Syllabus for the Preliminary Test for the recruitment of Assistant Director (Chemistry), (FSL), Class-I

ADVT- 117/2016-17

ભાગ -૧

	પ્રાથમિક કસોટીનો અભ્યાસક્રમ કુલ પ્રશ્નો-૧૦૦ માધ્યમ: ગુજરાતી કુલ ગુણ :૧૦૦
૧	ભારતની ભૂગોળ- ભૌગોલિક, આર્થિક, સામાજિક, કુદરતી સંસાધન અને વસ્તી અંગેની બાબતો- ગુજરાતના ખાસ સંદર્ભ સાથે
૨	ભારતનો સાંસ્કૃતિક વારસો- સાહિત્ય, કલા, ધર્મ અને સ્થાપત્યો- ગુજરાતના ખાસ સંદર્ભ સાથે
૩	ભારતનો ઈતિહાસ- ગુજરાતના ખાસ સંદર્ભ સાથે
૪	ભારતની અર્થવ્યવસ્થા અને આયોજન
૫	ભારતીય રાજનીતિ અને ભારતનું બંધારણ: (૧) આમુખ (૨) મૂળભૂત અધિકારો અને ફરજો (૩) રાજ્યનીતિના માર્ગદર્શક સિદ્ધાંતો (૪) સંસદની રચના (૫) રાષ્ટ્રપતિની સત્તા (૬) રાજ્યપાલની સત્તા (૭) ન્યાયતંત્ર (૮) અનુસૂચિત જાતિ, અનુસૂચિત જનજાતિ અને સમાજના પછાત વર્ગો માટેની જોગવાઈઓ (૯) એટર્ની જનરલ (૧૦) નીતિ આયોગ (૧૧) પંચાયતી રાજ (૧૨) નાણા પંચ (૧૩) બંધારણીય તથા વૈધનિક સંસ્થાઓ- ભારતનું ચૂંટણી પંચ, સંઘ લોક સેવા આયોગ, રાજ્ય લોક સેવા આયોગ, કોમ્પ્ટ્રોલર એન્ડ ઓડિટર જનરલ; કેન્દ્રીયસતર્કતા આયોગ, લોકપાલ તથા લોકાયુક્ત અને કેન્દ્રીય માહિતી આયોગ
૬	સામાન્ય બૌદ્ધિક ક્ષમતા કસોટી
૭	સામાન્ય વિજ્ઞાન, પર્યાવરણ અને ઈન્ફર્મેશન એન્ડ કોમ્યુનિકેશન ટેકનોલોજી
૮	ખેલ જગત સહિત રોજબરોજના પ્રાદેશિક, રાષ્ટ્રીય અને આંતરરાષ્ટ્રીય મહત્વના બનાવો

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Part-1

Syllabus of Preliminary Test TotalQuestions-100 Medium:Gujarati Total Marks- 100	
1	Geography of India-Physical, Economic, Social, Natural Resources and population related topics- with special reference to Gujarat
2	Cultural heritage of India-Literature, Art, Religion and Architecture- with special reference to Gujarat
3	History of India with special reference to Gujarat
4	Indian Economy and Planning
5	Indian Polity and the Constitution of India: (1) Preamble (2) Fundamental Rights and Fundamental Duties (3) Directive Principles of State Policy (4) Composition of Parliament (5) Powers of the President of India (6) Powers of Governor (7) Judiciary (8) Provisions for Scheduled Castes, Scheduled Tribes and backward classes of the society (9) Attorney General (10) NITIAayog (11) Panchayati Raj Institutions (12) Finance Commission (13) Constitutional and Statutory Bodies: Election Commission of India, Union Public Service Commission, State Public Service Commission, Comptroller and Auditor General; Central Vigilance Commission, Lokpal and Lokayukta, Central Information Commission
6	General Mental Ability
7	General Science, Environment and Information & Communication Technology
8	Daily events of Regional, National and International Importance including Sports

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PART-2

TotalQuestions-200 **Medium: English** Total Marks- 200

1. Fundamentals of Forensic Chemistry

Introduction to forensic chemistry, Types of cases/exhibits received for analysis, Overview of forensic chemical analysis.

