Veer Narmad South Gujarat University, Surat.

T.Y. B.Sc.

Industrial Chemistry – Vocational Syllabus

Papar – VI.

Heavy and fine Chemicals

In force from June 1999-2000

Total Lectures - 60
Three Hrs
Marks
52 + 15 + 7 = 74
Uni. Test Imp Lib.

UNIT – I Synthetic products – Ammonia, Ammonium nitrate, ammonium sulphate, nitric acid, urea.
- Caustic Soda – Phosphorus – phosphoric acid, ammonium phosphate, super – phosphate, triple super phosphate – carbon, activated, carbon, manufactures of graphite and carbon – lime, gypsum – silicon, silicon carbide, calcium carbide.

(Lectures – 12)

UNIT – II Flurine, chlorine, bromine, iodine, hydrobromic acid – sodium chloride, sodium sulphate, sodium sulphite, sodium thiosulphate – borax, boric acid – industrial catalysts – Raney nickcl and other forms of nickel, vanadium and platinum based catalyst. – aluminium alkoxised, titanium dioxide, titanium tetrachloride and titanated.

(Lecture – 12)

UNIT – III Fischer – Tropsch synthesis, Application and uses of zeolitxes – chemicals derived from acetylene, Vinyl chloride, vinyl ester, acrylates, propargyl alcochol – acetone, phenol, phthalic anhydride, pyridine and picolones, resorcinol, sorbitol, formaldehyde, formic acid, glycerol, melamine.

(Lecture – 12)

UNIT – IV Manufacture of the following with reference to raw materials, flow chart and uses of triphenyl phosphine, alkyl phosphate – methyl chloride, dichloro methane, chloroform, carbon tetrachloride – ethanol amine (mono, di, tri) – N – alkylated ethanolamine (dimethyl, diethyl) – alkylamines (methyl to amyl)-N alkylated amines – Ketenes, ethyl acetoacetate, methyl acetoacetate – acetaldehde, paraldehyde – Industrial solvents, DMF, THF, dimethyl ether, dioxane, 1, 4 butanediol.

(Lectures – 12)

UNIT – V Manufacture of following fine chemicals with reference to raw material, production process, hazard and safety, quality hydride, sodium amide,lithium aluminum hydride , sodium alkoxides – Essential oils, camphor, citral, citronellol, menthol – flavours and fragrances – Fodd additives. (Lectures – 12)

REFERENCE BOOKS :-

1. Chemical process industries, Shreve R. N. McGraw Hill.
2. Applied Organic Chemistry, Kilner E. and Samuel.
3. Heavy Organic Chemistry, A.J.Saite, Paragaon Press, U.K.
4. Industrial Chemicals, Faith at al, Wiley Interscience, New York.
5. Outline of Chemical Technology, G.E. Dryden East West Press, New Delhi, EWP.
6. Introduction to Material Science and Engineering, K.M.Rells, T. Courtany and J-Wulff, Wiley Eastern Pvt. Ltd. New Delhi.
7. Unit Process in Organic Sythesis P. H. Groggins, McGraw Hill Kogakusin Ltd.

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Papar – VII

PETROLEUM AND POLYMERS

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Total Lectures - 60
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UNIT – I Manufacture of the following compounde, Methane cthylene **,** acetylene – preparation of the following from methane , methanol , hydrogen cynide, carbon disulphide – preparation from ethylene – ethanol ethylene oxide, ethylene Isopropanol form c – 4 hydrocarbone , butadiere , isobutance .- Preparation of benzene, toluene , xylene – naphthalene.

(Lectures – 12)

UNIT – II Introduction to Polymers – general characteristics of polymers in comparision with common organic compound – nomenclature - classification of polymers – functionality concept – types of a polymerization addition, condensation, ionic , co- ordination – mechanism of ionic polymerization – necessity of copolymers and copolymerization , blocks, graft copolymers – concept of cross linking – introduction concepts of kinetics of polymerization.

(Lectures – 12)

UNIT- III Molecular weight and molecular weight determination number, weight and viscocity average molecular weight methods of determining molecular weight – practical significance of molecular weight distribution – size of polymers – glass transition temperature (GTT), Factors affection GTT, Crystallinity in polymers, Solubility.

(Lectures – 12)

UNIT - IV Detail study of following thermosetting polymers with respect to synthesis, chemistry properties and application.

(i) Phenol – formaldehyde resins
(ii) Amino – resins : Urea – formaldehyde and melamine formaldehyde resins.
(iii) Polyrethanes
(iv) Epoxy resins : Grades of epoxy resins, curing process and itsimportance with mechanism.
(v) Elastomers – polyisoprene, Polybutadiene, Neoprene.

(Lectures – 12)

UNIT – V Detailed study of the following thermoplastic polymers with respect to synthesis, chemistry, properties and applications.

