

**ICMR - NATIONAL INSTITUTE OF MALARIA RESEARCH**  
Sector-08, Dwarka, New Delhi -110077

No. NIMR/Admn/RoTCP/950/2023

Date: 22.11.2023

**NOTICE**

In continuation to this Institute's notice of even number dated 05.11.2023, all candidates are hereby intimated that CBT for the Technical Cadre posts of the ICMR-NIMR shall be held as per the schedule given below:-

| 01 Dec 23 |            |               | 02 Dec 23 |            |             |
|-----------|------------|---------------|-----------|------------|-------------|
| Ist Shift | IInd Shift | IIIrd Shift   | Ist Shift | IInd Shift | IIIrd Shift |
| TA (LS)   | TA (LS)    | Lab Attendant | TA (MLT)  | TA (MLT)   | Tech (LS)   |

| 05 Dec 23 |                | 06 Dec 23 | 07 Dec 23 |
|-----------|----------------|-----------|-----------|
| Ist Shift | IIIrd Shift    | Ist Shift | Ist Shift |
| TA (EE)   | TA<br>(Pharma) | TA (VS)   | Tech (CS) |

The shift timings shall be as under: -

Shift – I - (08:30 Hrs. to 10:30 Hrs.)

Shift – II - (12:15 Hrs. to 14:15 Hrs.)

Shift – III - (16:00 Hrs. to 18:00 Hrs.)

The syllabus for the Technical Cadre posts shall be as under:-

| <b>CBT Pattern</b> |                                       |                         |              |
|--------------------|---------------------------------------|-------------------------|--------------|
| <b>Sections</b>    | <b>Topics</b>                         | <b>No. of Questions</b> | <b>Marks</b> |
| <b>Section A</b>   | General Intelligence and Reasoning    | 10                      | 10           |
|                    | Quantitative Aptitude and Mathematics | 10                      | 10           |
|                    | General English                       | 10                      | 10           |
|                    | General Knowledge and current affairs | 10                      | 10           |
|                    | Computer Skills                       | 10                      | 10           |
|                    | About ICMR                            | 10                      | 10           |
| <b>Section B</b>   | Subject Specific                      | 40                      | 40           |
|                    | <b>Total</b>                          | <b>100</b>              | <b>100</b>   |

| <b>Section-A</b>                          |
|---|
| <b>General Intelligence and Reasoning</b> |
| Arithmetical reasoning                    |
| Arithmetic number series and Operations   |
| Non-verbal series                         |
| coding and decoding                       |
| Statement conclusion                      |

|   |
|---|
| Syllogistic reasoning   |
| Analogies   |
| Similarities and differences  |
| Relationship concepts,  |
| Figural Pattern-folding and completion  |
| <b>Quantitative Aptitude and Mathematics</b>  |
| Number Systems  |
| Percentage. Ratio & Proportion  |
| Interest, Profit and Loss, Discount,  |
| Time and distance, Time & Work  |
| Square roots, Averages  |
| Bar diagram & Pie chart, Histogram  |
| algebraic identities  |
| Trigonometric ratio, Degree and Radian Measures, Standard Identities                            |
| Partnership Business, Mixture and Alligation  |
| Congruence and similarity of triangles, Circle and its chords, tangents,                        |
| <b>General English</b>  |
| Preposition   |
| Correction of sentences   |
| Change active to passive/ passive to active voice   |
| Change direct to indirect/indirect to direct  |
| Verbs/Tense/Non Finites   |
| Punctuation   |
| Synonyms and Antonyms   |
| Meanings of difficult words   |
| Articles, jumbled letters   |
| Use of pronouns   |
| <b>General Knowledge and current affairs</b>  |
| Current Affairs   |
| Art and Indian Culture  |
| History   |
| Geography   |
| Politics  |
| <b>Computer Skills</b>  |
| Characteristics of computers, Evolution of computers, Generation of Computers                   |
| Classification of Computers, The Computer System, Applications of Computers                     |
| Input / Output devices and Memory   |
| Introduction, Keyboard, Pointing Devices, Speech Recognition, Digital Camera, Scanners          |
| Optical Scanners. Classification of Output, Printers, Plotters, Computer Output Microfilm (COM) |
| Optical Disk, Magneto Optical Disk  |
| Monitors, Audio Output, Projectors. Random Access Memory (RAM), Read Only Memory (ROM)          |
| Classification of Secondary Storage Devices, Magnetic Tape,                                     |
| MS-Office (MS-Word, MS-Excel, MS-Power Point)   |
| Net Surfing, Internet Services, Case Study, Intranet  |
| <b>About ICMR</b>   |

