

CHAPTER -10

Scientific Aids to Investigation

- 233-1.** Of all the functions of the police, investigation is the most important and vital one. In the constantly evolving socio-economic scenario the criminals using sophisticated tools and techniques commit more and more crimes. In order to overcome these complexities the police all over the world are depending more and more on scientific methods of investigation.
2. A wide range of scientific techniques are now available for analysis of varied nature of objects and materials encountered in the process of commission of crime by the culprit in and around the crime scene, on the suspect and victim. The study of such material evidence also known as objective evidence or physical evidence applying latest scientific tools and techniques for proving the guilt or innocence of the accused by the courts of law is broadly known as Forensic Science.
3. The applications/ aid of science to the crime investigation is fundamentally one of reconstruction, that is, trying to assist in determining what happened, where it happened, when it happened, and who was involved. It is not concerned with, and cannot determine, why something happened. Forensic analysis is performed on evidence to assist the police and the court in establishing physical facts so that criminal or civil disputes can be resolved. It is the job of the forensic scientist to translate the legal inquiry into appropriate scientific questions, and to advice the Investigating Officer and / or the judiciary on the

capabilities, limitations and results of the analytical techniques.

4. In forensic science, the laws of various facets of science are applied in conducting an analysis to determine the nature and characteristics of Physical Evidence collected in the process of crime or civil investigation. Using the scientific methods, inferences are drawn about how the evidence can be linked to crime and criminal. These inferences are thus connected to the events that may or may not have taken place in connection with said evidence. The law defines elements of a crime; science contributes information to assist in determining whether an element is present or absent.
5. It is an established fact that the criminals while committing crimes either due to carelessness or due to anxiety, or due to contact with other objects leave traces at the scenes and these are the basis for scientifically exploiting their culpability. This physical evidence when located, collected, preserved and forwarded for scientific evaluation and report is bound to have enormous potential in linking the criminal to the crime scene, victim or any other circumstances leading to the crime. Moreover evidence collected and based on scientific evolution and report is unbiased, universally acceptable and also stands the test of time.

Time limit for sending physical evidence to FSL for scientific analysis

6. The investigating officers should collect and forward all types of physical evidence along with controlled samples so as to reach the FSL within 30 days from the date of crime.

7. The success of the scientific effort in arriving at truth depends both on the role of I.O. and the Forensic Scientists i.e. in the thorough search and collection of evidence in proper way by the I.O., and the careful analysis through the right tools and techniques by the scientists.

Institutions Providing Scientific Investigative Aids to the Investigating Officers

I. Forensic Science Laboratory

234-1. Central Forensic Science Laboratory is situated at Kolkata. Till such time a FSL is established in the State, scientific aid, assistance, help and guidance can be obtained from experts of CFSL by the investigating officer.

- A. **Clinical Forensic Medicine:** Wounds cases are examined to decide the type (eg. abrasion), age and nature (simple/grievous) of the wound as well as the type of the weapon (blunt/sharp) responsible for the same. In sexual offence cases, both the accused and the victim are examined for signs of recent sexual intercourse. Further, the accused in particular is examined for potency and the victim for determination of her age, if required. Age determination is also conducted in cases such as kidnapping, juvenile crime and disputed age claims.
- B. **Forensic Pathology:** Dead bodies (whether fresh, decomposed or exhumed and whether intact or fragmented and mutilated) as well as skeletal remains can be examined for establishing the

cause and time since death and for possible clues to establish the identity of unidentified bodies. Injuries, poisoning or asphyxia commonly causes unnatural or violent deaths while disease processes cause natural or sudden deaths. A host of physical characteristics and traits help in identification of the body while the onset and progress of the post-mortem changes are of use in estimating the time that has elapsed since death.

II. Fingerprints Bureau (State Crime Records Bureau)

1. Fingerprints Bureau and his supporting staff at the head quarters are responsible for lifting, collecting and matching the finger prints in all criminal cases. The details of their functioning are given in Chapter .

III. Explosives/Bomb Disposal Experts

1. In all matters relating to explosive substances the bomb disposal squad, army have to be contacted by the Investigating officers in handling, investigating, diffusion and disposal of explosive substances.

A list of test houses and test laboratories and other technical institutes available for assistance in criminal cases are following:

Sl No.	Test House/Laboratory and location	Areas of specialization
1.	Advance System Integration & Evaluation Organization	Aircraft Accidents
2.	Aeronautical Development Establishment Suranjan Das Road C V Raman Nagar (PO) Banglore – 560 093	Test procedures for new prototype aircraft, equipment and aircraft materials and to conduct such tests and trails as may

	Karnataka	be required
3.	All India Institute of Hygiene & Public Health, 110 Chittranjan Avenue Kolkata- 700 073, West Bengal	Hygiene & Public Health
4.	All India Institute of Medical Sciences Ansari Nagar New Delhi- 110-029	Different aspects of medicines and medical examinations, Forensic Medicine
5.	Andhra Pradesh Engineering Research Laboratory, Himayatsagar Hyderabad- 500 030	Bricks, Cement, Mortar store, soil, water etc
6.	Anthropological Survey of India 27, Jawaharlal Nehru Road Indian Museum Kolkata- 700 016 (West Bengal)	Anthropology (Human Science) like races, evolution etc
7.	Archaeological Survey of India 24, Tilak Marg, New Delhi- 110 001	Antiques
8.	Armament Research & Development Establishment, Armament Post, Pashan Pune – 411 021 (Maharashtra)	Conventional armaments and explosives
9.	Atomic Minerals Division Deptt. of Atomic Energy AMD Complex 1-10-153-156, Begumpet Hyderabad- 500 016 Andhra Pradesh	(a) Radiometric instruments (b) techniques for multielemental & ultratrace levels & c) petromineragraphic characterisation & minerals beneficiation of radioactive ores & substances
10.	Atomic Minerals Division Deptt. of Atomic Energy West Block-7 R.K Puram, Sector-1 New Delhi	(a) Radiometric instruments (b) Analytical techniques for multi-elemental & ultratrace levels & (c) petromineragraphic characterisation & minerals beneficiation of radioactive

		ores & substances.
11.	Aviation Research Institute/HAL, Bangalore	Aviation related matters
12.	Bank Note Press, Dewas (M.P)	Counterfeit currency
13.	BCG Vaccine Laboratory Guindy, Chennai- 600 032 Tamil Nadu	BCG
14.	Bhabha Atomic Research Centre Trombay Mumbai- 400 085	Entire spectrum of Nuclear Science & Engg. Ranging from particle physics, nuclear Engg. Isotope technology, nuclear agriculture, computers, & robotics to information technology & nuclear medicine.
15.	Bharat Earth Movers Ltd. Bemis Soudha 23/1, 4 th Main S R Nagar Bangalore- 560 027 Karnataka	Heavy Engineering & equipments
16.	Bharat Electronics Ltd. 116/2, Race Course Road Trade Centre Bangalore- 560 001	Radars, Defense Communications, Telecommunications, Sound & Vision Broadcasting, Optoelectronics, Solar systems, IT products & Electronic components
17.	Bharat Heavy Electricals Ltd. Corporate Engg. & product Dev. 2 nd Floor, BHEL House Siri Fort, New Delhi – 110-049	Power, transmission, industry, transportation, oil & gas, non conventional energy sources & telecommunication.
18.	Bharat Immunological & Biologicals Corp. Ltd. 395 Civil Lines Bulandshahar,	Drugs related to chemicals and toxicology

	Uttar Pradesh	
19.	Bose Institute 93/1, APC Road Kolkata- 700 09 West Bengal	Medicine & bio-technology
20.	Botanical Survey of India P-8, Brabourne Road Kolkata- 700 001, West Bengal	Micro biological & chemical tests of floral plants
21.	Bureau of Indian Standards Manak Bhavan 9, Bahadur Shah Zafar Marg New Delhi- 110 002	Weights, measures
22.	CDFD (centre for DNA fingerprinting & Diagnostics) M/o Science & Technology Govt. of India, ECIL Road, Nacharam Hyderabad – 500 076	DNA test
23.	Cement Corporation of India Ltd. Core- 5, Scope complex 7, Lodhi Road New Delhi- 110 03	Cement production, quality & related aspects of cement
24.	Cement Research Institute (NDSE), New Delhi	Cement, Sand, Aggregate, concrete
25.	Central Agricultural Research Institute Port Blair- 744 101 Andaman & Nicobar Islands	Agriculture & Fisheries
26.	Central Building Research Institute Roorkee- 247 667 Uttar Pradesh	Testing of paints, soils, water aggregates, Timber, steel, cement, concrete, bricks etc.
27.	Central Drugs Research Institute Chattar Manzil Palace Post Box No. 173 Lucknow -226 001 (UP)	Analysis & testing of chemicals & drugs (Ayurvedic, Unani, Sidha & Homeopathic Medicines are not tested)

28.	Central Drugs Laboratory 3, Kyd. Street Kolkata- 700 016 (WB)	Analysis & testing of chemicals & drugs (Ayurvedic, Unani, Sidha & Homeopathic Medicines are not tested)
29.	Central Electrochemical Research Institute CECRI Nagar Karaikudi- 623 006 Andhra Pradesh	Corrosion Science & Engineering, Electrochemical Materials, Electrodes & Electrobiolgy, Electrochemcials, Batteries & Fuel Cells, Industrial Metal Finishing & Hydro & Pyro Metallurgy
30.	Central Electronics Engineering Research Institute , Post Bag No. 1 Pilani- 333 031 Rajasthan	Semiconductor Devices, Mocrowave Tubes, Electronic Systems & product engineering.
31.	Central Electronics Ltd. 4, Industrial Area Sahibabad -201 010 Uttar Pradesh	Electronic goods & devices
32.	Central Food Laboratory, 3, Kyd. Street, Kolkata – 700 016	Quantitative & qualitative analysis of foodgrains, cereals, pulses and oils.
33.	Central Food Technological Research Institute , Chaluvamba Mansion Vaniilas Mohalla Mysore – 570 013, Karnataka	Testing and Analysis of Food Quality, foodgrains, cereals, pulses and oils.
34.	Central Fuel Research Institute P.O FRI Dhanbad-828 108 Jharkhand	Coal, its quality assessment, Coal preparation & carbonization, carbon products, catalysis, Efficient Energy Systems & Waste Utilization, Heavy Residue Processing & process

		Engineering, Environmental Impact Assessment.
35.	Central Glass & Ceramic Research Institute, P.O Jadavpur, Kolkata	For Analysis & testing of Glass, & Ceramic articles.
36.	Central Inland Capture Fisheries Research Institute, Barrackpore- 743 101	Analysis and testing of Fisheries
37.	Central Institute for Cotton Research Post Bag No. 225 Nagpur- 440 001 Maharashtra	Testing samples of cotton & cotton waste
38.	Central Institute for Research on Cotton Technology, Adenwala Road Post Bag No. 16640, Matunga Mumbai- 400 019 Maharashtra	Testing samples of cotton & cotton waste
39.	Central Institute of Fire Research Roorkee	Fire Debris examination and analysis
40.	Central Leather Research Institute Adyar, Chennai- 20	Leather examination
41.	Central Mechanical Engineering Research Institute, Mahatma Gandhi Avenue, Durgapur 731 209, West Bengal	Testing & Evaluation of Automobiles & Engineering Products
42.	Central Plantation Crops Research Institute Kudlu – 671 124 Dist. Kasaragod, Kerala	Plantation of crops like coconut arecanut etc.
43.	Central Pollution Control Board Parivesh Bhavan CBD-cum-Office Complex East Arjun Nagar Delhi- 110 032	Air, water and noise pollution
44.	Central Road Research Institute Delhi- Mathura Road	Testing of aggregates, cement, concrete, Bitumen,

	CRRI (PO) New Delhi- 110 020	bricks & soils & all building materials.
45.	Central Soil & Research Materials Laboratory, New Delhi- 110 057	Testing of bricks, cement, mortar, stone, iron & soil & concrete
46.	Central Water & Power Research Station, Pune Maharashtra	Testing of Soil, steel & cement
47.	Centre for Biochemical Technology University Campus, Mall Road, Near Jubilee Hall New Delhi- 110 007	Allergy, Immunology & related Aerobiology
48.	Centre for Advanced Technology Rajendranagar Indore- 452 013 Madhaya Pradesh	Non-Nuclear advanced technologies, Accelerations & Lasers
49.	Centre for Aeronautical Systems Studies & Analysis, New Thippasandra Banglore- 560 075, Karnataka	Aeronautical system studies and analysis
50.	Centre for Artificial Intelligence & Robotics, Raj Bhawan Circle High Grounds, Banglore- 560 001 Karnataka	Artificial intelligence, robotics, vision, Neural Networks & control system
51.	Centre for Cellular & Molecular Biology RRL Campus Uppal Road Hyderabad- 500 007 Andhra Pradesh	Genetics & Evaluation, Molecular Biology, Biophysics & Biochemistry Biomedicine&Biotechnology & Cell Biology & DNA Testing
52.	Centre for Development of Advanced Computing, Pune University Campus Ganesh Khind, Pune -411 007 Maharashtra	High-performance Networks, Digital Libraries, Web Technologies, Localization of standard softwares etc.
53.	Centre for Development of Telematics 9 th Floor Akbar Bhavan Chanakyapuri, New Delhi- 110 021	Tele communication, components and system analysis

54.	Centre for Electronics Design & Technology, B-108, Industrial Area Phase VIII, SAS Nagar Mohali- 160 050 Punjab	Electronic materials and components
55.	Centre for Environment & Explosive Safety, Metcalfe House Delhi- 110 054	Explosives/fire/environment safety and related matters
56.	Centre for Environment Education Thaltej Tekra Ahmedabad – 380 054 Gujarat	Environment & Public health
57.	Centre for Environment Planning & Technology, Kasturbhai Lalbhai Campus University Road Ahmedabad- 380 009	Environment and public health
58.	Centre for Materials for Electronics Technology, Electronics Niketan (Ground Floor) 6, CGO Complex Lodhi Road, New Delhi- 110 003	Electronic components and devices
59.	Chief Chemist, Central Revenue Control Laboratory, New Delhi	Narcotics & Psychotropic substances & Drugs analysis
60.	Chief Electrical Inspectors of respective States	Testing & certification of electrical equipments
61.	Cochin Refineries Ltd. Research & Development Cell Post Bag No. 2 Ambalamugal- 682 302 Distt. Ernakulam, Kerala	Oil, natural gas & petroleum products
62.	College of Engineers, Guindy, Chennai	Testing of Aggregates, timbers, steel, cement, brick, soil & all building material
63.	Concrete Association of India, Mumbai	Testing of Cement, concrete aggregate, steel. Yield strength of steel & physical

		properties of materials
64.	Collectorate of Inspection (Armaments) Nehru Road, Kirkee, Pune	Explosives & ammunitions
65.	Cotton Technological Research Laboratory, Matunga, Mumbai (under ICAR)	For testing samples of cotton/cotton security stamps
66.	Currency Note Press, Nasik Road Nasik (Maharashtra)	Examination of counterfeit currency & security stamps
67.	Defence Agricultural Research Laboratory Post Box No. 40 Goraparao, Haldwani- 263 139 Dist. Nainital, Uttar Pradesh	Agricultural products of high biomedical equipments
68.	Defence Bio-Engineering & Electromedical Laboratory Post Bag No. 9326 CV Raman Nagar ADE Campus Banglore- 560 093 Karnataka	Evaluation & testing of biomedical equipments
69.	Defence Electronics Applications Laboratory, Rajpur Road Post Box No. 54 Dehradun- 248 001 Uttar Pradesh	Radio propagation studies, surveillance & reconnaissance studies

70.	Defence Electronics Research Laboratory Chandrayangutta Lines Hyderabad- 500 005 Andhra Pradesh	Radio propagation studies, surveillance & reconnaissance studies
71.	Defence Food Research Laboratory Jyoti Nagar Mysore- 570 011 Karnataka	Food, toxicology, nutritional and biochemical items
72.	Defence Institute of Physiology & Allied Sciences, Prolyn Road	Physioilogy, Biochemistry & Nutritions

