscess)
–Methods of collection, fixation, methods of cyto preparations & staining
–Clotted& blood fluids(methods of cyto preparations)
–Cellular componentsin Benign and malignant effusion, acute and chronic inflammations

(c) Interventional cytology, (FNAC)Fine Needle Aspiration Cytology
- Definition
- Application, methods
- Roleof FNAC
- Commonsites
- Advantage & disadvantage, limitations
- Complications, precaution & contra–indications
- Preparation of smears
- General properties of wet and dry msmears
- Imprint, crush smears, biopsy sediments, cell block preparations

(d) Aspiration of specific lesion eg.cyst, thyroid, lung, peritoneum, prostate, testis, radio logical

imaging aids for FNAC

(e) Methods of collection, fixation and cyto preparation of samples from–Female Genital tracts, Respiratory tracts, Gastro–intestinal tracts, urinary tractsetc.

(f) Staining

- Pap's stain

  Chemical requirements, preparation of various chemicals for pap's stain
  Various pap's stain methods
  Types of haematoxylene and its preparation
  Stain maintenance
  Preparation of graded alcohols (50%, 60%, 70%, 80%, 85%)
  Preparation of 0.5% Hcl, Lithium Carbonate, EAmodified, 0.2%Hcl, 1%Ammoniumhydroxidein 70%ethanol, OrangeG–6

- BismarkBrown, EA–50, EA–36

  ProceduresofPap'sstain
  MGGstain
  Giemsa'sstain
  Modifiedpap'sstain
  PASstain, AlcianBlueStaining
  Mayers & South Gate Mucicarminestain
  Gram's stain
  ZN stains

(g) Quality controls(Internal & External) definition, methods, advantage.

Unit - IX Aptitude Test

Quantitative Aptitude Tests:

NumberSystems: Computation of Whole Number, Decimal and Fractions, Relationship between numbers.

Fundamental arithmetical operations: Percentages, Ratio and Proportion, Square roots, Averages, Interest(Simple and Compound), Profit and Loss, Discount, Partnership Business, Mixture and Allegation, Time and distance, Time and work.

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