

Department of Chemical Engineering

Technical Assistant

Stage-I (Screening Test)

Stage-I (Screening Test): A screening test shall be conducted in the first phase in form of multiple choice written test. Written test shall be of **90 minutes'** duration comprising of **75 questions**. Each **correct answer will be awarded One [1] mark** and for each **wrong answer One-fourth [1/4] mark shall be deducted**. Screening test shall consist of questions on **General English**(Tenses, Active and Passive, Direct and Indirect speech, Punctuation, Correction of sentences, One word substitutes, Modals, Articles, Clauses, Synonyms, Antonyms, Idioms and Phrases); **Numerical Aptitude Arithmetic**(Simplification of Fractions, Simple and Compound Interest, Profit and Loss, Percentage, Averages, Number System, Time and Work, Problems on Trains, Calendar, Area, Problems on Numbers, Square root, Cube root, Time and Distance and Other basic Arithmetic related matters);**Reasoning and Data Interpretation** (Number Series Compilation, Missing Number finding, Pattern series, Direction Sense Test, Series Compilations, Classification, Missing Character finding, odd man out, Blood relations, Analogy, Coding and Decoding, Letter and Symbol Series, Verbal reasoning, Statement and Conclusions, Letter and Symbol Series, Logical Problems, Arithmetic reasoning, Logical Sequence of words, Pie Chart and Bar Chart).

Eligible candidates **Ten Times** of the positions in each category will be screened for the Stage-II subject to the fulfillment of all educational qualification etc. as per the Recruitment Rules-2019.

Stage-II (Skill test)

Stage-II (Skill Test): The skill test will be of qualifying nature.

Laboratory Experiments etc. as per nature of the post shall be conducted in the respective laboratories/field. Minimum qualifying marks in the skill test will be [UR:30%; EWS:27%; OBC:27%; SC:20%; ST:20%; PwD:15%].

The candidates, who will qualify the skill test, will be called for the final written test. The Candidates appearing in the written test must ensure their eligibility for the particular category of post. The documents in support of their eligibility shall be verified before the Final test. If

any candidate will not have requisite qualification etc. as per the post for which he is appearing will not be allowed to sit in the final test (Stage-III).

Stage-III(Final test)

Stage-III (Final Test): Final written test shall be of 2 hours duration comprising of 100 multiple choice questions.

Each **correct answer will be awarded One [1] mark** and for each **wrong answer One-fourth [1/4] mark shall be deducted**. Only those who are screened in after the Screening test [Stage –I] and qualify the Skill Test [Stage-II] will be allowed to appear in the Final Test [Stage III]. The minimum passing marks in Final test will be [UR:30%; EWS:27%; OBC:27%; SC;20%; ST:20%; PwD:15%].

The final merit list shall be drawn on the basis of the stage-III written test.

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Syllabus for the Skill Test (Technical Assistant)

The candidate should be able to perform any of the following experiments/tasks and he/she should present the theory/results/conclusions in the form of a brief report. His/her performance shall be evaluated by the constituted department committee.

1. Determination/Measurement of Reynold's number, volumetric and mass flow rates by Venturi-meter, Orifice-meter and Rotameter, friction factor.
2. Determination/Measurement of pH, viscosity, molecular weight, acid value, saponification value, total solids, dissolved solids, hardness.
3. Determination/Measurement of thermal conductivity, heat transfer coefficient, mass diffusivity, mass transfer coefficient, rate constant of a first order reaction, response of a first-order system for a step input.
4. Determination/Measurement of fire point, flash point, smoke point, calorific value, proximate and ultimate analysis of a fuel sample.
5. Basic knowledge of computers: hardware and software, proficiency in Microsoft office (word, excel, power-point), common file formats and their processing (doc, pdf, jpg, ppt, xls, tiff, etc).
6. Communication Skills: Letter writing, report writing, typing speed, correct usage of English grammar and vocabulary, oral communication.

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Syllabus for Final written test (Technical Assistant)

Computer Awareness:

Basic knowledge of Computer Applications, viz; MS Word, MS Excel, Power Point etc. Internet, MS-DOS, Computer Generation & Development, UNIX, Windows, Lotus, SmartSuite, Data Entry, Softwares knowledge, Networking Platforms, applications of computers in Chemical Instrumentation

Communication Skills and Computer Applications:

English grammar, vocabulary, oral and written communication. Introduction to operating systems, basic knowledge of MS-office and knowledge of internet.

Engineering Measurements:

Introduction to Physical Quantities and Units, Linear Measurements, Precision Measurements, Measurement of Area, Measurement of Electrical Energy, Measurement of frictional coefficient, Measurement of volumetric flow rate & Mass flow rate, Measurement of pH, Measurement of hardness of water, Measurement of Specific Gravity, Measurement of Viscosity.

