

**RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER**  
**SYLLABUS FOR SCREENING TEST FOR THE POST OF**  
**SENIOR SCIENTIFIC OFFICER- SEROLOGY DIVISION**  
**(STATE FORENSIC SCIENCE LABORATORY, RAJASTHAN,**  
**JAIPUR)**

**UNIT-I**

**1. MOLECULES AND THEIR INTERACTION**

a. Composition, structure and function of Bio-molecules (carbohydrates, lipids, proteins and nucleic acids).

**2. ACID- BASE BALANCE AND ENZYMES**

a. pH, buffer and buffer system.

b. Enzyme, catalysis, enzyme regulation, enzyme inhibition, iso-enzymes.

**3. CELLULAR ORGANIZATION**

a. Structural organization and functions of cell including Plasma membrane, intracellular organelles (Nucleus, Mitochondria, Golgi-bodies, Lysosomes, Endoplasmic reticulum, Peroxisomes) and Chromosomes.

b. Cell division and cell cycle.

**4. DNA REPLICATION AND PROTEIN SYNTHESIS**

a. Structure and types of DNA, replication mechanism, enzymes involved in replication.

b. Biosynthesis of Proteins.

**UNIT-II**

**1. HUMAN PHYSIOLOGY AND PATHOLOGY**

a. Physiology of digestive system. Saliva and gastric juices, digestion and absorption.

b. Nervous system –reflex action, reflex-arc and nerve impulse

c. Physiology of Respiratory system - exchange of gases, process of pulmonary respiration.

d. Physiology of human circulatory system - Heart structure, double circulation, cardiac cycle and its regulation, blood pressure, composition of blood, mechanism of blood clotting, Anti coagulants for blood.

e. Physiology of human reproductive system-

f. Human male and female reproductive systems, gamete formation ,fertilization and implantation.

g. Forensic Pathology

- i. Decomposition – Muscular Physiology
- ii. Causes of Death – Shock, Syncope, Asphyxia etc.
- iii. Post Mortem Examination – wounds, injuries, etc.
- iv. Estimation of Time Since Death

### **UNIT-III**

#### **1. FORENSIC SCIENCE**

- a. Principles and basics of Forensic Science
- b. Growth of Forensic Science Laboratories in India – Central and State level laboratories.
- c. Services and functionalities provided by various Forensic Science Laboratories.
- d. Various divisions in the FSL – Ballistics, Biology, Chemistry Documents, Physics, Psychology, Serology, Toxicology, Cyber, Narcotics, DNA, Arson and Explosive

#### **2. CRIME SCENE MANAGEMENT**

- a. Types of crime scenes
- b. Crime scene Management – initial response, role of first responding officer, duty management
- c. Role and duties of Forensic Scientists.

#### **3. PHYSICAL EVIDENCE COLLECTION & PACKAGING OF SEROLOGICAL MATERIALS**

- a. Physical evidence, types and importance in a criminal investigation
- b. Protecting a scene of crime – various steps involved, contamination issues.
- c. Protection of Packaging & transportation Biological Evidences
- d. Documentation
- e. Chain of Custody
- f. Recognition of Biological evidences encountered in various cases.

#### **4. SEROLOGICAL TECHNIQUES**

- a. Electrophoresis Methods
- b. Presumptive & Confirmatory Tests for blood
- c. Identification of Blood Properties Blood Grouping

### **UNIT-IV**

#### **HUMAN GENETICS**

- a. Genes, Genetic code, eukaryotic gene expression, regulation of gene expression, alleles, karyotypes, genetic disorders, mutation types and their causes.
- b. Mendel's Law of inheritance, Extension of Mendelian principles- co-dominance, incomplete dominance, linkage and crossing over

## **UNIT-V**

### **FORENSIC IMMUNOLOGY AND DNA EXAMINATION**

- a.** Forensic Immunology – Innate and Adaptive immunity, B cell / T cell –structure, development, diversity and recognition
- b.** Antigen and Antibodies –structure, types and function of antibody, monoclonal antibodies, antigen, hapten, adjuvants, antigen-antibody interaction and their application in forensic serology
- c.** Blood groups- ABO, MN, Rh polymorphic blood groups, Application of ABO blood group in disputed paternity cases, polymorphic enzymes and polymorphic proteins in the reference of forensic serology. HLA antigen. Secretor and non secretor status. Blood grouping in biological fluids other than blood.
- d.** DNA profiling- Use of DNA polymorphism in Forensic cases, DNA typing and individualization, source of DNA in forensic cases, isolation of DNA (organic extraction), PCR, SNP, STRs. Mitochondrial DNA polymorphism. .

## **UNIT-VI**

### **TECHNIQUES IN FORENSIC SEROLOGY**

- a.** Application of immunological techniques in forensic serology Determination of species by precipitin test (diffusion method) and Gel electrophoresis.
- b.** Spectrophotometry- U.V. and Visible. Blood group determination of stains by- absorption inhibition, absorption elution and mixed agglutination methods ,
- c.** Microscopy (simple microscope, compound microscope, phase contrast microscope, electron microscope).

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### **Pattern of Question Papers:**

1. Objective Type Paper
2. Maximum Marks : 100
3. Number of Questions : 100
4. Duration of Paper : Two Hours
5. All Questions carry equal marks
6. There will be Negative Marking

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