	Delhi- 110 054	
73.	Defence Research & Development Establishment, Tansen Road, Gwalior- 474 002 Madhya Pradesh	To conduct experimental studies of hazardous chemicals and developing suitable antidotes
74.	Defence Research & Development Laboratory Kanchanbagh, Hyderabad- 500 258 Andhra Pradesh	Internet and Intranet support to the Lab, communication including teleconferencing and Video Conferencing and software quality assurance
75.	Defence Scientific Information & Documentation Centre Metacalfe House Delhi- 110 054	To provide, reprography (photography, audio, video presentation materials) translation communication (e-mail, internet) & printing services)
76.	Deptt. of Telecommunication, Sanchar Bhawan, New Delhi- 110 001	Mobile Phones, phones & related issues
77.	Director General of Health Services Nirman Bhawan, Delhi	Testing of Medicines, Biochemical substances etc.
78.	Directorate of Vanaspati, Vegetable Oils & Fats, New Delhi	Examination/testing of edible oils
79.	Director –General, Food (Directorate of Storage & Inspection) New Delhi	Quantitative & Qualitative analysis of foodgrains fodder, cereals, oils etc.
80.	Disease Investigation Laboratory Ambala- 134 003	Disease/epidemics
81.	Disease Investigation Laboratory Krishi Gyan Kendra Sohna Road, Gurgaon – 122 001	Disease /epidemics
82.	Electrical Research & Development Association Makarpura Industrial Estate (PO) P.O Box No. 70	Electricity & related matters

	Vadodara – 390 010, Gujarat	
83.	Electrical Research & Development Centre A-1, UPSIDC Industrial Area Dewa- Chinhath Road Lucknow- 226 019 Uttar Pradesh	Electricity related issues
84.	Electronic Research & Development Centre Agriculture College Compound Shivajinagar, Pune- 411 005 Maharashtra	Conducts test on electronic items, its capacity, use etc.
85.	Electronic Research & Development Centre, Block EP & GP Webel Bhavan, Sector – V, Salt Lake Kolkata 0 700 091 West Bengal	Conducts test on electronic items, its capacity, use etc.
86.	Electronics & Radar Dev. Establishment, DRDO Complex CV Raman Nagar (PO) Post Box No. 9324 Bangalore – 560 093, Karnataka	Radar System engineering, radio trunk system (RTS) & radio local system (RLS) for radio mobile communication system.
87.	Electronics Res & Dev. & facilities Centre 1, Udyog Vihar Gurgaon- 122 016	Testing of electronic components
88.	Electronic Research & Development Centre, Vellayambalam, Thiruvananthapuram 695 033, Kerala	Electronic tests and their capacity, use etc
89.	Engineering Research Deptt. Red Hills, Hyderabad	Conducts tests & provides opinion on Bricks, Cement, Mortar, Stone, Soil & water etc.
90.	Engineering Research Institute, Baroda	Conducts test on aggregates, soil, concrete

91.	Engineers India Ltd R & D Centre Sector- 16 Gurgaon- 122 001 Haryana	Conducts tests on petroleum products & natural gas
92.	Food Drug & Toxicology Research Centre, National Institute of Nutrition Jamia-Osmania Campus Hyderabad – 500 007 Andhra Pradesh	Conducts tests on foods in view of drugs and toxicology
93.	Forest Research Institute , P.O New Forest, Dehradun (UP)	For testing of wood like identity of timber, for decay etc.
94.	G.B Pant Institute of Himalayan Environment & Development KOsai-Katarmal- 263 643 Dist. Almora, Uttar Pradesh	Conducts tests on Himalayan plants & its ecological impact on environment
95.	Geological Survey of India 27, JL Nehru Road Kolkata- 700 016 , West Bengal	Examination /Testing of soil, water, sands, powders, minerals, rocks clays, gems, rare-earths coal, water, gas etc.
96.	Govt. Security Paper Mill, Hoshangabad (MP)	Counterfeit currency and stamps
97.	High Energy Materials Research Laboratory Sutarwadi, Armament post Pune- 411 021, Maharashtra	High energy materials & Synthesis of new compounds
98.	Highway Research Station, Guindy, Chennai	For testing aggregates, cement concrete, bitumen, brick and soil
99.	Himalayan Forest Research Institute (Indian Council of Forestry Res. & Edn.) Press Villa, U.S Club Shimla- 171 001, Himachal Pradesh	Himalayan Plants & its impact on the environment and related matters

100.	Hindustan Aeronautics Ltd. Corporate Office 15/1, Cubbon Road Banglore- 560 001 Karnataka	Combat aircraft, helicopters, aero engines, gas turbines, engine test beds, aircraft communication & navigation systems.
101.	Hindustan Aeronautics Ltd Hyderabad Division Balanagar, P.O HAL Hyderabad- 500 042 Andhara Pradesh	Combat aircraft, helicopters, aero engines, gas turbines, engine test beds, aircraft communication & navigation systems.
102.	Hindustan Aeronautics Ltd. Lucknow Division P.B No. 215 Lucknow- 226 016 Uttar Pradesh	Combat aircraft, helicopters, aero engines, gas turbines, engine test beds, aircraft communication & navigation systems.
103.	Hindustan Aeronautics Ltd. Nasik Division Ojhar Township (PO) Nasik—422 207 Maharashtra	Combat aircraft, helicopters, aero engines, gas turbines, engine test beds, aircraft communication & navigation systems.
104.	Hindustan Teleprinters Ltd. G.S.T Road, Guindy Chennai- 60032 Tamil Nadu	Teleprints/ telecommunication
105.	Indian Agricultural Research Institute New Delhi- 110 012	Agricultural products and all the aspects of agricultural field.
106.	Indian Council for Agricultural Research, Krishi Bhawan, New Delhi	Testing of agriculture and Horticulture products
107.	Indian Drugs & Pharmaceuticals Ltd. IDPL Complex, Dundahera Delhi –Gurgaon Road Gurgaon – 122 016, Haryana	Drugs/medicines and all the matters relating to drugs
108.	Indian Government Mints, Mumbai, Kolkata, Hyderabad	Analysis and testing of coins as well as metals dyes.

109.	Indian Institute of Chemical Biology 4, Raja SC Mullick Road Jadavpur, Kolkata- 700 032 West Bengal	Membrane Biology, Genetic Engineering & Molecular Biology, Enzymology, Nuclear Medicine, Bioactive Compound Neurophysiology & neuropharmacology.
110.	Indian Institute of Chemical Technology Uppal Road, Tarnaka Hyderabad – 500 007 Andhra Pradesh	Drugs, Agrochemicals, Catalysis & Materials Science, Coal, Chemical Engineering , Oils & Fats, Organic Coatings & Polymers.
111.	Indian Institute of Packaging E-2, MIDC Area Post Box No. 9432 Andheri (E) Mumbai-400 093 Maharashtra	All the aspects of packaging i.e materials, space, weight etc.
112.	Indian Institute of Technology, Chennai	Ass aspects of Building materials
113.	Indian Institute of Technology, Hauz Khas, New Delhi	All aspects of Building materials
114.	Indian Institute of Technology, Kanpur	All aspects of Building materials
115.	Indian Institute of Technology, Mumbai	All aspects of Building materials
116.	Indian Oil Dev. Centre, Sec -13, Faridabad-121 007, Haryana	Oil & its characteristics
117.	Indian Plywood Industries Research & Training Institute, Tamkur Road P.B.No. 2273 Banglore- 560 022- Karnataka	Testing of wood & alternative wood like plywood, card-board
118.	Indian Space Research Organisation Headquarters, Antaiksh Bhavan New BEL Road Banglore- 560 094 Karnataka	All aspects of satellites, launch vehicles & sounding rockets

119.	Indian Statistical Institute 203, BT Road, Kolkata-700 035 West Bengal	Statistics, natural sciences and social sciences
120.	Indira Gandhi Centre for Atomic Research Kalpakkam- 603 102 Dist. Chengalpattu Tamil Nadu	Fast Breeder Reactor technology
121.	Industrial Toxicology Research Centre Mahatma Gandhi Marg Post Box No. 80 Lucknow- 226 001 Uttar Pradesh	Neuro-Toxicology, Pesticide & Hydrocarbon Toxicologies & Food additives
122.	Institute of Plasma Research Bhat Near Indira Bridge Gandhinagar- 382 428 Gujarat	Opinion on medical science (blood, plasma)
123.	Institute of Armament Technology Simhadgaon Road Girinagar, Pune- 411 025, Maharashtra	High energy materials
124.	Institute of Himalayan Bioresource Technology Post Box No. 6 Palamur-176 061, Kangra Himachal Pradesh	Biotechnology, Biodiversity, Hill area Tea Science, Natural Plant Products & Floriculture
125.	Institute of Immunohaematology (ICMR) New Multistoreyed Building 13 th Floor, KEM Hospital Campus Parel, Mumbai-400 012 Maharashtra	Immunohaematology
126.	Institute of Life Sciences 301, Sahid Nagar Bhubneshwar – 751 007	Biological aspects of life science
127.	Institute of Microbial Technology Post Box No. 1304 Sector -39-A Chandigarh- 160 014	Biochemical Engg. Microbial Fermentation & Bioprocess Engg.
128.	Institute of Nuclear Medicine & allied Sciences, Lucknow Road Delhi -110 054	Nuclear medicines and allied sciences, Radiation medicine and allied sciences.

129.	Institute of Oceanography Panaji, GOA	Analysis of Marine related issues
130.	Instruments Research & Development Establishment Raipur Road, Dehradun- 248 008 Uttar Pradesh	Optical, electro-optical & optronic instrumentation of surveillance, piloting, navigation, guidance and target identification
131.	Jadavpur University, Jadavpur, 24, Paragona, West Bengal	Testing of electrical transformers
132.	Kerala Engineering Research Institute Peechi-680 653, Dist. Thrissur	Testing of aggregates, soils, metals etc.
133.	King Institute of Preventive Medicine Guindy, Chennai- 600 032 Tamil Nadu	Preventive medicines, like vaccine antibiotics etc.
134.	Military Engineering Laboratory, Kirkee, Pune	Testing of Aggregates, timbers, steel, cement, bricks, soil & all building materials
135.	Ministry of Information Technology, Electronic Niketan, New Delhi- 110 003	Computers & Information Technology related issues
136.	Narcotics Commissioner, Gwalior M.P	Narcotics & dangerous drugs
137.	National Aerospace Laboratories Post Box No. 1779 Kodihalli, Bangalore- 560 017 Karnataka	Environmental Botany, Floriculture & Plant Biotechnology
138.	National Botanical Research Institute Rana Pratap Marg Lucknow- 226 001 Uttar Pradesh	Environmental Botany, Floriculture and Plant Biotechnology
139.	National Bureau of Animal Genetic Resources, P.O No. 129 Karnal-132 001, Haryana	All genetic aspects of animals
140.	National Bureau of Plant Genetic Resources, FCI Building, CTO complex Pusa, New Delhi- 110 012	All genetic aspects of plants

141.	National Centre for Software Technology Gulmohar Cross Road No. 9 Juhu, Mumbai- 400 049 Maharashtra	Software Technology
142.	National Chemical Laboratory Dr. Homi Bhabha Road Pune – 411 008, Maharashtra	Chemical analysis of Building materials and chemicals
143.	National Council for Cement & Building Materials M-10, South Extension II Ring Road, New Delhi- 110 049	Cement & building materials
144.	National Environment Engineering Research Institute Nehru Marg, Nagpur-440 020 Maharashtra	Toxic wastes and its environment impact.
145.	National Facility for Animal Tissue and Cell Culture , Jopasana, 85/1, Paud Road, Kothrud, Pune – 411 029 Maharashtra	Animal tissues and its related aspects
146.	National Institute of Communicable Diseases, 22, Sham Nath Marg New Delhi- 110 054	Communicable diseases
147.	National Institute of Immunology Aruna Asaf Ali Marg New Delhi- 110 067	Immunological aspects
148.	National Institute of Nutrition Jamia Osmania Hyderabad- 500 007 Andhra Pradesh	Provides opinion on medical science in the field of nutrition
149.	National Institute of Science Technology & Dev. Studies Dr. K.S Krishnan Marg New Delhi- 110 012	Matters related to History & Philosophy of Science, Sociology of Science, Information system & databases
150.	National Institute of Virology 20A, Dr. Ambedkar Road	Provides opinion on virus and virus related diseases

	Post B No. 11, Pune – 411 01 Maharashtra	
151.	National Metalurgical Laboratory P.O Burma Mines Jamshedpur- 831 007,Jharkhand	Testing of Bricks, Cement, Mortar, Stone, Iron & Steel, quality, standard, make etc of machinery, tools, implements etc. and (qualitative analysis only from metallurgical point of view)
152.	National Physical Laboratory Dr. K.S Krishnan Marg New Delhi- 110 012	Calibration & testing of standards
153.	National Remote Sensing Agency Bala Nagar, Hyderabad – 500 037, A .P	Development of photographs from video tapes satellite photos etc
154.	National Research Laboratory for Conservation of Cultural Property Sec- E/3, Aliganj, Lucknow- 226 024 Uttar Pradesh	Antique and cultural properties
155.	National Ship Design and Research Centre Gandhigram, Visakhapatnam- 530005, Andhra Pradesh	All the aspects of ship designing, ship maintenance etc.
156.	National Sugar Institute, Govt of India, Kanpur	Testing of Sugar & Sugar products
157.	National Test House, Alipore, Calcutta- 27, Branches at Mumbai, Chennai	Testing of Bricks, Cement, Mortar, Stone, Iron & Steel, Paints, Rubber, Glass & Ceramic articles, Leather, Soil, water quality, standard, make etc. of machinery, tools implements & electrical goods. General assessment of quality & cost of stores

		like furniture, cloth equipment etc. quality of stationary, paper etc.
158.	National Test House, 11/1, Judge's Court Road, Alipore, Kolkatta	Quantitative test/examination of various materials & chemicals
159.	National Tuberculosis Institute 'Avalon' 8, Bellary Road Banglore- 560 003 Karnataka	Tuberculosis disease & related issues.
160.	Neurological Research Centre Dispur, Guwahati- 781 006	Neuro Science & related issues
161.	NIMHANS, Wilson Garden Banglore- 27	Psychological, Psychiatric analysis, emotion analysis, behavioral science etc.
162.	North Eastern Regional Institute for Science & Technology- Nirjuli- 791 109	Testing of aggregates, soil, satellite imagery
163.	Orissa Remote Sensing Application Centre , Suryakiran Building Complex 2 nd Floor, Saheed Nagar Bhubneshwar- 751 007	Satellite and satellite launching , satellite imagery
164.	P.W.D research Institute Lucknow (UP)	Testing of aggregates, soil, bitumen, concrete, bricks
165.	Physical Research Laboratory Navrangapura Ahmedabad- 380 009, Gujarat	Analysis and opinion on satellites
166.	Postgraduate Institute of Medical Educational & Research Chandigarh- 160 012	Matter related medical science
167.	Project Directorate of Biological Control Bellary Road, P.B. No. 2491, H.A Farm Post, Banglore- 560 024, Karnataka	Provides opinion on the animal diseases
168.	PWD Research Institute, Chepauk, Chennai	Testing of Soil concrete and aggregates and all building materials
169.	PWD Research Laboratory, Karnal	Testing of aggregate, soil,

