

# 10.SYLLABUS FOR ENTRANCE EXAMINATION

## A.N.S.I. (SUGAR TECHNOLOGY) COURSE-2021

### MATHEMATICS (SECTION –A)

- 1 **ALGEBRA AND TRIGONOMETRY** Group, Permutation groups , Subgroups, Centre and Normalizer, Cyclic groups, Coset decomposition, Lagrange's theorem, Homomorphism and Isomorphism, Cayley's theorem , Normal Subgroups, Quotient group, Fundamental theorem of Homomorphism. Introduction to rings, subrings, integral domains and fields, characteristic of a ring, homomorphism of ring, ideals quotient rings. Sequence and its convergence, Convergence of infinite series, Comparison test, Ratio test, Root test, Raabe's test, Logarithmic test. Alternating series, Leibniz's test, Absolute and conditional convergence.  
Complex functions, Separation into real and imaginary parts, Exponential, Direct and inverse trigonometric and Hyperbolic functions, Logarithmic functions.
- 2 **MATRICES-** Addition and multiplications, elementary row and column operations, rank determination, solution of system of linear equations, Eigen values and Eigen vectors, Cayley-Hamilton theorem.
- 3 **CALCULUS-** Standard functions, limits. Continuity, properties of continuous functions in closed intervals, differentiability. Rolle's theorem, Mean Value theorem, Taylor's theorem. Maxima and Minima, properties of tangent and normal, curvature, asymptotes, double points, points of inflexion and tracing, Fundamental theorem of integral calculus, method of integration, Rectification, Quadrature, volume and surface of solids of revolution. Partial differentiation and its application. Double and Triple integration, Application of area, volume, centre of mass, moments of inertia etc.
- 4 **DIFFERENTIAL EQUATIONS-** Ordinary differential equations of first order, singular solutions, geometrical interpretations, linear differential equations with constant coefficients. Differential equation of the first order but not of the first degree, Clairaut's equation and singular solutions, linear differential equation of the second order.
- 5 **GEOMETRY-**Analytical Geometry of straight lines and conics referred to Cartesian and Polar coordinates. Three dimensional geometry for planes, straight lines.
- 6 **MECHANICS-** Velocity and acceleration along radial and transverse direction and along tangential and normal directions. Simple Harmonic Motion, Inverse Square Law, Projectiles .Common centenary and centre of Gravity.
- 7 **MATHEMATICAL STATISTICS-** Discrete and continuous distributions (Binomial, Poisson's and Normal Distributions), Moments, Correlation and simple linear Regression.
8. **VECTOR ALGEBRA AND VECTOR CALCULUS-** Vector addition, scalar multiplication and vector multiplication (multiplication of three and four vectors also), applications in geometry, vector Differentiation, Gradient, Divergence and curl and their applications.

### CHEMISTRY (SECTION- B)

#### **GENERAL& PHYSICAL CHEMISTRY**

1. Chemical equilibrium- Homogeneous and heterogeneous system, equilibrium constant, effect of temperature on equilibrium constant; Law of mass action ; definition, verification and its application to simple homogeneous and heterogeneous systems. Le Chateleur & Braun's Principle, its application.
2. Colloids – General method of preparation, properties and uses of colloids; Lyophilic and Lyophobic sol, charge on colloidal particles; Stability, protection and coagulation of colloids; Gold number and its application, Tyndall effect, Brownian Movement.
3. Electrochemistry- Specific, Equivalent and Molar conductivities. Ionic conductance, ionic mobility, Kohlrausch Law. Transport number and its determination. Solubility of sparingly soluble salts. Electrode potential and Nernst equation, Reference electrodes, description and working of hydrogen and glass electrodes and their use in pH determination. Common ion effect, solubility product and its application.
4. Chemical Kinetics- Molecularity and order of a reaction, Derivation of rate constant of first and second order reaction.

5. Catalysis, characteristics, classification, homogeneous, heterogeneous catalysis, enzyme catalysis and miscellaneous examples.

### **ORGANIC CHEMISTRY**

1. Optical and Geometrical isomerism, asymmetric carbon atom, racemisation and resolution of racemic mixtures, resonance and its application in organic chemistry.
2. Methods of preparation, properties and uses of alcohols, aldehydes, ketones, esters, ethers, amines, amides, amino acids and proteins.
3. Carbohydrates- Classification, structure of D-glucose and fructose (open and ring structure), inter-conversion of monosaccharide's: aldose to ketose, ketose to aldose, pentose to hexose, hexose to pentose, Killiani's synthesis, Wohl's degradation, epimerization. Disaccharides-manufacture of sucrose, structure and their common reaction, Polysaccharides.
4. Orientation and structure of Benzene. Simple reactions of benzene, toluene, phenols, nitro and amino compounds, benzoic, salicylic, cinnamic & sulphonic acids, aromatic aldehydes and ketones, diazo, azo compounds, naphthalene, pyridine, thiophene and furan.

### **INORGANIC CHEMISTRY**

1. Periodic properties- Ionization potential, Electron Affinity, Electro Negativity, Atomic and Ionic-radii, hybridization, Polarization.
2. Oxidation states and oxidation number, common oxidizing and reducing agents, ionic equations and balancing of chemical reactions by oxidation- reduction method.
3. Coordination compounds-double and complex salts, Definition: complex-ion coordination number, nomenclature. Werner's theory of complexes, effective atomic number, stability of complexions, Stability constant, factors affecting stability, valence bond theory, crystal field theory of complex compounds, methods of study of complexes.
4. Principles of inorganic chemical analysis.
5. Study of d-Block elements and little bit about Lanthanoid-contraction.
6. Metal Carbonyl and idea of back bonding.

### **PHYSICS (SECTION- C)**

1. **Mechanics and Wave Motion:**—Dynamics of particle in rectilinear and Circular Motion, Linear and angular momentum., combined translational and rotational motion of rigid body on horizontal and inclined planes, Relations between elastic constants, Bending of beam, Torsion of cylinder, Law of gravitation, satellites. Differential equation of Simple harmonic motion, Damped and forced vibrations, superposition of waves Phase and group velocity.
2. **Thermodynamics:**-Equipartition of energy, specific heat of gases. Adiabatic expansion, Joule-Thomson expansion and liquefaction of gases. Carnot cycle, Carnot theorem, Entropy, thermo dynamical scale of temperature, Clausius- Cleyperon equation, Adiabatic demagnetization, Black body and Kirchoff's Law.
3. **Basic Electronics:** Growth and decay of current through inductive resistances, Semiconductors, Diode as rectifier Zener Diode. Avalanche and Zener break down. Transistors , LED, Transistor amplifiers, Oscillators cathode ray oscillograph its working and application.
- 4- **Optics and Lasers:** Interference, coherent sources requirement.Lateral shift of fringes. thin films determination of wavelength half period Zones. Diffraction at a slit Diffraction grating (Plan and Convex) Resolving power Polarisation, double refraction in uniaxial crystal . Nicol Prism Optical activity and fresnel explanation Polymers. retardation plates laser action, population inversion Application of lasers.
- 5- **Electro-Magnetics** Electric field and potential due to a charged sphere . Gauss Law and its application. Electric quadrupole. Bio-savart Law, Lorentz Law, Amperes Circuital theorem , Faraday Law of induction, Lenz's Law, Mutual & Self induction. Ballistic Galvanometer. Dielectrics, magnetic susceptibility para, dia and ferromagnetic materials Hysteresis