- Polyoletins – polyethylene, LDPE, HDPE, LIDPE polypropylene, ethylene – propylene copolymers – poly vinyl chloride, Teflon, polystyrene, homopolymers, copolymers such as SBR, ABS, SAN, Polyvinyl acetate – polyamide nylon 6, nylon 66 and other nylons – polyethers and polyesters. teraphthalate, polycarbonates – silicona – cellulosics such as acetate, butyrate, nitrate, ether, regenerated celluloses.

(Lectures – 12)

REFERENCE BOOKS :-

1. Introduction to petroleum Chemicals, M.Steiner, Pergaman Press.
2. Introduction to petroleum chemicals by sukumar Maitti Oxford and TBS Puls, Co. New Delhi.
3. A text on petro Chemicals by Dr. B. K. Bhasker Rao, Khanna Publishers, New Delhi.
4. Hand book of peteoleum refining process, R. A. Mayers, Mcgraw Hill Book Com., New York.
5. Physical Chemistry of Macromolecules, D.D.Deshpande, Vishal Publication, New Delhi - 1985
6. polymer Science, V.R.Gowarikar, M.V.Vishwanathan and J. Sreedhar Willey Eastern Ltd. 1986.

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Papar – VIII

PHARMACEUTICALS

In force from June 1999-2000

Total Lectures - 60
Three Hrs
Marks
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UNIT – I Historical Background and developments of pharmaceutical industry in India in brief – introduction or various pharmaco pocias – introduction to various formulations and roots of administration – various types of pharmaceutical excipients, their chemistry, process of manufacture and quality, specifications – surgical dressings, sutures, ligatures with respect to process, equipments, pacakaging and sterilization.

UNIT – II FDA, important schedules and some legal aspects of drugs – phytochemicals, introduction to plant, - classification of crude drugs, cultivation, collection, preparation, for market, packing and storage – physical evaluation of crude drugs, moisture content, extractive value, volatile content, foreign organic matter, Microswpical evaluation of starch, leaf Constand , stomatal number and index veinislet number and termination number and index veinislet number and termination number – introduction to chromatographic method for identification of crude drugs – chemical constitution of plants (carbohydrates, proteins, lipids, waxes, glycosides, alkaloids) – isolation procedure for reserpine and diosgenin.

(Lectures – 12)

UNIT – III Pharmaceutical packaging – introduction, selection of packaging material, ancillary materials, packaging machinery, quality control of packaging materials – pharmaceutical quality control, sterility testing, pyrogenic testing, glass testing, bulk density of powders.

(Lectures – 08)

UNIT – IV Clasification of various types of drugs with examples raw materials, process of manufacture, effluent handling etc of the following bulk drugs :

(i) Silfa drugs : sulfonamide, sulfamethoxazole

(ii) Antimicrobial : chloramphenicol, furazolidine, mercurochrome, isoniazid, Na-PHS.

(iii) Antinflammatory and analgesic : Salicylic acid and its derivatives, Ibuprofen, mefenamic acid.
(iv) Steroidal hormones : androgens, oestrogens gestrogens
(v) Vitamins : Vit-A, Vit B6, Vit – 6
(vi) Barhiturates : Phenobarbital, Pentobarbital
(vii) Blockers : Propanolol, Atenolol
(viii) Cardiovascular agents : methyl dopa
(ix) Antil histamines : Chloropheniramine maleate.

(Lectures – 14)

UNIT – V Products based on fermentation process brief idea of microorganisms, their structure, growth and usefulness. Enzyme systems usefulness, Enzyme systems useful for transformation, microbial products. General principal of fermentation process and product Processing. manufacture of antibiotics – Penicillin – 4 and semisynthetic penicillins, Rifamycin, tetrayclins vt-B12, Biotransformation processes for prednisolone, 11 – hydroxylation in steroids. Enzyme cataysed transformation, manufacture of ephedrine.

REFERENCE BOOKS :-

1. Practical pharmacognosy : By T.B.Willis, Practical Pharmacognesy By T. N. Vassudevan
2. Modern pharmacognosy by Ramstand McGraw Hill.
3. Principales of medicinal chemistry : W.D.Foye Lea and Febigen publications, philidelphia.
4. Text book of organic medicinal and pharmaceutical chemistry Willson, Gisvold, Derge, Dippinetl – Toopan.
5. Essentials of Medicinal Chemistry – Koroovas and Burkhatter Wiley – Interscience.
6. Indian pharmacoppes 1985.
7. British pharmacoppes 1990 Handbooks of drugs and cosmetic Acts by Mebrotra.
8. Pharmaceutical Excipiants.
9. Organic chemistry of Drug synthesis, Daniel Lednice and L.A. Mitscher, Wiley Intersience.
10. An Introduction to synthetic Drugs : P.P.Singh and P.M. Rangnekar. Himalaya Publication, Bombay.
11. Medicinal Chemistry by Berger.