History of ICMR  
Leadership of ICMR  
Institutes and its Location  
Mandate, scope  
IJMR- Indian journal of medical research  
About Going Viral Book  
Landmark achievements in past  
Fellowships Programs by ICMR  
Outbreak investigations  
Test tube baby landmark achievement  
Covid-19 related information  
ICMR Health Communication Ecosystem  
Major work of ICMR Institutes  
DG/ Directors of ICMR

## **Section B - SUBJECT SPECIFIC :-**

### **1. TA (EE) :-**

DC Circuits  
AC Circuits  
Transformers  
Electrical Machines  
Electromagnetic Fields  
Electronic Devices and Circuits  
Power Electronics  
Measurements and Instrumentation  
Transmission and Distribution  
Control Systems  
Electrical Machine Design  
Power System Engineering  
Power System Protection and Switch Gear  
High Voltage Engineering  
FACTS  
HVDC and AC Transmission  
Power Quality  
Energy Engineering  
Renewable Energy Systems  
Electric and Hybrid Vehicles

### **2. TA (LS) :-**

#### **ZOOLOGY**

General characteristics of invertebrate, Chordata and vertebrata; Parasites: Morphology, pathogenesis, laboratory diagnosis, prevention and control of the following parasites. Leishmania donovani, Leishmania tropica, Plasmodium falciparum, Balantidium coli, Taenia saginata, Taenia solium, Ascaris lumbricoides.  
Vector borne human diseases: pathogens and mechanisms of transmission;  
Structure and functions of cell and cell organelles; cell division and cell cycle; basics of cancer cells  
Genetics: Mendelian concepts; linkage and crossing over; karyotype; chromosomal anomalies and syndromes.  
Physiology: Nutrition and digestion, respiration, circulation, locomotion; neural and chemical coordination, excretion and reproduction.  
Environmental Biology: ecosystem, food chain and food web, population and community ecology; pollution-water, soil, air, thermal and sound.

Embryology: gametogenesis, fertilization, cleavage, blastulation and gastrulation, extra embryonic membranes and placentation

Evolution: Origin of life, theories and types of evolution, isolation and speciation mechanisms, Hardy-Weinberg equilibrium.

## MICROBIOLOGY

Ultrastructure of micro-organisms-bacteria, fungus and virus; Principles and methods of sterilization; Types of culture media; Pure culture techniques.

Prokaryotic DNA replication: semi-conservative method, Meselson and Stahl Experiment, enzymes and mechanism involved; inhibitors of replication. Prokaryotic Transcription: mechanism and enzymes involved. Genetic code;

inhibitors of transcription. Prokaryotic Translation: steps involved and inhibitors of translation; Lac operon;

Bacteria: pathogenicity, laboratory diagnosis and prevention of infections caused by the following organisms: Staphylococcus aureus, Streptococcus pyogenes, Streptococcus pneumoniae, Neisseria meningitidis, Neisseria gonorrhoeae, Corynebacterium diphtheriae, Clostridium tetani, Escherichia coli, Shigella, Salmonella, Vibrio cholerae, Pseudomonas, Mycobacterium tuberculosis, Mycobacterium leprae.

Viruses: General properties and structure; classification: Human viruses, animal viruses, plant viruses, bacterial viruses and retroviruses.

Physical and chemical properties, types and functions of carbohydrates, proteins, lipids and nucleic acids; Metabolic pathways: Glycolysis, TCA cycle and its energetics, electron transport chain and oxidative phosphorylation: Gluconeogenesis, Glycogenesis, Glycogenolysis, Gluconeogenesis, Pentose phosphate pathway,  $\beta$  - oxidation of fatty acids, Urea cycle.

Nucleic acids: DNA and RNA- structure and types; as genetic materials, experiments of Griffith, Avery, Macleod and McCarty, Hershey and Chase, Lederberg and Tatum; Chargaff's principles

Mutation: spontaneous and induced mutations, mutation rate; carcinogens; repair of damaged DNA.

## MOLECULAR BIOLOGY

Ultrastructure of micro-organisms-bacteria, fungus and virus; Principles and methods of sterilization; Types of culture media; Pure culture techniques.

