Syllabus 2018-19

Add on Course - Industrial Chemistry

Certificate Course

Paper-1

1. Nomenclature: Generic name, trade name. Method for purification of organic compounds, separation techniques, solvent extraction, chromatography, numerical problem related to these.

2. Raw material for organic compounds: petroleum, natural gas, Fractionation of crude oil.

3. Synthetic petrol: Fractionation of crude Oil, cracking reforming, hydro forming, isomerism, Octane number, cetane number.

Unit-II

1. Petroleum: Cracking, reforming, hydro forming, summarization.
2. Fuel: Types of fuel their calorific values.
3. Coal: Types Structure, properties, distillation of coal, chemicals derived from coal, coal analysis, numerical based on these.

Unit-III

1. Basic Metallurgical operation: Pulverization, Calcination, roasting, Refining of ores and minerals, different types of ores, pulverization, methods of concentration of ores, calcinations, roasting, smelting.
2. Physicochemical principles of extraction of Fe, Cu, Al, Zn & Cr, metallurgical operations, refining of metal and properties of metals.
3. Inorganic Material of industrial importance, their valuability forms structure & Modification silicon, silicate cages, carbon & Zeolite, Ozone depletion, acid rain photochemical smog.
4. Corrosion: Theory, Preventive methods.

Unit-IV

1. Distillation- Introduction batch & continuous distillation, separation of plate column and pack column.

2. Absorption – Introduction equipment packet column spray column, packed bubble columns, mechanically agitated contractors.

Unit- V

1. Evaporation : Introduction, equipment, short tube(standard) evaporation by falling, evaporators, climbing film(upward flow) evaporation (agitated) film evaporator.
2. Filtration: Introduction, filter media and filter aids, equipment plate frame notches filter rotator drum filter, sparkler filter, candle filter.
3. Drying :Introduction , free moisture, humid moisture drying curve, equipment, rotatory dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.

Cerificate Course

Paper II

Unit-1

Dimension and Unit – Basic chemical calculation, atomic weight, molecular weight, equivalent weight, mole composition of liquid mixture, gaseous mixture, mineral balance involving, chemical reaction concept of limiting reactant conversion of solid, liquid phase reaction, gas phase reaction without recycle of phase.

Unit-2

1. Entropy Balance: heat capacity of pure gases and gaseous mixture at constant pressure and temperature.
2. Heat capacity of solid, enthalpy change, energy balance, numerical based on energy balance.

Unit-3

1. Surface chemistry and interfacial phenomenon , adsorption isotherm, soils , effect of surfactant, hydro tropes.

Unit-4

Boilers -Types of boilers and their functioning

Water -Specification for industrial use, various water treatment methods.

Steam -Generation and uses, specification for industrial use, processing air.

Water analysis and treatment of water for domestic use, hardness of water, analysis of free chloride, alkalinity, acidity free CO_2, BOD, COD, D.O.

Unit-5

Introduction of chemical engineering- water pollution.

Fluid flow –Fans, blowers, compressors, vacuum pump selector.

Pumps - Reciprocating pump, gear pumps, centrifugal pumps, air nitrogen cycle.

Atmosphere, pollution unit, pollutant, types of pollution statutory units pollution evaluation methods.

Certificate course

INDUSTRIAL CHEMISTRY PRACTICAL

Practical Examination

Distribution of marks -	Experiment	-	30 Section – A 20 B-10
	Viva	-	05
	Sessional	-	05
	Project	-	10
	Total	-	50

Section- A

1. Extraction Processes – Phase diagram, partition coefficient.
2. Chromatography – column, paper, thin layer.
3. Ore analysis – Dolomite, limestone, calcite, analysis of alloys as cupro-nickel.
4. Determination of physical constant, refractive index, surface tension, effect of surfactants on surface tension, viscosity fluids, polymer solution, effect of additive on viscosity, optical rotation.

Section – B

1. Simple laboratory Techniques – Crystallization, Fractional crystallization, Distillation, fractional distillation, B. pt. diagram.
2. Preparation of standard solution.
3. Calibration of thermometer
4. Acquaintances with safety measures in laboratory hazaqrds chemicals.
5. Depression and elevation in M. Pt./B.Pt. of solids and liquids.

Diploma Course

Industrial Chemistry

Paper-I

Unit I

Material Science: Mechanical properties of material and change with respect to temperature.

Material of construction used in industry:

Metal and alloys: Important metals and alloys, iron, copper aluminium, lead, nickel, titanium, and their alloys, mechanical and chemical properties and their applications.

Cements: Types of cement, composition, manufacturing process, setting of cement,

Ceramics: Introduction, types, manufacturing process, application, refectories.

Unit-II

Polymeric Materials: Industrial Polymer and composite material their constitution, chemical and physical properties, industrial application.

Glass: types, Comparison, manufacture chemical and physical properties, application.

Corrosion: Various types of corrosion relevant to chemical industry-mechanism, preventative methods.

Unit- III

Pollution: Air oxygen, nitrogen cycle, water, biosphere, flora and fauna, energy, soil, pollutant and their statutory limits, pollution and evaluation methods.

Air Pollution – Various pollutants, water pollution- organic / inorganic pollutants, noise pollution, sewage analysis, pesticides pollution, radiation pollution green house effect, future.

Unit –IV

Effluent treatment and waste management : Principles and equipment for aerobic anaerobic treatment, adsorption, filtration, sedimentation, Bag filters, Electrostatic precipitators, mist eliminators, wet scrubbers, absorber , solid waste management, industrial safety.

Unit -V

Process instrumentation: Concepts of measurement and accuracy, principle, construction and working and following measuring instruments.

Temperature: Glass thermometers, bimetallic thermometers, pressure spring thermometer, vapour filled thermometer, Resistance thermometer, radiation pyrometers.

Pressure: Manometers, Barometers, Bourdon pressure gauge, bellow type Diaphragm type pressure gauge, Macleod gauges, pirani gauges etc.

Liquid Level: Direct- Indirect liquid level measurement, float, type, liquid level gauge, ultrasonic level gauges, Bubbler system, Density measurement, viscosity measurement.

Books Recommended:

1. Pollution control in chemical and Allied industries ; S.P. Mahajan
2. Pollution control in industries; A. series of books b.Jones H.P.
3. Air Pollution- Volume 1 to 4 ; Editors, STERN . A.C.; Academic press
4. Environmental engineering: G N Pandey , Tata MacGraw Hill
5. Handbook of air pollution ; A. Parker, , Tata MacGraw Hill
6. Science of ceramics Chemical Processing ; Hench LL
7. Science of ceramics ; Stewart G.H
8. Chemistry of cement
9. Properties of Glass, morey G.w. Chemistry of glasses; Paul A.
10. Corrosion, causes & prevention : Spellur F. n.
11. Effluent Treatment in process Industries; inst. Of Chemical engg.
12. Effluent Treatment and waste disposal ; inst. Of chemical engg.
13. Effluent Treatment and disposal; inst. Of Chemical Engg.\
14. Industrial Insturmentation ; Eckmen D.P. Johe Welly
15. Appiled Instrumentation in process industry Vol I , II, & III; Andwres W. G.Gulf Publication
16. Instrumentation and control for the process industries ; Borer S.Elsevier; Applied Science Publisher
17. Chemical Engg Hankbook: Perry J.H. and Green D. McGraw Hill

DIPLOMA COURSE
Industrial Chemistry
Paper –II

M.M. 50

UNIT –I

Unit Processes in organic chemicals manufacture:

Nitration Introduction –Nitrating agents, kinetics and mechanism of nitration processes such as nitration of –

(a) Paraffinic Hydrocarbons

(b) Benzene to nitrobenzene and m-dinitrobenzene

(c) Chlorobenzene to o and p- nitrochloro benzene

(d) Acetanilide to p-nitro acetanilide

(e) Toluene

Continuous Vs. batch nitration

UNIT-II

Halogenation:

Introduction- Kinetic of halogenation reaction, Reagents for halogenation, Halogenation of aromatic-side chain and nuclear halogenation, commercial manufacture of chlorobenzene, Chloral, Mono chloracetic acid and chloromethane.

UNIT-III

Sulphonation :

Introduction , Sulphonating agents, chemical and physical factors in sulphonation, kinetics and mechanism of sulphonation reaction, commercial sulphonation of benzene, naphthalene , Alkyl benzene, Batch Vs Continuous Sulphonation.

UNIT –IV

Oxidation : Introduction , Types of oxidation reaction reactions ,Oxidizing agents , kinetics and mechanism of oxidation of organic compounds ,liquid phase oxidation , vapour phase, Oxidation, commercial manufacture of benzoic acid ,maleic anhydride, Phthalic anhydride , acroleins ,Acetaldehyde ,acetic acid.

Hydrogenation : Introduction, Types of Alkylation, Alkylating agents ,Thermodynamics and mechanism of Alkylation reaction

,Manufacture of Alkylbenzenes(for detergent manufacture),Ethyl benzene,Phenyl ethyl alcohol , N- alkyl anilines (Mono and Di-methyl anilines)

UNIT-V

Esterification : Introduction, Hydrodynamics and kinetics of esterification reaction Esterification by organic acid by addition of unsaturated compounds, Esterification of carboxy acid derivatives ,commercial manufacture of ethyl acetate ,dioctylphthalate ,vinylacetate ,cellulose acetate.

Amination :

(A) By Reduction : Introduction ,methods of reduction-metal and acid ,catalytic ,sulfide electrolytic ,metal and alkali sulphites , metal hydrides ,sodium metal concentrated caustic ,oxidation ,Reduction ,Commercial manufacture of Aniline ,m-nitro aniline ,p- amino phenol.

(B) By Aminolysis : Intoduction , Aminating agents, Factors affecting.

Hydrolysis : Introduction , Hydrolyzing agents ,kinetics ,thermodynamics and mechanism of hydrolysis.

Books Recommended:

1. Unit process in organic synthesis; P. M. Groggins; Mc Graw Hill.
2. Chemicals Engineer's Handbook; Perry J. H. and green D; Mcgraw Hill

Diploma Course Practical

M. M. 50

Industrial Chemistry Practical

Duration of Examination: 04 Hours

Distribution of marks: Experiments -30 [Section A - 15

Section B- 15]

Viva	-05
Sessional	-05
Project	-10
Total	-50

Section –A (Any one)

1. Unit process : one to two examples of each of the
    a. following unit processes.
2. Nitration, Sulphonation , Friedel- Craft reaction,
    a. Esterification , Hydrolysis ,Oxidation, Halogenation ,Chloro- Sulphonation,reduction,polymerization ,reaction of diazonium salts.
3. Material testing : Testing of Alloys Identification of plastics/Rubbers, Estimation of Tield point, Young's Modulus, Flaredness, Optical, Thermal ,Mechanical and Electrical Properties.
4. Process Instrumentation : Transducer of different types ,Use of transducer for measuring flow control ,determination of flash point and ignition points of liquids.

