Syllabus and Scheme of Examination for the Post of Junior Laboratory Assistant (Technical)- School of Chemical Sciences. Advertisement No. IIT Mandi/Recruit./NTS/2023/02 dated 22.03.2023

Date: 29.09.2023

Time: 11:00 a.m. onwards

Venue: Classroom A10-1B, North Campus, IIT Mandi

Scheme and Pattern of Written Examination

Total Marks of examination : 100 marks

Time Duration : 02 hours

Syllabus
Physical Chemistry: Atomic Structure, Heisenberg's uncertainty principle, Schrodinger wave equation, particle in one-dimensional box, quantum numbers, hydrogen atom wave functions, Ionic bond and characteristics, covalent bondand its general characteristics, Valence bond theory, Molecular orbital theory for diatomic molecules (LCAO method), Crystal systems; Designation of crystal faces, lattice structures and unit cell; Bragg's law, Equation of state for real gases, Maxwell's distribution of speeds, intermolecular collisions, collisions on the wall and effusion, Kelvin equation; Surface tension and surface energy, Work, heat and internal energy; First and second law of thermodynamics, entropy as a state function, entropy– reversibility and irreversibility, Free energy functions; Thermodynamic equation of state; Maxwell relations; Temperature, volume and pressure dependence of U, H, A, G, Cp and Cv, α and β; Nernst heat theorem, Clausius-Clapeyron equation; phase diagram for a pure substance, their significance and determination; excess thermodynamic functions and their determination. Debye-Huckel theory, Differential and integral rate equations for zeroth, first, second and fractional order reactions; Rate equations involving reverse, parallel, consecutive and chain reactions; effect of temperature and pressure on rate constant. **Organic Chemistry:** Aromaticity, anti-aromaticity, Reaction Mechanisms and Reactive Intermediates: Generation, geometry, stability and reactions of carbonium ions and carbanions, free radicals, carbenes, benzynes and nitrenes, SN1, SN2 and SNi mechanisms; neighbouring group participation;electrophilic and nucleophilic reactions of aromatic and heteroaromatic compounds, E1, E2 and E1cb mechanisms; orientation in E2 reactions–Saytzeff and Hoffmann; pyrolytic syn elimination – Chugaev and Cope eliminations, Electrophilic addition to C=C and C=C; nucleophilic addition to C=O, C=N, conjugated olefins and carbonyls, Name Reactions and Rearrangements, Pericyclic Reactions: Classification and examples; Oxidizing and reducing agents, Photochemical reactions Norrish-Type I and Type II reactions, Mass Spectrometry: Parent peak, base peak, metastable peak, McLafferty rearrangement. **Inorganic Chemistry:** Chemical periodicity, Structure and bonding in homo- and heteronuclear molecules, Acids and bases, Main group elements and their compounds, Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties. Organometallic compounds. Analytical chemistry- separation, spectroscopic, electro- and thermoanalytical methods. Characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, MS, electron spectroscopy and microscopic techniques.

General information about the exam:

- Use of calculator, cell phones, log book, periodic table, and any type of electronic device etc., are strictly prohibited.
- Medium of instructions/answers will be English only.
- Involvement in any malpractices will lead to disqualification
- Bags, purses, mobile phones, calculators, and any other personal belongings are not allowed in the examination hall. Please leave them in the designated area outside.
- Any additional instructions given during the selection process must be adhered/complied.
- 50 multiple choice questions based on the syllabus, each question carries 2 marks for the correct answer. Each wrong answer will attract a negative mark of 0.5.