6. **Quantum Mechanics:** Photo-electric effect, de Broglie matter wave, Heisenberg Uncertainty principle, spectra of hydrogen, X-ray spectrum and its dependence of voltage, characteristics of x-ray, Mosley Law, Bragg's Law.
7. **Relativity:** Reference frames, Inertial frames, Galilean invariance and conservation laws, Lorentz - length contraction and time dilation, Probability and thermodynamic probability. Bose-Einstein and Fermi-Dirac distribution.
8. **Solid state and Nuclear Physics:** Crystal structure, Three dimensional lattice types. Simple Crystal structure of NaCl, Diamond. Hall effect, General properties of the nucleus, mass defect and binding energy, Nuclear models. Fission and fusion.
9. **Solid State Electronics:** Tunnel diode, Point contact diode, Distortion in amplifiers, Negative and positive feedback in transistor amplifier, FED and their characteristics. Power supplies, Photo transistors

#### **CHEMICAL ENGINEERING (SECTION -D)**

1. **Process Calculation:** Law of conservation of mass and energy, Recycle, by pass and purge, its calculation, degree of freedom analysis. Ideal gas law, Dalton's law, Amagat's law, Average molecular weight of gaseous mixture, Vapour pressure, Raoult's law and Henry's law.
2. **Thermodynamics:** First and second Law of thermodynamics and their application. Evaluation of P-V-T-Equation of state and thermodynamic properties of ideal Gases and Real system, phase equilibria, Chemical potential, fugacity, mixture properties, chemical reaction equilibria., Thermodynamic relations, Gibb's phase rule, Carnot cycle, Enthalpy and Entropy.
3. **Fluid Mechanics and Mechanical Operation:** Fluid statics, Newtonian and Non-Newtonian fluids, Bernoulli equation, flow through pipe line system. Flow meters, Pump and compressors, Flow through packed and fluidized bed. Size reduction and size separation filtration, mixing and agitation. Entrance and exit losses in flow process, Rayleigh's method of dimensional analysis, Buckingham's Pi theorem.
4. **Heat Transfer:** Conduction, convection and radiation, Heat transfer coefficient including boiling, condensation and evaporation systems, type of heat exchangers and evaporators and their design, Basic laws of Radiation Black body and Grey body concepts, Furnaces, their classification, principle and design criteria.
5. **Mass Transfer and Transport Phenomena:** Principles and theories of mass transfer, Fick's Law, Film Penetration and Surface renewal theories. Momentum heat and mass transfer analogies, distillation, absorption leaching, liquid-liquid extraction, crystallization, drying, adsorption,
6. **Chemical Reaction Engineering:** Classification of reactors and reactions, Theories of reaction rates, single and multiple reactions in ideal reactors, kinetics of homogeneous reactions, Interpretation of kinetic data. Catalysis and enzyme catalysis, Transport number, Kohlrausch's law, solubility product, redox reaction. Electrochemical & Concentration cell.

**Question paper will consist of four sections i.e. Mathematics, (weightage 20%), Chemistry (weightage 40%) & Physics (weightage 20%)& Chemical Engineering (weightage 20%). Each section will be of equal marks. In each section questions shall be of objective, short answer and long answer type. Candidates may attempt all the sections.**

# 11. SYLLABUS FOR ENTRANCE EXAMINATION

## A.N.S.I.(SUGAR ENGG.) COURSE - 2021

### MECHANICAL ENGINEERING & PRODUCTION ENGINEERING (SECTION– A)

1. **Basic concepts and Laws of Thermodynamics:** Definitions, microscopic and macroscopic properties, Zeroth law, First law, Second law of thermodynamics, Intensive and extensive properties, quasi-static, reversible, irreversible, flow, non-flow, steady flow, throttling processes, Carnot cycle, etc.
2. **Combustion of fuels :** Classification fuels, merits and demerits of liquid, solid and gaseous fuels, calorific value of fuels (HCV and LCV), combustion equations of fuels, minimum volume of air required for complete combustion, gravimetric analysis, conversion of mass analysis to volumetric analysis, excess air, flue gas analysis by Orsat apparatus.
3. **Properties of steam, steam generators, steam turbines and condensers:** Formation of steam, steam tables, Enthalpy and entropy of wet and superheated steam, temperature – entropy and pressure and volume diagrams for steam, constant pressure, constant volume, adiabatic, isothermal, polytropic processes, dryness fraction, Mollier diagram, Types of boilers, functioning, boiler mountings and accessories, performance of boilers, draught in boilers, calculation of chimney diameter, height and efficiency, classification of turbines and principle of operation, compounding , performance of turbines, governing, lubrication system for steam turbine, Classification of condensers, vacuum measurement, mass of cooling water required, air removal, vacuum efficiency etc.
4. **Internal combustion engines, air compressors, Gas turbines:** Classification of I.C. Engines, cyclic operations, Two stroke and four stroke cycle engines, Valve timing diagrams, scavenging, detonation, Rating of Engine fuels (Octane number and Cetane Number), cooling super charging, lubrication, carburetor, governing, spark plug, fuel pump, atomizer, etc.
5. **Heat transfer:** Conduction, thermal conductivity, conduction through flat wall, hollow cylinder, composite cylinder, sphere, convection, free and forced convection, LMTD, heat exchanger, radiation, absorption, reflection and transmission of radiation, plank's Law, Stefan-Boltzman's law, heat transfer coefficient for radiation.
6. **Mechanical engineering design:** Engineering materials and their properties, simple stresses in machine parts, torsional, bending and variable stresses in machine parts, pressure vessels, pipes and pipe joints, welded joints, screwed joints, keys and couplings, shafts, levers, columns and struts, belt and rope drives, fly wheel, bearings, spur, helical and worm gears, etc.
7. **Manufacturing technology:** Manufacturing cycle, manufacturing processes and their selection, engineering materials and their selection, casting, product design, defects, inspection techniques, casting processes, basic design considerations in casting, plastic deformation, hot and cold working, sheet metal operations, heat treatment processes, metal cutting, tool materials, tool geometry, and nomenclature, cutting fluids, single and multipoint cutting operations, production of gears and screw threads, grinding and finishing process, machines tools, introduction to NC, CNC and DNC machining, joining processes, welding process, testing of welded joints, brazing and soldering, mechanical fastening processes, etc.
8. **Computer aided manufacturing and manufacturing automation**  
Computer aided design of engineering systems, applications in modeling analysis, design and manufacturing, computer graphics, geometric transformations, computer aided drafting, surface and solid models, customizing, auto cad, lisp, design of surfaces, solid modeling, finite element analysis, definition of automation, reasons for automating, pros and cons of automation, manufacturing operations and automation strategies, production economics, high volume production systems, numerical control production systems i.e. CNC, DNC and adoptive control, industrial robots, automated material handling, storage and retrieval systems, automated inspection and testing principles and methods, sensor technologies for automated inspection, etc.