2. Narcotic drugs & psychotropic substances

Introduction to Controlled Substances, Classification of controlled substances, Precursor chemicals, Narcotic raids and clandestine drug laboratories evidences and forensic examination. Mandatory provisions of NDPS Act, 1985. NDPS Drugs, Classification of Drugs. Commonly abused drugs, Drug dependence and Drug Tolerance. Designer Drugs, Analysis of Drug of abuse by various chemical and instrumental methods.

3. Explosives Chemistry

Introduction, assessment, classification and chemistry of explosives. Various types of IEDs and their reconstruction. Mechanism of explosion and their effects. Oxygen balance, Explosive Power, Index, Heat and Temperature of Explosion, Pressure of explosion, Mechanism of Ignition and hot spot formation. Thermal decomposition, physical and chemical aspects of combustion, Deflagration and Detonation, Kinetics of Explosive Reactions, Analysis of low and high explosives by different instrumental techniques, Quality control, Proficiency Testing, Interpretation and Significance of Results .

Processing of explosion scene of crime - Role of Forensic scientist in Post blast investigation-Documentation of bomb scene and Collection of post blast residues-Evaluation and assessment of explosion site and reconstruction of sequence of events-Famous case studies in explosion

and court testimony. Clandestine explosive manufacturing. Analysis of Post blast residues by chemical methods, microscopic method and various instrumental techniques including chromatographic, spectroscopic and electrophoresis methods.

4. Forensic nuclear chemistry

Introduction to nuclear forensics, nuclear threats, Nuclear explosive devices, Radioactivity, Radioactive decay rates and Half lives, Methods of detection and measurement of radio actives (G.M and Scintillation Counter). Applications of Radioisotopes.

Activation analysis: Neutron activation analysis, principle, technique, applications and steps involved in neutron activation analysis.

Isotope dilution analysis: Principle, types of isotope dilution analysis, typical applications of isotope dilution analysis.

5. Chemical Warfare Agents

Classification, physical and biochemical properties, toxic effects detection by Biosensors and various instrumental Techniques

6. Forensic Drug Chemistry

Introduction to Drugs, Controlled Substance Act, Forensic examination of drugs/Narcotics (Cannabis), Phenethylamines (Amphetamine, Methamphetamine), Hydroxyl derivative (Ephedrine) Ketone Derivative (Cathinone), Methoxy Derivative (Mescaline) Tertiary Amines (Cocaine and Opiates) Tryptamines (Psilocin and Psilocybin) Anabolic Steroids, Miscellaneous Controlled Substances (Barbiturates, Benzodiazepines, GHB, Ketamine and LSD). Sample Preparation, Extraction Techniques- Chemical-color test, Microcrystal techniques and other instrumental techniques involved in analysis.

7. **Petroleum Chemistry** Paraffins, Iso-olefins, Olefin Hydrocarbons, Naphthenes, Cycloparaffins or Aromatic Hydrocarbons, Sulphur Compounds, Nitrogen Compounds, Oxygen Compounds, Organo-Metallic Hydrocarbons; H/C Ratio of Hydrocarbons;

Physical Properties of Petroleum Products : Density, Viscosity, Surface Tension, Color, Fluorescence, Cloud Point, Pour Point, Aniline Point, smoke point, boiling point, Optical Properties, Flash Point, Refractive Index and Calorific Value, Determination of Cetane and Octane number, **Analytical Techniques**: Quantitative and Qualitative Steps in Analysis of Petroleum. Forensic Analysis of Petroleum Products.

8. **Fire Chemistry**

Fire and energy, basic chemistry, chemistry and behavior of fire. State of matter and behavior of gases, liquids and solids, stereo chemistry and Flammable limits.

Scientific Investigation of Fire, modern fire analysis, NEPA 921 and NEPA 1033, The chemistry and physics of combustion, Dynamics of Fire, Development of fire patterns, Separation and analytical techniques of ignitable liquid residues, Field tests, Interpretation of Data Obtained from Fire Debris, Quality Assurance in Fire debris Analysis, Report Writing and Court Testimony. Fire and arson, motives and pathology of arson. Introduction, need and presumption of accidental causes, planning of investigation, survey and documentation, Determination of origin and cause of fire, Reconstruction, inventory, avoiding spoliation. Mythology of arson investigation (sources of error in fire and arson investigation). Eliminating accidental cause, investigating fatal fire and vehicular fire. Origin determination, hypothesis development and testing of hypothesis Evidence collection, preservation. Reporting procedures and conclusion. Professional practice of fire investigation.