		bitumen, concrete, bricks
170.	Railway testing laboratory, Lonavala, Dist. Pune (Maharashtra)	Testing of aggregates, timbers, steel, cement, bricks, soil and all building materials
171.	Raman Research Institute CV Raman Avenue, Sadshivanagar, Banglore- 560 080, Karnataka	Analysis of plants
172.	Regional Directors of Food, Ministry of Food & Agriculture	Quantitative & qualitative analysis of foodgrains fodder, cereals, oils etc.
173.	Regional Research Laboratory, Hyderabad (under CSIR)	Conducts tests on adulteration of edible oils.
174.	Regional Research Laboratory Canal Road, Jammu Tawi- 180 001, J&K	Matters related to chemical Engg. & Drug Design
175.	Regional Research laboratory Hoshangabad Road, Near Habibganj Maka, Bhopal- 462 026 Madhya Pradesh	Matters related to composites/alloys & metallurgy
176.	Regional Research Laboratory Jorhat- 785 006 Assam	Matters related to Agrotechnology, oil, field chemicals, medicinal & aromatic plants, speciality papers & boards & seismic survey.
177.	Regional Research Laboratory Pappanamcode, Industrial Estate Thiruvanthapuram- 695 01, Kerala	Matters related to minerals, clays, coconut products, spices & processing of Agro products
178.	Regional Research Laboratory Sachivalaya Marg Bhubneshwar – 751 013 Orissa	Matters related to special materials, composites & alloys, drugs, industrial & perfumery chemicals ,medical plant, coal & cement & paints &

		pigments.
179.	Research Deptt. office of the Chief Engineer (R&D) All India Radio & Doordarshan Indraprastha Estate, New Delhi- 110 002	Opinion on internet related issues, wireless, video and audio recordings etc.
180.	Rubber Research Institute of India Rubber Board Kottayam – 686 009, Kerala	All the matters relating to rubber
181.	Saha Institute of Nuclear Physics Sec – 1, Block AF Bidhan Nagar, Kolkata- 700 064 West Bengal	Conducts tests on Biophysical Science, Condensed Matter Physics, Material Physics, Nuclear Science
182.	Semiconductor Complex	Opinion on semiconductor and its use, effect
183.	Society for applied microwave electronics, Engineering & Research (SAMEER) CIT campus, Taramani, Chennai- 600 113, Tamil Nadu	Matters related to microwave engineering
184.	Space Application Centre Jadavpur Tekra, Ahmedabad- 380 053 Gujarat	Opinion on satellite and its functioning, effect etc.
185.	State Agriculture Laboratory, Hyderabad	Quantitative & Qualitative analysis of foodgrains, fodder, cereals, oils etc.
186.	State Drugs Control & Research Laboratory 2, Convent Lane, Kolkata- 700 015	Tests & analysis relating of different type of drugs.
187.	State Health Laboratory, Chemical Examiner , Hyderabad	Analysis of medicines and drugs
188.	Structural Engineering Research Centre, Central Govt. Enclave Sec 19, Kamla Nehru Nagar Ghaziabad – 201 002, UP	Computer Software for structural engg. Application

189.	Structural Engg. Research Centre P.B No. 8287, Taramani, Chennai- 600 113, Tamil Nadu	Computer aided Designing & Structural Dynamics including Vibration, Blast & impact studies
190.	Tata Memorial Centre (Tata Memorial Hospital) Dr. Ernest Borges Marg Parel, Mumbai- 400 02 Maharashtra	Cancer disease and its related aspects.
191.	Technology Dev. Centre Raj Bhawan Circle, CAIR Building High Grounds, Bangalore- 560 001 Karnataka	Tests/research on technology developments
192.	Terminal Ballistics Research Laboratory Sec – 30 Chandigarh- 160 020	Conducts tests relating to high speed photography, Oscillography, Flash Radiography & Shadowgraphy
193.	Vallabhbhai Patel Chest Institute Delhi University Campus P.O Box No. 2101 Delhi- 110 007	Heart and related aspects
194.	Variable Energy Cyclotron Centre Sector-1, Block AF Bidhan Nagar, Kolkata- 700 064 West Bengal	Conducts tests relating to nuclear physics & allied sciences
195.	Vikram Sarabhai Space Centre Thiruvananthapuram- 695 002 Kerala	Setallites and related issues
196.	VSNL, New Delhi(Regional Centre at Kolkata , Mumbai & Chennai) Videsh Sanchar Nigam Ltd. Research & Dev. Videsh Sanchar Bhavan MG Road, Fort Mumbai- 400 001, Maharashtra	ISDs, Internet & other modern communication related matters.
197.	West Bengal Vaccine studies X2, Convent Lane	Wildlife related issues

	Kolkata- 700 015 Uttar Pradesh	
198.	Wildlife Institute of India P.B No. 18 Chandrabani, Dehradun- 248 001 Uttar Pradesh	Wild life related issues
199.	Zoological Survey of India M-Block, New Alipore Prani Vigyan Bhawan Kolkata- 700 053 West Bengal	Biological & chemical tests relating to animals

NB: There are a number of institutes other than the above which offer technical assistance or opinion on a variety of subjects. In the event of any confusion/doubt, the investigating officers may take the advice of the concerned Director CFSL/FSL & then seek technical assistance from a specialised institution.

Institutes where facilities of DNA test is available

1. Andhara Pradesh State Forensic Science Laboratory
Reed Hills, Opposite Niloufer Hospital
Hyderabad, Andhra Pradesh- 500004
2. State FSL (Karnataka)
Madiwala, Banglore – 56006

Physical Evidence and its role in Crime Investigation

235.1 The word Physical Evidence denotes all evidence having certain physical dimensions such as size, shape, pattern, length, width, height, volume etc., which can be preserved, lifted, collected, packed and forwarded for scientific analysis to the specialist concerned. Physical evidence can alternatively be called as material evidence, objective evidence, circumstantial evidence or indirect evidence in different contexts. Physical Evidence includes all naturally occurring substances as well as machine/men made objects in the Universe.

Purpose of Physical Evidence in Crime Investigation

2. The goal of physical evidence examination is to provide useful information for criminal investigators in solving crimes and for courts of law during the adjudication of these cases. The following leads can be obtained from the examination of physical evidence in the process of investigation.
 - A. **Information on the corpus delicti** : The corpus delicti (literally means the “body of the crime”) refers to those essential facts which show that a crime has taken place. For example, tool marks, broken doors or windows, ransacked rooms, and missing valuables would be important in establishing that a burglary has taken place. Similarly, in an assault case, the victim’s blood, a weapon, or torn clothing could be important pieces of physical evidence.
 - B. **Information on the modus operandi (MO)**: Many criminals have a particular modus operandi or (MO), which is their characteristic way of committing a crime. Physical evidence can

help in establishing an MO. In burglary cases, for example, the point of entry, the means used to gain entry, tools that were used and articles stolen may all establish an identifiable method of operation. In arson cases, the types of accelerant used and the way the fires were set constitute physical evidence that helps to establish the “signature” of an arsonist. Similarly the type of explosive remnants, triggering devices, timing devices, containers and composition of explosive substances used in the making of Bombs and IED’s establish the commonness of source/origin of Improvised Explosive Devices (IED’s) in serial blast cases. Analysis of physical evidence is one important way of linking cases in the investigation of a “serial” killer or rapist.

- C. ***Linking a suspect with a victim:*** This linkage is one of the most common and important aspects that physical evidence can help to establish. Blood, hairs, clothing fibers, cosmetics and other items from the victim may be transferred to a perpetrator. Items found in a suspect’s possession can sometimes be linked to a victim, for example through the comparison of bullets with a weapon seized from the suspect; the suspect can be linked with the crime. It is also possible that evidence is transferred from a perpetrator to a victim; in rape, murder and assault cases.

- D. ***Linking a person to a crime scene:*** This type of link is also one of the most vital in a crime scene investigation. Numerous types of evidence may be deposited by the person committing a crime, including fingerprints, foot prints, blood, hair, fibers, and soil. In addition, the type of weapons or objects used may also leave evidence, for example, bullets and cartridge cases or tool

marks. Depending on the type of crime, various kinds of evidence from the scene may be carried away intentionally, as a stolen property and unintentionally as a transfer of trace evidence such as carpet fibers or hairs on the criminal's shoes or clothing. These materials are extremely useful in linking an individual to a particular crime scene.

- E. ***Disproving or supporting a witness' testimony:*** Physical evidence analysis can often indicate conclusively whether a person's version of a set of events is credible, or whether an alibi put forth is convincing or not. For example, the examination of a car, which fits the description of a hit and run vehicle, might reveal blood on the underside of the bumper. If the owner of the vehicle claims he hit a dog, laboratory tests on the blood can reveal whether the blood is from a dog or from a human and further testing for DNA Profiling may reveal the truth relating to the accident and victim.

- F. ***Identification of a suspect:*** The best evidence for identifying a suspect is his or her palm prints and evidence such as blood, semen, saliva, skin tissues etc. collected for DNA Finger Printing examination. A fingerprint found at a scene, and later identified as belonging to a particular person, results in an unequivocal identification of that person as having been at the scene. The term identification when applied to people really means "individualization" (identifying a single unique source).

- G. ***Providing investigative leads:*** Physical evidence analysis can assist the investigator in pursuing a productive path, by providing clues from the characteristics of the physical evidence. In a hit-and-run case, for example, examination of a

chip of paint found in the victim's clothing could be used to provide information on the colour and possibly the model and year, of the automobile involved. With the rapid emergence of computerized fingerprint and DNA data-bases, the ability of physical evidence to provide investigative leads has increased enormously.

- H. **Identification of a substance:** The results of examining a piece of physical evidence can provide information on the identity of a particular substance. As indicated above, this is a classification process. In its simplest form, such as in the identification of cocaine, heroin, LSD, morphine or any other type of drug, it meets the legal requirement for classification as a controlled substance. Laboratory analysis of fibers can sometimes yield information on the manufacturer of the fabric or garment. Simple identification of many types of physical evidence can provide critical information for use in the investigation or prosecution of a case.

- I. **Crime Scene Reconstruction:** Transient evidence such as odour, temperature (of car engine, fire debris etc), imprints, marks/stains; pattern evidence like blood stain patterns, skid mark patterns, gunshot residue patterns, projectile trajectory patterns, glass fracture patterns etc., and conditional evidence such as light, smoke, fire, water, piled up news papers etc., will play a key role in reconstruction of the events surrounding the crime scene and the nature of offence. Sometimes it may also give valuable leads regarding the perpetrator based on the individual traits in relation to the evidentiary pattern.

Sources of Physical Evidence

3. The primary source of physical evidence is generally the crime scene but it is by no means the only source. Many crimes occur over multiple scenes and many criminals carry physical evidence away from the actual scene in addition to leaving evidence behind. The victim, suspect and sometimes the witnesses are major sources of physical evidence. The methodology of search depends on the case and the scene. The purpose of the search is to look for clues and for evidence of what happened during the crime. It is not a random groping in dark but rather a directed search for objects and materials. Recognizing, recording, collecting, marking, packaging and preserving evidence discovered while searching a crime scene is the basic essential duty of the investigating officer. In cases where the evidence is of a common nature, i.e., evidence, which is not hidden and is easily collectable, without expert's assistance, the Investigating Officer should invariably collect all possible forms of physical evidence. For other kinds of evidence the investigator should take the assistance of expert or medico-legal experts. Some types of physical evidence, which are hidden, latent or fragile, require scientific procedures for location as well as collection and packing. In such circumstances the involvement of expert from the initial stages of inspection is essential. The details of services of expert are given in Order .

Known Standards/controls

4. The examination of evidence, whether soil, blood, glass, hair, fibers etc., often require comparison with a known standard or control. Such material may be obtained from a victim, suspect, crime scene, or other sources. For instance, investigation of a hit and run accident

necessitates the collection of control paint from the suspect vehicle to enable comparison with the paint recovered from the scene. Similarly hair found at a crime scene will be of value only when compared with control hair collected from the suspect or the victim. Likewise, bloodstains collected at the scene of crime can only be useful when control samples are collected from all possible suspects/victims involved in the offence. The quality and quantity of control samples often determine the evidential value of crime scene evidence. The control specimens must therefore be collected and treated with equal care and caution as that of crime specimens. In the collection of standards too, due care should be taken for proper recognition, legal possession, marking for identity, preservation of the integrity of the sample, and accuracy in reporting acquisition, besides chain of custody.

Chain of custody of physical evidence

5. Continuity of possession or the chain of custody of evidence is an important aspect whenever evidence is collected until it is presented in the court as an exhibit. This subject is discussed in detail in Order in Chapter .

Significance of physical evidence

6. The major purpose of examination of physical evidence by a forensic scientist is to identify or absolutely determine the nature of the material or to compare two substances in order to know whether they possess the same characteristics and composition, with a view to establish their commonness of origin.

- A. **Identification:** The absolute determination of the biological,

physical or chemical nature of a substance is the purpose of identification. This information helps the police officer to secure leads for further investigation or confirm his hypothesis or draw certain inferences and conclusions based on other circumstantial evidences, e.g.

- Identification of specific poison in the viscera of a person who died under suspicious circumstances.
- Identification of an inflammable material in the burnt clothing of young woman in a dowry death case.
- Identification of a reddish stain to be blood in a case where the suspect claims it to be a vegetable stain or a synthetic dye.
- Absolute determination of a white powder to be cocaine in case of illicit drug trafficking.

B. **Comparison:** The comparison of two or more substances, usually crime and control specimens, is generally undertaken to establish commonness of origin (source) of the materials involved. For example, the forensic scientist may assist in placing a suspect at a particular location by matching similarities in the hair found at the crime scene to the hair collected from the suspect. Similarly, comparison of a paint chip found on a road accident victim's clothing with the paint removed from a suspected vehicle might prove its involvement in the accident. Comparing chance fingerprints at the crime scene with the fingerprints of the suspected persons may establish their association with the crime.

C. **Individual Characteristics:** Evidence that can be traced to a

common source with an extremely high degree of probability is said to possess individual characteristics. Examples of this type are the matching ridge characteristics of the fingerprints, the comparison of random striation marks on bullets, tool marks, irregular and random tread patterns in tyre or footwear impressions and handwriting for authorship determination.

- D. **Class characteristics:** Evidence is said to possess class or group characteristics when it can only be traced to a group and not to a single source. Here, probability is a determining factor. Class characteristics help provide leads and corroborate evidence. For example determination of the direction of twist, the number of lands and grooves on fired bullets for group or class characterization and further individual characterization can be done by matching the striation marks on the crime bullet with the test bullet fired from the suspect weapon.

Limitations of Physical Evidence

7. The Forensic Scientist will be able to give scientific opinion definitely only when the necessary details are furnished to him in the prescribed manner enabling a clear analysis.

Letter of advice

8. Letter of advice is an important document, which acts as a link between the Investigating Officers and Forensic Scientist and therefore should contain all possible information to derive maximum benefit from the physical evidence collected. The brief history of the case shall contain all pertinent facts relating to the motive, opportunity and means of committing the crime.

Regarding collection of evidence full information should be furnished against each item, the details of when, where and how the evidence was collected against the column “List of articles forwarded for examination.....”. The Investigating Officer should go through the nature of examination and the types of analytical information provided by the FSL authority for each class of physical evidence given in detail in Order to before filling the column “Exact nature of examination required”. The Investigating Officer should affix the sample seal invariably on the letter of advice.

Collection of physical evidence in the following cases is mandatory

9. The Investigating Officers should collect pertinent physical evidence from all possible sources in the types of cases mentioned below and forward it to the FSL for scientific analysis. The Investigating Officer should ensure that the evidence to be derived from the examination of the material is relevant to prove the guilt of the accused. In the process of collection of material evidence, they should take the assistance and guidance of Mobile Investigation Teams, (experts) of their jurisdiction. *Failure to collect and forward the physical evidence in these cases for analysis to FSL will entail in severe disciplinary action.*

- A. Murder
- B. Rape
- C. Arson

- D. Property offences
- E. Cases involving firearms
- F. Cases involving explosives
- G. Road accidents
- H. Mass disasters
- I. Custodial deaths
- J. Dowry deaths
- K. Industrial accidents
- L. Printing of counterfeit currency
- M. White-collar offences involving forged documents
- N. Environmental crime
- O. Other sensational and grave crimes
- P. Crimes against wild animals

List of documents to be sent along with physical evidence

10. Depending upon the nature of physical evidence forwarded, the following documents should be sent along with the covering letter.
 - A. Forwarding letter/authorisation letter of competent authorities.
(Order)
 - B. Letter of advice from Investigating Officers.
 - C. Doctor's Report (post-mortem examination) in Toxicology cases, Medical examination Report of victim and accused (if arrested) in rape and serology cases.
 - D. Confessional Statements of suspects/accused, statements of witnesses, etc., in Polygraph cases.
 - E. Inquest copies in Toxicology cases.
 - F. FIR copies where desirable.