Section- B

1. Instrumental methods of analysis : Use of colorimeter , pH meter , Potentiometer, Conductometer , Refactometer , polarimeter.
2. Water Analysis : Solid content , Hardness, COD and other tests as per industrial specifications
3. Flow measuring devices : Floats , Monograph of representatives raw material such s sulphuric acid , toluene sodium carbonate , sodium hydroxide, carbon tetrachloride , Benzoic acid(5-6 compounds) Limit tests for heavy metals Pb , As ,Hg ,Fe and ash content

ADVANCED DIPLOMA COURSE

Paper –I

Pharmaceuticals & Industrial Organization

UNIT –I

1. Historical Background and Development of Pharmaceutical Industry in India in brief.

2. Pharmacopoeias: Development of pharmac opoeia and Introduction of B. P., U. S. P. , E. P., N. F. and other important Pharmacopoeias.
3. Introduction to various types of formulation and roots of administration.

UNIT II

1. Pharmaceutical packaging – Introduction , package selection, packaging materials , ancillary materials, packaging machinery, quality control of packaging materials.
2. F.D.A. Important Schedules & some legal aspects of drugs.
3. Pharceuticals quality control (other than the analytical methods covered under core subject) Sterility testing pyrogenic testing , glass testing bulk density of powder etc.

UNIT III

Instrumentation :

1. UV- visible spectroscopy
2. IR- spectroscopy non dispersive IR.
3. NMR Spectroscopy.
4. Atomic Absorption and Flame Photometry
5. Neutron diffraction.
6. X-ray fluorescence.
7. Ion Selective Electrodes

UNIT –IV

1. Concept of Scientific Management in Industry.
2. Function of management decision making planning, organizing directing & control.
3. Location of Industry.

UNIT V

1. Materials Management.
2. Inventory Control.

3. Management of human resources –selection , incentives , welfare safety.

Books-

1. Economics of chemicals industry. Hempel, E. H.
2. Plant Design and Economics for chemical engineers, Peter Time-Rhaus, McGraw Hill.
3. I.C.M.A. Booklets-9&10.
4. Industrial Organization & Management, Bethel, L.L.
5. Industrial Organization & Management, Tarachand, Vol. I & II.
6. Books on Management, O.P. Khandelwal.
7. Rheology theory & application,Vol.-5,Elrich R.F.
8. Instrmental Methods of Analysis, Willard, merit, dean.
9. Introduction to Instrumental methods of analysis, Braun, R.D. McGraw Hill.
10. Analytical chemistry, J.B. Dick, McGraw Hill
11. Quantitative Inorganic analysis, A. Vogel.
12. Instrumental methods of analysis, Skoog & West.
13. Instrumental methods of analysis, B.K. Sharma.

ADVANCED DIPLOMA COURSE

PAPER –II

DRUGS

UNIT-I

1. Phyto - chemical - introduction to plant classification and crude drugs, , Cultivation, collection, preparation for the market & storage of medicinal plants.

2. Classification of various types of drugs with example.
3. Raw material process of manufacture effluent handling etc. of the following bulk drugs.
   (i)Sulpha drugs Sulphaguandine (ii)Sulphamethoxazole.

UNIT II

1.Chemical constitution of plants including carbohydrates , amino acids , proteins , fats waxes volatile oils turpenoids ,steroids , saponins , flavonoids , tannins ,glycoside alkaloids

2.Various isolation procedures for active ingridients with examples for alkaloids reserpine one for steroids sapognin , diosegnin,diogron.

UNIT III

1. Antimicrobial : Chloramphenicol, Furazolidine Mercurochrome ionized , Na PAS.
2. Analgesic – Antiflammatory : salicylic acid and its derivatives ,Ibuprofen , Mefenamic acid.
3. Steroidal harmones –Progesterone, Testosterone , methyl testosterone.

UNIT IV

1. Vitamins – Vit- A, Vit-B6, Vit-C
2. Barbiturates – Pentobarbital
3. Blockers, Propranolol , Antenolol
4. Cardiovascular agent – Methyldopa
5. Antihistamins :-Chloropheneramine Maleate.

UNIT V

Product based Fermentation processes :- Brief idea of micro- organism , their structure , growth & usefulness - Enzyme system useful for transformation microbial products.

1. General Principles of fermentation processes and Product processing.
2. Manufacture of antibiotics – penicillin- G & semi synthetic penicillins, Rifamycin , Vitamin B12.

3. Bio – transformation process for prednisolone ,11 hydroxylation in steroids.
4. Enzyme- catalysed Transformation , Manufacture of ephedrine.

Books-

1. Practical Pharmacognosy,T.B. Wills.
2. Practical Pharmacognosy , T.N. vasudevan.
3. Modern Pharmacognosy , Ramstad, McGraw Hill.
4. Indian Pharmacopoea ,1985.
5. British Pharmacopoea ,1990.
6. Hand Book of Drugs & Cosmetics Act , Mehrotra.
7. Pharmaceutical excipients.
8. Pharmaceutical Dosage Forms.
9. Principles of Medical Chemistry,W.O.Foye,Lea &Febigen Publication Phidelphia.
10. Text Book of organic medicinal and Pharmaceuticals chemistry,Willson, Gisvold derge Lippinett, Toppan.
11. Essential of medicinal chemistry, Korolkovas Burkhatter,Wiely Interscience.

ADVANCED DIPLOMA COURSE

Industrial Chemistry

Practical **M.M. 50**

The practical examination will be of 08 Hrs. duration spread over two days carrying 50 marks.

Two experiments have to be performed:

1. Synthesis of common industrial compounds involving two step reaction :- 4- Bromoaniline , 3- Nitroaniline, Sulphanilamide, 4- Aminobenzoic acid, 4- Nitrobenzoic acid, Dihalobenzenes, Nitrohalobenzenes.
2. Industrial Analysis of common raw materials as per industrial specification :- phenol aniline formaldehyde, hydrogen per oxide, acetone , epoxide ,olefins , oil etc.
3. Demonstration of various pharmaceutical packaging materials quality control tests of some material –A1 Strips, Cartons, glass, bottles.
4. Limit tests for chlorine heavy metals arsenic etc. of two representatives bulk drugs.

5. Demonstration of various Pharmaceutical product.
6. Active ingradients analysis of few types of formulation representating different methods of analysis :- acidmetry, alkalimetry, non aqueous
7. Determination of sulphate :-ash less of drying and other tests of bulk drugs complete L. P. Monograph of three drugs representing variety of testing methods.
8. Evaluation of crude drugs:- macroscopic examination determination and Identification of starch granules, calcium oxalate.
9. Palisate ratio Stomatal Index Determination and Identification of few drugs TLC method for Identification.
10. Microbiological testing determination of MIC of some antibacterial drugs by zone/cup plate methods.

Distribution of marks-

- Experiment No.1 - 20
- Experiment No.2 - 10
- Viva - 05
- Sessional - 05
- Project Work - 10

Total 50

Syllabus 2017-18

Add on Course - Industrial Chemistry

Certificate Course

Paper-1

1. Nomenclature: Generic name , trade name. Method for purification of organic components, separation techniques, solvent extraction, chromatography, numerical problem related to these.

2. Raw material for organic compounds: petroleum, natural gas, Fractionation of crude oil.

3. Synthetic petrol : Fractionation of crude Oil, cracking reforming, hydro forming, isomerism, Octane number, cetane number.

Unit-II

- Petroleum: Cracking, reforming, hydro forming, summarization.
- Fuel : Types fof fuel their calorific values.
- Coal: Types Structure, properties, distillation of coal, chemicals derived from coal, coal analysis, numerical based on these.

Unit-III

- Basic Metallurgical operation: Pulverization, Calcination, roasting, Refining of ores and minerals, different types of ores, pulverization, methods of concentration of ores, calcination , roasting, smelting.
- Physicochemical principles of extraction of Fe, Cu, Al, Zn & Cr, metallurgical operations, refining of metal and properties of metals.
- Inorganic Material of industrial importance, their valuability forms structure & Modification silicon, silicate cages, carbon & Zeolite, Ozone depletion, acid rain photochemical smog.
- Corrosion: Theory, Preventive methods.

Unit-IV

- Distillation- Introduction batch & continuous distillation, separation of plate column and pack column.
- Absorption – Introduction equipment packet column spray column, packed bubble columns, mechanically agitated contractors.

Unit- V

- Evaporation: Introduction, equipment, short tube(standard) evaporation by falling, evaporators, climbing film(upward flow) evaporation (agitated) film evaporator.
- Filtration: Introduction, filter media and filter aids, equipment plate frame notches filter rotator drum filter, sparkler filter, candle filter.

- Drying :Introduction , free moisture, humid moisture drying curve, equipment, rotatory dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.

Cerificate Course

Paper II

Unit-1

- Dimension and Unit – Basic chemical calculation, atomic weight, molecular weight, equivalent weight, mole composition of liquid mixture, gaseous mixture, mineral balance involving, chemical reaction concept of limiting reactant conversion of solid, liquid phase reaction, gas phase reaction without recycle of phase.

Unit-2

- Entropy Balance: heat capacity of pure gases and gaseous mixture at constant pressure and temperature.
- Heat capacity of solid, enthalpy change, energy balance, numerical based on energy balance.

Unit-3

- Surface chemistry and interfacial phenomenon , adsorption isotherm soils , effect of surfactant, hydro tropes

Unit-4

- Boilers -Types of boilers and their functioning
- Water -Specification for industrial use, various water treatment methods.
- Steam -Generation and uses, specification for industrial use, processing air.

  Water analysis and treatment of water for domestic use, hardness of water, analysis of free chloride, alkalinity, acidity free CO_2, BOD, COD, D.O.

Unit-5

- Introduction of chemical engineering- water pollution.
- Fluid flow – fans, blowers, compressors, vacuum pump selector.
- Pumps - Reciprocating pump, gear pumps, centrifugal pumps, air nitrogen cycle. Atmosphere, pollution unit, pollutant, types of pollution statutory units pollution evaluation methods.

Certificate course

INDUSTRIAL CHEMISTRY PRACTICAL

Practical Examination

Distribution of marks -	Experiment	-	30 Section – A 20 B-10
	Viva	-	05
	Sessional	-	05
	Project	-	10
	Total	-	50

Section- A

- Extraction Processes – Phase diagram, partition coefficient.
- Chromatography – column, paper, thin layer.
- Ore analysis – Dolomite, limestone, calcite, analysis of alloys as cupro-nickel.
- Determination of physical constant, refractive index, surface tension, effect of surfactants on surface tension, viscosity fluids , polymer solution , effect of additive on viscosity, optical rotation.

Section – B

- Simple laboratory Techniques – Crystallization, Fractional crystallization, Distillation, fractional distillation, B. pt. diagram.
- Preparation of standard solution.
- Calibration of thermometer
- Acquaintances with safety measures in laboratory hazards chemicals.
- Depression and elevation in M. Pt./B.Pt. of solids and liquids.