Prokaryotic DNA replication: semi-conservative method, Meselson and Stahl Experiment, enzymes and mechanism involved; inhibitors of replication. Prokaryotic Transcription: mechanism and enzymes involved. Genetic code;

inhibitors of transcription. Prokaryotic Translation: steps involved and inhibitors of translation; Lac operon;

Bacteria: pathogenicity, laboratory diagnosis and prevention of infections caused by the following organisms: Staphylococcus aureus, Streptococcus pyogenes, Streptococcus pneumoniae, Neisseria meningitidis, Neisseria gonorrhoeae, Corynebacterium diphtheriae, Clostridium tetani, Escherichia coli, Shigella, Salmonella, Vibrio cholerae, Pseudomonas, Mycobacterium tuberculosis, Mycobacterium leprae.

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Physical and chemical properties, types and functions of carbohydrates, proteins, lipids and nucleic acids; Metabolic pathways: Glycolysis, TCA cycle and its energetics, electron transport chain and oxidative phosphorylation: Gluconeogenesis, Glycogenesis, Glycogenolysis, Gluconeogenesis, Pentose phosphate pathway,  $\beta$  - oxidation of fatty acids, Urea cycle.

Nucleic acids: DNA and RNA- structure and types; as genetic materials, experiments of Griffith, Avery, Macleod and McCarty, Hershey and Chase, Lederberg and Tatum; Chargaff's principles

Mutation: spontaneous and induced mutations, mutation rate; carcinogens; repair of damaged DNA.

## BIOTECHNOLOGY

BIO-ANALYTICAL TOOLS: Electron microscopy (TEM and SEM), Spectrophotometry (visible, UV, infrared), centrifugation, Chromatography. Electrophoresis. Blotting (Southern, Northern and Western).

RECOMBINANT DNA TECHNOLOGY: Restriction enzymes, ligases, polymerases, alkaline phosphatase. Gene recombination and gene transfer: Transformation, Episomes, Plasmids

and other cloning vectors (Bacteriophage-derived vectors, artificial chromosomes), Microinjection, Electroporation, Ultrasonication, Principle and applications of Polymerase chain reaction (PCR), primer-design, and RT- (Reverse transcription), PCR.

IMMUNOLOGY AND IMMUNODIAGNOSTICS: Components of mammalian immune system, Genetic basis of antibody diversity, Major Histocompatibility complexes; Autoimmune diseases, Immunodeficiency-AIDS: Vaccines & Vaccination; immunodiagnosics - RIA, ELISA. PLANT AND ANIMAL BIOTECHNOLOGY: Transgenesis and Molecular markers, Bioethics, Biosafety, Plant tissue culture techniques & secondary metabolites production, Transgenic animals and Animal propagation, Gene Therapy; Embryo transfer techniques and Stem Cell Technology.

ENVIRONMENTAL & INDUSTRIAL BIOTECHNOLOGY: Pollution Types, Biodegradation and Bioremediation, Biofuels, Basic principles of Microbial Technology, Commercial Production of Microbial products.

### **3. TA (MLT) :-**

History of Microbiology

Morphology and physiology of Bacteria

Sterilization and disinfectant

Culture media

Culture methods

Laboratory identification of bacteria and taxonomy

Bacterial genetics

Genetics engineering

Molecular biology of microorganism

Molecular biology techniques

Antimicrobial therapy and resistance

Microbial pathogenesis

Laboratory diagnosis of bacterial infection

Vaccines

Types of immunity

Antigens

Antibodies

Antigen antibody reaction

Complement system

Structure and function of immune system

Cell mediated Immune response

Humoral Immune response

Immunodeficiency

Hypersensitivity

Autoimmunity

Transplantation immunology

Cancer immunology

Antimicrobial immunity

Immunohematology

Techniques in immunology

ELISA

Western blot

Flow cytometry

Biology and pathogenesis of Mycobacterium tuberculosis and treatment

Biology and Pathogenesis of medically important bacteria and treatment

General properties of virus

Pathogenesis of viral infection

Antiviral agents & mechanism of their action

Viral drug resistance

Laboratory diagnosis of viral infection

Bacteriophages

Medically important virus pathogenesis and treatment

Medical mycology  
Biology and treatment of opportunistic infection  
Hospital acquired infections  
Microbiology of Air, water and soil  
Biomedical waste management  
Immune prophylaxes  
Carbohydrate metabolism  
Lipid metabolism  
Nucleic acid metabolism  
Trace elements in health and disease  
Biology and function of vitamins  
Genomics  
Proteomics  
DNA biology and replication  
RNA biology and transcription  
Protein biology and translation  
Sanger Sequencing and NGS  
Nutritional biochemistry