- G. Sample seal on a sheet of paper, or on forwarding letter/letter of advice.
- H. Any other document relevant for examination.

Case property will be accepted by FSL if the following conditions are satisfied

- 11-A. Physical evidence forwarded should be described in detail with information as to when and where it was found, who found and how it was processed and forwarded and tally with the description given in the letter of advice/postmortem report/medical officer letter.
- B. The Investigating Officer should indicate any special priority to be given to the case of sensational and important nature for examination and report, within one week.
- C. If special handling is required, it must be indicated and specific instructions given on the packing itself, e.g., material is fragile or perishable, for safe transportation and handling in the laboratory.
- D. Adequate and appropriate samples should be collected and forwarded.
- E. The Police Constables or other personnel who are authorized to bring the case property should bring relevant identification cards, command certificate and other proofs of identity while delivering or taking back the case property.
- F. Tag or mark all the articles. If the articles can be enclosed put a mark on the container or the box.
- G. Bulky articles, samples in huge quantities e.g., cots, mattress, flooring stones, a drum of petrol or diesel oil, etc., or articles unconnected with the case should not be sent.

- H. Label, initial and seal all envelopes and the packages without fail. The seal should be legible and intact and all knots of stitching ropes must be sealed. It must be packed to avoid breakage, loss or contamination in transit.
- I. Ensure prompt delivery of all items of interest to the laboratory within one month from the date of occurrence of crime. In case of delay beyond one month the case property should be forwarded along with a DO letter from the SP giving the reasons for delay. Record all the procedures adopted for location, recording, lifting, packing and forwarding in case diaries. Wherever feasible it is advisable to bring the physical evidence in person and discuss the circumstances and history of the case so that the scientist will endeavour to bring out the right information from the scientific studies.
- J. Always obtain a signed receipt whenever evidence is transferred (chain of custody) from place to place or person to person.
- K. Notify the laboratory if the case is associated with any previous submission, evidence, or case.
- L. Tweezers, forceps and similar tools should be used to collect and place trace and small items into containers. It is advisable to use rubber gloves to handle such physical evidence.
- M. An "evidence box" such as a clean empty cartons, cardboard boxes, etc., should be utilized for transporting the evidence. An evidence box with pegboard sides allows for tying or wiring small and medium sized objects in place. A series of drilled holes and appropriately sized clamps can serve the same purpose.
- N. Items of evidence that need comparative analysis for possible commonness of origin should be packed in separate containers to avoid any cross contamination. Thoroughly clean and dry all

containers, wrapping paper, card board boxes before packing physical evidence. No wet or metal containers should be used.

- O. Evidence in the form of documents should be first placed in transparent envelopes without folding or bending, and then placed between two pieces of rigid card board and packed in a suitable cloth lined envelope.
- P. Plastic pill bottles such as used medicine containers with lids, which are unbreakable, can be easily sealed with tape. So they make excellent containers for hair, fibers and other small trace evidence. They are ideal for spent bullets, empty cartridge cases, and cartridges because they can be packed with absorbent cotton to minimize movement.
- Q. Plastic envelopes and bags are suitable for packing wide variety of materials. However in case of soil, debris or clothing impregnated with bloodstains this may result in bacterial action contaminating the blood sample, and should be avoided.
- R. If the stain is on a transportable object such as a Kukhuri, Bhamphok, knife, crowbar, firearm or any other weapon, it is preferable to send the whole object, protecting the area of the stain or completely enclosing the object in a package (if it is small enough). If the stain is on clothing, the garments should be wrapped separately in paper, marked appropriately and packed. This is better than any other technique (such as scrapping) for forwarding a movable sample of the stain for analysis.
- S. Garments and other materials such as bed-sheets, towels, tablecloths and similar evidence should be folded to a minimum size. Specific areas which contain trace evidence should be folded in such a way as to protect such areas to avoid loss of incriminating evidence by falling off, peeling off, etc.

- T. It is preferable to send a soil-stained or mud-soaked object to the laboratory rather than to attempt to remove and send the soil or mud as a separate item. When such traces are picked up as individual items of evidence, it is vital that every precaution is taken to keep the evidence in separate sealed containers to avoid any accidental loss or mixing in transit.
- U. Bed-sheets, carpets, woollen materials from the scene of arson may be wrapped in metal foil and sealed in airtight containers. Smaller objects, such as paper and rags or solid samples should be sealed in the container in which they were found or placed in airtight bottles or cans. This protects the fire accelerants and their residues from evaporation.
- V. Pills and other non-caustic substances should be left in their original containers for transport to the laboratory. Such containers often contain useful information. The investigating officer should count the number of pills and capsules or accurately determine the bulk quantity of fluids or powders and should include such data in observation notes and letter of advice.
- W. Caustic or corrosive poisons should not be transported until their safe transit is ensured by suitable means. Appropriate containers such as glass bottles with glass lids should be used for transporting substances such as acids.
- X. Food and edible substances should be placed in as many separate moisture-proof bottles or containers as necessary to avoid any contamination. In case of suspected food poisoning, the packages should be marked clearly as suspected or known samples of poison.
- Y. Trace evidence, such as hair, fibers, etc., should be sealed in folded paper or placed in clean, sealed envelopes.

- Z. All evidence should be forwarded or received only in sealed condition. Sample seal should be affixed on covering letter/letter of advice for comparison.

Crime Scene Processing and Physical Evidence Collection

Protection of Evidence at The Crime Scene And Its Preservation

- 236.** The importance of the crime scene, its protection and preservation cannot be over-emphasized. Successful investigation of a crime largely depends upon how well various clues, leads, and evidence available at the scene of crime are protected, located, recorded, processed, evaluated and interpreted. The observations and findings in an undisturbed crime scene are vital to the success of the investigation. An improperly secured and unprotected crime scene may lead to loss, destruction or contamination of various forms of evidence, especially physical evidence. Moreover evidence once overlooked cannot be retrieved at a later stage. Therefore the scene of crime should be properly secured and protected as a first step by the investigator and all available evidence preserved in an appropriate manner thereafter. Protection of crime scene, guidelines for protection, preservation of evidence are dealt in detail in Order _____ in Chapter _____.

Recording the Crime Scene

- 237.** The method of recording crime scene through videography and photography is given in detail in Order _____ in Chapter _____.

Searching the Crime Scene for Physical Evidence & Role of the Investigating Officer

238. Initially the Investigating Officer should conduct an overall survey to assimilate the items, conditions, and locations that seem to have the greatest importance. At this stage the Investigating Officer should only observe carefully and record the position of each item. The detailed steps thereafter are given in Order in Chapter .

Principles and Laws Governing Forensic Science

Principle of Exchange

239-1. This was the first and foremost concept that led to the systematic development of forensic science. A French scientist Prof. Edmand Locard while working in the University of Lausanne, Switzerland in 1928 proposed this theory, i.e. “*When any two objects come into contact, each of them will leave its traces on to the other*”. The transfer of traces may be in the form of materials or impressions. Such transference may be large or small, visible or invisible, detectable readily or difficult to detect. Nevertheless, transference does occur. It is the responsibility of the investigating officer to search, locate and collect it.

Law of Individuality

2. *Every object natural or manmade, animate or inanimate has some individuality/uniqueness of its own which is not repeated*

in any other objects. The natural objects are; human beings, animals, plants, leaves, seeds, insects, wood, soil etc., whereas the manmade objects are; tools, guns, bullets, shoes, pens, paper, ink, pills etc. Sometimes it would be possible to distinguish a person or an object through the acquired characteristics as indicated below:

<u>Natural or Manmade Objects</u>	<u>Original Characteristics</u>	<u>Acquired Characteristics</u>
Human beings	Physical features, Finger / Foot Prints, Color of eyes, Hair, Blood group etc.	Handwriting, Gait Pattern, (Shoe sole pattern), Voice Prints, Beard, Moustache, Hair style
Twins	Fingerprints, Physical features	Handwriting, Gait pattern, Hairstyle
Bullet	Caliber	Lands and grooves, Barrel impressions, Striations due to wear and tear, maintenance, storage conditions of weapon.
Cartridge Case	Case and primer	Striking pin impression
Tyres	Treads, Tread Pattern, Tread width, Rubber etc.	Wear and Tear marks, Defects due to usage, Environmental marks
Khukuri Bhamphok Knife	Length of Blade, Hard characteristics, Blade characteristics	Marks due to sharpening on stone, metal, wall etc., scratches etc.

Law of Progressive Change

3. *Everything in the Universe undergoes a change as the time progresses.*

People undergo change

- Criminals – Disguise, Alibi
- Witnesses – Hostile, influenced
- Police – transfer, promotion, retirement
- Judges- transfer, promotion, retirement
- Lawyers-busy with new cases, priorities
- Prosecutors-transfer, promotion, retirement
- Places undergo change
- Crime scene – Contamination, weather, atmosphere, rain, sun, birds, animals, maggots
- Materials/objects also undergo change
- Objects/materials/matter – Volatile, decomposition,
- Chemical transformation, Physical transformation, Biological transformation.

Hence the importance of speedy investigation, speedy trial and speedy -justice, as the justice delayed is justice denied.

Principle of Comparison

4. *Only like things can be compared .*

No purpose will be served if comparison is made between

- Black Fibre – Black hair
- Grey Hair – Grey Fibre
- Bullet .38 – Bullet .32

- Nylon Fibre – Cotton Fibre
- Telugu Writing – English Writing
- SBML – SBBL
- DBBL – Rifle

Principle of Analysis

5. *The analysis can be no better than the sample itself.*

Hence the importance of proper collection of sample and also its integrity and chain of custody.

Law of Probability

6. *All identifications definite or indefinite are made consciously or unconsciously on the basis of Probability.*

The duties and responsibilities of expert are given below

- 7-A. Video recording of the crime scenes along with the surroundings (including approach, entry and exit route of the culprits).
- B. Photograph the vital clues from all perspectives using 35 mm Camera and Digital Camera.
- C. Sketch the crime scene covering the place of occurrence and clues therein.
- D. Systematic search for physical evidence other than what is visible and obvious.
- E. Collection of all visible physical evidence by appropriate tools

and techniques.

- F. Collection of partially visible physical evidence such as blood, dust, fingerprints, fibres, footprints, hair, stains, marks and other microscopic evidence or anything that is likely to have been left behind or stays behind the offenders that are useful for establishing linkages.
- G. To extend all possible assistance and guidance to the investigating officers. In collection of control samples collection of control physical evidence such as casts of footprints, shoe prints and other track marks; collection of tool marks on metals, wood, plastics and other medias, collection of controls and standards for all classes of physical evidence, especially in the matter of questioned documents, DNA fingerprints etc., and assisting the Investigating Officers in properly labeling, marking and preparing the Letter of Advice.
- H. Proper preservation and packing of physical evidence and handing over to the I.O for forwarding to the FSL or other authorities concerned.
- I. To co-ordinate with the Medical Officers, Bomb Disposal team officers or other scientific experts for prompt inspection of the scene of crime/victim/suspect.
- J. Preliminary analysis of clues such as blood stains, semen, soil, paint, glass, hair, fibre and other routinely occurring evidence materials like stains, marks etc., so as to give leads to the Investigating Officers in the matter of proper collection of right samples for analysis.
- K. Preliminary examination of tool marks on heavy vehicles such as buses, lorries, tractors, or light vehicles, cars, scooters etc., and other objects such as weapons, household articles,

furniture, fixtures, machinery, and other non movable heavy articles.

- L. Preliminary examination of explosive residues in cases of bomb explosions and examination of ingredients of defused bombs. In case of live bombs seized or recovered by Investigating Officers such examination should be done only after diffusion by the Bomb diffusion teams.
- M. Physical and mental reconstruction of crime scene in close association with the investigating officers which may help the investigating officers in getting right leads for apprehension of offenders.
- N. To impart theoretical and practical training in scientific methods to the Police Officers and assist the SP in conducting district level police competitions.
- O. To act as liaison officer between the District/ Range Police Administration and FSL Hqrs. and to discharge any other scientific or technical functions as required by the Range/District/Sub Divisional Police Officers from time to time.

Requisition of expert Mandatory in certain types of cases

8. *It is mandatory for the Investigating officers to seek the assistance of the expert in cases involving/relating to*

- a) explosions,*
- b) firearms,*
- c) arson,*
- d) dowry deaths,*

- e) homicide,
- f) property offences,
- g) mass disasters,
- h) road accidents,
- i) custodial deaths,
- j) use of force by police,
- k) industrial accidents and any other sensational crimes. Failure to requisition the services of the expert in the above types of cases will entail an appropriate disciplinary action.

The section wise details regarding the nature of physical evidence handled, methods of analysis used and the type of analytical information which may be furnished

Ballistics

- 240-1. Ballistics is the study of projectiles in motion. The term ballistics is derived from the Latin word “ballista” which refers to a crossbow like device for throwing stones by means of twisted ropes. Forensic Ballistics is the examination and identification of firearm, cartridges, fired cartridges, fired cartridge cases, bullets, gun powder, wads, pellets, etc. Further ballistics section links the firearm with fired cartridge cases and bullets, determine the range of fire & angle of firing etc.
- 2. **Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.**

Sl.	Nature of	Nature of	Type of analytical information
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No	Physical Evidence	examination conducted	laboratory can provide.
1.	Firearms	<p>1. Physical examination</p> <p>2. Test firing</p> <p>3. Chemical examination</p> <p>4. Chemical Etching Method</p>	<p>Whether it is company made or country made</p> <p>What is its bore/calibre</p> <p>What is the make and model</p> <p>Whether it is prohibited or not</p> <p>Whether it comes under the purview of arms act or not.</p> <p>Whether the firearm is in working order, if not what repairs are required</p> <p>Whether the firearm is prone to accidental discharge</p> <p>What is its effective range</p> <p>Whether recently used for firing</p> <p>What type of gunpowder is used?</p> <p>If any erased markings are present to restore the original markings.</p>

2.	Ammunition a) Cartridge	1.Physical examination 2.Chemical examination	What is its caliber/bore Whether it is company or country made What is its shot size number? Whether it is live or not Through which weapon they can be fired Whether it is reloaded or not. What type of gunpowder is used?
	b) Empty cartridge case	1.Physical examination 2.Microscopic examination (i.e., firing pin mark, breech face mark, extractor & ejector marks and chamber marks) 3.Chemical examination	What is the calibre/bore From which type of weapon it was fired. Whether the empty cartridge cases were fired or not.

	c) Bullets	1.Physical examination 2.Microscopic examination (Rifling marks i.e., lands, grooves, twist etc. and striation marks.	What is its calibre Whether the bullet was fired or not Whether it was fired from a company made or country made firearm.
	d) Pellets and wads	1.Physical examination 2.Chemical examination	What is the shot size number What is the size of the bore/calibre How many no. of cartridges were fired What is its make? What kind of gun powder was used to propel the pellets & wads
3.	Firearms along with empty cartridge cases & fired bullets	1.Under comparison microscope	To ascertain whether the empty case/bullet was fired from the firearm seized from the culprit.

4.	Clothes and skin pieces containing holes	1.Physical examination and under IR light 2.Chemical examination 3.Instrumental methods of analysis	How many no. of firearms were used How many no. of shots were fired What is the range of firing Whether the holes are entry /exit/multiple entry by one bullet or not What type of gun powder was used for firing Whether the rents were caused by the laden projectiles or copper jacketed bullets etc.,
5.	Postmortem certificates	1. Study	What was the range of fire What was the angle of fire Whether the wounds were entry or exit How many no. of shots/bullets were fired.