9. **Analysis of ignitable residues and evaluation of ignition sources**

Introduction, Evolution of separation and analytical techniques and standard methods. Isolation of the residue, Analysis of ILR (ignitable liquid residue). Criteria for identification 1) Identification of gasoline 2) distillates and other classifiable products. Improving sensitivity and estimation of the degree of evaporation. Reporting procedures, quality assurance and conclusion.

Evaluation of ignition sources: Introduction 1) Joint examination of physical evidence appliances and electrical components 2) Testing of ignition scenario, spontaneous ignition tests, Conclusion.

10. Food Chemistry

Analysis of Lipids and fats: Physical examination of lipids, Chemical examination of lipids (Acid value, Saponification value, Ester value, Acetyl value, Iodine value), Test for hydrogenated oils and fats, Detection and Determination of rancidity, Analysis of butter and butter fats, Analysis of adulterated and non-adulterated oils. Analysis of dairy products: Milk and its products. Adulterated Food Analysis.

11. Basic Biochemistry

Amino acids – structure and functional group properties. Proteins and peptides – Composition of proteins – Primary, Secondary and Tertiary structure of protein. Definition, biological importance, classification and chemistry of Carbohydrates and Lipids.

12. Forensic Toxicological Examination.

Law relating to poisons. Introduction to Poisons, form of poisons, classification and methods of administration of poison. Mode of action of poison, Diagnosis and management of poisoning cases. Factors affecting the effect of poison and medico-legal aspects in poisoning cases. Collection and preservation of biological evidences (viscera and /or body fluids) and circumstantial evidences in fatal and survival cases. Submission of samples to the laboratory, postmortem examination,

specific analysis plan / approach to toxicological examinations of poisoning samples. Isolation and Extraction of poison/ drug by various classical and modern methods using instrumental techniques. Introduction to toxicology, Disposition and Translocation of Toxicants, Toxic agents, Analytical Toxicology and application of Toxicology.

13. Basic Principles of Pharmacology and Forensic pharmacology

Pharmacopoeias IP, USP, EP. Drug & Drug Receptor mechanisms. Pharmacodynamics. Factor affecting the effects of Drug. Post mortem redistribution. Forensic pharmacological studies, absorption, distribution, pharmacokinetics and metabolism, pathways of drug metabolism, drug toxicity, excretion of drugs and poisons. Detection of poison on the basis of their metabolic studies. Pharmacology and Pharmaceutical Analysis.

14. Nanotechnology

Introduction, history and development in nanotechnology. Physical synthesis of nanoparticles. Properties and characteristic of nanomaterials. Tool for the characterization of nanomaterial: Optical microscopy, Electron microscopy (TEM and SEM), scanning probe microscopy, atomic force microscopy, fluorescence microscopy. DNA based nanostructure, DNA-protein nanostructure. Carbon nanotubes, nanorods and fullerens. Application of nanoparticles as molecular imaging probes (Quantum dots). Application of nanoparticles as therapeutic drug carriers, gene delivery and diagnostics. Application of nanomaterials in forensic and life science. Nanoparticles as a tool for cleaning environment: Remediation of heavy metal. Nanoparticles as sensors.

15. Forensic Science and Criminology

16. Biomolecules

17. Energetics and Kinetics

18. Aromatics, Carbonyls and Alkenes Spectroscopy

19. Forensic Genetics and Molecular Biology

20. Lasers, Photochemistry and Spectroscopy

21. Organometallic Chemistry

22. Chemicals used in Forensic Science, Nanotechnology products

23. Regulatory affairs and IPR

Basic principles of quality control (QC) and quality assurance (QA). Guidelines for QA and QC: raw materials, products and validation. Introduction to pharmacopoeia. Intellectual Property Rights. Importance of protecting scientific discoveries. IPR policy of Government of India. Patent: Qualification (novel, commercial and non-obvious), jurisdiction of patent laws, Indian and international patent laws, filing procedures.

24. Current Trends and Recent Advancements in Forensic Chemistry.