PUNJAB PUBLIC SERVICE COMMISSION
BARADARI GARDEN, PATIALA-147001
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SYLLABUS FOR THE POSTS OF SCIENTIFIC OFFICER

SYLLABUS FOR SCIENTIFIC OFFICER (BALLISTICS)

Conventional Concepts of firearms: classification and characteristics, various components of small arms, smooth bore and rifled firearms.
Operational features of firearms: Barrel, body, Firing pin, Breech face, trigger, cork, and firing mechanism, measurement of strength of barrel & trigger pull.
Rifled Firearms: Caliber, Rifling, purpose of rifling, types of rifling and methods to produce rifling to produce rifling,
Smooth bore firearms: Bore, Choking& types of choking, Methods of choking purpose of choking, method of choking, purpose of choking.
Illegal firearms: AK-47, SKS and M16/AR15 Assault Rifles
Techniques of dismantling / assembling of firearm, improvised / country-made / imitative firearm and their constructional features.
Conventional Concepts of Ammunition: Types of ammunition- classification and constructional features of different types of cartridges, types of primers and priming composition, propellants and their compositions, velocity and pressure characteristics under different conditions, various types of bullet and compositional aspects, latest trends in their manufacturing and design projectile, identification of origin, improvised ammunition and safety aspects for handling firearm and ammunition.

Core concepts of Internal Ballistics: Definition, ignition of propellants, shape and size of propellants, manner of burning, various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting, equation of motion of projectile, Density of loading, Pressure, Heat problems, Vibration & jump, Measurement of strength of firearm, projectile velocity determination, theory of recoil, methods for measurement of recoil.
Core concepts of External Ballistics: principal of external ballistics: vacuum trajectory, Trajectory Formation & its computation, effect of air resistance on trajectory, Angle of Fall, Influence of Earth on Trajectory, base drag, yaw, shape of projectile and stability, ballistics coefficient and limiting velocity, Ballistics tables, measurements of trajectory parameters, Escape velocity & Ricochet.

Core concepts of Terminal Ballistics: Effect of projectile on hitting the target: function of Bullet shape, striking velocity, striking angle and nature of target, tumbling of bullets, effect of instability of bullet, effect of intermediate targets, Influence of range Cavitations- Temporary and permanent cavities, Ricochet and its effects, stopping power

Wound Ballistics: Threshold velocity for penetration of skin/flesh/bones, preparation of gel block, penetrative in gel block and other targets, nature of wounds of entry, exit, initial with various ranges and velocities with various types of projectiles, explosive wounds, evaluation of injuries caused due to shot-gun, rifle, handguns and country made firearms, methods of measurements of wound ballistics parameters, post-mortem and anti-mortem firearm injuries. Determination of range of fire- burning, scorching, blackening, tattooing and metal fouling shots dispersion and GSR distribution, time offering different method employed, and their limitations, Bullet recovery, time of firing.

Gunshot Residues/ Powder Residues: Composition of GSR depending upon propellants & primer mixtures, GSR Distribution**,** Mechanism of formation of GSR, Location, source and collection of GSR, Analysis of GSR: spot test, chemical test, identification of shooter and instrumental techniques involved of GSR Analysis, Practical problems related with GSR detections.

Test firing, Procedure for test fire, Purpose for test firing, Recovery methodology, Specifications of Firing gallery, working of automatic firing rest, Safety & Preventive measures., Characterization of bullet proof jacket.

Principles and practice of identification of origin: ammunition and their components, different types of marks produced during firing process on cartridge- firing pin marks, breech face marks, chamber marks, extractor and ejector marks band on bullet- number/ direction of lands and grooves, striation marks on lands and grooves, identification of various parts of firearms, techniques for obtaining test material from various types of weapons and their linkage with fired ammunition, class and individual characteristics.

Instrumental techniques used for ballistic evidence analysis: Boroscope, Comparison Microscope, Stereo microscope, traveling microscope, Neutron Activation analysis, Flameless AAS, Scanning Electron microscope, EDXRF.

Introduction to automated system of trajectory computation **(Ballistic Data Acquisition system)**: Operating system & its concepts, Universal Receiver, ICM, Target Frame.

Automated management of ballistics data **(Integrated Ballistics Identification system)**: History of establishment, Brass Trax, Bullet Trax & Match Point, Limitation & Advantages, Application-