Diploma Course

Industrial Chemistry

Paper-I

Unit I

Material Science: Mechanical properties of material and change with respect to temperature.

Material of construction used in industry:

Metal and alloys: Important metals and alloys, iron, copper aluminum, lead, nickel, titanium, and their alloys, mechanical and chemical properties and their applications.
Cements: Types of cement, composition, manufacturing process, setting of cement,
Ceramics: Introduction, types, manufacturing process, application, refectories.

Unit-II

Polymeric Materials: Industrial Polymer and composite material their constitution, chemical and physical properties, industrial application.
Glass: types, Comparison, manufacture chemical and physical properties, application.
Corrosion: Various types of corrosion relevant to chemical industry-mechanism, preventative methods.

Unit- III

Pollution: Air oxygen, nitrogen cycle, water, biosphere, flora and fauna, energy, soil, pollutant and their statutory limits, pollution and evaluation methods.
Air Pollution – Various pollutants, water pollution- organic / inorganic pollutants, noise pollution, sewage analysis, , pesticides pollution, radiation pollution green house effect, future.

Unit –IV

Effluent treatment and waste management : Principles and equipment for aerobics anaerobic treatment, adsorption, filtration, sedimentation, Bag filters, Electrostatic precipitators, mist eliminators, wet scrubbers, absorber , solid waste management, industrial safety.

Unit -V

Process instrumentation: Concepts of measurement and accuracy, principle, construction and working and following measuring instruments.

Temperature: Glass thermometers, Bimetallic thermometers, pressure spring thermometer, vapour filled thermometer, Resistance thermometer, radiation pyrometers.

Pressure: Manometers, Barometers, Bourdon pressure gauge, bellow type Diaphragm type pressure gauge, Macleod gauges, pirani gauges etc.

Liquid Level : Direct- Indirect liquid level measurement , float, type, liquid level gauge, ultrasonic level gauges, Bubbler system , Density measurement, viscosity measurement.

Books Recommended:

- Pollution control in chemical and Allied industries ; S.P. Mahajan
- Pollution control in industries; A. series of books b.Jones H.P.
- Air Pollution- Volume 1 to 4 ; Editors, STERN . A.C.; Academic press
- Environmental engineering: G N Pandey , Tata MacGraw Hill
- Handbook of air pollution ; A. Parker, , Tata MacGraw Hill
- Science of ceramics Chemical Processing ; Hench LL
- Science of ceramics ; Stewart G.H
- Chemistry of cement
- Properties of Glass, morey G.w. Chemistry of glasses; Paul A.
- Corrosion, causes & prevention : Spellur F. n.
- Effluent Treatment in process Industries; inst. Of Chemical engg.
- Effluent Treatment and waste disposal ; inst. Of chemical engg.
- Effluent Treatment and disposal; inst. Of Chemical Engg.\
- Industrial Insturmentation ; Eckmen D.P. Johe Welly
- Appiled Instrumentation in process industry Vol I , II, & III; Andwres W. G.Gulf Publication
- Instrumentation and control for the process industries ; Borer S.Elsevier; Applied Science Publisher
- Chemical Engg Hankbook: Perry J.H. and Green D. McGraw Hill

DIPLOMA COURSE
Industrial Chemistry
Paper –II

M.M. 50

UNIT –I

Unit Processes in organic chemicals manufacture:

Nitration Introduction –Nitrating agents, kinetics and mechanism of nitration processes such as nitration of –

(a) Paraffinic Hydrocarbons

(b) Benzene to nitrobenzene and m-dinitrobenzene

(c) Chlorobenzene to o and p- nitrochloro benzene

(d) Acetanilide to p-nitro acetanilide

(e) Toluene

Continuous Vs. batch nitration

UNIT-II

Halogenation:

Introduction- Kinetic of halogenations reaction, Reagents for halogenation, Halogenation of aromatics-side chain and nuclear halogenation, commercial manufacture of chlorobenzene, Chloral, Mono chloracetic acid and chloromethane.

UNIT-III

Sulphonation :

Introduction , Sulphonating agents, chemical and physical factors in sulphonation, kinetics and mechanism of sulphonation reaction,commercial sulphonation of benzene, naphthalene , Alkyl benzene,Batch Vs Continuous Sulphonation.

UNIT –IV

Oxidation : Introduction , Types of oxidation reaction reactions ,Oxidizing agents , kinetics and mechanism of oxidation of organic compounds ,liquid phase oxidation , vapour phase, Oxidation, commercial manufacture of benzoic acid ,maleic anhydride, Phthalic anhydride , acroleins ,Acetaldehyde ,acetic acid.

Hydrogenation : Introduction, Types of Alkylation, Alkylating agents ,Thermodynamics and mechanism of Alkylation reaction ,Manufacture of Alkylbenzenes(for detergent manufacture),Ethyl

benzene,Phenyl ethyl alcohol , N- alkyl anilines (Mono and Di-methyl anilines)

UNIT-V

Esterification : Introduction, Hydrodynamics and kinetics of esterification reaction Esterification by organic acidby addition of unsaturated compounds, Esterification of carboxy acid derivatives ,commercial manufacture of ethyl acetate ,dioctylphthalate ,vinylacetate ,cellulose acetate.

Amination :

(A) By Reduction : Introduction ,methods of reduction-metal and acid ,catalytic ,sulphide electrolytic ,metal and alkali sulphites , metal hydrides ,sodium metal concentrated caustic ,oxidation ,Reduction ,Commercial manufacture of Aniline ,m-nitro aniline ,p- amino phenol.

(B) By Aminolysis : Introduction , Aminating agents, Factors affecting.

Hydrolysis : Introduction , Hydrolyzing agents ,kinetics ,thermodynamics and mechanism of hydrolysis.

Books Recommended:

- Unit process in organic synthesis ; P. M. Groggins; Mc Graw Hill.
- Chemicals Engineer's Handbook; Perry J. H. and green D; Mcgraw Hill

Diploma Course Practical

M. M. 50

Industrial Chemistry Practical

Duration of Examination : 04 Hours

Distribution of marks : Experiments -30 [Section A - 15

Section B- 15]

Viva -05

Sessional -05

Project -10

Total -50

Section –A (Any one)

- Unit process : one to two examples of each of the
  a. following unit processes.
- Nitration, Sulphonation , Friedel- Craft reaction,
  a. Esterification , Hydrolysis ,Oxidation, Halogenation , Chloro- Sulphonation, reduction, polymerization ,reaction of diazonium salts.
- Material testing : Testing of Alloys Identification of plastics/Rubbers,Estimation of Tield point, Young's Modulus,Flaredness, Optical, Thermal , Mehanical and Electrical Properties.
- Process Instrumentation : Transducer of different types ,Use of transducer for measuring flow control ,determination of flash point and ignition points of liquids.

Section- B

- Instrumental methods of analysis : Use of colourimeter , pH meter , Potentiometer, Conductometer , Refactometer , polarimeter.
- Water Analysis : Solid content , Hardness, COD and other tests as per industrial specifications
- Flow measuring devices : Floats , Monograph of representatives raw material such s sulphuric acid , toluene sodium carbonate , sodium hydroxide, carbon tetrachloride , Benzoic acid(5-6 compounds) Limit tests for heavy metals Pb , As ,Hg ,Fe and ash content

ADVANCED DIPLOMA COURSE

Paper –I

Pharmaceuticals & Industrial Organization

UNIT –I

- Historical Background and Development of Pharmaceutical Industry in India in brief.
- Pharmacopoeias : Development of pharmac opoeia and Introduction of B. P., U. S. P. , E. P., N. F. and other important pharmacopoeias.
- Introduction to various types of formulation and roots of administration.

UNIT II

- Pharmaceutical packaging – Introduction , package selection, packaging materials , ancillary materials, packaging machinery, quality control of packaging materials.
- F.D.A. Important Schedules & some legal aspects of drugs.
- Pharceuticals quality control (other than the analytical methods covered under core subject) Sterility testing pyrogenic testing , glass testing bulk density of powder etc.

UNIT III

Instrumentation :

- UV- visible spectroscopy
- IR- spectroscopy non dispersive IR.
- NMR Spectroscopy.
- Atomic Absorption and Flame Photometry
- Neutron diffraction.
- X-ray fluorescence.
- Ion Selective Electrodes

UNIT –IV

- Concept of Scientific Management in Industry.
- Function of management decision making planning ,organizing directing & control.
- Location of Industry.

UNIT V

- Materials Management.
- Inventory Control.
- Management of human resources –selection , incentives , welfare safety.

Books-

- Economics of chemicals industry. Hempel,E. H.
- Plant Design and Economics for chemical engineers, Peter Time-Rhaus,McGraw Hill.
- I.C.M.A. Booklets-9&10.
- Industrial Organization & Management,Bethel,L.L.
- Industrial Organization & Management,Tarachand,Vol.I & II.
- Books on Management, O.P. Khandelwal.
- Rheology theory & application,Vol.-5,Elrich R.F.
- Instrmental Methods of Analysis ,Willard,merit,dean.
- Introduction to Instrumental methods of analysis,Braun,R.D.McGraw Hill.
- Analytical chemistry,J.B. Dick, McGraw Hill
- Quantitative Inorganic analysis,A.Vogel.
- Instrumental methods of analysis,Skoog & West.
- Instrumental methods of analysis,B.K.Sharma.

ADVANCED DIPLOMA COURSE

PAPER –II

DRUGS

UNIT-I

- Phyto - chemical - introduction to plant classification and crude drugs, , Cultivation, collection, preparation for the market & storage of medicinal plants.
- Classification of various types of drugs with example.
- Raw material process of manufacture effluent handling etc. of the following bulk drugs.

(i)Sulpha drugs Sulphaguandine (ii)Sulphamethoxazole.

UNIT II

1.Chemical constitution of plants including carbohydrates , amino acids , proteins , fats waxes volatile oils turpenoids ,steroids , saponins ,flavonoids , tannins ,glycoside alkaloids

2.Various isolation procedures for active ingridients with examples for alkaloids reserpine one for steroids sapognin , diosegnin,diogron.

UNIT III

- Antimicrobial :Chloramphenicol, Furazolidine Mercurochrome ionized , Na PAS.
- Analgesic – Antiflammatory : salicylic acid and its derivatives ,Ibuprofen , Mefenamic acid.
- Steroidal harmones –Progesterone, Testosterone , methyl testosterone.

UNIT IV

- Vitamins – Vit- A, Vit-B6, Vit-C
- Barbiturates – Pentobarbital
- Blockers, Propranolol , Antenolol
- Cardiovascular agent – Methyldopa
- Antihistamins :-Chloropheneramine Maleate.