#### 4. TA (Pharma) :-

- Significance of quantitative analysis in quality control, Different techniques of analysis, Types of errors, Statistical treatment of small data sets, Precision and accuracy.
- Biometrics: Significant digits bend rounding of numbers, data collection, random and non-random sampling methods, sample size, data organization, diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams, measures of central tendency, measures of dispersion, Standard Deviation and standard error of means, coefficient of variation, Student's and paired t-test, F-test and elements of ANOVA
- Gravimetric Analysis: Precipitation techniques, Supersaturation co-precipitation, Filter papers and crucibles,
- Standardization of analytical weights and calibration of volumetric apparatus.
- Phytochemical Screening: a. Preparation of extracts. b. Screening of alkaloids, saponins, cardenolides and bufadienolides, flavonoids and leucoanthocyanidins, tannins and polyphenols, anthraquinones, cynogenetic glycosides, amino acids in plant extracts.
- Chromatography: Introduction, classification and study of different chromatographic methods and their applications in evaluation of herbal drugs.
- Spectroscopic analysis of organic compounds.
- The theoretical aspects, basic instrumentation, elements of interpretation of spectra, and applications of the following analytical techniques: Ultraviolet and visible spectrophotometry, Infrared spectrophotometry, Nuclear Magnetic Resonance spectroscopy Mass Spectrometry.
- Sources of drugs: Biological, marine, mineral and plant tissue cultures as sources of drugs
- Quality control of crude drugs: Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods and properties.
- Preparation of herbarium sheets.
- Dehumidification and Humidity Control: Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychrometric chart and measurement of humidity.
  - Hazards and Safety Precautions: Mechanical, Chemical, Electrical, fire hazards. Accident records etc.
- General considerations & concepts, half-life determination, Influence of temperature, light, solvent, catalytic species and other factors, Accelerated stability study, shelf-life determination and expiration dating of pharmaceuticals.
- Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.
- Classification of microbes and their taxonomy. Actinomycetes, bacteria, rickettsiae, spirochetes and viruses.

- Identification of Microbes: Stains and types of staining techniques, electron microscopy, Nutrition, cultivation, isolation of bacteria, actinomycetes, fungi, viruses, etc., Control of microbes by physical and chemical methods.
- Basic Principles of Cell Injury and Adaptation: Causes of Cellular injury, pathogenesis, morphology of cell injury. Intercellular alterations in lipids, proteins and carbohydrates, Cellular adaptation, atrophy, hypertrophy.
- Basic Mechanisms involved in the process of inflammation and repair:
- Biochemical organization of the cell and transport processes across cell membrane.
- Bioenergetics, production of ATP.
- Carbohydrate Metabolism: Glycolysis, Gluconeogenesis and glycogenolysis.
- The Citric Acid Cycle
- Lipids Metabolism: Control of lipid metabolism.
- Biosynthesis of DNA and its replication.
- Regulation of gene expression.
- General Pharmacology: mechanism of action, Combined effect of drugs Pharmacogenetics. Absorption, Distribution, Metabolism and Excretion of drugs, Principles of Basic and Clinical pharmacokinetics, Adverse Drug Reactions and treatment of poisoning, ADME drug interactions, Bioassay of Drugs and Biological Standardization, Discovery and development of new drugs. Drug receptor interaction including transduction mechanisms.
- Experimental Pharmacology: Preparation of different solutions for experiments. Drug dilutions, use of molar and w/v solutions in experimental pharmacology. Common laboratory animals and anesthetics used in animal studies. Commonly used instruments in experimental pharmacology.
- Bioavailability and bioequivalence: Measures of bioavailability, Cmax, t max, and Area Under the Curve (AUC),
- Immunology and Immunological Preparations: Principles, antigens and haptens, immune system, cellular humoral immunity, immunological tolerance, antigen- antibody reactions and their applications.
- Quality assurance.
- Regulatory control, regulatory drug analysis, interpretation of analytical data.
- Validation, quality audit: quality of equipment, validation of equipment, validation of analytical procedures.