3. Important precautions and guidelines for the collection of physical evidence involving firearms.

- A. In case of a crime scene involving firearms all possible evidence such as firearms, empty cartridge cases, live cartridges, bullets, pellets, wads, gun powder and gun shot residue should be recovered after properly recording and photographing the position of each item.
- B. Firearms in loaded condition should not be sent to Forensic Science Laboratory. If there is any difficulty in unloading the firearm the services of the ballistics expert has to be

requisitioned. In extreme cases where the firearm has to be sent in loaded condition, the safety catch of firearm should be kept in safe mode and the constable who carries the case property should be informed about the loaded condition of the firearm and the parcel should be marked with red letters "*Handle With Extreme Caution- Firearm Is In Loaded Condition*".

- C. The firing pin of the firearm should be protected with cotton before packing the firearm.
- D. Empty cartridge cases and bullets should be packed separately in cotton.
- E. Live cartridges should be packed in a wooden/card board boxes with proper padding.
- F. Blood stained clothes and wads should be dried in shade and then packed separately taking due care not to disturb the gunshot residue.
- G. While recovering bullets lodged in furniture, walls etc care should be taken so that the rifling marks on the bullets are not disturbed.

Biology

- 241-1.** Biology is the branch of science dealing with the examination of biological materials encountered in crimes against persons or property. Biology section deals with the examination of hairs, fibres, diatoms, plant material like wood, leaves, seeds, fruits, flowers, pollens and cigarettes, beedies, zarda, insects, flies, maggots etc.
- 2. Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.** The

Investigating Officer should also bring the precautions/guidelines mentioned in sub-order below to the notice of the Medical Officers for collection of evidence in an appropriate manner.

Sl. No.	Nature of Physical evidence	Nature of examination conducted	Type of analytical information laboratory can provide
1.	<p>Hair :</p> <p>a) Loose hair found at crime scene, victim, suspect's clothes.</p> <p>b) Hair in the fist of victim/deceased</p> <p>c) Hair in combs.</p> <p>d) Loose/exchanged pubic hair of the accused on victim and vice versa.</p> <p>e) Hair on</p>	<p>Macroscopic and microscopic examination for morphological characteristics</p>	<p>a) Human origin or not</p> <p>b) Animal origin</p> <p>c) Site of origin</p> <p>d) Comparison and matching hair for the commonness of source</p>

	weapon		
2.	<p>Fibres :</p> <p>a) Loose fibre found at crime scene, victim, suspect clothes</p> <p>b) Ropes</p> <p>c) Cloth bits</p> <p>d) Cords</p> <p>e) Fibres adhering to vehicles</p>	<p>a) Macroscopic and microscopic examination for identification</p> <p>b) Flame test to distinguish classes of fibres</p> <p>c) Solubility tests</p>	<p>a) Whether fibres or not</p> <p>b) Whether natural or manmade</p> <p>c) Whether the fibres in question belong to the same original source.</p>
3.	<p>Diatoms:</p> <p>a) From sternum, long bones, liver, kidney, heart</p> <p>b) Control water sample</p>	<p>Microscopic examination</p>	<p>a) Detection of diatoms</p> <p>b) Comparison of diatoms to confirm whether they belong to same source or not.</p>

4.	<p>Wood:</p> <p>a) Wood fragments</p> <p>b) Saw dust</p> <p>c) Wooden logs/splinters</p> <p>d) Broken wooden parts of the weapon etc.</p>	<p>a) Macroscopic examination for physical characterisation</p> <p>b) Microscopic examination for anatomical characterisation</p>	<p>a) Detection of wood.</p> <p>b) Comparison of wood to determine whether the questioned and control came from the same source.</p>
5.	<p>Tobacco :</p> <p>a) Cigarettes</p> <p>b) Cigars</p> <p>c) Zarda</p> <p>d) Beedies</p>	<p>a) Macroscopic examination for physical characterisation</p> <p>b) Microscopic examination for anatomical characterisation</p>	<p>a) Detection of tobacco leaves</p> <p>b) Comparison of tobacco leaves to fix the source /commonness of origin</p>
6.	<p>Pollen :</p> <p>a) Pollen adhering to clothes of victim/suspect</p> <p>b) Pollen adhering to flooring</p> <p>c) Surrounding</p>	<p>a) Macroscopic examination for physical characterisation</p> <p>b) Microscopic examination for species identification</p>	<p>a) Detection of pollen</p> <p>b) Comparison of pollen to confirm whether they belong to same origin or not.</p>

	flora		
7.	Insects, flies, maggots etc. Live or dead maggots from dead body	Macroscopic examination for physical characterization and for species identification	a) Detection of maggots and flies b) To determine the time since death

2. Important precautions/guidelines for the collection of Physical evidence

1) Hair : loose hair; hair in the fist; hair in combs; loose exchanged pubic hair; hair on immovable objects like furniture, hair on weapons etc.	Hair samples should be collected with rubber tipped forceps air-dried and packed in a paper packet; pack the weapon along with hair sticking to it carefully in paper packet. Preferably 25 control hair samples and as many crime samples to be sent
2) Fibre : a) Loose fibre, fibres found adhering to vehicles/ other objects b) Ropes: cloth bits; cords	Fibre samples should be collected with rubber tipped forceps and packed in a paper packet Tag and place in polythene covers
3) Diatoms:	

<p>a) Sternum, long bones, liver, kidney, heart</p> <p>b) Control water sample</p>	<p>To be placed in a bottle containing saturated sodium chloride</p> <p>2-3 litres of water should be collected in sterile bottle from where the dead body was found.</p>
<p>4) Wood :</p> <p>a) Wood fragments</p> <p>b) Saw dust</p> <p>c) Wooden logs, splinters, broken wooden part of the weapon</p>	<p>Place the article to which the material is sticking in paper packet, use forceps where necessary.</p> <p>Pack in paper packet.</p>
<p>5) Tobacco:</p> <p>Cigarettes, cigars, zarda, beedies</p>	<p>Pack in paper packet.</p>
<p>6) Pollen :</p> <p>a) Pollen adhering to clothes of victim/suspect/other objects</p> <p>b) Surrounding flora as control</p>	<p>Place the article to which the material is sticking in paper packet, in case it is sticking to person or other objects such as vehicles, etc., the materials should be collected using clean forceps and placed in paper packet</p> <p>Pack in paper packet.</p>
<p>7) Insects :</p> <p>a) Dead maggots from dead body</p> <p>b) Live maggots from dead body</p>	<p>To be collected in a sterile bottle containing alcohol.</p> <p>To be collected in wide mouthed bottle with a small piece of flesh</p>

	inside. The mouth of the bottle should be covered with gauze cloth to allow sufficient aeration. (Weather conditions at the crime scene should be noted in both the cases).
8) Other Plant Materials : Leaves, flowers, bark etc.	To be packed in paper packets.

Biomedical

242-1. Biomedical section deals with the examination of skull, bones etc., by using combination of biological/anthropological and medical knowledge for the purpose of personnel identification and determination of age, sex, stature etc.,

2. **Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.**

Sl. No.	Nature of Physical Evidence	Nature of Examination conducted	Type of analytical information laboratory can provide
1.	Skull with/without mandible and photograph of deceased	a) Superimposition b) Examination of suture pattern on the skull. c) Computerised photo skull software	a) Whether the skull belonged to person in the photograph or not. b) Age and sex of person
2.	Bones	Osteometry	Age, Sex, and stature.

3. **Guidelines for Investigating Officers**

1. The skull should be intact and clean.
2. The photograph should be clear showing the facial portrait preferably taken recently.
3. Bones should be packed separately in paper packets or aluminium foil.

Chemistry

243-1. The Chemistry Section deals with analysis of a wide range of materials encountered in cases of explosives, adulteration of fuels, acid burning, fire, spurious goods etc.

2. **Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.**

Sl. No.	Nature of Physical Evidence	<i>Nature of Examination conducted</i>	<i>Type of analytical Information Laboratory can Provide</i>
1. Bomb blast cases	<i>Explosive remnants in the form of pieces of thread, cloth, glass, soil from the crater etc., and also other affected objects in the vicinity of explosion.</i>	Spot tests, thin layer chromatography, instrumental methods of analysis using GC, GC-MS, HPLC etc.	<p>a) Whether explosive or not.</p> <p>b) Low or high explosive.</p> <p>c) Approximate quantity of explosive charge and risk potential.</p> <p>d) Type of explosive device.</p> <p>e) components used for explosion.</p>

<p>2. Recovery / seizures.</p> <p>Live explosives.</p>	<p><i>Representative sample of chemical substances and components collected by the bomb defusal experts.</i></p>	<p>Spot test, thin layer chromatography, Instrumental methods of analysis using GC, HPLC etc.</p>	<p>a) Nature of explosive substance.</p> <p>b) Low or high explosive.</p>
<p>3.</p> <p>Fire/Arson/ Burning</p>	<p><i>Partially burnt and affected material objects like clothes, objects in-vicinity along with ash etc.</i></p>	<p>Spot test, steam distillation, thin layer chromatography, Instrumental methods of analysis using GC.</p>	<p>Whether any fire accelerants are present or not</p>
<p>4. Sale of spurious, substandard / duplicate goods.</p> <p>Manufactured goods.</p>	<p><i>Samples of pain balm, toothpowders, tooth pastes, detergents, cosmetics, Engine oils etc.</i></p>	<p>Appropriate chemical and instrumental analysis.</p>	<p>a) Whether the samples are genuine or spurious.</p> <p>b) Nature of deviation from standards.</p>

<p>5. In cases of Vitriolage (Acid throwing)</p>	<p><i>Affected clothing material, containers seized at scene, pieces of skin, soil and other affected objects.</i></p>	<p>Colour tests, Inorganic chemical analysis.</p>	<p>a) Nature of acid. b) Corrosive potency.</p>
<p>6. Sale/use of different chemical substances.</p>	<p><i>Unknown powders, substances etc.</i></p>	<p>Chemical analysis together with instrumental methods depending upon the type of samples.</p>	<p>The qualitative and quantitative nature of substances.</p>

7. In cases of suspected adulteration of fuels, petrol, Diesel Oil etc.	<i>Samples of Motor spirit and High speed diesel</i>	Density, distillation, flash point, kinematic viscosity etc. and instrumental analysis using gas chromatography.	a) Whether the fuel samples referred for examination are genuine or adulterated. b) Nature of adulterant. c) Percentage of adulterant.
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3. Important precautions and guidelines

A. Explosive Remnants

- Samples for examination in cases of explosion should be collected from the crater (seat of explosion) apart from other affected areas.
- Pieces of wire, detonator, containers, clock mechanism, batteries, plastic pieces, nails, metal scrapings, sawdust etc., should be collected from the scene.
- In-cases where it is not possible to collect explosive affected remnants from an immovable object, cotton swab preferably moistened with acetone from the affected objects should be collected.

B. Fuel Samples (Petrol/HSD)

- Fuels should be referred for examination in glass bottles or aluminium containers, but never in plastic bottles.

- Samples for examination should be sent within two working days from the date of seizure.

C. Fire/Arson/Burning

- The sample should be collected from the origin point of fire and sent for examination within two working days from date of occurrence.
- In cases of Arson the un-burnt portion of the material stored in godowns/warehouses etc., should be sent as control.

D. Spurious Samples

- Control samples of the same batch number and of same volume and weight should be sent for comparison.

Computer Forensics

244-1. As the name implies the Computer Forensics section deals with examination of all types of Computer related crimes in which hardware, software, peripherals, communication devices, print outs etc., form part of physical evidence to prove the use of computers as a means or media to commit frauds and other computer related offences.

2. Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.

Sl. No.	Nature of Physical Evidence	Nature of Examination conducted	Type of analytical information laboratory can provide
1.	Computer	a) Physical	a) Whether the

	hardware including peripherals like scanners, printers, communication devices etc., seized/recovered from the crime scene/suspect	<p>examination</p> <p>b) Retrieval of stored data</p> <p>c) Capture of deleted/erased data</p> <p>d) Analysis of data</p> <p>e) Status of functioning of each component</p>	computers and other gadgets were used for manipulation/tampering/ unauthorized access /unauthorized reproduction / unauthorized copying of data and information or other intellectual property so as to link the person using the computers with the crime.
2.	Software in the form of CDROM/Diskettes etc.	<p>a) Physical examination of the printed inscriptions on the packages, labels, diskettes etc.</p> <p>b) Microscopic examination of the quality of the floppies, diskettes.</p> <p>c) Analysis of data stored.</p>	Whether software in the diskettes/CDROM is original or pirated.
3.	Communication Devices like dial	a) Physical examination	Whether the gadgets could have been used

	modem, network cables modem etc.	b) Functionality studies	in the commission of offence.
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3. Precautions to be taken by the Investigating Officers while handling computer evidence

- A. In all cases of suspected computer crimes it is advisable to seek guidance and assistance of specialists of computer crime analysis of FSL before commencing the investigation and during the process of Investigation.
- B. Disconnect all power, communication sources.
- C. Photograph the screen, back of computer components with existing connections.
- D. Label all cable ends.
- E. Keep away from magnets, radio transmitters.
- F. *Write protect* all diskettes at the scenes and label them.
- G. For packing, use anti static plastic material.
- H. All loose sheets, documents, sheets available at Scene of Crime should be handled carefully.

DNA

245-1-A. DNA section deals with DNA fingerprinting of all types of forensic samples of human origin like, blood, blood stains, semen, seminal stains, vaginal swabs, tissues, bones, hair, teeth, saliva and other skeletal remains. It also deals with paternity/maternity testing which are useful in solving disputed parentage, swapping of child from hospitals, illegal adoption and immigration cases. This section can also undertake

examination, of samples of animal or plant origin wherever required.

- B. DNA or Deoxyribo nucleic acid is the genetic material present in the nucleus of cells in all living organisms and DNA is unique for each and every individual just like finger prints. It is the DNA present in every one of us that makes us distinguishable from each other. Hence DNA is an excellent identification parameter which differs from individual to individual.
- C. Deoxyribonucleic acid, or DNA, is sometimes referred to as our genetic blueprint because it stores the information necessary for passing down genetic attributes to future generations. Residing in every cell of our body (with the exception of red blood cells, which lack nuclei), DNA provides a 'computer programme' that determines our physical features and many other attributes. The complete set of instructions for making an organism, i.e. all the DNA in a cell, is referred to collectively as its genome.
- D. Half of the DNA is inherited from a person's mother and the other half from his/her father. Siblings inherit different combinations of DNA from the same parents and are therefore different from each other. Each generation of people is a new and different combination of genetic material from the previous generation. Except for identical twins, each person's DNA is unique, although the technology available does not yet allow the examination of every single difference between people's DNA.
- E. Within human cells, DNA found in the nucleus of the cell (nuclear DNA) is divided into chromosomes, which are dense packets of DNA and protection proteins called histones. The

human genome consists of 22 matched pairs autosomal chromosomes and two sex determining chromosomes. Thus, normal human cells contain 46 different chromosomes or 23 pairs of chromosomes. Males are designated XY because they contain a single copy of the X chromosome and a single copy of the Y chromosome, while females contain two copies of the X chromosome and are designated XX.