UNIT V

- Product based Fermentation processes: - Brief idea of micro-organism , their structure , growth & usefulness - Enzyme system useful for transformation microbial products.
- General Principles of fermentation processes and Product processing.
- Manufacture of antibiotics – penicillin- G & semi synthetic penicillins, Rifamycin , Vitamin B12.
- Bio – transformation process for prednisolone , 11 hydroxylation in steroids.
- Enzyme- catalysed Transformation , Manufacture of ephedrine.

Books-

- Practical Pharmacognosy,T.B. Wills.
- Practical Pharmacognosy , T.N. vasudevan.
- Modern Pharmacognosy , Ramstad, McGraw Hill.
- Indian Pharmacopoea ,1985.
- British Pharmacopoea ,1990.
- Hand Book of Drugs & Cosmetics Act , Mehrotra.
- Pharmaceutical excipients.
- Pharmaceutical Dosage Forms.
- Principles of Medical Chemistry,W.O.Foye,Lea &Febigen Publication Phidelphia.
- Text Book of organic medicinal and Pharmaceuticals chemistry,Willson, Gisvold derge Lippinett, Toppan.
- Essential of medicinal chemistry, Korolkovas Burkhatter,Wiely Interscience.

ADVANCED DIPLOMA COURSE

Industrial Chemistry

Practical M.M. 50

The practical examination will be of 08 Hrs. duration spread over two days carrying 50 marks.

Two experiments have to be performed:

- Synthesis of common industrial compounds involving two step reaction :- 4- Bromoaniline , 3- Nitroaniline, Sulphanilamide, 4- Aminobenzoic acid, 4- Nitrobenzoic acid, Dihalobenzenes, Nitrohalobenzenes.
- Industrial Analysis of common raw materials as per industrial specification :- phenol aniline formaldehyde, hydrogen per oxide, acetone , epoxide ,olefins , oil etc.
- Demonstration of various pharmaceutical packaging materials quality control tests of some material –A1 Strips, Cartons , glass, bottles.
- Limit tests for chlorine heavy metals arsenic etc. of two representatives bulk drugs.
- Demonstration of various Pharmaceutical product.
- Active ingradients analysis of few types of formulation representating different methods of analysis :- acidmetry, alkalimetry,non aqueous

- Determination of sulphate :-ash less of drying and other tests of bulk drugs complete L. P. Monograph of three drugs representing variety of testing methods.
- Evaluation of crude drugs:- macroscopic examination determination and Identification of starch granules, calcium oxalate.
- Palisate ratio Stomatal Index Determination and Identification of few drugs TLC method for Identification.
- Microbiological testing determination of MIC of some antibacterial drugs by zone/cup plate methods.

Distribution of marks-

- Experiment No.1 - 20
- Experiment No.2 - 10
- Viva - 05
- Sessional - 05
- Project Work - 10

Total 50

Syllabus 2016-17

Add on Course - Industrial Chemistry

Certificate Course

Paper-1

1. Nomenclature: Generic name, trade name. method for purification of organic components, separation techniques, solvent extraction, chromatography, numerical problem related to these.

2. Raw material for organic compounds: petroleum, natural gas, Fractionation of crude oil.

3. Synthetic petrol : Fractionation of crude Oil, cracking reforming, hydro forming, isomerism, Octan number, cetane number.

Unit-II

- Petroleum: Cracking, reforming, hydro forming, summarization.
- Fuel : Types fof fuel their calorific values.
- Coal: Types Structure, properties, distillation of coal, chemicals derived from coal, coal analysis, numerical based on these.

Unit-III

- Basic Metallurgical operation: Pulverization, Calcination, roasting, Refining of ores and minerals, different types of ores, pulverization, methods of concentration of ores, calcination , roasting, smelting.
- Physicochemical principles of extraction of Fe, Cu, Al, Zn & Cr, metallurgical operations, refining of metal and properties of metals.
- Inorganic Material of industrial importance, their valuability forms structure & Modification silicon, silicate cages, carbon & Zeolite, Ozone depletion, acid rain photochemical smog.
- Corrosion : Theory, Preventive methods.

Unit-IV

- Distillation- Introduction batch & continuous distillation, separation of plate column and pack column.
- Absorption – Introduction equipment packet column spray column, packed bubble columns, mechanically agitated contractors.

Unit- V

- Evaporation : Introduction, equipment, short tube(standard) evaporation by falling, evaporators, climbing film(upward flow) evaporation (agitated) film evaporator.
- Filtration : Introduction, filter media and filter aids, equipment plate frame nutsche filter rotator drum filter, sparkler filter, candle filter.
- Drying :Introduction , free moisture, humid moisture drying curve, equipment, rotatory dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.

Cerificate Course

Paper II

Unit-1

- Dimension and Unit – Basic chemical calculation, atomic weight, molecular weight, equivalent weight, mole composition of liquid mixture, gaseous mixture, mineral balance involving, chemical reaction concept of limiting reactant conversion of solid, liquid phase reaction, gas phase reaction without recycle of phase.

Unit-2

- Entropy Balance: heat capacity of pure gases and gaseous mixture at constant pressure and temperature.
- Heat capacity of solid, enthalpy change, energy balance, numerical based on energy balance.

Unit-3

- Surface chemistry and interfacial phenomenon , adsorption isotherm soils , effect of surfactant, hydro tropes

Unit-4

- Boilers -Types of boilers and their functioning
- Water -Specification for industrial use, various water treatment methods.
- Steam -Generation and uses, specification for industrial use, processing air.

  Water analysis and treatment of water for domestic use, hardness of water, analysis of free chloride, alkalinity, acidity free CO_2, BOD, COD, D.O.

Unit-5

- Introduction of chemical engineering- water pollution.
- Fluid flow – fans , blowers, compressors, vacuum pump selector.
- Pumps - Reciprocating pump, gear pumps, centrifugal pumps, air nitrogen cycle. Atmosphere, pollution unit, pollutant, types of pollution statutory units pollution evaluation methods.

Certificate course

INDUSTRIAL CHEMISTRY PRACTICAL

Practical Examination

Distribution of marks -	Experiment	-30 Section – A 20 B-10
	Viva	- 05

Sessional	-	05
Project	-	10
Total	-	50

Section- A

- Extraction Processes – Phase diagram, partition coefficient.
- Chromatography – column, paper, thin layer.
- Ore analysis – Dolomite, limestone, calcite, analysis of alloys as cupro-nikel.
- Determination of physical constant, refractive index, surface tension, effect of surfactants on surface tension, viscosity fluids, polymer solution , effect of additive on viscosity, optical rotation.

Section – B

- Simple laboratory Techniques – Crystallization, Fractional crystallization, Distillation, fractional distillation, B. pt. diagram.
- Preparation of standard solution.
- Calibration of thermometer
- Acquaintances with safety measures in laboratory hazaqrds chemicals.
- Depression and elevation in M. Pt./B.Pt. of solids and liquids.

Diploma Course

Industrial Chemistry
Paper-I

Unit I

Material Science: Mechanical properties of material and change with respect to temperature.

Material of construction used in industry:

Metal and alloys: Important metals and alloys, iron, copper aluminium, lead, nickel, titanium, and their alloys, mechanical and chemical properties and their applications.

Cements: Types of cement, composition, manufacturing process, setting of cement,

Ceramics: Introduction, types, manufacturing process, application, refectories.

Unit-II

Polymeric Materials: Industrial Polymer and composite material their constitution, chemical and physical properties, industrial application.
Glass: types, Comparison, manufacture chemical and physical properties, application.
Corrosion: Various types of corrosion relevant to chemical industry-mechanism, preventative methods.

Unit- III

Pollution: Air oxygen, nitrogen cycle, water, biosphere, flora and fauna, energy, soil, pollutant and their statutory limits, pollution and evaluation methods.
Air Pollution – Various pollutants, water pollution- organic / inorganic pollutants, noise pollution, sewage analysis, , pesticides pollution, radiation pollution green house effect, future.

Unit –IV

Effluent treatment and waste management : Principles and equipment for aerobics anaerobic treatment, adsorption, filtration, sedimentation, Bag filters, Electrostatic precipitators, mist eliminators, wet scrubbers, absorber , solid waste management, industrial safety.

Unit -V

Process instrumentation: Concepts of measurement and accuracy, principle, construction and working and following measuring instruments.
Temperature: Glass thermometers, Bimetallic thermometers, pressure spring thermometer, vapor filled thermometer, Resistance thermometer, radiation pyrometers.

Pressure: Manometers, Barometers, Bourdon pressure gauge, bellow type Diaphragm type pressure gauge, Macleod gauges, pirani gauges etc.

Liquid Level : Direct- Indirect liquid level measurement , float, type, liquid level gauge, ultrasonic level gauges, Bubbler system , Density measurement, viscosity measurement.

Books Recommended:

- Pollution control in chemical and Allied industries ; S.P. Mahajan
- Pollution control in industries; A. series of books b.Jones H.P.
- Air Pollution- Volume 1 to 4 ; Editors, STERN . A.C.; Academic press
- Environmental engineering: G N Pandey , Tata MacGraw Hill
- Handbook of air pollution ; A. Parker, , Tata MacGraw Hill
- Science of ceramics Chemical Processing ; Hench LL
- Science of ceramics ; Stewart G.H
- Chemistry of cement
- Properties of Glass, morey G.w. Chemistry of glasses; Paul A.
- Corrosion, causes & prevention : Spellur F. n.
- Effluent Treatment in process Industries; inst. Of Chemical engg.
- Effluent Treatment and waste disposal ; inst. Of chemical engg.
- Effluent Treatment and disposal; inst. Of Chemical Engg.\
- Industrial Insturmentation ; Eckmen D.P. Johe Welly
- Appiled Instrumentation in process industry Vol I , II, & III; Andwres W. G.Gulf Publication
- Instrumentation and control for the process industries ; Borer S.Elsevier; Applied Science Publisher
- Chemical Engg Hankbook: Perry J.H. and Green D. McGraw Hill

DIPLOMA COURSE

Industrial Chemistry

Paper –II

M.M. 50

UNIT –I

Unit Processes in organic chemicals manufacture:

Nitration Introduction –Nitrating agents, kinetics and mechanism of nitration processes such as nitration of –

(a) Paraffinic Hydrocarbons

(b) Benzene to nitrobenzene and m-dinitrobenzene

(c) Chlorobenzene to o and p- nitrochloro benzene

(d) Acetanilide to p-nitro acetanilide

(e) Toluene

Continuous Vs. batch nitration

UNIT-II

Halogenation:

Introduction- Kinetic of halogenation reaction, Reagents for halogenation, Halogenation of aromatics-side chain and nuclear halogenation, commercial manufacture of chlorobenzene, Chloral, Mono chloracetic acid and chloromethane.

UNIT-III

Sulphonation :

Introduction , Sulphonating agents, chemical and physical factors in sulphonation, kinetics and mechanism of sulphonation reaction,commercial sulphonation of benzene, naphthalene , Alkyl benzene,Batch Vs Continuous Sulphonation.

