

Syllabus for Junior Technical Superintendent Applicant Written Tests

Test 1: Screening Test

Chemical Engineering

Fluid Mechanics: Orifice meter, Venturi meter, Rotameter, Reynold's experiment, terminal settling velocity, Types of valves, Manometers, Types of pumps, Emptying of tanks, properties of water & air, compressors and vacuum pumps. Identification of various flow measuring devices and parts, Identification of types of valves, Identification of various types of pumps

Heat Transfer: Types of thermometers and their principle of working, Fourier's law of heat conduction, Double pipe heat exchanger, Newton's law of cooling, Shell and Tube heat exchanger, natural convection principle, heat transfer by Radiation and applicable laws. Identification of various types of thermometers, Identification of various types of heat exchangers

Mechanical Operations: Particle size and shape, particle size distribution – sieve analysis, size reduction and classification of solid particles; Blaine's apparatus and solution densitometry; free and hindered settling; sedimentation; centrifuge and cyclones; thickening and classification, filtration, agitation and mixing; conveying of solids. Identification of different size reduction equipment.

Mass Transfer: Fick's laws, Molecular diffusion in fluids, Mass transfer coefficients, Design and operation of equipment for distillation, absorption, leaching, liquid-liquid extraction, drying, humidification, dehumidification and adsorption. Identification of various mass transfer equipment

Chemical Reaction Engineering: Rate of reaction, order, rate constant; Design principles and analysis of batch reactors and ideal flow reactors; Isothermal, adiabatic and non-isothermal operations. Identification of various types of reactors.

Safety: Various symbols used to classify chemicals, gases & liquids, color codes for marking various zones in a chemical lab, pressure relief valves, HAZOP related definitions. Identification of Various symbols used to classify chemicals, gases & liquids, color codes for marking various zones in a chemical lab

Analytical Ability: Logical reasoning, numerical ability

Test 2: Practical Test (Experimental)

Fluid Mechanics: Determination of coefficient of discharge of Orifice meter and Venturi meter, Reynold's experiment to determine critical Reynolds number, Determination of terminal settling velocity of sphere in a fluid and determining the viscosity of fluid, Determination of friction factor for frictional losses in pipe flow.

Heat Transfer: Determination of overall heat transfer coefficient in a heat exchanger, Determination of connective heat transfer coefficient in cooling of an object in air, Conductivity of a metal rod

Test 3: Descriptive Test (Detailed answers, Solutions to Problems posed, etc.)

Fluid Mechanics: Orifice meter, Venturi meter, Rotameter, Reynold's experiment, terminal settling velocity, Types of valves, Manometers, Types of pumps, Emptying of tanks, properties of water & air, compressors and vacuum pumps.

Heat Transfer: Types of thermometers and their principle of working, Fourier's law of heat conduction, Double pipe heat exchanger, Newton's law of cooling, Shell and Tube heat exchanger, natural convection principle, heat transfer by Radiation and applicable laws.

Mechanical Operations: Particle size and shape, particle size distribution – sieve analysis, size reduction and classification of solid particles; Blaine's apparatus and solution densitometry; free and hindered settling; sedimentation; centrifuge and cyclones; thickening and classification, filtration, agitation and mixing; conveying of solids.

Mass Transfer: Fick's laws, Molecular diffusion in fluids, Mass transfer coefficients, Design and operation of equipment for distillation, absorption, leaching, liquid-liquid extraction, drying, humidification, dehumidification and adsorption.

Chemical Reaction Engineering: Fundamentals of Catalysts, Catalytic rates, Reaction mechanisms; Yield and Selectivity; Fundamentals of Reactor design for ideal flow reactors; Concept of Residence Time Distribution (RTD).

Safety: Various symbols used to classify chemicals, gases & liquids, colour codes for marking various zones in a chemical lab, pressure relief valves, HAZOP related definitions