- F. Given this uniqueness of DNA, physical evidence collected from crime scene can either link a suspect to the crime scene or eliminate him just like fingerprints. It is possible to collect DNA from blood, skin cells, semen, hair roots, urine and saliva. The types of materials useful for DNA analysis are: i) Blood and blood stains ii) Semen and semen stains iii) Bones iv) Teeth v) Hair with root vi) Hair shaft vii) Saliva viii) Urine ix) Feaces x) Debris from fingernails or broken fingernails xi) Muscle tissue xii) Cigarette butts xiii) Postage stamps (licked) xiv) Envelope sealing flaps xv) Dandruff xvi) Fingerprints xvii) Personal items: razor blade, chewing gum, wrist watch, ear wax, toothbrush xviii) clothes, xix) tools, xx) used toothpick, xxi) bottles, xxii) bite marks.
- G. The direct transfer of DNA from one individual to another individual or to an object can be used to link a suspect to a crime scene. This direct transfer could involve:
- The suspect's DNA deposited on the victim's body or clothing;
 - The suspect's DNA deposited on a object;
 - The suspect's DNA deposited at a location;

- The suspect's DNA deposited on the suspect's body or clothing;
- The suspect's DNA deposited on an object;
- The suspect's DNA deposited at a location;
- The witness DNA deposited on victim or suspect; or
- The witness DNA deposited on an object or at a location

H. DNA evidence collection from a crime scene must be performed carefully and a chain of custody established in order to produce DNA profiles that are meaningful and legally accepted in court. DNA testing techniques have become so sensitive that biological evidence too small to be easily seen with the naked eye can be used to link suspects to crime scenes. The evidence must be carefully collected, preserved, stored, and transported prior to any analysis conducted in a forensic DNA laboratory.

2. **Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.**

Sl. No.	Nature of physical evidence	Nature of examination conducted	Type of analytical information laboratory can provide
1.	Evidence for Individualization a) Blood & blood stains b) Semen & seminal	1. Extraction of DNA 2. Quantization	a) In rape cases, whether the seminal stains

	<p>stains, vaginal swabs, garments with seminal stains.</p> <p>c) Saliva on Cigarette butts, bottles, glasses etc.,</p> <p>d) Hairs with roots</p> <p>e) Teeth</p> <p>f) Bones</p> <p>g) Tissue/skin</p>	<p>3. Quality check</p> <p>4. PCR Amplification for STR</p> <p>5. Gene scan analysis</p> <p>6. Interpretation of results</p>	<p>belong to the suspect or not.</p> <p>b) In murder cases, whether the bloodstains belong to the suspect or not.</p> <p>c) In man missing cases, the DNA from bones, tissues, teeth, hair belong to the nearest blood relations of the missing person or not .</p>
2.	<p>Evidence for paternity/maternity testing</p> <p>a) Blood from the child</p> <p>b) Blood from the mother</p> <p>c) Blood from disputed father</p>	<p>1. Extraction of DNA</p> <p>2. Quantization</p> <p>3. Quality check</p> <p>4. PCR Amplification for STR</p> <p>5. Gene scan analysis</p> <p>6. Interpretation of results</p>	<p>a) Whether the person is biological father of child.</p> <p>b) Whether the child is biological off spring of the father/mother</p>
3.	<p>Evidence from Animals</p> <p>a) Skin</p>	<p>1. Extraction of DNA</p> <p>2. Quantization</p>	<p>Whether the skin/tissues/blood etc., belong to the</p>

	<ul style="list-style-type: none"> b) Tissues c) Blood 	<ul style="list-style-type: none"> 3. Quality check 4. PCR Amplification for STR 5. Gene scan analysis 6. Interpretation of results 	particular animal or not
4.	<p>Evidence from plant material</p> <ul style="list-style-type: none"> a) Seeds b) Roots c) Leaves d) Flower etc., 	<ul style="list-style-type: none"> 1. Extraction of DNA 2. Quantization 3. Quality check 4. PCR Amplification for STR 5. Gene scan analysis 6. Interpretation of results 	Whether the seeds/roots/leaves/flower etc., belong to particular origin/source or not.
5.	In child swapping cases	<ul style="list-style-type: none"> 1. Extraction of DNA 2. Quantization 3. Quality check 4. PCR Amplification for STR 5. Gene scan analysis 6. Interpretation of results 	To determine who is the biological mother/father of the child/children.

3. Collection storage & transportation of DNA samples

Sl. No.	Sample	Collection
1.	Blood	Should be collected in sterile vial with EDTA 5 ml of blood in case of adults & 2-5ml in case of children.
2.	Blood stained clothes	Blood stained garments should be thoroughly dried in shade & packed in separate paper packet.
3.	Blood stained articles/weapons etc	In case the stains are dry, scrape the stained area, keep in paper envelope & seal or swab the stains with sterile gauze cloth soaked with saline, dry and pack separately.
4.	Semen/seminal stains/vaginal swabs	Air dry and pack in separate paper packets.
6.	Hairs	Hair with roots to be air dried and packed in separate paper packets.
7.	Tissues of skin, muscle etc.,	Muscle tissues to be collected in clean glass bottle Add 20% Dimethyl sulphoxide or sodium chloride.

8.	Bones	Whole bones like femur, humerus to be collected and packed in separate paper packets and kept in aluminum foil and frozen.
9.	Teeth	Teeth should be packed in dry paper packets and sealed (Molar or canine are preferred).
10.	Visceral matter	Collect Intestine, spleen and heart (avoid liver).

Notes:

(1) Avoid contaminating the area where DNA might be present by not touching it with bare hands, or sneezing and coughing over the evidence.

(2) Use clean latex gloves for collecting each item of evidence. Gloves should be changed between handling of different items of evidence.

(3) Samples should be packaged in paper envelopes or paper bags after drying. Plastic bags should be avoided because water condenses in them, especially in areas of high humidity and water can speed the degradation of DNA molecules. Packages should be clearly marked with case number, item number, collection date, and initialed across the package seal in order to maintain a proper chain of custody.

(4) Stains on immovable surfaces (such as table or floor) may be transferred with sterile cotton swabs and distilled water. Rub the stained area with the moist swab until the stain is transferred to the swab. Allow the swab to air dry without touching any others. Store each swab in a separate paper envelop.

(5) Blood in sterile vials with preservative may be collected from laboratory. The blood so collected should be labeled and sealed properly and transported in ice so as to reach the laboratory within 24-48 hours. Blood should not be drawn from a person who has undergone blood transfusion till three months.

(6) *The above precautions and guidelines should be brought to the notice of the medical officer for collection of evidence in an appropriate manner. With every blood sample collected by the medical officer from the individual an identification form should be got filled up.*

246-1. **As the name implies the document section deals with several problems relating to documentary frauds. The examination conducted by the laboratory include**

- A. Handwriting, signatures, initials etc.
- B. Erasures (Mechanical and Chemical)
- C. Secret and invisible writings
- D. Indented writings/pressure marks
- E. Alterations of writings
- F. Additions and deletions of writings
- G. Traced, simulated and other forms of forgery
- H. Forged rubber stamp/metal impressions, postal cancellation marks
- I. Anonymous letters
- J. False Certificates, marks lists
- K. False ration cards, passports & pass books
- L. False vehicle registration books
- M. False wills & agreements
- N. False Traveller cheques & credit cards
- O. Forged / tampered bank cheques & drafts
- P. Examination of ink
- Q. Examination of paper
- R. Examination of type/printed matter
- S. White-collar crimes such as land scams, share certificates etc.
- T. Torn, mutilated and charred documents

2. Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.

Sl. No	Nature of Physical Evidence	Nature of Examination conducted	Type of Analytical information laboratory can provide.
1.	Writings / initials / Signatures	<u>Comparison with known standards.</u>	To fix the authorship with the suspected person/persons
2.	Erasures (Mechanical and Chemical)	Examination under different light sources	Confirmation whether erasure exists or not and if possible to decipher the original writings.
3.	Obliterations	Examination under different light sources	To decipher the obliterated writings.
4.	Indentations	Examination under ESDA, Poliview and VSC-4.	To develop the indented writings.
5.	Tampered documents consisting of alterations, additions, insertions etc	Examination under different light sources.	To establish whether the document is tampered and if possible to decipher the original writings.
6.	Type	Comparison with	Whether they are printed by

	writings/Printed Matter	known standards	the same type writer/printing machine or not
7.	Rubber stamp impressions /Metal seal impressions	Comparison with known standards.	Whether the impressions are made by the same stamp/seal or not
8.	Paper	Comparison with standards	To establish commonness of source/origin and relative age of documents, where possible
9.	Ink	Examination under different light sources and using instruments such as FTIR, HPTLC etc.	To establish whether the ink is of same origin or not
10	Torn, mutilated & charred Documents	Examination under different light sources	To decipher the original writings.
11	Secret/Invisible Writings	Examination under different light sources / heat / water / other media.	To decipher the original writings.
12	Credit Cards/ Identity cards	Examination under UV/IR/oblique light sources	To determine whether they are original or duplicate/false.

Precautions and guidelines for collection of standards

247-1. Standards: Hand writings or signatures or initials etc., written by a known person taken for the purpose of comparison with the questioned are known as standards. Standards also include typed/printed scripts, seals and stamp impressions etc., taken from a known source. Standard Writings are of two types (a) Admitted and (b) Specimen.

A. **Admitted:** Admitted writings are those written by a person in his/her routine course of activity/business, which are freely written, natural and undistorted. Such writings are normally available in case of employees, students, working class people, professionals, business men etc. The most suitable admitted standards are those which belong to the same general class (post-card with post-card) and contemporary (near about date/month/year) to the questioned documents. The investigating officer should endeavour to collect standards, which would enable the expert to compare "LIKE WITH LIKE" i.e., initials with initials, signatures with signatures, writings with writings of the same language, cheques with cheques and so on and so forth depending on the nature of the documents. The admitted standard material can be procured in the following forms of documents

- Personal Correspondence: Post cards, inland letters, applications for employment / loans / services like electricity, telephone etc, ration cards / passports / diaries / account books etc.

- Academic Records: School/College/applications, answer scripts, notes, records, project reports etc.
- Financial and Business Documents: Passed bank cheques, applications for demand drafts, withdrawal forms, account opening forms, specimen signature cards, ledgers, receipts etc.
- Vocational & Professional Documents: Official correspondence, leave letters, applications for loans, (P.F., LIC etc.) attendance register, legal documents, etc.,
- Miscellaneous Documents: Railway reservation forms etc.

B. **Specimen:** Specimens are the writings specially written by the suspect for the purpose of comparison with the disputed documents. The specimen writing of the suspect can be taken only if he volunteers to give. For collection of such specimens, there are some essential points to be followed to facilitate expert's examination meaningful, objective and conclusive, as indicated below;

- The suspect should be seated in a comfortable posture to ensure comfort and natural writing conditions.
- He/she should be supplied similar paper and writing instruments (pen/ball pen) as that of the questioned.
- The suspect should not be shown the questioned document
- The dictation should be given to the suspect at different intervals to prevent the suspect from imitating the same style.

- After each dictation, the sheet of specimens should be removed, and a fresh sheet of paper to be supplied.
- The suspect should be encouraged to write the word combination and numerals as present in the questioned sample several times.
- At least 20 specimen signatures / writings on different sheets should be taken. In case of deliberate efforts to disguise, more specimens should be taken.

2. **Marking:** The process of segregating the disputed portion of text from out of the total document by marking distinctively for comparison is known as 'Marking of documents'. The questioned portions should be encircled and numbered as Q1, Q2, Q3 and so on, whereas the specimen portions and admitted portions should be encircled and numbered as S1, S2, S3 and A1, A2, A3, , respectively.

Handling and Preservation of Documents

- 3-A. Documents should be handled with clean hands carefully.
- B. They should not be cut, torn or trimmed even if they are bigger in size.
- C. Partially torn documents should be joined with clean cellophane tape carefully.
- B. Documents should not be exposed to moisture, sun-light etc.,
- C. Documents should be packed in clean paper/cloth lined/cellophane covers.

- D. The investigating officer should not make any additions or under lines on the disputed or standards portions.
- E. The Investigating Officer should put initial, date and numbering etc., in one corner, away from the marked portions
- F. Documents should be sent in as is where condition is.
- I. Charred documents should be carefully lifted and placed in a suitable card board box and should be transported with care.

Forensic Engineering

248-1. Forensic Engineering deals with applications of engineering principles and methodology to determine the cause of failure of a man-made machine, a structure, a bridge, a building, a dam, or to know the cause of accident of a motor vehicle, , or any other vehicle in motion or it may simply be to evaluate the strength and quality of materials so as to know whether it is meeting the specifications and standards laid down and so on. In all these instances the Investigating Officer will be able to elicit such information to distinguish between a natural failure, accident or a sabotage or involvement of any other human factors with a view to fix the responsibility for failure, accidents or spurious and sub standard materials.

- 2. **Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.**

Sl. No	Nature of Physical Evidence	Nature of Examination conducted	Type of Analytical information laboratory can provide.
1.	Cement Mortar pieces from the debris of collapsed building, dam, bridge etc.	a) <u>Chemical tests</u> b) <u>Mechanical tests</u> c) <u>Physical tests</u> d) <u>Instrumental Analysis</u> e) <u>Design/structure evaluation</u>	Whether the collapsed building/wall/bridge/dam/structure is on account of substandard materials or improper design or human failure or due to aging.
2.	Components recovered and seized in the road/air accidents including evidence of drag marks, skid marks etc. on the ground	a) <u>Chemical tests</u> b) <u>Mechanical tests</u> c) <u>Physical tests</u> d) <u>Instrumental Analysis</u> e) <u>Design/structure evaluation</u>	Whether the accident is caused on account of component failure or human failure or design failure or other reasons.
3.	Manufactured goods used in automobiles, industries	a) <u>Chemical tests</u> b) <u>Mechanical tests</u> c) <u>Physical tests</u> d) <u>Instrumental</u>	Whether the goods are meeting the specifications claimed by the manufacturer.

	and other sensitive installations	<p style="text-align: center;"><u>Analysis</u></p> <p>e) <u>Design/structure evaluation</u></p>	
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Precautions and guidelines for the collection of physical evidence

3. In all the above type of cases the Investigating Officer should requisition the services of the Scientists of FSL for on-site inspection, search for evidence, collection of appropriate evidence etc. In case it is not feasible, the Investigating Officers should collect incriminating materials and documents considering the nature of accident/damage etc. However the site/scene of devastation should be protected from human and environmental factors so as to obtain the true picture of what had happened when the scientists come for inspection.

Narcotics

249-1. The word narcotic is derived from a Greek word “Narcotikos” means lethargy or sluggishness. According to the “Pharmacologists” narcotics are the drugs, which adversely affect the activity of the central nervous system. In Medicine they are used for the relief of the pain, to induce sleep and to treat psychiatric disorders under medical supervision, but the misuse or over dose leads to dependence, addiction, toxic symptoms and death. Forensic Narcotics section deals with examination of narcotic drugs and psychotropic substances

(including drugs of abuse and distilled liquors) such as opium, cannabis etc, and liquors, liquor adulterant or illicit distilled liquors, chloral hydrate, alprazolam, diazepam etc.

2. **Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.**

Sl. No.	<i>Nature of Physical Evidence</i>	<i>Nature of Examination conducted</i>	<i>Type of analytical information laboratory can provide</i>
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1.	<i>Illicit distilled liquor</i>	a) Physical Examination b) Chemical Tests c) Steam distillation d) Instrumental Methods of Analysis.	a) <i>Whether any alcohol/higher alcohol are detected</i> b) <i>Composition of alcohol</i> c) <i>Whether it is adulterated or mixed with any other poison.</i> d) <i>Quantitative estimation where it is positive.</i>
2.	<i>Plant materials</i>	a) Physical Examination b) Chemical Test c) Steam distillation d) Instrumental Methods of Analysis.	a) <i>Whether any plant alkaloids like ganja, opium and other narcotic drugs detected.</i> b) <i>Nature of the poison.</i> c) <i>Quantitative estimation where it is positive.</i>
4.	<i>Tablets etc.</i>	a) Physical Examination b) Chemical Tests c) Steam distillation d) Instrumental Methods of Analysis.	a) <i>Whether any narcotic drugs/psychotropic substance is detected.</i> b) <i>Nature of the poison.</i> c) <i>Quantitative estimation where it is positive.</i>

Guidelines for proper collection of samples for Narcotic Examination

3. The quantity to be drawn in each sample for chemical test shall not be less than 5 grams in respect of all narcotic drugs and psychotropic substances except in the case of opium, ganja and charas (hashish) where a quantity of 24 grams in each case is required for chemical test. The seized drugs in the packages/containers should be thoroughly mixed to make it homogeneous and representative sample is drawn from it.