## 5. TA (VS) :-

Veterinary Anatomy  
 Veterinary Physiology  
 Veterinary Biochemistry  
 Livestock Production Management  
 Veterinary Microbiology  
 Veterinary Pathology  
 Animal Genetics and Breeding  
 Animal Nutrition  
 Veterinary Pharmacology and Toxicology  
 Veterinary Public Health and Epidemiology  
 Veterinary Parasitology  
 Livestock Product Technology  
 Veterinary and Animal Husbandry Extension Education  
 Veterinary Clinical Practices  
 Livestock Farm Practices  
 Veterinary Surgery and Radiology  
 Veterinary Medicine  
 Veterinary Gynaecology and Obstetrics  
 Lab animal management

## 6. Tech (CS):-

Unit I Computer Fundamentals

Digital computer components  
Number representations  
Memory hierarchy  
Virtual memory  
Cache memory  
I/O organization  
Modes of data transfer

## Unit II Programming and Data Structures

C programming  
Recursion  
Arrays, stacks, queues  
Linked lists  
Trees, binary search trees, binary heaps  
Graphs

## Unit III Computer Networks

OSI and TCP/IP Protocol Stacks  
Data link layer  
Routing protocols  
IP addressing  
Transport layer  
Application layer protocols  
Linux commands

## Unit IV Operating Systems

Operating System concepts  
Process management  
CPU scheduling algorithms  
Threads and Semaphores  
Memory Management  
Disk scheduling  
File management

## Unit V Database Management

ER-model  
Relational model and SQL  
Integrity constraints  
File organization and indexing  
Transactions and concurrency control

## Unit VI Object-Oriented Programming with C++

Object-Oriented Programming (OOP) concepts  
Classes, objects, and constructors  
Function and operator overloading  
Inheritance and polymorphism  
File and I/O operations  
Templates

## Unit VII Java Programming

Java basics



Classes, objects, and methods  
Inheritance and interfaces  
Exception handling  
Multithreading and applets  
Event handling and JDBC

#### Unit VIII Internet Programming

HTML and CSS  
JavaScript  
PHP and database connectivity  
Data backup and security  
Server management and FTP

#### Unit IX Data Management

Data retrieval and security  
FTP management

#### Unit X Algorithm Design

Searching, sorting, and hashing algorithms  
Asymptotic time and space complexity  
Algorithm design techniques

#### Unit XI Mobile Computing

Introduction to Android  
User interface components  
Data storage and retrieval  
Layout design for mobile apps

### **7. Tech (LS):-**

#### **MICROBIOLOGY**

##### **GENERAL MICROBIOLOGY:**

History of Microbiology, Working principle, construction, operation and maintenance of microscopes. Principles and methods of sterilization by physical and chemical agents. Morphology of Bacteria and staining methods. Growth and nutrition of bacteria, culture media and culture methods. Antimicrobial susceptibility tests.

##### **BACTERIOLOGY:**

Classification: Occurrence, host pathogen relationship, pathogenic and laboratory diagnosis of Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacterium, Mycobacterium, Enterobacteria, salmonella, Shigella, E.coli, Klebsiella, Pseudomonas, Proteus, vibrio, Spirochetes.

##### **VIROLOGY:**

Classification: General properties of viruses mode of infection, spread and lab diagnosis of common human viral diseases - Polio, Influenza, Para influenza, Dengue, Japanese encephalitis, Chicken pox, Herpes, HIV, Hepatitis.

##### **PARASITOLOGY:**

Nomenclature, morphology, life cycle, pathogenicity and lab diagnosis and mode of infection of plasmodium, Entamoeba, Giardia, Trichomonas, Hookworm, Roundworm, Tapeworm and Whipworm.

##### **MYCOLOGY:**

Morphology, pathogenesis and lab diagnosis of fungi

##### **IMMUNOLOGY:**

Immunity classification, Antigen- Ab reactions and their application in the diagnosis of the diseases.

## PATHOLOGY:-

### HAEMATOLOGY

#### Composition of Blood:

Components of the blood (Plasma and Cellular elements) and their functions - Haemopoietic system of the body (Leucopoiesis, erythropoiesis and thrombopoiesis).

Haemostasis - disorders and regulation - Types of Anaemia ( deficiency of iron, B12 and folic acid, haemolytic, aplastic and genetic disorders), Bleeding disorders of man.

#### Coagulation of blood:

Coagulation system- recalcification time activated partial thromboplastin time and thrombin time, Clotting time, bleeding time, Prothrombin time, Partial Prothrombin time, Mechanism of coagulation of blood.

#### Haemogram

Haemogram - Haemoglobin, PCV, ESR, RBC count, WBC count, Platelet count, Calculations of Anaemia using MCH, MCV & MCHC, Reticulocyte count, Absolute Eosinophil count, Differential count.