Elements of Mechanical and Electrical Engineering:

Power transmission & Safety, Boilers, Prime movers, Welding, Material Handling, Fundamentals of Electrical engineering, A.C. and D.C. Circuits, Electrical Machines, Electrical Appliances.

Engineering Materials:

Introduction & properties of material, Corrosion, Metals, Ceramic materials, Inorganic and other materials, Coatings and Materials for special application.

Physics:

Distance and displacement, Scalar and Vector quantities, Speed and velocity, motion, mass and weight, momentum, impulse, laws of motion, conservation of momentum, work, power and energy, conservation of energy, laws of reflection and refraction, refraction through a glass slab and prism, total internal reflection, dispersion of light, Ohm's law, Law of resistance in series and parallel, electric power, Chemical effect of current - electroplating and electrolysis.

Chemistry:

Atomic and molecular mass, mole concept, Avogadro's Number, Avogadro's law, ideal gas, gas laws, ideal gas equation, diffusion, isotopes and isobars in an atom, Postulates of Bohr's theory, Periodic classification of elements and gradation of properties (atomic size, ionization energies, electron affinities, electro-negativities and metallic character etc.), electrovalent, covalent and co-ordinate bonds, Chemical equation, Chemical Kinetics, Electrochemistry, Surface Chemistry, Phase Rule, Distribution Law, True solution, colloids and suspension, strong and weak electrolytes. Acids, bases and salts, pH of a solution, Rate of the reaction and factors affecting the rate of the reaction, Oxidation and reduction, Metallurgical processes, Manufacture & chemical properties of Sodium Carbonate and Ammonia, Properties of halogens & alkali metals, Properties of sulphur compounds, Allotropes of sulphur, Phosphorus and Carbon. Hydrocarbons: saturated and unsaturated, functional groups, Combustion of hydrocarbons, Detection and estimation, IUPAC Nomenclature, Stereo-chemistry, Aliphatic compounds, Aromatic compound, Orientation, Carbohydrates and Polymers.

Mathematics:

Linear equations, Application of linear equations in two variables, Quadratic equations and their solutions, Applications of quadratic equations in solving simple problems, Surface area and volume of a cuboid, cube, cone and sphere. Theorems and problems based upon vertically opposite angles, congruence of triangles. Theorems and problems on similar triangles. Pythagorus theorem, Circle through three points, problems based upon equal

chords, angle subtended at centre by an arc /chord of a circle, angle in semicircle and segments. Trigonometrical ratios of angles and problems. Collection and presentation of data, frequency distribution, mean of grouped data and bar chart. Co-ordinates of a point, distance between two points, section formula and its application.

Mechanical Operation:

Introduction and concepts of Mechanical Operations, particulate solids, Screen Analysis, Size Reduction, Sedimentation, Filtration, Agitation and Mixing.

Chemical Process Industries:

Chlor-Alkali Industry, Cement Industries, Fertilizers, Marine chemicals, Oil & Fats Industries, Carbohydrate and polymer Industries, Pulp and Paper Industries, Pharmaceuticals, Pesticides, Dyes & Intermediates, Electrochemical Industries, petroleum refining and petrochemical technology, Fuels.

Industrial Safety and Environmental Engineering:

General Introduction & Concept of Safety, Chemical & Fire Hazards & their Control, Other hazards & occupational diseases, Personal Protective Devices, Introduction to pollution, Air Pollution, Water pollution, Solid waste of disposal.

Plant Utilities and Energy Engineering:

Introduction, Conventional fuels, Non-conventional sources of energy, Water & Steam, Air & Refrigeration.

Heat Transfer:

Fundamentals of Heat Transfer, Steady State Heat Transfer by conduction, Heat Transfer by Convection, Heat Transfer by Phase Change, Thermal Radiation, Heat Exchangers, Evaporation.

Fluid Flow Operation:

Fluid Statics, Fluid dynamics, Behavior of different types of fluids, Transportation of fluids, Conveying, Fluidization, Flow and Level measurement.

Process Calculations:

Introduction, Basic Chemical Calculations, Material Balance with and without chemical reaction, Energy Balance, Combustion, ideal gas law.

Mass Transfer:

Introduction, Molecular Diffusion of Fluids, Interphase Mass Transfer, Gas Absorption, Liquid-Liquid Extraction, Leaching, Equipment for Gas-Liquid Operation Distillation, Humidification, Drying, Adsorption and Ion Exchange, Crystallization.

Instrumentation:

Introduction to Instrumentation, Temperature Measuring Devices, Measurement of Pressure & Vacuum, Measurement of Head & Level, Process Recording Instruments, Distributed Control Systems.

Thermodynamics and Reaction Engineering:

Introduction and First law of thermodynamics, Second law of thermodynamics, Introduction to refrigeration and liquefaction, Introduction to reaction engineering, Kinetics of homogeneous reaction, Interpretation of batch reactor data, Introduction to reactor.