UNIT –IV

Oxidation : Introduction , Types of oxidation reaction reactions ,Oxidizing agents , kinetics and mechanism of oxidation of organic compounds ,liquid phase oxidation , vapour phase, Oxidation, commercial manufacture of benzoic acid ,maleic anhydride, Phthalic anhydride , acroleins ,Acetaldehyde ,acetic acid.

Hydrogenation : Introduction, Types of Alkylation, Alkylating agents ,Thermodynamics and mechanism of Alkylation reaction ,Manufacture of Alkylbenzenes(for detergent manufacture),Ethyl benzene, Phenyl ethyl alcohol , N- alkyl anilines (Mono and Di-methyl anilines)

UNIT-V

Esterification : Introduction, Hydrodynamics and kinetics of esterification reaction Esterification by organic acidby addition of unsaturated compounds, Esterification of carboxy acid

derivatives , commercial manufacture of ethyl acetate ,dioctylphthalate ,vinylacetate ,cellulose acetate.

Amination :

(A) By Reduction : Introduction ,methods of reduction-metal and acid ,catalytic ,sulfide electrolytic ,metal and alkali sulphites , metal hydrides ,sodium metal concentrated caustic ,oxidation ,Reduction ,Commercial manufacture of Aniline ,m-nitro aniline ,p- amino phenol.

(B) By Aminolysis : Intoduction , Aminating agents, Factors affecting.

Hydrolysis : Introduction , Hydrolyzing agents ,kinetics ,thermodynamics and mechanismof hydrolysis.

Books Recommended:

- Unit process in organic synthesis ; P. M. Groggins; Mc Graw Hill.
- Chemicals Engineer's Handbook; Perry J. H. and green D; Mcgraw Hill

Diploma Course Practical

M. M. 50

Industrial Chemistry Practical

Duration of Examination : 04 Hours

Distribution of marks : Experiments -30 [Section A - 15

Section B- 15]

Viva	-05
Sessional	-05
Project	-10
Total	-50

Section –A (Any one)

- Unit process : one to two examples of each of the
    a. following unit processes.
- Nitration, Sulphonation , Friedel- Craft reaction,
    a. Esterification , Hydrolysis ,Oxidation, Halogenation ,Chloro- Sulphonation, reduction, polymerization ,reaction of diazonium salts.
- Material testing : Testing of Alloys Identification of plastics/Rubbers,Estimation of Tield point, Young's Modulus, Flaredness, Optical, Thermal ,Mehanical and Electrical Properties.
- Process Instrumentation : Transducer of different types ,Use of transducer for measuring flow control ,determination of flash point and ignition points of liquids.

Section- B

- Instrumental methods of analysis : Use of colourimeter , pH meter , Potentiometer, Conductometer , Refactometer , polarimeter.
- Water Analysis : Solid content , Hardness, COD and other tests as per industrial specifications
- Flow measuring devices : Floats , Monograph of representatives raw material such s sulphuric acid , toluene sodium carbonate , sodium hydroxide, carbon tetrachloride , Benzoic acid(5-6 compounds) Limit tests for heavy metals Pb , As ,Hg ,Fe and ash content

ADVANCED DIPLOMA COURSE

Paper –I

Pharmaceuticals & Industrial Organization

UNIT –I

- Historical Background and Development of Pharmaceutical Industry in India in brief.
- Pharmacopoeias : Development of pharmac opoeia and Introduction of B. P., U. S. P. , E. P., N. F. and other important pharmacopoeias.

- Introduction to various types of formulation and roots of administration.

UNIT II

- Pharmaceutical packaging – Introduction , package selection, packaging materials , ancillary materials, packaging machinery, quality control of packaging materials.
- F.D.A. Important Schedules & some legal aspects of drugs.
- Pharceuticals quality control (other than the analytical methods covered under core subject) Sterility testing pyrogenic testing , glass testing bulk density of powder etc.

UNIT III

Instrumentation :

- UV- visible spectroscopy
- IR- spectroscopy non dispersive IR.
- NMR Spectroscopy.
- Atomic Absorption and Flame Photometry
- Neutron diffraction.
- X-ray fluorescence.
- Ion Selective Electrodes

UNIT –IV

- Concept of Scientific Management in Industry.
- Function of management decision making planning ,organizing directing & control.
- Location of Industry.

UNIT V

- Materials Management.
- Inventory Control.
- Management of human resources –selection , incentives , welfare safety.

Books-

- Economics of chemicals industry. Hempel, E. H.
- Plant Design and Economics for chemical engineers, Peter Time-Rhaus, McGraw Hill.
- I.C.M.A. Booklets-9&10.
- Industrial Organization & Management, Bethel, L.L.
- Industrial Organization & Management, Tarachand, Vol. I & II.
- Books on Management, O.P. Khandelwal.
- Rheology theory & application,Vol.-5,Elrich R.F.
- Instrmental Methods of Analysis, Willard, merit, dean.
- Introduction to Instrumental methods of analysis, Braun, R.D. McGraw Hill.
- Analytical chemistry, J.B. Dick, McGraw Hill
- Quantitative Inorganic analysis, A.Vogel.
- Instrumental methods of analysis, Skoog & West.
- Instrumental methods of analysis, B.K. Sharma.

ADVANCED DIPLOMA COURSE

PAPER –II

DRUGS

UNIT-I

- Phyto - chemical - introduction to plant classification and crude drugs, , Cultivation, collection, preparation for the market & storage of medicinal plants.
- Classification of various types of drugs with example.
- Raw material process of manufacture effluent handling etc.of the following bulk drugs.
  (i)Sulpha drugs Sulphaguandine (ii)Sulphamethoxazole.

UNIT II

1.Chemical constitution of plants including carbohydrates , amino acids , proteins , fats waxes volatile oils turpenoids ,steroids , saponins ,flavonoids , tannins ,glycoside alkaloids

2.Various isolation procedures for active ingridients with examples for alkaloids reserpine one for steroids sapognin , diosegnin,diogron.

UNIT III

- Antimicrobial : Chloramphenicol, Furazolidine Mercurochrome ionized , Na PAS.
- Analgesic – Antiflammatory : salicylic acid and its derivatives ,Ibuprofen , Mefenamic acid.
- Steroidal harmones –Progesterone, Testosterone , methyl testosterone.

UNIT IV

- Vitamins – Vit- A, Vit-B6, Vit-C
- Barbiturates – Pentobarbital
- Blockers,Propranolol , Antenolol
- Cardiovascular agent – Methyldopa
- Antihistamins :-Chloropheneramine Maleate.

UNIT V

- Product based Fermentation processes :- Brief idea of micro-organism , their structure , growth & usefulness - Enzyme system useful for transformation microbial products.
- General Principles of fermentation processes and Product processing.
- Manufacture of antibiotics – penicillin- G & semi synthetic penicillins, Rifamycin , Vitamin B12.
- Bio – transformation process for prednisolone , 11 hydroxylation in steroids.
- Enzyme- catalysed Transformation , Manufacture of ephedrine.

Books-

- Practical Pharmacognosy,T.B. Wills.
- Practical Pharmacognosy , T.N. vasudevan.

- Modern Pharmacognosy , Ramstad, McGraw Hill.
- Indian Pharmacopoea ,1985.
- British Pharmacopoea ,1990.
- Hand Book of Drugs & Cosmetics Act , Mehrotra.
- Pharmaceutical excipients.
- Pharmaceutical Dosage Forms.
- Principles of Medical Chemistry,W.O.Foye,Lea &Febigen Publication Phidelphia.
- Text Book of organic medicinal and Pharmaceuticals chemistry,Willson, Gisvold derge Lippinett, Toppan.
- Essential of medicinal chemistry, Korolkovas Burkhatter,Wiely Interscience.

ADVANCED DIPLOMA COURSE

Industrial Chemistry

Practical M.M. 50

The practical examination will be of 08 Hrs. duration spread over two days carrying 50 marks.

Two experiments have to be performed:

- Synthesis of common industrial compounds involving two step reaction :- 4- Bromoaniline , 3- Nitroaniline, Sulphanilamide, 4- Aminobenzoic acid, 4- Nitrobenzoic acid, Dihalobenzenes, Nitrohalobenzenes.
- Industrial Analysis of common raw materials as per industrial specification :- phenol aniline formaldehyde, hydrogen per oxide, acetone , epoxide ,olefins , oil etc.
- Demonstration of various pharmaceutical packaging materials quality control tests of some material –A1 Strips, Cartons , glass, bottles.
- Limit tests for chlorine heavy metals arsenic etc. of two representatives bulk drugs.
- Demonstration of various Pharmaceutical product.
- Active ingredients analysis of few types of formulation representating different methods of analysis :- acidmetry, alkalimetry, non aqueous
- Determination of sulphate:-ash less of drying and other tests of bulk drugs complete L. P. Monograph of three drugs representing variety of testing methods.

- Evaluation of crude drugs:- macroscopic examination determination and Identification of starch granules, calcium oxalate.
- Palisate ratio Stomatal Index Determination and Identification of few drugs TLC method for Identification.
- Microbiological testing determination of MIC of some antibacterial drugs by zone/cup plate methods.

Distribution of marks-

- Experiment No.1 - 20
- Experiment No.2 - 10
- Viva - 05
- Sessional - 05
- Project Work - 10

Total 50

Syllabus 2015-16

Add on Course - Industrial Chemistry

Certificate Course

Paper-1

1. Nomenclature: Generic name, trade name. method for purification of organic components, separation techniques, solvent extraction, chromatography, numerical problem related to these.

2. Raw material for organic compounds : petroleum, natural gas, Fractionation of crude oil.

3. Synthetic petrol : Fractionation of crude Oil, cracking reforming, hydro forming, isomerism, Octane number, cetane number.

Unit-II

- Petroleum: Cracking, reforming, hydro forming, summarization.
- Fuel : Types fof fuel their calorific values.
- Coal: Types Structure, properties, distillation of coal, chemicals derived from coal, coal analysis, numerical based on these.

Unit-III

- Basic Metallurgical operation: Pulverization, Calcination, roasting, Refining of ores and minerals, different types of ores, pulverization, methods of concentration of ores, calcination , roasting, smelting.
- Physicochemical principles of extraction of Fe, Cu, Al, Zn & Cr, metallurgical operations, refining of metal and properties of metals.
- Inorganic Material of industrial importance, their valuability forms structure & Modification silicon, silicate cages, carbon & Zeolite, Ozone depletion, acid rain photochemical smog.
- Corrosion : Theory, Preventive methods.

Unit-IV

- Distillation- Introduction batch & continuous distillation, separation of plate column and pack column.
- Absorption – Introduction equipment packet column spray column, packed bubble columns, mechanically agitated contractors.

Unit- V

- Evaporation: Introduction, equipment, short tube(standard) evaporation by falling, evaporators, climbing film(upward flow) evaporation (agitated) film evaporator.
- Filtration : Introduction, filter media and filter aids, equipment plate frame notches filter rotator drum filter, sparkler filter, candle filter.
- Drying :Introduction , free moisture, humid moisture drying curve, equipment, rotatory dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.