Special Haematological tests: Osmotic fragility - Heinz body preparation, Blood parasites – Lupus Erythematosus (LE) Cell preparation - Cytochemical tests, Quality control and quality assessment.

### BLOOD BANKING

#### Blood Bank:-

Basic principle involved in Immuno haematology as prior to blood transfusion, Blood collection procedure, Blood grouping (Slide method, tube method ), Rh typing, Forward and Reverse grouping techniques, Cross matching(Major and Minor types), Separation of Blood components, Coombs test

#### Screening Test:-

HbsAg, HCV, HIV (ELISA, Western Blot tests), TPHA (Treponemapallidum haemagglutination), Malarial parasites.

### HISTOPATHOLOGY AND CYTOLOGY

General introduction of histopathology, Reception, recording, handling and labelling of histology specimens, fixation and various fixatives and their preparation.

Tissue processing-processing of histological tissues, dehydration, clearing, wax preparation, paraffin embedding and embedding media, decalcification and block preparation.

Microtomes- various types, their working principle and maintenance.

Microtomes knives and knife sharpening procedure, practical section cutting, cutting fault and remedies

Staining preparation-preparation of slide, deparaffinization and routine staining procedures, Identification and Demonstration of different metabolic compounds, mounting and mounting media.

Exfoliate Cytology - Preparations of Pap smear, stain, cell blocks.

### CLINICAL BIOCHEMISTRY

Basic principles and practices of clinical chemistry

Patient management, prognosis and diagnosis. Laboratory safety – toxic chemicals and biohazards - computers in the clinical chemistry lab for a reliable report.

#### Instrumentation

Description of certain important instruments e.g. balance, centrifuge colorimeter, spectrophotometer, flame photometer etc., principle & instrument.

#### Blood Chemistry

Methods of collection and preservation of blood; Use of selective anticoagulants; Separation of serum and plasma, different protein precipitation agents, preparation of pff and its preservation.

#### Blood sugar and G.T.T

Normal levels, abnormal levels associated with various pathological conditions; different methods of sugar estimation- principle reagents, procedure precautions to be observed. Renal threshold importance of G.T.T, Methods of G. T. T.

#### Urea:-

Normal level, pathological conditions associated with abnormal levels. Principles and procedure of different methods of urea estimated.

Plasma and serum proteins:-

Separation of different proteins. Normal and abnormal levels. Clinical significance of plasma and serum protein estimation. Different methods of protein estimation including principle and procedure.

Fibrinogen and prothrombin time:-

Significance of fibrinogen and prothrombin time determinations, principle and procedure of the method applied.

Liver functions test

Liver and its functions. Detoxication of bile pigments. Normal and abnormal estimation of conjugated and unconjugated bilirubin in relation to differential diagnosis of jaundice. Principles and procedures for different L.F tests index.

Cholesterol

Significance of cholesterol estimation. Normal and abnormal values. Principles and procedures of cholesterol estimation.

Renal function test

Kidneys and their physiological role laboratory test to assess detect and monitor renal diseases.

Urine Chemistry

Physical characteristics of urine, chemical composition. Clinical importance of Urine analysis. Presence of abnormal constituents like protein, sugar, bile salts and bile pigments occult blood etc. qualitative estimation of protein and sugar. Identification of sugar, glycosuria and albuminuria, ketone bodies.

Stool Chemistry

Physical characteristics and chemical composition of stool. Formation of stercobilinogen. Significance of presence of blood and excess fat in stool. Principle of stercobilinogen and fat estimation.

Cerebro spinal fluid

Composition and function of C.S.F. normal levels of chloride sugar and protein in C.S.F. Abnormal levels in relating to different pathological conditions. Methods determination of chlorides, sugar and protein in C.S.F.

Enzymes

Importance of acid and alkaline phosphates, amylase, SGOT, LDH & CPK, their normal levels. Abnormal levels in relation to pathological conditions. Iso-enzymes. Principle and procedure of different methods of assaying the above mentioned enzymes.

Electrolytes

Function of electrolytes like Na<sup>+</sup> K<sup>+</sup> and Cl<sup>-</sup>. other essential trace elements like P, Ca<sup>++</sup> iron etc. Normal levels. Abnormal levels associated with different pathological conditions. Principle and procedure for determining their concentrations.

Electrophoresis and Chromatography

Principle and procedure of Agar gel electrophoresis, TLC and paper Chromatography. Application in clinical biochemistry.

## **8. Laboratory Attendant:** Basic Science and Laboratory related Science

(Administrative Officer)  
ICMR-NIMR