Physics

- 250-1.** Forensic Physics is the study of physical properties of material evidence by examining the surface characteristics, morphological features and other physical parameters such as length, size, shape, pattern, design, weight, volume, density, refractive index, fluorescence, elemental composition etc. The Physics section deals with the examination of wide range of materials such as soil, glass, paint, tool marks, foot prints, foot wear prints, tyre impressions that are commonly found at the scene of offence and also undertakes examination of restoration of erased numbers, counterfeit currency notes, spurious manufactured articles etc.,
2. Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.

Sl. No	Nature of Physical Evidence	Nature of Examination conducted	Type of Analytical information laboratory can provide.
1.	Soil: Soil, mud, dust, debris	a) <u>Physical</u> b) <u>Microscopic</u> c) <u>Particle size</u> d) <u>Fluorescence</u> e) <u>Density</u> f) <u>Elemental analysis</u>	Whether the soil samples have originated from the same location/spot or not
2.	Glass: Glass pieces, fragments, glass panes with fractures.	a) <u>Physical</u> b) <u>Physical Matching</u> c) <u>Microscopic</u> d) <u>Fluorescence</u> e) <u>Density analysis</u> f) <u>Refractive index</u> g) <u>Elemental analysis</u>	1) Whether a glass piece found at crime scene was originally from of the control sample such as glass bangle / window / sheet glass, spectacle lens, head lamp etc. or not 2) In case of fracture of a glass

			<p>window/ glass sheet determination of force direction and sequence of fractures etc.</p>
3.	<p>Paint: Paint flakes, chips and smears</p>	<p>a) <u>Physical</u> b) <u>Physical Matching</u> c) <u>Microscopic</u> d) <u>Reaction to solvents</u> e) <u>Pyrolysis Gas Chromatography</u> f) <u>IR Spectrophotometry</u> elemental analysis</p>	<p>Whether the two paint samples originated from the same source or not.</p>
4.	<p>Restoration of Erased Numbers: Erased numbers on vehicles, firearms and other valuable gadgets</p>	<p>a) <u>Visual examination</u> b) <u>Under magnification</u> c) <u>Polishing</u> d) <u>Chemical etching examination under oblique light</u></p>	<p>To restore the original numbers.</p>
5.	<p>Tool Marks: Tool marks on doors, windows, locks, wires, and other surfaces.</p>	<p>a) <u>Visual Examination under magnification</u> b) Stereo Microscope/SEM c) Photography</p>	<p>Type of tool used whether the tool marks on the questioned were made by the suspected tool or</p>

			not.
6.	Foot Prints:	<ul style="list-style-type: none"> a) Dimensions b) Shape c) Pattern d) Margins e) Toe marks f) Crease, Phalange, cut marks etc g) Other peculiarities 	Whether the crime foot print and the suspect footprint are of the same individual or not.
7.	Foot wear Prints	<ul style="list-style-type: none"> a) Dimensions b) Shape c) Pattern & design d) Studs, nails e) Number of patches, shape & size f) Wear & tear g) Other peculiarities 	Whether the crime print was made by the suspected footwear or not.
8.	Tyre Prints	<ul style="list-style-type: none"> a) Dimensions b) Design c) Tread Pattern d) Wear & Tear e) Distance between ridges & angles f) Other peculiarities 	Whether the crime print was made by the suspected tyre or not.
9.	Spurious Articles: (in the form of labels, trade marks, brand name, logo, specifications etc.,	<ul style="list-style-type: none"> a) Physical parameters such as length, size, shape, pattern, design, weight, 	Whether the labels, trade marks, brand name, logo etc, found on the

	found on the covers, packages) Cement, soap, washing/talcum powders, pain balms, oils, fans, gutka, seed, seals, printed matter, court fee stamps, machine parts etc.,	<p>volume, density.</p> <p>b) Microscopic Examination</p> <p>c) Fluorescence under Ultra Violet Radiation</p>	covers/packages of the spurious article tallied with the standard or not.
10.	Counterfeit Currency: Counterfeit Currency notes, materials used for counterfeiting such as paper, ink, blocks, screen printing devices etc	<p>a) Visual</p> <p>b) Dimensions</p> <p>c) Stereomicroscopic</p> <p>d) Examination under transmitted light</p> <p>e) Fluorescence under ultra violet radiation</p> <p>f) Scanning electron microscope</p>	<p>1) Whether the suspected/questioned notes are counterfeit or not</p> <p>2) Whether the materials such as blocks, inks, paper, screen printing devices etc., were used to print the suspected notes or not.</p>

3. **Guidelines & precautions in the collection of**

A. Soil

1. Control soil samples should be collected from the upper layer randomly as close to the scene as possible without contamination.
2. Care should be taken so as not to destroy other trace materials that may be present.
3. If the soil is found adhering to an object, as in the case of soil on a shoe, the I.O must not remove it. Instead the object should be wrapped in a paper with the soil intact and transmitted to the laboratory.
4. When a lump of soil is found, it should be collected and preserved intact.
5. If a foot print or tyre track indentations in question penetrates into subsoil that is different from the top soil then it is necessary to obtain samples of both the top soil and sub soil separately.
6. Dirt in the fingernails has to be scrapped and collected in a clean paper. Scrapings from other fingernails should be packed and sent as control samples.
7. Dust and dirt from pockets and trouser folds should be collected by means of small clean brush.

B. Glass

1. The evidence of glass must be photographed and their location noted on the sketch before they are touched or moved.

2. The fragments of glass, which may lodge in or adhere to the clothing of perpetrator or fall in his pockets or trouser folds, shoes etc, should be searched / collected.
3. While collecting glass or glass fragments, fingerprints, dust or dirt, blood stains, other foreign matter should be well protected.
4. All available pieces, fragments should be collected to examine the commonness of source or origin.
5. Control glass should always be taken from any remaining glass in the window or door frames, as close as possible to the point of breakage.
6. Fragments of glass, which may be adhering to or embedded in the tyres of the suspected vehicle, should be collected.

C. Paint

1. When transfer of paint occurs in hit and run accident, uncontaminated control sample must always be collected from near the surface of the vehicle as was suspected of being in contact with the victim's vehicle with the help of a clean scalpel or a knife/blade.
2. Control sample should also include all the paint layers down to the base metal.
3. Loose paint chips from a garment or from the road must be collected carefully and should be packed in small plastic containers.
4. Each paint sample should be separately packed and marked as to the exact location of its recovery.

D. Tool Marks

1. The tool marks should be protected with cotton.

2. In case of theft of electric wires etc., the crime cut end to be examined should be marked properly and the other end cut by the investigating officer should be bent so as to distinguish from crime end.
3. The crime tools recovered should not be put to use before forwarding to FSL.

E. Foot Prints & Footwear Prints

1. If the footprints are on easily removable articles, they should be packed & forwarded.
2. If the prints cannot be immediately removed or recorded they should be covered with inverted hollow cardboard boxes or any other suitable objects.
3. If footprints are in open places, adequate precautions should be taken for protection.
4. All prints and impressions should be photographed before attempting any other method.
5. While taking photographs
 - The lens of the camera should be kept parallel to the surface on which the print is found.
 - A scale or foot rule is to be kept along the length of the footprint.
 - A paper containing identification details such as date, crime number police station, location, left/right foot print etc., should be kept besides the footprint.
6. In case of tracing of footprints

- The sheet of glass or celluloid should not actually touch the impression.
- The sheet should not be moved until the tracing is complete.
- The lines should be drawn as thin as possible.
- The part of the foot for which the tracing is to be made, the tip of the pen and the eye should be in a line vertically above the print.
- The clear edge of the different parts of the footprint should be shown in thin continuous lines. The faint and doubtful impressions may be shown with dotted lines.

F. Spurious Articles

Control sample of same size, batch, manufacturing date has to be procured from authorized dealer/manufacture along with certificate as that of the suspected article.

Polygraph

- 251-1.** The word 'polygraph' denotes graphic representation of multiple/many parameters under examination. In the present context the parameters under study are meant for knowing whether a person subjected to the examination is telling truth or lying. In other words the polygraph test is intended for lie-detection of the person under examination. That is why the polygraph equipment is also known as *lie-detector* and the process is known as Lie-Detection.
2. Nature of evidence received by the section, nature of examinations conducted and type of analytical information

laboratory can provide is given below.

Nature of Evidence	Nature of Examination conducted	Type of Analytical information laboratory can provide.
Persons/subjects brought for examination include suspects victims complainants witnesses	<u>Lie- detector tests are conducted on persons using polygraph instrument by putting appropriate questionnaires to study the responses found in his/her respiratory, circulatory and perspiratory parameters which are the measures distinguishable between "Truth and Deception". The individual gadgets used in Polygraph for studying these parameters are pneumograph -for respiratory, cardiograph -for circulatory & galvanograph -for perspiratory.</u>	Whether the statement/statements of the subject regarding his/her involvement in the crime under investigation appears/appear to be True/False, and whether the subject is telling lie or withholding the truth.

Important Precautions and guidelines to be followed by Investigating Officers

3. *Before bringing the subjects for Lie-detector tests, the I.O's are to follow the following precautions:*

A. Willingness of the subject to undergo Lie detector tests is a must for conducting polygraph examination.

A.A requisition from Judicial Officer or a Police Officer not below the rank of SDPO is to be sent to Director FSL, requesting for fixation of date and time for examining the subjects.

B.The I.O should bring the subject along with

- FIR copy and letter of advice
- Statement of the subject
- Sketch of scene of crime, where applicable.

C.The I.Os *should not use any third degree method/methods on the subjects.*

D.No intensive interrogation should be made on the subjects.

E.In case of pregnant women, diabetic, cardiac patients a written permission from the subject's doctor should be obtained.

F.The I.O should see that the subject is not with empty stomach while being brought for examination.

G.The subject should not take any drugs in the 24 hours prior to examination.

H.A good night's rest is necessary to the subject while being brought for examination on the following day.

Serology

252-1. The word serology is derived from the word “Serum” which means a pale yellow liquid contained in the blood. As such serology section deals with the examination of blood and other body fluids of human origin. The body fluids include semen, saliva, sweat, urine, faeces, vaginal secretions etc. Body organs, tissues, teeth, bones etc., are also examined. The section also undertakes examination of blood and body tissues of animal origin.

2. **Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below**

Sl. No.	Nature of Physical Evidence	Nature of examination conducted	Type of analytical information laboratory can provide
1.	<p>Blood:</p> <p>a) Stained clothes</p> <p>b) Weapons etc., stained with blood</p> <p>c) Furniture, boulders, flooring or any other immovable articles stained with blood</p> <p>d) Soil impregnated</p>	<p>a) Biochemical tests for detection of blood</p> <p>b) Immunological tests for origin of species and blood grouping</p>	<p>a) Whether blood stains or not</p> <p>b) Human or Animal Origin</p> <p>c) Blood group</p>

	with blood e) Liquid blood		
2.	<p>Semen:</p> <p>a) Stained clothes</p> <p>b) Urethral swabs stained with semen</p> <p>c) Seminal stains from immovable articles</p> <p>d) Vaginal swabs stained with semen</p> <p>e) Pubic Hair stained with semen</p> <p>f) Nail clippings stained with semen</p> <p>g) Liquid Semen</p>	<p>a) Florescence studies for location of seminal stains</p> <p>b) Biochemical tests for detection of semen.</p> <p>c) Microscopic Examination for presence of spermatozoa</p> <p>d) Immunological tests for Origin of species and blood grouping</p>	<p>a) Whether semen was present or not</p> <p>b) Detection of spermatozoa</p> <p>c) Blood group</p>
3.	<p>Saliva:</p> <p>a) Liquid saliva</p> <p>b) Cigarette butts, beedi butts etc., stained with saliva</p> <p>c) Gags stained with saliva</p> <p>d) Tumblers stained with</p>	<p>a) Physical examination for location of saliva</p> <p>b) Biochemical tests for detection of saliva</p> <p>c) Immunological</p>	<p>a) Whether saliva is present or not</p> <p>b) Human Origin</p> <p>c) Blood group</p>

	<p>saliva</p> <p>e) Eatables stained with saliva</p> <p>f) Stamps, envelopes etc., stained with saliva</p> <p>g) Bite marks stained with saliva</p>	<p>tests for Origin of species and blood grouping</p>	
4.	<p>Urine:</p> <p>Urine stained clothes/soil</p>	<p>a) Physical examination for location of urine stains</p> <p>b) Biochemical tests for detection of urine</p> <p>c) Immunological tests for Origin of species and blood grouping</p>	<p>a) Whether urine is present or not</p> <p>b) Human or animal Origin</p> <p>c) Blood group</p>
5.	<p>Faecal matter:</p> <p>Faecal stained clothes</p>	<p>a) Physical examination for location of faecal stains</p> <p>b) Biochemical tests for</p>	<p>a) Whether faecal matter is present or not</p> <p>b) Human or animal Origin</p> <p>c) Blood group</p>

		<p>detection of faecal matter</p> <p>c) Immunological tests for Origin of species and blood grouping.</p>	
6.	<p>Tissues, Skin etc.:</p> <p>a) Tissues, skin present on nail clippings</p> <p>b) Tissues, skin adhering to clothes</p> <p>c) Tissues, skin adhering to weapons</p>	<p>a) Physical examination for location of tissues skin etc.</p> <p>b) Biochemical tests for detection of tissues etc.</p> <p>c) Immunological tests for detection of Origin of species and blood grouping</p>	<p>a) Human or animal Origin</p> <p>b) Blood group</p>
7.	<p>Bones, teeth etc.:</p> <p>a) Bones, teeth etc.</p> <p>b) Exhumed/un-identified skeletal remains</p>	<p>a) Immunological tests for Origin of species and blood grouping</p>	<p>a) Human or animal Origin</p> <p>b) Blood group</p>

3. **Important precautions and guidelines for the collection of Physical evidence**

Sample	Collection procedures
<p>1) Blood:</p> <p>a) Stained clothes</p> <p>b) Weapons etc., impregnated with blood; Furniture, fixtures, boulders, flooring or any other immovable articles</p> <p>c) Soil impregnated with blood</p> <p>d) Liquid blood</p>	<p>Thoroughly dry in shade. Pack each bloodstained garment separately in dry paper parcels. Pack in dry moisture resistant paper parcels and <i>not in polythene packets</i>.</p> <p>In case stain is thick, scrap the stained area using a clean knife/blade into a clean dry paper packet. Alternatively swab the area using sterile gauze cloth wetted with normal saline. Each stain should be collected using separate gauze cloth. Air-dry and pack them separately in dry paper parcel. Unused gauze cloth should be sent as control. (Avoid sending heavy articles such as furniture, fixtures, cots, boulders, stones, pounders etc.)</p> <p>Superficial blood stained soil should be collected and packed in paper parcel. Adjacent unstained soil should also be sent as control.</p> <p>To be collected using sterile gauze cloth wetted in normal saline. Unused gauze cloth should be sent</p>

	as control.
<p>2) Semen:</p> <p>a) Stained clothes</p> <p>b) Swabs, Vaginal swabs</p> <p>c) From immovable articles</p> <p>d) Pubic hair; Nail clippings</p> <p>e) Liquid Semen</p>	<p>To be air-dried and packed in dry paper parcels. Avoid folding, crushing the stained area in the process of packing.</p> <p>Air-dry the swabs and pack them in clean dry glass vial/bottle.</p> <p>To be collected using a sterile gauze cloth wetted in normal saline. Air-dry and pack them separately in dry paper parcels.</p> <p>Air-dry and pack them separately in dry glass bottles.</p> <p>To be collected using sterile gauze cloth wetted in normal saline. Air dry and pack in dry glass bottle. Unused gauze cloth should be sent as control</p>
<p>3) Saliva:</p> <p>a) Liquid saliva</p> <p>b) Cigarette butts, beedi butts etc.</p>	<p>To be collected using sterile gauze cloth wetted in normal saline. Unused gauze cloth should be sent as control.</p> <p>Air-dried and packed in paper parcels.</p>
4) Skin etc.:	

a) Tissues found at Crime scene	Collected in a clean glass bottle containing saturated with sodium chloride.
5) Bone:	Whole bones like Femur, Humerus, rib bones etc., to be collected and packed in dry paper parcels (or) should be kept in aluminium foil and frozen.
6) Teeth:	Teeth to be packed in dry paper parcel.