Cerificate Course

Paper II

Unit-1

- Dimension and Unit – Basic chemical calculation, atomic weight, molecular weight, equivalent weight, mole composition of liquid mixture, gaseous mixture, mineral balance involving, chemical reaction concept of limiting reactant conversion of solid, liquid phase reaction, gas phase reaction without recycle of phase.

Unit-2

- Entropy Balance: heat capacity of pure gases and gaseous mixture at constant pressure and temperature.
- Heat capacity of solid, enthalpy change, energy balance, numerical based on energy balance.

Unit-3

- Surface chemistry and interfacial phenomenon , adsorption isotherm soils , effect of surfactant, hydro tropes

Unit-4

- Boilers -Types of boilers and their functioning
- Water -Specification for industrial use, various water treatment methods.
- Steam -Generation and uses, specification for industrial use, processing air.

  Water analysis and treatment of water for domestic use, hardness of water, analysis of free chloride, alkalinity, acidity free CO_2, BOD, COD, D.O.

Unit-5

- Introduction of chemical engineering- water pollution.
- Fluid flow – fans, blowers, compressors, vacuum pump selector.
- Pumps - Reciprocating pump, gear pumps, centrifugal pumps, air nitrogen cycle. Atmosphere, pollution unit, pollutant, types of pollution statutory units pollution evaluation methods.

Certificate course

INDUSTRIAL CHEMISTRY PRACTICAL

Practical Examination

Distibution of marks -	Experiment	-30	Section – A 20 B-10
	Viva	-	05
	Sessional	-	05
	Project	-	10
	Total	-	50

Section- A

- Extraction Processes – Phase diagram, partition coefficient.
- Chromatography – column, paper, thin layer.
- Ore analysis – Dolomite, limestone, calcite, analysis of alloys as cupro-nickel.

- Determination of physical constant, refractive index, surface tension, effect of surfactants on surface tension, viscosity fluids , polymer solution , effect of additive on viscosity, optical rotation.

Section – B

- Simple laboratory Techniques – Crystallization, Fractional crystallization, Distillation, fractional distillation, B. pt. diagram.
- Preparation of standard solution.
- Calibration of thermometer
- Acquaintances with safety measures in laboratory hazards chemicals.
- Depression and elevation in M. Pt./B.Pt. of solids and liquids.

Diploma Course

Industrial Chemistry
Paper-I

Unit I

Material Science: Mechanical properties of material and change with respect to temperature.

Material of construction used in industry:

Metal and alloys: Important metals and alloys, iron, copper aluminum, lead, nickel, titanium, and their alloys, mechanical and chemical properties and their applications.

Cements: Types of cement, composition, manufacturing process, setting of cement,

Ceramics: Introduction, types, manufacturing process, application, refectories.

Unit-II

Polymeric Materials: Industrial Polymer and composite material their constitution, chemical and physical properties, industrial application.

Glass: types, Comparison, manufacture chemical and physical properties, application.

Corrosion: Various types of corrosion relevant to chemical industry-mechanism, preventative methods.

Unit- III

Pollution: Air oxygen, nitrogen cycle, water, biosphere, flora and fauna, energy, soil, pollutant and their statutory limits, pollution and evaluation methods.

Air Pollution – Various pollutants, water pollution- organic / inorganic pollutants, noise pollution, sewage analysis, , pesticides pollution, radiation pollution green house effect, future.

Unit –IV

Effluent treatment and waste management : Principles and equipment for aerobics anaerobic treatment, adsorption, filtration, sedimentation, Bag filters, Electrostatic precipitators, mist eliminators, wet scrubbers, absorber , solid waste management, industrial safety.

Unit -V

Process instrumentation: Concepts of measurement and accuracy, principle, construction and working and following measuring instruments.

Temperature: Glass thermometers, Bimetallic thermometers, pressure spring thermometer, vapour filled thermometer, Resistance thermometer, radiation pyrometers.

Pressure: Manometers, Barometers, Bourdon pressure gauge, bellow type Diaphragm type pressure gauge, Macleod gauges, pirani gauges etc.

Liquid Level : Direct- Indirect liquid level measurement , float, type, liquid level gauge, ultrasonic level gauges, Bubbler system , Density measurement, viscosity measurement.

Books Recommended:

- Pollution control in chemical and Allied industries ; S.P. Mahajan
- Pollution control in industries; A. series of books b.Jones H.P.
- Air Pollution- Volume 1 to 4 ; Editors, STERN . A.C.; Academic press
- Environmental engineering: G N Pandey , Tata MacGraw Hill
- Handbook of air pollution ; A. Parker, , Tata MacGraw Hill

- Science of ceramics Chemical Processing ; Hench LL
- Science of ceramics ; Stewart G.H
- Chemistry of cement
- Properties of Glass, morey G.w. Chemistry of glasses; Paul A.
- Corrosion, causes & prevention : Spellur F. n.
- Effluent Treatment in process Industries; inst. Of Chemical engg.
- Effluent Treatment and waste disposal ; inst. Of chemical engg.
- Effluent Treatment and disposal; inst. Of Chemical Engg.\
- Industrial Insturmentation ; Eckmen D.P. Johe Welly
- Appiled Instrumentation in process industry Vol I , II, & III; Andwres W. G.Gulf Publication
- Instrumentation and control for the process industries ; Borer S.Elsevier; Applied Science Publisher
- Chemical Engg Hankbook: Perry J.H. and Green D. McGraw Hill

DIPLOMA COURSE
Industrial Chemistry
Paper –II

M.M. 50

UNIT –I

Unit Processes in organic chemicals manufacture:

Nitration Introduction –Nitrating agents, kinetics and mechanism of nitration processes such as nitration of –

(a) Paraffinic Hydrocarbons

(b) Benzene to nitrobenzene and m-dinitrobenzene

(c) Chlorobenzene to o and p- nitrochloro benzene

(d) Acetanilide to p-nitro acetanilide

(e) Toluene

Continuous Vs. batch nitration

UNIT-II

Halogenation:

Introduction- Kinetic of halogenations reaction, Reagents for halogenations, Halogenations of aromatics-side chain and nuclear halogenations, commercial manufacture of

chlorobenzene, Chloral, Mono chloracetic acid and chloromethane.

UNIT-III

Sulphonation :

Introduction , Sulphonating agents, chemical and physical factors in sulphonation, kinetics and mechanism of sulphonation reaction,commercial sulphonation of benzene, naphthalene , Alkyl benzene, Batch Vs Continuous Sulphonation.

UNIT –IV

Oxidation : Introduction , Types of oxidation reaction reactions ,Oxidizing agents , kinetics and mechanism of oxidation of organic compounds ,liquid phase oxidation , vapor phase,Oxidation, commercial manufacture of benzoic acid ,maleic anhydride, Phthalic anhydride , acroleins ,Acetaldehyde ,acetic acid.

Hydrogenation : Introduction, Types of Alkylation, Alkylating agents ,Thermodynamics and mechanism of Alkylation reaction ,Manufacture of Alkylbenzenes(for detergent manufacture),Ethyl benzene,Phenyl ethyl alcohol , N- alkyl anilines (Mono and Di-methyl anilines)

UNIT-V

Esterification : Introduction, Hydrodynamics and kinetics of esterification reaction Esterification by organic acidby addition of unsaturated compounds, Esterification of carboxy acid derivatives ,commercial manufacture of ethyl acetate ,dioctylphthalate ,vinylacetate ,cellulose acetate.

Amination :

(A) By Reduction : Introduction ,methods of reduction-metal and acid ,catalytic ,sulfide electrolytic ,metal and alkali sulphites , metal hydrides ,sodium metal concentrated caustic ,oxidation

,Reduction ,Commercial manufacture of Aniline ,m-nitro aniline ,p- amino phenol.

(B) By Aminolysis : Intoduction , Aminating agents, Factors affecting.

Hydrolysis : Introduction , Hydrolyzing agents ,kinetics ,thermodynamics and mechanismof hydrolysis.

Books Recommended :

- Unit process in organic synthesis ; P. M. Groggins; Mc Graw Hill.
- Chemicals Engineer's Handbook;Perry J. H. and green D; Mcgraw Hill

Diploma Course Practical

M. M. 50

Industrial Chemistry Practical

Duration of Examination : 04 Hours

Distribution of marks : Experiments -30 [Section A - 15

Section B- 15]

Viva -05

Sessional -05

Project -10

Total -50

Section –A (Any one)

- Unit process : one to two examples of each of the
  a. following unit processes.
- Nitration, Sulphonation , Friedel- Craft reaction,
  a. Esterification , Hydrolysis ,Oxidation, Halogenation ,Chloro- Sulphonation,reduction,polymerization ,reaction of diazonium salts.

- Material testing : Testing of Alloys Identification of plastics/Rubbers,Estimation of Tield point, Young's Modulus,Flaredness, Optical, Thermal ,Mehanical and Electrical Properties.
- Process Instrumentation : Transducer of different types ,Use of transducer for measuring flow control ,determination of flash point and ignition points of liquids.

Section- B

- Instrumental methods of analysis : Use of colourimeter , pH meter , Potentiometer, Conductometer , Refactometer , polarimeter.
- Water Analysis : Solid content , Hardness, COD and other tests as per industrial specifications
- Flow measuring devices : Floats , Monograph of representatives raw material such s sulphuric acid , toluene sodium carbonate , sodium hydroxide, carbon tetrachloride , Benzoic acid(5-6 compounds) Limit tests for heavy metals Pb , As ,Hg ,Fe and ash content

ADVANCED DIPLOMA COURSE

Paper –I

Pharmaceuticals & Industrial Organization

UNIT –I

- Historical Background and Development of Pharmaceutical Industry in India in brief.
- Pharmacopoeias : Development of pharmac opoeia and Introduction of B. P., U. S. P. , E. P., N. F. and other important pharmacopoeias.
- Introduction to various types of formulation and roots of administration.

UNIT II

- Pharmaceutical packaging – Introduction , package selection, packaging materials , ancillary materials, packaging machinery, quality control of packaging materials.
- F.D.A. Important Schedules & some legal aspects of drugs.
- Pharceuticals quality control (other than the analytical methods covered under core subject) Sterility testing pyrogenic testing , glass testing bulk density of powder etc.

UNIT III

Instrumentation :

- UV- visible spectroscopy
- IR- spectroscopy non dispersive IR.
- NMR Spectroscopy.
- Atomic Absorption and Flame Photometry
- Neutron diffraction.
- X-ray fluorescence.
- Ion Selective Electrodes

UNIT –IV

- Concept of Scientific Management in Industry.
- Function of management decision making planning, organizing directing & control.
- Location of Industry.

UNIT V

- Materials Management.
- Inventory Control.
- Management of human resources –selection , incentives , welfare safety.

