

**ASSISTANT ENGINEER (CHEMICAL)****SYLLABUS****(Degree Standard)**

Syllabus for Screening Test for Recruitment to the Post of Assistant Engineer (Chemical) under Public Health Engineering (PHE) Department of Govt. of Assam. The Educational Qualification is Degree Standard.

**General Studies :-**

Full Marks :- 100 Marks.

Time : Two Hours

Multiple Choice Objective Type Question

- (i) Current Events of National & International importance.
- (ii) History of India & History of Assam.
- (iii) World Geography including India & Assam.
- (iv) Indian Economy, Indian National Movement.
- (v) Mental Ability.
- (vi) Role and Impact of Science and Technology in India.
- (vii) Indian Polity, Political System in India.
- (viii) Indian Culture.

**Chemical Engineering :-**

Full Marks :- 100 Marks.

Time : Two Hours

Multiple Choice Objective Type Question

- CEMENT – Types, Portland cement and special types of cement
- PROCESSES AND PROCESS VARIABLES- mass and volume, mole and molecular weight, choosing a basis, flow rate , chemical composition, density and specific gravity, concentration, pressure temperature
- PROPERTIES AND CORROSION OF MATERIAL: Electrical and magnetic properties of materials- Chemical, thermal and technological properties of materials - corrosion, theories of corrosion - control and prevention of corrosion.
- METALS: Engineering materials - ferrous metals - Iron and steel, Iron-carbon equilibrium diagram. Non ferrous metals and alloys - Aluminium, copper, zinc, lead, nickel and their alloys with special reference to the application in chemical industries.
- FLUID FLOW PHENOMENA : Velocity field, laminar flow, velocity gradient and rate of shear, Eddie viscosity, viscosity and momentum flux, shear stress field, Newtonian and non- Newtonian fluids, Bingham model, Ostwald-de Waele model of non-Newtonian fluid, turbulent flow, Reynold's experiments, flow in boundary layer, laminar and turbulent flow in boundary layer, transition from laminar to turbulent flow – Reynold's

number, boundary layer separation and wake formation.

- BASIC EQUATION OF FLUID FLOW :Stream lines and stream tubes, average velocity, mass velocity, integral equation of flow – Euler's equation of motion, momentum equation for one dimensional flow under steady state condition, the Bernoulli's equation, its application to pumps, blowers, turbines etc.
- FLOW OF INCOMPRESSIBLE FLUID IN CONDUITS :Flow of incompressible fluids in pipes, boundary layer formation in straight tube, laminar flow of Newtonian fluids, Hagen- Poisseuille equation, laminar flow of non-Newtonian fluids, velocity distribution for turbulent flow, average velocity, relation between maximum and average velocity, application of dimensional analysis to fluid flow problems – friction factor, pipe roughness, loss of head due to friction, bends, fittings etc.
- SEDIMENTATION: Gravitational sedimentation – Fine suspensions – Coarse suspensions – Solids flux in batch sedimentation – The Kynch theory of sedimentation – thickner, Centrifugal separation – behavior of liquids in centrifuge basket – fluid pressure – sedimentation in a centrifugal field – separation of two immiscible liquids – centrifugal equipment.
- FILTRATION: The theory of filtration – relation between thickness of cake and volume of filtrate-flow of liquid through the cloth-flow of filtrate through the cloth and cake combined, compressible filter cakes, Filtration practice-The filter medium- blocking filtration, effect of particle sedimentation on filtration-delayed cake filtration- preliminary treatment of slurries before filtration-washing of filter cake, Filtration equipment, Filtration in a centrifuge, Filtration calculations.
- MIXING AND AGITATION: Agitation of liquids – Purpose of agitation-agitation equipment-Impellers-Flow patterns in agitation vessels-circulation rate- velocity gradients in agitated vessels-power correlations for specific impellers-effect of system geometry-calculation of power consumption.

#### WATER POLLUTION :

(A)

- (i) Regulations on the discharge of industrial pollutants in water, threshold limits.
- (ii) Types of waste water, sources of pollutants, classification of pollutants.
- (iii) Site selection, sampling, preservation, water quality parameters and significance, monitoring, determination of BOD and COD.
- (iv) Dissolved oxygen balance in water, self purification of a water system (Critical deficit of a runoff).

B. Some fundamental aspects of microbiology as applied to pollution control.

#### C. Control of Water Pollution :

- Basic approach to solve the problem.
- Primary, secondary and tertiary treatment of waste water, clariflocculation, sludge disposal.
- Treatment of phenolic waste water and also water containing N and P.
- Control of heavy metal ions, As, Hg, Cr.

SOLID WASTE MANAGEMENT : Types of solid wastes, sources and composition,

methods of waste management – sanitary landfill, composting, incineration, pyrolysis, anaerobic digestion, concepts of recycling.

- Design of lagoons, oxidation pond, activated sludge process units, gravity settler, Rotating Biological Cyclone (RBC) separators, anaerobic digester, and stack for emission control.

DESIGN OF PIPE FITTINGS AND JOINTS: Design and schematic of simple bolts and screws. Riveted joints. Design & Draw of shafts and couplings.

DESIGN OF STORAGE TANK: Design and schematic of storage tank, (vertical and horizontal) supports.

HYDROELECTRICITY – its production and future prospects in India.

RESERVOIR CONSIDERATION: Hydrocarbon properties of oil & gas, Characteristics of reservoir rocks, porosity, permeability, resistivity etc, Fluid flow in the reservoir, Reservoir drive mechanism, reservoir homogeneity.

DRILLING TECHNOLOGY: Methods of Drilling, Rotary Drilling rig, Rotary rig circulation system, Basic operation in drilling, the drill stem, Introduction to offshore drilling, types of offshore rigs,

WELL COMPLETION: Casing and Cementation, Well Head, Production Techniques

PROBLEM WELL ANALYSIS: Low reservoir pressure, Low reservoir permeability, plugging, high viscosity oil, Removal of wax deposits etc.

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