## **ELECTRICAL ENGINEERING (SECTION – B)**

1. **Electromagnetic Induction:** Relation between magnetism and electricity, production of induced emf and current, Faraday's law of electromagnetic induction, Lenz's law, types of induced emf, coefficient of self inductance, and mutual inductance, coefficient of coupling, Inductances in series and in parallel.
2. **A.C. Fundamentals:** Generation and equations of alternating voltage and current, wave form, cycle, time period frequency, amplitude etc, different forms of emf equation, phase, phase difference, R.M.S. value of half wave rectified, phasor representation of alternating quantities, A.C. through resistance, inductance and capacitance.
3. **A.C. Circuits:** Series A.C. circuit, power factor, active and reactive components of circuits, current, Q-factor of a coil, power in an iron cored choking coil, resonance in R.L.C. circuit, graphic representation of resonance, resonance curve, Q-factor of series circuit, parallel A.C. circuits, Vector and phasor method, application of admittance method, complex or phasor algebra, series – parallel circuits, parallel equivalent of a series circuit, resonance in parallel circuit, phase sequence, parallel circuit, polyphase circuits, generation of three phase velocity, Q-factor of a sequence, numbering of phase, inter connection of three phase, star/delta connection, power factor improvement, power measurement in 3 phase circuit, phase sequence indicators.
4. **D.C. Generators:** Principles, working and construction, types of generators, generated emf and emf equation, losses, efficiencies, characteristics of DC generators, no load curve, critical resistance, critical speed, voltage built up of shunt generators, series generators, compound generators, application of generators.
5. **D.C. Motors:** Principle, comparison with generators, significance of back emf, voltage equation, torque, speed regulation, motor characteristics, performance curves, losses, power stages and efficiency.
6. **Transformer:** Principle of working, construction, emf equation, voltage transformation ratio, losses, equivalent circuit, and approximate equivalent circuit, transformer tests, regulation efficiency, auto transformer, equal and unequal voltage ratio, three phase transformer, connections, parallel operation phase conversion, current transformer, potential transformer.
7. **Induction motors:** Classification, principle and construction, slip frequency of motor current, relation between torque and rotor, power factor, starting torque, effect of change in supply voltage, rotor emf and resistance under running conditions, torque under running conditions, relation between torque and slip, measurement of slip, power stages, rotor output.
8. **Alternator:** Basic principle, construction armature windings, connections, pitch factor, distribution factor, equation of induced emf, effect of harmonics on pitch and distribution factors, vector diagram of a loaded alternator, voltage regulation, three phase alternators parallel operation of alternators, synchronizing of alternators, synchronizing current power and torque, effect of unequal voltage distribution of load.
9. **Power system components:** Single line diagram of power system, brief description of power system elements : synchronous machine, transformer, transmission line, busbar, circuit breaker and isolator, concepts of FACTS.
10. Transmission of Electricity.

**Question paper will consist of two sections i.e. Mechanical Engineering and Production Engineering (weightage 60%) & Electrical Engineering (weightage 40%). Each section will be of equal marks. In each section questions shall be of objective, short answer and long answer type. Candidates may attempt all the sections.**

## 12. SYLLABUS FOR ENTRANCE EXAMINATION

### POST GRADUATE DIPLOMA COURSE IN INDUSTRIAL FERMENTATION AND ALCOHOL TECHNOLOGY (D.I.F.A.T) -2021

#### CHEMISTRY (SECTION –A)

##### GENERAL & PHYSICAL CHEMISTRY

1. **Chemical Equilibrium-** Homogeneous and heterogeneous system, equilibrium constant, effect of temperature on equilibrium constant; Law of mass action ; definition, verification and its application to simple homogeneous and heterogeneous systems
2. **Colloids** – General method of preparation, properties and uses of colloids; Lyophilic and Lyophobic sol, charge on colloidal particles; Stability, protection and coagulation of colloids; Gold number and its application
3. **Electrochemistry-** Specific, Equivalent and Molar conductivities. Ionic conductance, ionic mobility, Kohlrausch Law. Transport number and its determination. Solubility of sparingly soluble salts. Electrode potential and Nernst equation, Reference electrodes, Description and working of hydrogen and glass electrodes and their use in pH determination.
4. **Chemical Kinetics-** Molecularity and order of a reaction, Derivation of rate constant of first and second order reaction.

##### ORGANIC CHEMISTRY

1. Methods of preparation, properties and uses of alcohols, aldehydes, ketones, esters, ethers, amines, amides, amino acids proteins. Carbohydrates, polysaccharides & sugars.
2. Benzene and its structure. Simple reactions of benzene, toluene, phenols, nitro and amino compounds, benzoic, salicylic, cinnamic, sulphonic acid, aromatic aldehydes and ketones, diazo, azo compounds, naphthalene, pyridine, thiophene and furan.

##### INORGANIC CHEMISTRY

1. Periodic properties- Ionization potential, Electron Affinity, Electro negativity, Polarization.
2. Oxidation states and oxidation number, common oxidizing and reducing agents, ionic equations and balancing of chemical reactions by oxidation- reduction method.
3. Coordination compounds- double and complex salts, Definition: complex-ion coordination number, nomenclature. Valence bond theory, crystal field theory of complex compounds, methods of study of complexes.
4. Principles of inorganic chemical analysis.

#### INDUSTRIAL CHEMISTRY & APPLIED CHEMISTRY- (SECTION- B)

##### A. Industrial Aspects Of Organic And Inorganic Chemistry.

1. Nomenclature: Generic names, Trade names
2. Raw materials for organic compounds: Petroleum, Natural gas, Fractionation of crude oil, cracking, reforming, hydro forming and Isomerisation.
3. Coal: Types of coal, properties, calorific value, distillation of coal, chemicals derived from them. 4. Renewable Natural resources: Cellulose, Starch:-properties, modification, important industrial chemicals derived from them. Alcohols, oxalic acid and Furfural.
4. Metallurgical operations pulverization, calcination, roasting refining etc. extraction of iron, copper, lead, silver, sodium, aluminium etc.

