Syllabus for the post of SENIOR TECHNICAL ASSISTANT (Chemistry)

(A) WRITTEN TEST

Organic Chemistry:

1. Basic concepts of organic chemistry, Basic mechanistic concepts – kinetic versus thermodynamic control, Hammond's postulate and Curtin-Hammett principle, identification of products, intermediates and isotopic labelling.
2. Addition reactions to carbon-carbon and carbon-heteroatom (N, O) multiple bonds. Elimination reactions. Reactive intermediates – carbocations, carbanions, carbenes, nitrenes, arynes and free radicals. Molecular rearrangements involving electron deficient atoms, and name reactions. Synthesis and reactions, of following classes of compounds – alkenes, alkynes, arenes, alcohols, phenols, aldehydes, ketones, carboxylic acids, esters, nitriles, halides, nitro compounds, amines and amides. Selectivity in organic synthesis – chemo-, regio- and stereoselectivity. Protection and deprotection of functional groups.
3. Isomers and their classifications. Chirality of organic molecules with or without chiral centres and determination of their absolute configurations. Homotopic, enantiotopic and diastereotopic atoms, groups and faces. Optical /Specific rotation. Stereo-selective and stereospecific synthesis. Conformational analysis of acyclic and cyclic compounds.
4. Structure, preparation, properties and reactions of heterocyclic molecules, e.g., furan, pyrrole, thiophene, pyridine, indole, quinoline and isoquinoline etc.
5. Pericyclic reactions and their classifications. Orbital correlations - FMO and PMO treatments. Photochemistry of alkenes, arenes and carbonyl compounds. Photooxidation and photoreduction. Di-ıı-methane rearrangement, Barton reaction.
6. Synthesis and properties of natural and synthetic polymers, e.g., polythene, nylon polyesters, bakelite, rubber. Biodegradable and nonbiodegradable polymers.
7. Applications of UV-visible, IR, NMR and Mass spectrometry in the structural determination of organic molecules.
8. Common laboratory techniques/methods, such as crystallization, decolorization, extraction, purifications and separation etc.

Inorganic Chemistry:

1. Chemistry of s and p block elements
2. Coordination and Transition Metal Chemistry
3. Electrochemistry
4. Solid State Chemistry

Physical Chemistry:

1. Quantum Chemistry
2. Molecular Spectroscopy
3. UV-VIS and Fluorescence Spectroscopy
4. Chemical Kinetics
5. Thermodynamics
6. Surface Chemistry
7. NMR and ESR Spectroscopy

(B) SKILL TEST

1. **Safety in Chemistry Lab**
   (a) Operation of fire extinguisher.
   (b) Use of personal protective equipments.
   (c) Introduction to Material Safety Data Sheet
   (d) (MSDS) and personal protection equipments
   (e) General laboratory safety rules

2. **General laboratory Practices**
   (a) Preparation of solutions of solids, liquids, volatile, non-volatile, etc. substances.
   (b) Preparation of standard & primary standard solutions.
   (c) Purification & separation of liquid mixture by distillation

3. **Titrations**
   (a) Analysis of acids & bases (Acidimetric titrations and Alkali metric titration).
   (b) Acid, base, salt, Atomic Weight, Molecular Weight, Equivalent Weight, Normality, Molarity, Molality , ppm, ppb, density, Specific gravity Weight - volume relationship.
   (c) Precipitation titration. Complexometric titrations.

4. **Organic Synthesis and Quantitative analysis**
   (a) Preparation of organic compounds Nitration Laboratory preparation of nitro benzene And percentage yield determination.
   (b) Saponification
   (c) Aldol reaction
   (d) Analysis of organic compounds to determine: a) elements present b) functional group c) melting point

5. **Inorganic Synthesis and quantitative analysis**
   (a) Preparation of copper sulphate and determination of percentage purity and percentage yield
   (b) Preparation of metal complexes and its determinations.

6. **Instrumental analysis**
   (a) Determination the pH of given solution by using pH meter.
   (b) Determination of optical rotation of sugar solution using polarimeter
   (c) Study of Micro scope
   (d) Melting point determination
   (e) Operation of High end equipment such as NMR, HRMS, TEM, etc.

7. **English Literacy and general computer skills**
   (a) Pronunciation
   (b) Accentuation on simple words, Diction (use of word and speech)
   (c) Functional Grammar Transformation of sentences, Voice change, Change of tense, Spellings.
   (d) Reading and understanding simple sentences about self, work and environment
   (e) Writing Construction of simple sentences Writing simple English and Speaking / Spoken English
   (f) Basics of Computer Introduction, Computer and its applications, Hardware and peripherals
   (g) Computer Operating System Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.

(h) Word processing and Worksheet Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document.

(i) Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets

(j) Computer Networking and INTERNET Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes

*****