Books-

- Economics of chemicals industry. Hempel, E. H.
- Plant Design and Economics for chemical engineers, Peter Time-Rhaus, McGraw Hill.

- I.C.M.A. Booklets-9&10.
- Industrial Organization & Management, Bethel, L.L.
- Industrial Organization & Management, Tarachand, Vol. I & II.
- Books on Management, O.P. Khandelwal.
- Rheology theory & application,Vol.-5,Elrich R.F.
- Instrumental Methods of Analysis ,Willard, merit, dean.
- Introduction to Instrumental methods of analysis, Braun, R.D. McGraw Hill.
- Analytical chemistry, J.B. Dick, McGraw Hill
- Quantitative Inorganic analysis, A. Vogel.
- Instrumental methods of analysis, Skoog & West.
- Instrumental methods of analysis, B.K. Sharma.

ADVANCED DIPLOMA COURSE

PAPER –II

DRUGS

UNIT-I

- Phyto - chemical - introduction to plant classification and crude drugs, , Cultivation, collection, preparation for the market & storage of medicinal plants.
- Classification of various types of drugs with example.
- Raw material process of manufacture effluent handling etc. of the following bulk drugs.
  (i)Sulpha drugs Sulphaguandine (ii)Sulphamethoxazole.

UNIT II

1.Chemical constitution of plants including carbohydrates , amino acids , proteins , fats waxes volatile oils turpenoids ,steroids , saponins ,flavonoids , tannins ,glycoside alkaloids

2.Various isolation procedures for active ingridients with

examples for alkaloids reserpine one for steroids sapognin ,

diosegnin, diogron.

UNIT III

- Antimicrobial :Chloramphenicol, Furazolidine Mercurochrome ionized , Na PAS.
- Analgesic – Antiflammatory : salicylic acid and its derivatives ,Ibuprofen , Mefenamic acid.
- Steroidal harmones –Progesterone, Testosterone , methyl testosterone.

UNIT IV

- Vitamins – Vit- A, Vit-B6, Vit-C
- Barbiturates – Pentobarbital
- Blockers, Propranolol , Antenolol
- Cardiovascular agent – Methyldopa
- Antihistamins :-Chloropheneramine Maleate.

UNIT V

- Product based Fermentation processes :- Brief idea of micro-organism , their structure , growth & usefulness - Enzyme system useful for transformation microbial products.
- General Principles of fermentation processes and Product processing.
- Manufacture of antibiotics – penicillin- G & semi synthetic penicillins, Rifamycin , Vitamin B12.
- Bio – transformation process for prednisolone , 11 hydroxylation in steroids.
- Enzyme- catalysed Transformation, Manufacture of ephedrine.

Books-

- Practical Pharmacognosy,T.B. Wills.
- Practical Pharmacognosy , T.N. vasudevan.
- Modern Pharmacognosy , Ramstad, McGraw Hill.
- Indian Pharmacopoea ,1985.
- British Pharmacopoea ,1990.
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- Pharmaceutical excipients.
- Pharmaceutical Dosage Forms.

- Principles of Medical Chemistry,W.O.Foye,Lea &Febigen Publication Phidelphia.
- Text Book of organic medicinal and Pharmaceuticals chemistry,Willson, Gisvold derge Lippinett, Toppan.
- Essential of medicinal chemistry, Korolkovas Burkhatter,Wiely Interscience.

ADVANCED DIPLOMA COURSE

Industrial Chemistry

Practical M.M. 50

The practical examination will be of 08 Hrs. duration spread over two days carrying 50 marks.

Two experiments have to be performed:

- Synthesis of common industrial compounds involving two step reaction :- 4- Bromoaniline , 3- Nitroaniline, Sulphanilamide, 4- Aminobenzoic acid, 4- Nitrobenzoic acid, Dihalobenzenes, Nitrohalobenzenes.
- Industrial Analysis of common raw materials as per industrial specification :- phenol aniline formaldehyde, hydrogen per oxide, acetone , epoxide ,olefins , oil etc.
- Demonstration of various pharmaceutical packaging materials quality control tests of some material –A1 Strips, Cartons , glass, bottles.
- Limit tests for chlorine heavy metals arsenic etc. of two representatives bulk drugs.
- Demonstration of various Pharmaceutical product.
- Active ingradients analysis of few types of formulation representating different methods of analysis :- acidmetry, alkalimetry,non aqueous
- Determination of sulphate:-ash less of drying and other tests of bulk drugs complete L. P. Monograph of three drugs representing variety of testing methods.
- Evaluation of crude drugs:- macroscopic examination determination and Identification of starch granules, calcium oxalate.
- Palisate ratio Stomatal Index Determination and Identification of few drugs TLC method for Identification.
- Microbiological testing determination of MIC of some antibacterial drugs by zone/cup plate methods.

Distribution of marks-

- Experiment No.1 - 20
- Experiment No.2 - 10
- Viva - 05
- Sessional - 05
- Project Work - 10

Total 50

Syllabus 2014-15

Add on Course - Industrial Chemistry

Certificate Course

Paper-1

1. Nomenclature : Generic name , trade name. method for purification of organic components, separation techniques, solvent extraction, chromatography, numerical problem related to these.

2. Raw material for organic compounds: petroleum, natural gas, Fractionation of crude oil.

3. Synthetic petrol : Fractionation of crude Oil, cracking reforming, hydro forming, isomerism, Octan number, cetane number.

Unit-II

- Petroleum: Cracking, reforming, hydro forming, summarization.
- Fuel : Types fof fuel their calorific values.
- Coal: Types Structure, properties, distillation of coal, chemicals derived from coal, coal analysis, numerical based on these.

Unit-III

- Basic Metallurgical operation: Pulverization, Calcination, roasting, Refining of ores and minerals, different types of ores, pulverization, methods of concentration of ores, calcination , roasting, smelting.

- Physicochemical principles of extraction of Fe, Cu, Al, Zn & Cr, metallurgical operations, refining of metal and properties of metals.
- Inorganic Material of industrial importance, their valuability forms structure & Modification silicon, silicate cages, carbon & Zeolite, Ozone depletion, acid rain photochemical smog.
- Corrosion : Theory, Preventive methods.

Unit-IV

- Distillation- Introduction batch & continuous distillation, separation of plate column and pack column.
- Absorption – Introduction equipment packet column spray column, packed bubble columns, mechanically agitated contractors.

Unit- V

- Evaporation : Introduction, equipment, short tube(standard) evaporation by falling, evaporators, climbing film(upward flow) evaporation (agitated) film evaporator.
- Filtration : Introduction, filter media and filter aids, equipment plate frame nutsche filter rotator drum filter, sparkler filter, candle filter.
- Drying :Introduction , free moisture, humid moisture drying curve, equipment, rotatory dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.

Cerificate Course

Paper II

Unit-1

- Dimension and Unit – Basic chemical calculation, atomic weight, molecular weight, equivalent weight, mole composition of liquid mixture, gaseous mixture, mineral balance involving, chemical reaction concept of limiting reactant conversion of solid, liquid phase reaction, gas phase reaction without recycle of phase.

Unit-2

- Entropy Balance: heat capacity of pure gases and gaseous mixture at constant pressure and temperature.
- Heat capacity of solid, enthalpy change, energy balance, numerical based on energy balance.

Unit-3

- Surface chemistry and interfacial phenomenon , adsorption isotherm soils , effect of surfactant, hydro tropes

Unit-4

- Boilers -Types of boilers and their functioning
- Water -Specification for industrial use, various water treatment methods.
- Steam -Generation and uses, specification for industrial use, processing air.

  Water analysis and treatment of water for domestic use, hardness of water, analysis of free chloride, alkalinity, acidity free CO_2, BOD, COD, D.O.

Unit-5

- Introduction of chemical engineering- water pollution.
- Fluid flow – fans , blowers, compressors, vacuum pump selector.
- Pumps - Reciprocating pump, gear pumps, centrifugal pumps, air nitrogen cycle. Atmosphere, pollution unit, pollutant, types of pollution statutory units pollution evaluation methods.

Certificate course

INDUSTRIAL CHEMISTRY PRACTICAL

Practical Examination

Distribution of marks -	Experiment	-30	Section – A 20 B-10
	Viva	-	05
	Sessional	-	05
	Project	-	10
	Total	-	50

Section- A

- Extraction Processes – Phase diagram, partition coefficient.
- Chromatography – column, paper, thin layer.
- Ore analysis – Dolomite, limestone, calcite, analysis of alloys as cupro-nickel.
- Determination of physical constant, refractive index, surface tension, effect of surfactants on surface tension, viscosity fluids , polymer solution , effect of additive on viscosity, optical rotation.

Section – B

- Simple laboratory Techniques – Crystallization, Fractional crystallization, Distillation, fractional distillation, B. pt. diagram.
- Preparation of standard solution.
- Calibration of thermometer
- Acquaintances with safety measures in laboratory hazaqrds chemicals.
- Depression and elevation in M. Pt./B.Pt. of solids and liquids.

Diploma Course

Industrial Chemistry
Paper-I

Unit I

Material Science: Mechanical properties of material and change with respect to temperature.

Material of construction used in industry:

Metal and alloys: Important metals and alloys, iron, copper aluminum, lead, nickel, titanium, and their alloys, mechanical and chemical properties and their applications.

Cements: Types of cement, composition, manufacturing process, setting of cement,

Ceramics: Introduction, types, manufacturing process, application, refectories.

Unit-II

Polymeric Materials: Industrial Polymer and composite material their constitution, chemical and physical properties, industrial application.

Glass: types, Comparison, manufacture chemical and physical properties, application.

Corrosion: Various types of corrosion relevant to chemical industry-mechanism, preventative methods.

Unit- III

Pollution: Air oxygen, nitrogen cycle, water, biosphere, flora and fauna, energy, soil, pollutant and their statutory limits, pollution and evaluation methods.
Air Pollution – Various pollutants , water pollution- organic / inorganic pollutants, noise pollution, sewage analysis, , pesticides pollution, radiation pollution green house effect, future.

Unit –IV

Effluent treatment and waste management : Principles and equipment for aerobics anaerobic treatment, adsorption, filtration, sedimentation, Bag filters, Electrostatic precipitators, mist eliminators, wet scrubbers, absorber , solid waste management, industrial safety.

Unit -V

Process instrumentation: Concepts of measurement and accuracy, principle, construction and working and following measuring instruments.
Temperature: Glass thermometers, Bimetallic thermometers, pressure spring thermometer, vapour filled thermometer, Resistance thermometer, radiation pyrometers.

Pressure: Manometers, Barometers, Bourdon pressure gauge, bellow type Diaphragm type pressure gauge, Macleod gauges, pirani gauges etc.
Liquid Level : Direct- Indirect liquid level measurement , float, type, liquid level gauge, ultrasonic level gauges, Bubbler system , Density measurement, viscosity measurement.