##### B. Industrial Aspects Of Physical Chemistry

1. **Surface chemistry and Interfacial phenomena:** Adsorption isotherm, Sols, Gels, Emulsions, Micro emulsions, Micelles, Aerosols, Effect of Surfactants, Hydro tropes.
2. **Catalysis:** Introduction, Types, Basic principles, mechanisms, factors affecting the performance, introduction to phase transfer catalysis, Enzymes catalyzed reactions- rate model, industrially important reactions.

### **C. Material Science and Industrial Pollution.**

1. **Polymeric Materials:** Industrial polymers and composite materials—their constitutions, chemical and physical properties.
2. **Industrial pollution:** Pollutants and their statutory limits, pollution evaluation methods. Water pollution – organic/inorganic pollutants Pesticide pollution, Radiation pollution and Green House Effect.

### **D. Effluent treatment & Waste management and Process Instrumentation.**

1. Principles and equipment for aerobic, anaerobic treatment, adsorption, sedimentation. Electrostatic precipitator, Mist eliminator, Wet scrubbers, Absorbers.
2. Solid waste management, Industrial safety.
3. Thermometer, pH meter, conductivity meter, manometer, barometers, pressured gauge,

### **E. Environmental Analysis in Process Industries.**

Environmental Chemistry, determination of pH, acidity alkalinity, total suspended solids(TSS), total dissolved solids(TDS), total hardness and Ca & Mg hardness, chloride, sulphate, nitrate, oil and grease, DO, COD, BOD chlorine demand, limit test for heavy metals- Pb, As, Hg, Fe and ash content

## **BIOCHEMISTRY & BIOTECHNOLOGY( SECTION –C)**

### **1. MOLECULAR GENETICS**

Basic structure and function of cell, cell cycle, control of cell cycle, Chromatin organization, Molecular basis of life: Structure and function of DNA and RNA; basics of cell signalling, Bioenergetics: Laws of thermodynamics. Mendelian principles and inheritance, Law of segregation, Law of independent assortment, Sex determination and sex-linked inheritance. Basics of DNA replication, transcription and translation

### **2. GENERAL BIOCHEMISTRY**

1. **CARBOHYDRATES** Structure and properties of monosaccharide, disaccharides. oligosaccharides and polysaccharides, Mutarotation, Inversion of sucrose, color test with sugars, Estimation of total reducing sugar by fehling solution, tests to differentiate aldehyde and ketone. Metabolism of carbohydrates including glycolysis, HMP pathway, glyoxalate cycle, TCA cycle, Entner- Duodoroff pathway, gluconeogenesis, Pasteur effect.
2. **PROTEINS** : Outline of the structure of the common amino acids present in proteins, their general properties, metabolism of amino acids including deamination, transamination and decarboxylation, physical & chemical properties, classification and structure of proteins. Isolation, purification and estimation of proteins.
3. **NUCLEIC ACIDS:** Outline of the structure & functions of purine & pyrimidine bases, nucleosides and nucleotides, structure and biosynthesis of nucleic acids. Genetic Code, Evidence & Essentiality of Codon, Triplet code, start and stop codons. Overlapping genes and reading frames, universality of genetic code, Protein synthesis, mechanism in prokaryotes, Post translational modification and cell secretion.
4. **ENZYMES:** Nature, occurrence, classification of enzymes, outline of enzyme kinetics, competitive, non-competitive and uncompetitive inhibition, enzyme activity and importance of enzymes in fermentation industry

### **5. Vitamins and Minerals**

### **3. GENERAL MICROBIOLOGY**

The microscope, spontaneous generation, biogenesis, fermentation, germ theory of diseases, Microbial Diversity: Prokaryotes and Eukaryotes, Microalgae, Microfungi, Protozoa, Bacteria and Viruses, Bacterial size, shapes and pattern of arrangement, Structures external to cell wall: Flagella, Pili, Capsule, sheath, Prosthecae and stalk. The cell wall structure: Gram positive and gram-negative bacteria. Structures internal to cell wall: Cytoplasmic membrane, Cytoplasmic inclusion and nuclear material. Reproduction and growth of bacteria & Yeast. Modes of cell division, Growth curve, Lag phase, Exponential phase, stationary phase and death phase, Nutritional requirements. Nutritional types of bacteria, Phototrophs, Chemotrophs, Autotrophs, Heterotrophs, Obligate parasites. Bacteriological media, Selective media, Maintenance media, Differential media. Control of microorganisms, Definitions and fundamentals of control, Physical agents / processes for control: high temperatures, low temperature, dessication, osmotic pressure, radiation, filtration, host parasite interaction: pathogenicity, virulence and infection.

Nature of the Gene, one gene one enzyme hypothesis, gene-protein relation, Genetic fine structure, Colinearity of gene & protein, Inducible and constitutive operons, Manipulation of DNA: denaturation of DNA by heat, reassociation of complimentary strands, Engineering: restriction enzymes, formation of recombinant DNA, vectors, cloning strategies, detection of clone genes, applications of recombinant DNA technology, PCR technology.

#### **4. AN INTRODUCTION TO IMMUNOLOGY**

Introduction to immunology, Innate and adaptive immunity; Defense mechanisms of host: physical barriers, chemical barriers, biological barriers, Fever, Inflammation and Phagocytosis.

### **CHEMICAL & BIOCHEMICAL ENGINEERING ( SECTION – D)**

#### **CHEMICAL ENGINEERING**

1. Material balance involving chemical reaction: Law of conservation of mass & energy. Recycle , bypass & purges, its calculations, degree of freedom analysis. Ideal gas law, Dalton's Law, Amagat's Law, Average molecular weight of gaseous mixture, vapour pressure, Dalton's Law & Henry's Law.
2. Energy Balance: Heat capacity of pure gases & gaseous mixtures, sensible heat , changes in liquids, enthalpy changes.
3. Fluid flow: Fluid statistics, Newtonian and non Newtonian fluids, Bernoulli's equation. Flow through pipe line systems, flow meters, pump & compressors, vacuum pumps, ejectors.
4. Heat transfer: Conduction, Convection & radiation. Heat transfer coefficient including boiling& condensation, types of heat exchangers, like shell & tube type, plate type heat exchangers , refrigeration cycles and systems.
5. Distillation: Introduction, phase equilibria, equilibrium diagram and boiling point diagram. Binary systems, and their distillation systems, batch distillation and continuous distillation and the details of distillation columns both Plate & packed type separation of azeotropes.