Note:

- 1) *The Investigating Officer should bring the above precautions/guidelines to the notice of the Medical Officers for collection of evidence in an appropriate manner.*
- 2) *Gloves may be used to handle the garments or any other biological specimen as the cells of the person collecting may contaminate the samples.*

Toxicology

253-1. The word “TOXICOLOGY” is derived from a Greek word “TOXICON”. Toxicology is defined as the science embodying the knowledge, sources, characters, fatal effects, lethal doses and analysis of poisons.

The Section deals with examination of human and animal viscera in case of suspected death due to poisoning to determine the cause of death. The examinations include qualitative analysis of all types of poisons such as organic, in-

organic, metallic, non-metallic, volatile poisons etc. In specific cases quantitative estimations are carried out. The section also examines cases of alcohol in suspected drunken driving and consumption of alcohols.

2. **Nature of physical evidence received by the section, nature of examinations conducted and type of analytical information laboratory can provide is given below.**

Sl. No.	Nature of physical Evidence	Nature of Examination conducted	<i>Type of analytical information laboratory can be provide</i>
1)	<i>Viscera</i>	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether any poison/drug/other toxin is detected. b) Nature of the poison.
2)	<i>Body fluids (blood, urine, stomach wash)</i>	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether any poison/drug/alcohol is detected. b) Nature of the poison/alcohol.

3)	<i>Bones and Ash</i>	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether any metallic poisons/ toxin is detected. b) Nature of the metallic poison.
4)	Utensils/Vessels which contained suspected poisons	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether any poison/drug/other toxin is detected. Nature of the poison
5)	Liquor Bottles	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether any poison/drug /alcohol is detected. b) Nature of the poison/alcohol.

6)	Stained cloths; Vomit Materials ; Food Materials; Water Samples; Suspected Soil; Tins (Pesticides); Syringes/Syringe needles; Drugs / Poisons mixed with soft drinks	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether any poison / drug / other toxin is detected. b) Nature of the poison.
7)	Medicinal/Tablet wrappers	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether any drug is detected. b) Nature of the drug.
8)	Drugs, pesticides and other unknown poisons.	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether any other toxic substance is present in the material objects. b) Nature of the poison/drugs.

9)	Ground glass pieces	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether any mechanical poison is detected. b) Nature of the poison.
10)	<i>Plant roots</i>	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	Whether aconite is detected.
11)	Plant materials like leaves / bark / fruits / seeds / latex	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether vegetable poison is detected. b) Nature of the poison.
12)	Powdered plant materials; Plant products mixed with food.	a) Physical Examination b) Chemical Tests c) Instrumental Methods of Analysis.	a) Whether vegetable poison is detected. b) Nature of the poison.

Precautions and guidelines for collecting and forwarding appropriate

material toxicological evidence

3. In-order to obtain optimum results the right kind of viscera/body fluids should be collected by the Medical Officer in desirable quantity and preserved properly in suitable containers and forwarded without delay to the Forensic Science Laboratory. The Investigating Officers are advised to give a requisition to the Medical Officers to collect the samples as per the guidelines.

1) Viscera/body fluids should be preserved for toxicological analysis in the following manner:

Material	Quantity
Stomach	Whole
Stomach contents	Up to 100gms/ml
Small intestine (Jejunum)	30cms
Liver	50 to 100gms
Kidney	One half of each kidney

- 2) In all cases of poisoning, including carbolic acid, saturated solution of common salt should be used as preservative.
- 3) In cases where poisoning by acids is suspected (except carbolic acid), rectified spirit should be used as preservative. Denatured alcohol or formalin should never be used while preserving the samples for toxicological analysis.
- 4) For determining the alcohol levels in living persons, suspected to have consumed alcohol 10 ml of blood using fluoride/liquid

paraffin as preservative and a minimum of 10 ml of urine sample should be collected and forwarded.

- 5) In case of burn victims to determine the levels of carbon monoxide, 10ml of blood sample preserved in liquid paraffin in a glass bottle should be collected and forwarded.
- 6) No useful purpose will be served by chemical analysis of viscera in case of electric shock victims and persons known to have died due to diseases like TB, Cancer, Hepatitis, Aids etc. Hence the I.O's should accordingly not ask the M.O's to collect such samples for chemical analysis.
- 7) Similarly it will be of no consequence if chemical analysis of viscera is carried out in case of natural deaths due to starvation, sunstroke, old age, lightning, extreme cold etc.
- 8) In case of hanging, the Medical Officer having observed fracture of hyoid bone arrives at a conclusion that death is due to hanging, there is no additional advantage in referring the visceral organs for chemical analysis.
- 9) In case of drowning where the Medical Officer arrives at a definite opinion that the cause of death is due to drowning, no additional purpose will be served by chemical examinations.
- 10) Testing for Diatoms in visceral organs, spleen & bone marrow may be most useful in cases of drowning. In such case control sample of the water in which body was recovered should be taken in a separate container.
- 11) In case of snakebite or other insect bites, samples of skin bits of affected area should only be collected and forwarded.
- 12) In cases of hanging, drowning, burns, accidents etc., the Medical Officers may sometimes refer the viscera if any suspicious circumstances arise which are to be recorded clearly to conduct proper analysis.

- 13) In case of deaths due to administering injections the sites of injections, skin subcutaneous tissues along with needle tract weighing about 100gms should be collected. Similar material from symmetrical side of the body should also be taken as control in a separate container.
- 14) In case of inhaled poisons like carbon monoxide, coal gas, hydrocyanic acid, chloroform or other anaesthetic drugs the lung tissues, brain and blood from the cavity of the heart should be preserved and forwarded.
- 15) Shaft of long bones (8 to 10cms of femur), a tuft of head hair, finger and torn-nails and some muscles should be preserved in suspected cases of chronic poisoning by heavy metals like arsenic, lead, antimony etc. In case of prolonged use of drugs like barbiturates samples like Hair, Nails are to be collected for chemical analysis.
- 16) A piece of heart, portion of brain and spinal cord should be preserved if poisoning is by nux-vomica or strychnine.
- 17) Brain and urine should be preserved in suspected cases of poisoning by barbiturates, opium or anesthetics.
- 18) In highly putrefied bodies, larvae, maggots, pupa and other entomological samples should be preserved.
- 19) In embalmed bodies vitreous humour from eyeballs usually remains uncontaminated by the process and may serve the purpose of analysing urea, creatinine and ethyl alcohol.
- 20) Fatty tissue should be taken from abdominal walls in case of pesticide poisoning.
- 21) Soil samples from above, beneath and sides of the dead body and control soil samples away from the dead body should be taken in cases of exhumed or skeletalised dead bodies.

254 Quick Check List for the Investigating Officers to ascertain what type of samples to be collected in different types of crimes and which section of FSL handles the analysis

Sl. No.	Section FSL	Type of Physical Evidence	Type of Crime
1.	Biology	Hair, Fibers, Diatoms, Tobacco products, other plant materials like Pollen, Leaves, Wood, Seeds, Fruits, Flowers etc., and insects such as Maggots, Flies.	Rape, Murder, Suicide, Drowning and Cheating.
2.	Bio-Medical	Skull, Skeletal remains, skin and Tissues, photographs.	Suicide and Murder.
3.	DNA	Liquid blood, Bloodstains & Swabs, Semen, Seminal Stains & Swabs, Tissues, Bones, Hair, Teeth, Saliva, Skeletal remains.	Rape, Murder, Disputed paternity and Swapping of new born babies.
4.	Serology	Blood, Semen, Saliva, Other body fluids, Skin tissues etc.	Rape, Murder and Assault.
5.	Chemistry	Adulterated Petrol, High-speed diesel, lubricating oils etc., Detergents, Cosmetics, Cement, etc., Explosive materials, Arson & Fire residues. Acid burning residues, unknown chemicals, remnants of Mechanical Explosions,	Explosive cases, Accidents, Arson, Acid Burning and Burning Cases.

		Chemical Explosions.	
6.	Narcotics	Plants and plant products containing Narcotics and Psychotropic Substances, Adulterated Liquor/Toddy.	Cheating, NDPS Act and Central Excise cases.
7.	Toxicology	Poisonous/Intoxicating Substances like Alcohol and Drugs.	Suicide, Murder and Accident.
8.	Computer Forensics	Software, Hardware, Computer Peripherals, Communication devices, Computer Products related materials such as computer Fake currency, Pornography, Software piracy, Unauthorized Reproduction.	Cheating, Counterfeiting and Computer related crimes.
9.	Documents	Handwritings, Erasures, Obliterations, Alterations, Over writings, Secret writings etc., Typewriting, Printed matter, Inks & Paper, Stamp impressions, Fax, Carbon Copies, Xerox Copies.	Cheating, Forgery misappropriation, Murder, Suicide, Scams and Frauds.
10.	Polygraph-Lie Detector	Suspects, witnesses or Complainants.	Burglary, Dacoity, Theft, Arson, Rape, Murder and White collar offences.
11.	Ballistics	Firearms, Parts of firearms,	Murder, Assault,

		Cartridge cases, Bullets, pellets/wads, clothes and other materials affected by firing.	Suicide, Attempt to Murder and Dacoity.
12.	Physics	Glass Pieces and fragments, Paint flakes, chips and smears, Foot prints, Tyre impressions, Tool marks, Counterfeit currency, Erased numbers on vehicles and other valuable gadgets, Spurious articles, Voice analysis.	Cheating, Burglary, Accident, Murder and Hit and Run cases.
13.	Forensic Engineering	Materials recovered in construction of buildings, roads, dams & Road, Air Accidents, Failures of machines and structures.	Fraud, Cheating, Misappropriation and Criminal Negligence.

255. **Miscellaneous Police Equipment for Technical Support**

- (1) Explosive Detector
- (2) Deep Search Mine/metal Detector
- (3) Extension Search Mirror
- (4) Night Vision Device
- (5) Hand held metal detector
- (6) Investigation Kit
- (7) Portable X-ray unit
- (8) Small Arm training stimulator
- (9) Satellite telephone - Iridium
- (10) Multi Shot riot gun
- (11) Cellular phones
- (12) Polygraph machine
- (13) Bomb Blanket
- (14) Bullet proof vehicle
- (15) Breath Analyser
- (16) Traffic radar for vehicle speed detection
- (17) Search light
- (18) Dogs- Tracker & Sniffer
- (19) Binoculars
- (20) Bullet proof jacket
- (21) Bomb Disposal equipment
- (22) Pollution measuring equipment
- (23) Traffic signaling equipment
- (24) Control Room Equipment.
- (25) Porta Hut
- (26) Body protector set - Poly Carbonate Sheet, Rubberized Baton,
Riot Control Helmet Self protection Aerosol spray

(27) Vehicle mounted Water Canon

(28) Video Camera

Utility Contexts of Police Equipment

256. The following table presents a bird's eye view on use and utility of various police equipment.

S. No.	Name of Equipment	Utility
1	Explosive Detector	Useful for detection of explosives
2.	Mine Sweeper/Deep Search Metal Detector	To locate mines and other metallic devices buried under ground
3.	Mine Sweeper	Same (limited capability)
4.	Non linear Junction Detector	To detect and locate concealed electronic active/passive devices. It is to be used in combination with Deep search Mine Detector and Explosive Detector.
5.	Wire & Cable Locator WD-3.WD-4, WD-5, MEL-1690	For the detection of buried wire and cable which are connected to IEDs (improvised explosive devises)
6.	Optical Fiberscope search Kit	Used for covert viewing or for searching small cavities. Where explosives might have

		been hidden.
7.	Forensic Science Equipment	For Upgradation of State Forensic Science Lab
8.	Door Frame Metal Detector (Portable & Fixed)	For the detection of ferrous & non ferrous metals.
9.	Hand Held Metal Detector	Used for frisking
10.	Search Light	For carrying out anti sabotage checks
11.	Binocular	For Surveillance
12.	Extension Search Mirror	To search in accessible areas during building search.
13.	Prodder	Useful in anti sabotage checks for objects like flowerpots etc.
14.	TOOL Kit (Screw driver set cutter, plier, tester, nylon rope, etc.	Useful in anti sabotage checks
15.	Under -Vehicle Search Mirror	To search inaccessible areas under the vehicles.
16.	Trained Explosive Sniffer Dogs	For the detection of concealed explosives
17.	TFC Signalling Eqpt.	For City TFC
18.	Portable X-Ray Unit (RTVS)	For checking inside suspected Briefcases, closed packets etc. Images are viewed on a display monitor.
19.	Polygraph Machine	For Lie detection test
20.	Breath Analyser	For alcohol detection testing
21.	Night vision devices	For night time surveillance in the security areas.

22.	Self Protection Aerosol Spray	For self protection while escorting criminals
23.	Bomb Truck	Transport equipment for bomb disposal
24	Bomb Blanket	Useful in suppressing bomb blast effects hi emergency cases.
25.	Bomb Basket	Used for temporary holding of suspected explosive devices.
26.	Bomb-suit	Guards against bomb explosion.
27.	RSP Tool Kit	Useful hi bomb disposal work
28.	Water Cannon(Bomb disposal)	To blast connection between power source and explosive.
29.	Blasting machine	Same as above.
30.	Gas Gun	Same as above.
31.	Car Remote opening Tool Kit	To open a car from a distance
32.	Ice Tong	To pick up a suspected item.
33.	Radio Communication. Set	For communication- between bomb squad members
34	Cellular Phone	For communication
35	Indium Satellite Phone	For long distance communication Using a portable set.
36.	Thermal Cutter	For cutting electrical connection in a bomb
37.	Drilling Machine	For reaching spot where ED

		may be kept.
38	Bullet proof Jackets Composite	Protection against bullets & ambush
39	Sniper rifle	To shoot terrorists from a distance
40	Bullet proof light vehicle	For protection from bullets & ambush
41	Portahut	For temporary location of police station
42	Rubberised baton	Light weight high impact, useful in controlling mobs
43	Polycarbonate shield	Riot control
44	Vehicles Mounted Water canon	Non lethal, useful for mob dispersal
45	Investigation Kit	For scientific investigation
46	Control Room Equipment	For Police Control Room
47	Multi-shot riot gun	For quick firing of tear gas shells while controlling mobs
48	Speedet	For Over speed detection
49	CC TV Systems	For monitoring unauthorised intrusion
50	Alarm Systems	For perimeter security
51	Fire Arms Training system	For training of troops without expending ammunition.
52	Small Arms Trg. Simulator	For fire arms training indoors
53	Bomb disposal robotic vehicle	For remote controlled disposal of bombs &.

		explosives
54	Vehicle immobiliser	To stop vehicles speeding away
55	Pollution Measuring Eqpt.	For city traffic
56	Frequency Jammer	For preventing IED s explosion
57	Vehicle tracking system with GPS	For auto tracking of police vehicles
58	Riot control helmets	For protection Of Jawans
59	All terrain vehicle	For cross country troop transportation
60	Tape Recorder	For evidence recording
61	Concealed Camera	For clandestine photography
62	Ultra Violet Lamp	For identifying fake currency

The Maintenance Contexts

257. There shall be regular maintenance of all the needed equipment and regular replenishment of consumables for the Police Tele-communication, the Police Transport Services and other technical support units for an efficient and effective technical application and technological utilization.