Books Recommended:

- Pollution control in chemical and Allied industries ; S.P. Mahajan
- Pollution control in industries; A. series of books b.Jones H.P.
- Air Pollution- Volume 1 to 4 ; Editors, STERN . A.C.; Academic press
- Environmental engineering: G N Pandey , Tata MacGraw Hill
- Handbook of air pollution ; A. Parker, , Tata MacGraw Hill
- Science of ceramics Chemical Processing ; Hench LL
- Science of ceramics ; Stewart G.H

- Chemistry of cement
- Properties of Glass, morey G.w. Chemistry of glasses; Paul A.
- Corrosion, causes & prevention : Spellur F. n.
- Effluent Treatment in process Industries; inst. Of Chemical engg.
- Effluent Treatment and waste disposal ; inst. Of chemical engg.
- Effluent Treatment and disposal; inst. Of Chemical Engg.\
- Industrial Insturmentation ; Eckmen D.P. Johe Welly
- Appiled Instrumentation in process industry Vol I , II, & III; Andwres W. G.Gulf Publication
- Instrumentation and control for the process industries ; Borer S.Elsevier; Applied Science Publisher
- Chemical Engg Hankbook: Perry J.H. and Green D. McGraw Hill

DIPLOMA COURSE
Industrial Chemistry
Paper –II

M.M. 50

UNIT –I

Unit Processes in organic chemicals manufacture:

Nitration Introduction –Nitrating agents, kinetics and mechanism of nitration processes such as nitration of –

(a) Paraffinic Hydrocarbons

(b) Benzene to nitrobenzene and m-dinitrobenzene

(c) Chlorobenzene to o and p- nitrochloro benzene

(d) Acetanilide to p-nitro acetanilide

(e) Toluene

Continuous Vs. batch nitration

UNIT-II

Halogenation:

Introduction- Kinetic of halogenation reaction, Reagents for halogenations, Halogenations of aromatics-side chain and nuclear halogenations, commercial manufacture of chlorobenzene, Chloral, Mono chloracetic acid and chloromethane.

UNIT-III

Sulphonation :

Introduction , Sulphonating agents, chemical and physical factors in sulphonation, kinetics and mechanism of sulphonation reaction,commercial sulphonation of benzene, naphthalene , Alkyl benzene,Batch Vs Continuous Sulphonation.

UNIT –IV

Oxidation : Introduction , Types of oxidation reaction reactions ,Oxidizing agents , kinetics and mechanism of oxidation of organic compounds ,liquid phase oxidation , vapor phase, Oxidation, commercial manufacture of benzoic acid ,maleic anhydride, Phthalic anhydride , acroleins ,Acetaldehyde ,acetic acid.

Hydrogenation : Introduction, Types of Alkylation, Alkylating agents ,Thermodynamics and mechanism of Alkylation reaction ,Manufacture of Alkylbenzenes(for detergent manufacture),Ethyl benzene,Phenyl ethyl alcohol , N- alkyl anilines (Mono and Di-methyl anilines)

UNIT-V

Esterification : Introduction, Hydrodynamics and kinetics of esterification reaction Esterification by organic acidby addition of unsaturated compounds, Esterification of carboxy acid derivatives ,commercial manufacture of ethyl acetate ,dioctylphthalate ,vinylacetate ,cellulose acetate.

Amination :

(A) By Reduction : Introduction ,methods of reduction-metal and acid ,catalytic ,sulfide electrolytic ,metal and alkali sulphites , metal hydrides ,sodium metal concentrated caustic ,oxidation ,Reduction ,Commercial manufacture of Aniline ,m-nitro aniline ,p- amino phenol.

(B) By Aminolysis :Intoduction , Aminating agents, Factors affecting.

Hydrolysis : Introduction , Hydrolyzing agents ,kinetics ,thermodynamics and mechanism of hydrolysis.

Books Recommended:

- Unit process in organic synthesis ; P. M. Groggins; Mc Graw Hill.
- Chemicals Engineer's Handbook;Perry J. H. and green D; Mcgraw Hill

Diploma Course Practical

M. M. 50

Industrial Chemistry Practical

Duration of Examination : 04 Hours

Distribution of marks : Experiments -30 [Section A - 15

Section B- 15]

Viva -05

Sessional -05

Project -10

Total -50

Section –A (Any one)

- Unit process : one to two examples of each of the
    a. following unit processes.
- Nitration, Sulphonation , Friedel- Craft reaction,
    a. Esterification , Hydrolysis ,Oxidation, Halogenation ,Chloro- Sulphonation,reduction,polymerization ,reaction of diazonium salts.
- Material testing : Testing of Alloys Identification of plastics/Rubbers,Estimation of Tield point, Young's Modulus,Flaredness, Optical, Thermal ,Mehanical and Electrical Properties.

- Process Instrumentation : Transducer of different types ,Use of transducer for measuring flow control ,determination of flash point and ignition points of liquids.

Section- B

- Instrumental methods of analysis : Use of colorimeter , pH meter , Potentiometer, Conductometer , Refactometer , polarimeter.
- Water Analysis : Solid content , Hardness, COD and other tests as per industrial specifications
- Flow measuring devices : Floats , Monograph of representatives raw material such s sulphuric acid , toluene sodium carbonate , sodium hydroxide, carbon tetrachloride , Benzoic acid(5-6 compounds) Limit tests for heavy metals Pb , As ,Hg ,Fe and ash content

ADVANCED DIPLOMA COURSE

Paper –I

Pharmaceuticals & Industrial Organization

UNIT –I

- Historical Background and Development of Pharmaceutical Industry in India in brief.
- Pharmacopoeias : Development of pharmac opoeia and Introduction of B. P., U. S. P. , E. P., N. F. and other important pharmacopoeias.
- Introduction to various types of formulation and roots of administration.

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- Pharmaceutical packaging – Introduction , package selection, packaging materials , ancillary materials, packaging machinery,quality control of packaging materials.
- F.D.A. Important Schedules & some legal aspects of drugs.

- Pharceuticals quality control (other than the analytical methods covered under core subject) Sterility testing pyrogenic testing , glass testing bulk density of powder etc.

UNIT III

Instrumentation :

- UV- visible spectroscopy
- IR- spectroscopy non dispersive IR.
- NMR Spectroscopy.
- Atomic Absorption and Flame Photometry
- Neutron diffraction.
- X-ray fluorescence.
- Ion Selective Electrodes

UNIT –IV

- Concept of Scientific Management in Industry.
- Function of management decision making planning ,organizing directing & control.
- Location of Industry.

UNIT V

- Materials Management.
- Inventory Control.
- Management of human resources –selection , incentives , welfare safety.

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- Plant Design and Economics for chemical engineers, Peter Time-Rhaus,McGraw Hill.
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- Industrial Organization & Management,Bethel,L.L.
- Industrial Organization & Management,Tarachand,Vol.I & II.
- Books on Management, O.P. Khandelwal.

- Rheology theory & application,Vol.-5,Elrich R.F.
- Instrmental Methods of Analysis ,Willard,merit,dean.
- Introduction to Instrumental methods of analysis,Braun,R.D.McGraw Hill.
- Analytical chemistry,J.B. Dick, McGraw Hill
- Quantitative Inorganic analysis,A.Vogel.
- Instrumental methods of analysis,Skoog & West.
- Instrumental methods of analysis,B.K.Sharma.

ADVANCED DIPLOMA COURSE

PAPER –II

DRUGS

UNIT-I

- Phyto - chemical - introduction to plant classification and crude drugs, , Cultivation, collection, preparation for the market & storage of medicinal plants.
- Classification of various types of drugs with example.
- Raw material process of manufacture effluent handling etc. of the following bulk drugs.
  (i)Sulpha drugs Sulphaguandine (ii)Sulphamethoxazole.

UNIT II

1.Chemical constitution of plants including carbohydrates , amino acids , proteins , fats waxes volatile oils turpenoids ,steroids , saponins ,flavonoids , tannins ,glycoside alkaloids

2.Various isolation procedures for active ingridients with examples for alkaloids reserpine one for steroids sapognin , diosegnin,diogron.

UNIT III

- Antimicrobial :Chloramphenicol, Furazolidine Mercurochrome ionized , Na PAS.
- Analgesic – Antiflammatory : salicylic acid and its derivatives ,Ibuprofen , Mefenamic acid.
- Steroidal harmones –Progesterone, Testosterone , methyl testosterone.

UNIT IV

- Vitamins – Vit- A, Vit-B6, Vit-C
- Barbiturates – Pentobarbital
- Blockers,Propranolol , Antenolol
- Cardiovascular agent – Methyldopa
- Antihistamins :-Chloropheneramine Maleate.

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- Product based Fermentation processes :- Brief idea of micro-organism , their structure , growth & usefulness - Enzyme system useful for transformation microbial products.
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- Manufacture of antibiotics – penicillin- G & semi synthetic penicillins,Rifamycin , Vitamin B12.
- Bio – transformation process for prednisolone ,11 hydroxylation in steroids.
- Enzyme- catalysed Transformation , Manufacture of ephedrine.

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- Practical Pharmacognosy , T.N. vasudevan.
- Modern Pharmacognosy , Ramstad, McGraw Hill.
- Indian Pharmacopoea ,1985.
- British Pharmacopoea ,1990.
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- Pharmaceutical excipients.
- Pharmaceutical Dosage Forms.
- Principles of Medical Chemistry,W.O.Foye,Lea &Febigen Publication Phidelphia.
- Text Book of organic medicinal and Pharmaceuticals chemistry,Willson, Gisvold derge Lippinett, Toppan.
- Essential of medicinal chemistry, Korolkovas Burkhatter,Wiely Interscience.

ADVANCED DIPLOMA COURSE

Industrial Chemistry

Practical **M.M. 50**

The practical examination will be of 08 Hrs. duration spread over two days carrying 50 marks.

Two experiments have to be performed:

- Synthesis of common industrial compounds involving two step reaction :- 4- Bromoaniline , 3- Nitroaniline, Sulphanilamide, 4- Aminobenzoic acid, 4- Nitrobenzoic acid, Dihalobenzenes, Nitrohalobenzenes.
- Industrial Analysis of common raw materials as per industrial specification :- phenol aniline formaldehyde, hydrogen per oxide, acetone , epoxide ,olefins , oil etc.
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- Demonstration of various Pharmaceutical product.
- Active ingradients analysis of few types of formulation representating different methods of analysis :- acidmetry, alkalimetry,non aqueous
- Determination of sulphate :-ash less of drying and other tests of bulk drugs complete L. P. Monograph of three drugs representing variety of testing methods.
- Evaluation of crude drugs:- macroscopic examination determination and Identification of starch granules, calcium oxalate.
- Palisate ratio Stomatal Index Determination and Identification of few drugs TLC method for Identification.
- Microbiological testing determination of MIC of some antibacterial drugs by zone/cup plate methods.

Distribution of marks-

- Experiment No.1 - 20
- Experiment No.2 - 10
- Viva - 05
- Sessional - 05

- Project Work - 10

Total 50