#### **BIOCHEMICAL ENGINEERING**

1. **Introduction** – Definition and scope of Biochemical Engineering, history of biochemical engineering, commercial aspects of biochemical processes, different biochemical unit operations and processes.
2. **Microbial Growth Kinetics**:- Media design optimization and preparation for growth of microorganisms ,Microbial growth in closed , semi open and open cultivation systems, maintenance energy and yield concept, parameters of growth and analysis of growth data, microbial kinetics of growth, substrate utilization and product formation in batch, plug flow and chemo state culture.
3. **Media and Air Sterilization**:-Principles and design of batch and continuous media sterilization processes. Theory and methods of air sterilization, Design of air filters.
4. **Aeration and Agitation** : Demand and supply of oxygen in microbial system , masses transfer theory concept of Volumeter mass transfer coefficients ( $K_2a$ ) , factors affecting it and methods for measurement power requirements in gassed and un gassed systems , Rheology of fermentation fluids
5. **Kinetics of Enzymatic Reactions**: Characteristics of enzymes, Enzyme catalyzed reactions, Factors influencing the rate of enzymatic readctors, Michaels- Men ten Kinetics, Estimation of  $V_{max}$  and  $K_m$ . immobilization of enzymes

6. **Bioreactors and Scale up:** Mode of reactor operation, Ideal reactor models Batch, Fed batch, Extended fed batch, continuous stirred tank (CSTR), plug flow mono chemo state, scale-up criteria selection of scale-up criteria practical considerations for bioreactor contraction
7. **Bioreactor control mechanisms:** Control of physical, chemical and biological environment of the bioreactor. Advanced control strategies viz. PID controllers, fuzzy logic based controllers and artificial neural and artificial neural network based controllers, Role of physical, chemical & biological sensors.
8. **Down- Stream Processing:** Role of downstream processing, Recovering and purification of products problems and requirements of bio product purification, separation processes flocculation sedimentation, centrifugation, Filtration, Extraction, Distillation Ad operation, chromatography, electro dialysis, drying, ultra filtration, electrophoreses and isoelectric focusing , cell, disruption.
9. **Biological waste-water treatment:** Principle of biological oxidation of waste water, mathematical expressed and graphical representation of BOD removal and sludge growth , operation and design features of aerobic biological treatment processing oxidation pond, truckling filter, rotating biological contractor(RBC). Activated sludge process , Anaerobic treatment system sludge digestion theory, digester design, high rate digestion UASB, Nitrification and denitrification Phosphorus removal, characterization and treatment of waste water of the sugar industries such as distilling , Brewing , and antibiotics.

**Question paper will consist of four sections i.e. Chemistry (weightage 25%), Industrial Chemistry/Applied Chemistry (weightage 25%), Biochemistry/Biotechnology (weightage 25%) & Chemical & Biochemical Engineering (weightage 25%). Each section will be of equal marks. In each section questions shall be of objective, short answer and long answer type. Candidates may attempt all the sections.**

# 13. SYLLABUS FOR ENTRANCE EXAMINATION

## POST GRADUATE DIPLOMA IN SUGAR CANE PRODUCTIVITY & MATURITY MANAGEMENT (DSPMM)– 2021

### AGRICULTURE CHEMISTRY (SECTION-A)

1. **Irrigation & water:**-Sugarcane (crops) water Requirement, Relationship of the water requirement with soil texture, control of wastage of irrigation water, quality & Effect of irrigation water.
2. **Irrigation Methods:**- Flooding Method, Thala Method, Sprinkler & Drip irrigation, Boarder Method, Limitations & benefits of each irrigation Method.
3. **Measurement of irrigation water:**-‘B’ Katawa & Kulawa, Hectare, cm, Meter method of measurement.
4. **Necessity of Drainage:**-Disadvantages of High Moistured soils, Land development & improvement, Land preparation, General farm management & control.
5. **Accidents:**-Flood, Cyclone, Earthquake, Sensitive Zones, Control measurement of losses.
6. Weeds & Weedicides of sugarcane.
7. Plant protection chemicals used in sugarcane with quantity and method of application.
8. Anatomy of plants.
9. Structure of flower & their function of different parts.
10. Pollination
11. Fertilization
12. Type of Fruits
13. **Seed**
  - (a) External& internal structure of seed.
  - (b) Types of germination.
  - (c) Factor affecting of the seed germination.
  - (d) Types of seed.
  - (e) Methods of dispersal of & seed & its importance.
14. Cell and its structural organization
15. Plant phyosology
  - (a) Plant water relation
  - (b) Mineral nitrogen nutrition in plants
  - (c) Cellular respiration.
  - (d) Photosynthesis
16. Classification of plants
17. Diversity of life
  - (a) Five kingdom of life and Biological classification
  - (b) Kingdom monera
  - (c) Kingdom fungi
  - (d) Kingdom plante
  - (e) Virus
18. Inorganic Chemistry :- Classification of Elements, Hard & Soft water, Nitrogen & Nitrogen Cycle, Ammonia, Nitric Acid, Carbon, Carbon dioxide, Phosphorus & Phosphoric acid, Sulphur, Sulphur dioxide, Sulphuric acid, Chlorine, Hydrolic acid, Sodium & Potassium, Calcium, Iron &Aluminium.
19. Organic Chemistry :- Nomenclature & Classification of Organic Compounds, Alkene or Paraffins, Alkene or olifins, Alkayne or Acetylene, Alcohol Glycerol, Aldehyde & Ketone, Carboxylic acid, Amine & Amide, Oil, Fat & Soaps, Carbohydrates, Benzene & phenol.

### CHEMISTRY ( SECTION- B)

1. Chemical equilibrium- Homogeneous and heterogeneous system, equilibrium constant, effect of temperature on equilibrium constant; Law of mass action ; definition, verification and its application to simple homogeneous and heterogeneous systems. Le Chateleur & Braun’s Principle, its application.
2. Colloids – General method of preparation, properties and uses of colloids; Lyophilic and Lyophobic sol, charge on colloidal particles; Stability, protection and coagulation of colloids; Gold number and its application, Tyndall effect, Brownian Movement.

3. Electrochemistry- Specific, Equivalent and Molar conductivities. Ionic conductance, ionic mobility, Kohlrausch Law. Transport number and its determination. Solubility of sparingly soluble salts. Electrode potential and Nernst equation, Reference electrodes, Description and working of hydrogen and glass electrodes and their use in pH determination. Common ion effect, solubility product and its application.
4. Chemical Kinetics- Molecularity and order of a reaction, Derivation of rate constant of first and second order reaction.
5. Catalysis, characteristics, classification, homogeneous, heterogeneous catalysis, enzyme catalysis and miscellaneous examples.
6. Optical and Geometrical isomerism, asymmetric carbon atom, racemisation and resolution of racemic mixtures, resonance and its application in organic chemistry.
7. Methods of preparation, properties and uses of alcohols, aldehydes, ketones, esters, ethers, amines, amides, amino acids and proteins.
8. Carbohydrates- Classification, structure of D-glucose and fructose (open and ring structure), inter-conversion of monosaccharides: aldose to ketose, ketose to aldose, pentose to hexose, hexose to pentose, Killiani's synthesis, Wohl's degradation, epimerization. Disaccharides-manufacture of sucrose, structure and their common reaction, Polysaccharides.

**Question paper will consist of two sections i.e. AGRICULTURE CHEMISTRY (weightage 60%) and CHEMISTRY (weightage 40%). Each section will be of equal marks. In each section questions shall be of objective, short answer and long answer type. Candidates may attempt all the sections.**

## 14. SYLLABUS FOR ENTRANCE EXAMINATION

### POST GRADUATE DIPLOMA IN INDUSTRIAL INSTRUMENTATION & PROCESS AUTOMATION (DIIPA)- 2021

#### INSTRUMENTATION ENGINEERING ( SECTION –A)

1. **Electronics:-** Semiconductor diode and its applications; Bipolar transistors, Transistor Biasing Circuits, Single Stage Transistor Amplifier; Field Effect Transistors. Number System, Logic Gates and Families, Logic Simplification, Arithmetic circuits, Decoders, Multiplexers and De Multiplexers, Sequential Circuits, Counters, Shift Register, A/D and D/A Converters.
2. **Linear and Digital Integrated Circuits:-** Basics of Operational Amplifiers, Op-amp with Negative Feedback, General Linear Application, Active Filters, Comparators, Timer and Multi vibrator. Basics of Logic Families such as RTL, DTL, TTL, ECL,IIL, CMOS etc and their application.
3. **Electronic Instruments and Measurements:-** Voltage, Current and Resistance Measurement, Cathode Ray Oscilloscope, AC Bridges and Q Meters, Digital Instruments.
4. **Transducers and Process Instrumentation & Control:-** Variable Resistance Transducers, Variable Inductance transducer, Variable capacitance Transducers, Piezoelectric Transducers, Hall effect sensor, Optical transducers, Techo-generator, Thermocouples, Principle of Analog Signal Conditioning. Measurement of Pressure , Torque, Power, Speed and Force, Measurement of Stress and Strain, Measurement of Motion, Thickness Measurement, Measurement of Density, pH, Humidity and Viscosity; Basic Control Loops and Characteristics, Controller Modes and Characteristics, Electrical Control Elements, Pneumatic and Hydraulic Control Elements, Control Valves, Switches.
5. **Control System:-**Feedback principles, signal flow graphs, differentials equation-transfer function, transient response, steady-state-errors, Bode plot, phase and gain margins, Routh and Nyquist criteria, root loci, design of lead, lag and lead-lag compensators, state-space representation of systems; time-delay systems; mechanical, hydraulic and pneumatic system components, synchro pair, servo and stepper motors, servo valves; on-off, P, P-I, P-I-D, cascade, feed-forward, and ratio controllers

#### BASIC ENGINEERING (SECTION –B)

1. **Electrical Engineering and Machines:-**Circuits Analysis, KCL, KVL, Batteries, Magnetism and Electromagnetism, Electromagnetic Induction, AC Fundamentals, AC Circuits, Poly-Phase systems.DC generators, DC motors, Transformers, Alternators, Synchronous Motors, Induction Motors.
2. **Mechanical Engineering:-** Isothermal and adiabatic changes, First and Second law of thermodynamics, Thermal Conductivity, Black Body Radiation, Bernoulli's Theorem and its application, Biometers.
3. **Microprocessor:-**Introduction to 8085 & 8086, Basic Configuration and architecture, Instruction set and assembler directives, Parallel and Serial Communication, DMA Controller.
4. **Engineering Mathematics:-**Linear Algebra, Calculus, Differential equations, Analysis of complex variables, Probability and Statistics, Laplace Transform, Z-Transform

**Question paper will consist of two sections i.e. Instrumentation Engineering (weightage 60%) and Basic Engineering (weightage 40%). Each section will be of equal marks. In each section questions shall be of objective, short answer and long answer type. Candidates may attempt all the sections.**

**15. SYLLABUS FOR ENTRANCE EXAMINATION**  
**POST GRADUATE DIPLOMA IN QUALITY CONTROL**  
**& ENVIRONMENTAL SCIENCE**  
**(DOCES)- 2021**

**CHEMISTRY (SECTION- A)**

**PHYSICAL CHEMISTRY**

1. Colloids – General method of preparation, properties and uses of colloids; solution, types of solution, Buffer solution, Acid & Base Buffer, Buffer capacity, difference between suspension, colloids & solutions, Lyophilic and Lyophobic sol, charge on colloidal particles; Stability, protection and coagulation of colloids; Gold number and its application, Tyndall effect, Brownian Movement.
2. Electrochemistry- Conduction in metals & in Electrolytes solution, Kohlrausch Law, Debye's Huckel's Onsager's equation. Electrode reactions, Nernst's equation, Electrolytic & Galvanic cell, Calculations of E.M.F, Electrochemical Series.
3. Chemical Kinetics- Rate of reaction, Factors influencing the rate of reaction, Molecularity and order of a reaction, Half life time, Mean life time, Radioactive Decay,
4. Catalysis, characteristics, classification, homogeneous, heterogeneous catalysis, enzyme catalysis and miscellaneous examples.
5. Crystallization : Difference between crystalline and amorphous solids. law of crystallography Space lattice and unit cell, Bravais lattices, Seven crystal systems. Point defects; Schottky defects, Frenkel defects

**ORGANIC CHEMISTRY**

1. Methods of preparation, properties and uses of alcohols, phenols, ethers, aldehydes, amines, amides, ketones, carboxylic acids.
2. Arenes & Aromaticity: Orientation and structure of Benzene. Aromatic Electrophilic substitution., naphthalene & Anthracene.
3. Carbohydrates- Classification, structure of D-glucose and fructose (open and ring structure), Mutarotation, optical activity, specific rotation, Isomers, Enantiomers, inter-conversion of monosaccharides: aldose to ketose, ketose to aldose, pentose to hexose, hexose to pentose, Killiani's synthesis, Wohl's degradation, epimerization. Disaccharides-manufacture of sucrose, structure and their common reaction, Polysaccharides.
4. Amino acid, Peptides, Proteins & Nucleic acid

**INORGANIC CHEMISTRY**

1. Atomic structure: Aufbau Principle, Hund's Rule, Heisenberg uncertainty Principle & Pauli
2. Exclusion Principle
3. Periodic properties- Ionization potential, Electron Affinity, Electronegativity, Atomic radii.
4. Chemical Bonding: Valence bond theory, Valence shell electron pair repulsion theory, Hybridization
5. Molecular orbital theory, crystal field theory & Hydrogen bonding.
6. Acids and Bases; Arrhenius, Bronsted - Lowry, Lewis, HSAB concept of acid and base.
7. Bio Inorganic chemistry: Essential and trace elements in biological process, Hemoglobin,
8. Myoglobin, chlorophyll, Nitrogen fixation.

## **ENVIRONMENTAL SCIENCES & BIO-TECHNOLOGY (SECTION - B)**

### **A. BIOCHEMISTRY AND METABOLISM**

CARBOHYDRATES: Structure and properties of monosaccharide, disaccharides, oligosaccharides and polysaccharides, Metabolism of carbohydrates including glycolysis, HMP pathway, glyoxalate cycle, TCA cycle, Entner- Duodoroff pathway, gluconeogenesis, Pasteur effect.

PROTEINS : Outline of the structure of the common amino acids present in proteins, their general properties, metabolism of amino acids including deamination, transamination and decarboxylation, physical & chemical properties, classification and structure of proteins. Isolation, purification and estimation of proteins.

NUCLEIC ACIDS: Outline of the structure & functions of purine & pyrimidine bases, nucleosides and nucleotides, structure of nucleic acids. Genetic Code, Evidence & Essentiality of Codon, Triplet code, start and stop condons. Protein synthesis, mechanism in prokaryotes, Post translational modification and cell secretion.

ENZYMES: Nature, occurrence, classification of enzymes, outline of enzyme kinetics, competitive, non-competitive and uncompetitive inhibition, enzyme activity and importance of enzymes in fermentation industry

### **B. MICROBIOLOGY AND MICROBIAL GENETICS**

The microscope, spontaneous generation, biogenesis, fermentation, Microbial Diversity: Prokaryotes and Eukaryotes, Protozoa, Bacteria and Viruses, Bacterial size, shapes and pattern of arrangement, Structures external to cell wall: Flagella, Pili, Capsule, sheath, Prostheca e and stalk.

The cell wall structure: Gram positive and gram negative bacteria. Structures internal to cell wall: Cytoplasmic membrane, Cytoplasmic inclusion and nuclear material.

Reproduction and growth of bacteria & Yeast. Modes of cell division, Growth curve, Lag phase, Exponential phase, stationary phase and death phase, Nutritional requirements. Nutritional types of bacteria, Phototrophs, Chemotrophs, Autotrophs, Heterotrophs, Obligate parasites. Bacteriological media, Selective media, Maintenance media, Differential media. Control of microorganisms, Definitions and fundamentals of control, Physical agents / processes for control: high temperatures, low temperature, dessication, osmotic pressure, radiation, filtration, host parasite interaction: pathogenicity, virulence and infection,

### **C. MOLECULAR BIOLOGY AND BASIC GENETIC ENGINEERING:**

Nature of the Gene, one gene one enzyme hypothesis, gene-protein relation, Genetic fine structure, Co linearity of gene & protein, Inducible and constitutive operons, Manipulation of DNA: denaturation of DNA by heat, reassociation of complimentary strands,.

### **D- ENVIRONMENTAL SCIENCES**

Components of Environment – Hydrosphere, lithosphere, atmosphere and biosphere – definitions with examples; Interaction of man and environment; Environmental Studies as a multidisciplinary subject. Global Environmental Problems – Green House Effect, Acid rain, El Nino, Ozone depletion, deforestation, desertification, salination, biodiversity loss; chemical and radiation hazards. Positive and negative interactions of populations – competition, predation, parasitism, mutualism.

Ecosystem : Basic concepts, components of ecosystem. Trophic levels, food chains and food webs. Ecological pyramids, ecosystem functions. Carbon, Nitrogen, Phosphorus and Sulphur Cycles. Environmental pollution and degradation – Pollution of air, water and land with reference to their causes, nature of pollutions, impact and control strategies. Noise pollution.

Environmental Management – Concept of health and sanitation.

Environmental diseases – infectious (water and air borne) and pollution related, spread and control of these diseases, health hazards due to pesticide and metal pollution, waste treatment, solid waste management, environmental standards and quality monitoring.

Bioremediation – Oil spills, Wastewater treatment, chemical degradation, heavy Metals. (8 periods)

Definition, Scope and basic principles of ecology and environment. Biological levels of organization, population, community, ecosystem and biosphere.

#### **E. ELEMENTARY IMMUNOLOGY**

Defense mechanisms of host: physical barriers, chemical barriers, biological barriers, Fever, Inflammation and Phagocytosis. innate and specific immunity.

#### **F. BASIC BIOCHEMICAL BIOPHYSICAL TECHNIQUES AND BIOMATHS**

Basic environmental techniques: Colorimetry, Chromatography – paper chromatography, Thin layer chromatography, Column chromatography, Gas chromatography, Gas Liquid chromatography

Sampling methods : Random and non random sampling – concepts of mean (Arithmetic mean, Geometric mean, Harmonic mean), mode, median, Standard deviation and Standard error t-test and Chi. Square test

**Question paper will consist of two sections i.e. Chemistry (weightage 50%) and Environmental Sciences / Biotechnology\_(weightage 50%). Each section will be of equal marks. In each section questions shall be of objective, short answer and long answer type. Candidates may attempt all the sections.**

# 16. SYLLABUS FOR ENTRANCE EXAMINATION

## SUGAR ENGINEERING CERTIFICATE COURSE(SECC) - 2021

### MECHANICAL & PRODUCTION ENGINEERING (SECTION- A)

1. **Strength of Materials:-** Stresses and Strains, Resilience, Moment of Inertia, Bending Moment and Shearing Force, Bending stresses, Columns, Torsion, Springs.
2. **Thermodynamics:-** Fundamental Concepts, Laws of Perfect Gases, Thermodynamic Processes on Gases, Laws of Thermodynamics, Ideal and Real Gases, Properties of Steam, Steam Generators, Air Compressors, Introduction to Heat Transfer.
3. **Hydraulics and Pneumatic Systems:-** Pressure and its Measurement, Flow of Fluids, Flow through Pipes, Flow through Orifices, Hydraulic Machines, Water Turbines and Pumps. Pneumatic Elements –Pipes, Air Compressors, Pneumatic Cylinders; Pneumatic Valves- Type, symbols, working, applications and selection criteria.
4. **Theory of Machines:-** Simple Mechanisms, Power Transmission, Flywheel, Governor, Balancing, Vibrations.
5. **CNC Machines and Automation:-** Introduction to NC, CNC & DNC, Construction and Tooling, Part Programming, Problems in CNC Machines, Automation and NC system.
6. **Production Management:-** Management approach to Planning, Analysis and Control functions involved in a Production System; Production cycles, planning functions; Types of industry : Job, Batch, Continuous, Mass and Flow Productions; Organization and policies in respect of production planning and control; Product design and development; Forecasting techniques; Scheduling, Sequencing and plant loading for optimal utilization; Queuing models and line balancing; Materials Planning and Control, Inventory Management; Value Analysis; Productivity Analysis, Mechanics of production control.

### ELECTRICAL ENGINEERING (SECTION -B)

1. **Fundamentals of Electrical Engineering:** DC Circuits, Batteries, Magnetism and Electromagnetism, Electromagnetic Induction, AC Fundamentals, AC Circuits, Poly-Phase systems.
2. **Electrical Machines:** DC generators, DC motors, Transformers, Alternators, Synchronous Motors, Induction Motors.
3. **Energy Sources and Management of Electrical Energy:** Various energy sources, Importance of non-conventional sources of energy, present scenario, future prospects and economic criteria; Energy Conservation & Management-Energy efficiency, Need for energy efficient devices, Energy conservation in Industrial sector (Motors, Industrial lighting, Distribution system, Pumps, Fans, Blowers etc.)
4. **Estimating and Costing in Electrical Engineering:** Types of wiring, Estimating and Costing - Domestic installations, Industrial installations, Estimating the material required for Transmission and distribution lines (overhead and underground) & Substation.
5. **Electrical Power (Generation, Transmission and Utilization):**Power Generation, Economics of Generation, Transmission Systems - Constructional features of transmission lines, Mechanical features of lines, Electrical features of lines; Substations - Switch Gears, Protection Devices Faults, Protection Scheme. Power Factor and its importance; Illumination, Electric Heating, Electric Welding, Electrolytic Processes.
6. **Industrial Electronics and Control of Drive:** SSCR and its applications, Thyristor Control of Electric Drives, Uninterrupted Power Supplies.

Question paper will consist of Two sections i.e. Mechanical / Production Engineering (weightage 60%) & Electrical Engineering (weightage 40%). Each section will be of equal marks. In each section questions shall be of objective, short answer and long answer type. Candidates may attempt all the sections.

# 17. SYLLABUS FOR ENTRANCE EXAMINATION

## SUGAR BOILING CERTIFICATE COURSE (SBCC) - 2021

### PAN BOILING PROCESS (SECTION-A)

1. General idea about various raw materials and crops for Sugar Manufacture, their cultivation, production etc.
2. General information about the equipment & Machinery installed in mill and Boiling House.
3. An overview of the Working, Types and Design of Equipment's used for sugar manufacture: (from Milling to Sugar Bagging).
4. Basic of Steam , Vapor bleeding etc,
5. Basics of the Process of vacuum pan boiling, Types and Grades of Sugar Produced, Boiling Schemes, Masecuities, Molasses their purities, Brixes, Grain Sizes etc.
6. Preparation of A masecuite, B masecuite & C masecuite or R1, R2,& R3 etc. masecuities.
7. Methods of slurry preparation, False grain & conglomerates.  
Different instruments Used in Vacuum Pan control and their Designs.
8. Different types of Vacuum Pans used in the sugar industry, their parts, connections, etc.
9. Comparison between batch pan & Continuous pan.
10. Details of Vacuum Generation, Temperatures and Vacuum in Pans and Evaporators, usage of Condensate etc.
11. General Idea about the Working and designs of Crystallizers, Centrifugal, Grader etc.

### MATHEMATICS & SCIENCE (SECTION –B)

1. Basics of Percentage, Fractions, Simple Interest, Compounds Interest, Work – Time and Speed calculations.
2. Surface Area and Volume of different shapes such as Triangle, Rectangle, Trapezium cuboids, cylinder, cone, sphere etc.
3. Fundamental and secondary units and their conversion related to Weight, Time, Length, Area, Volume, Temperature etc.
4. General Information about pressure, temperature, Volume of Gases, Gas laws, Law of diffusion, Rate of diffusion, Atmospheric pressure and its effects.
5. Laws of Force, Motion, Work, Energy, Momentum, Torque, Couple etc.
6. Evaporation, Boiling point, Freezing point, Melting point, Elevation of Boiling point, Depression of Freezing point, , Temperature Scales, Principle of Calorimeter etc.

**Question paper shall consist of two sections i.e. Pan Boiling Process and Mathematics & Science. Each section will be of equal marks. In each section questions shall be of objective, short answer and long answer type. Candidates may attempt all the sections.**

## 18. SYLLABUS FOR ENTRANCE EXAMINATION

### CERTIFICATE COURSE IN QUALITY CONTROL (CCOC) - 2021

#### MATHEMATICS (SECTION –A)

##### Algebra:-

Logarithms – Properties of logarithms

Complex Number as an ordered pair of real numbers in the form of  $a+ib$ ,  $(a,b)$ ,

Use of the formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$  in solving quadratic equation.

Simple problems of arithmetic, geometric & harmonic progression

##### Trigonometry:-

Angles: convention of sign of angles, magnitude of an angle, the relation  $s = r\theta$  where  $\theta$  is in radians, truth of the identity  $\sin^2 X + \cos^2 X = 1$ , relationship between trigonometric functions.

##### Coordinate Geometry:-

Basic concepts of points and their coordinates, slope & gradient of a line, angle between two lines, various forms of equation of lines, distance of a point from a line, distance between parallel lines. Conic sections, circle, ellipse, parabola, hyperbola and their properties.

Statistics:- Estimation of mean, median & mode. Graphical Presentation of Data

#### CHEMISTRY (SECTION – B)

**Basic concepts of chemistry** – Properties of matter & their measurements, Dalton's atomic theory, laws of chemical combination, Avogadro's Hypothesis, Atoms & Molecules, chemical equivalents, volumetric and gravimetric calculation, empirical & molecular formula. Electro chemistry, with special reference to pH and conductivity measurement, theory of solutions with special reference to solubility and solubility products, common ion effect.

**Surface Chemistry** – Adsorption, colloidal state, emulsions & chromatography.

**Chemical Kinetics** – Rate of affecting rate of reaction, dependence of rate of reaction on concentration, order and molecularity chemical reaction, factors of a reactions.

**Organic Chemistry & Organic compounds-** Detection of elements in organic compounds (qualitative analysis), estimation of elements in organic compounds (quantitative analysis), Calculation of empirical & molecular formula.

**Carbohydrates-** General concept, mono, di and oligosaccharides, Reducing and Invert sugars, Specific rotations, Polarization, Polaroids. Refractrometry and Hygrometry.

**Question paper will consist of two sections i.e. Mathematics and Chemistry. Each section will be of equal marks. In each section questions shall be of objective, short answer and long answer type. Candidates may attempt all the sections.**