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Papar – IX

FUNDAMENTALS OF CHEMICAL ENGINEERING, NDUSTRIAL ECONOMICS MANAGEMENT AND CHEMICAL ANALYSIS.

In force from June 1999-2000

Total Lectures - 60
Three Hrs
Marks
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Uni. Test Imp Lib.

Section - I

UNIT – I **FUNDAMENTALS OF CHEMICAL ENGINEERING**

Classification of fluids, mechanism and types of flow, mass and energy balances over the fluid flow system, major and minor energy lases – modes of heat transfer, fourier's law, thermal conductivity, thermal insulators, fourier's law, thermal and parallel, forced convaction. calculations based on heat exchange and evaporators.

(Lectures – 12)

UNIT – II Development of the project, evaluation of a process choice of process, selection of process equipments control system, terminology, manual and automatic cont closed and open loop control system, modes of controls action and control valves.

(Lectures - 12)

Section - II

INDUSTRIAL ECONOMICS MANAGEMENT AND INDUSTRIAL CHEMICAL ANALYSIS

UNIT - III Concept of scientific management in industry, function if management, decision making, planning organising, directing and control - Location of industry, management of human resources, selection incentives welfare and safety, material management inventory control.

(Lectures - 08)

UNIT - IV Factors involved in project cost estimation, method employed for the estimation of capital investment, capital, formation, estimation by cost accounting, interest and investment costs, time value of money, equivalence - Depreciationm methods of determining depreciation, taxes, selecting some aspects of marketing, pricing policy, profitability, criteria, economics of selecting alternatives, variation of cost with capacity, break even point, optimum batch sizes, production scheduling etc.

(Lectures - 08)

UNIT - V Sampling procedures, techniques of samping solids, liquids, gases - collecting and processing of data chromatography, paper chromatography, TLC, GLC, HPCL, U.V. - Visible spectroscopy - IR Spectroscopy - NMR spectroscopy - atomic absorption - flame photometry - netron diffraction - X - ray fluoroscene - fonselective electracies - lon chromatography.

REFERENCE BOOKS

1. Introduction to chemical engineering, waltes and bedge and juliur, Banche So McGraw Hill Book Co.
2. Ch. Tech. I (Volume - I) K. D. Chandra, S. Selkran, D. V. enkates - weran, K. R. Addarsh,, S.chand & Co. Ltd., New Delhi
3. Chemical engineering Plant design vilbrant and Dryden McGraw Hill Book Co.
4. Instrumentation Tech.(Vol.III) E-B. John.
5. Economics of Chemical Industry, Hempel E.H.
6. Industrial Organization and Management Behel.
7. Instrumental methods of chemical analysis Willard.
8. Instrumental methods of chemical analysis, chatwal , Anand.
9. Introduction to instrumental analysis – Braun R.D. , McGraw Hill Publishing Co.
10. Quantitative inorganic analysis, A Vogel. Longman Publication.
11. Chemical Analysis by Day & Underwood.
12. Instrumental Analysis by Sinch & Dixit.

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Industrial Chemistry – Vocational Syllabus

In force from June 1999-2000

PRACTICALS .

Three Days exam of 7 Hrs.
Marks :
140+ 40 +20 = 200
Uni. Test Imp .

INORGANIC

1. Purity determination of all heavy chemicals : amminia, urea, nitric acid, caustic soda , phosphoric acid .
2. Preparation of Heavy Chemicals.
   Raney Nickel , Aluminium iso propoxide Trimethyl phosphite sod. meloxide. potassium trioxalato ferrate, sod. ethoxide.
3. Limit tests for chlorides, sulphate , heavy metals , iron, lead and arsenic.
4. Gravimetric and Volumtric estimations :
   - i) Estimation of sulphur as Baso4 (gtavimetric)
   - ii) Determination of sulphate ash in Aspirin (gtavimetric)
   - iii) Determination of loss on drying Nacl (gtavimetric)
   - iv) Analysis of alloy such as Brass.
     Zn^{+2} as $Zn_{2p2p}o7$ gravimetrically .
     Cu^{+2} by iodometry Volumetrically .
   - v) Determination of adehydes and ketones (Acidimetry))
   - vi) Determination of the acid value / % of acid (Alkalimetry)
   - vii) Analysis of talcum powder (Comp leyometry.
   - viii) a) Determination of % purity of sod. benzoate .
     b) Estimation of isoniazid.
     c) Estimation of diazepam (Non aqueous titrations).
5. Analysis of dye intermediate : Nitrite Litrations , diazociupling , titanous chloride titration, estimation of Cu,Ni, Cretc.
6. i) Set Point :-
   - a) m – dinitro benzene
   - b) 2,4, dinitro chloro benzene
   - c) p – nitro chloro benzene
   - d) B naphthol
   - e) Acetic acid.
   - f) o – nitro chloro benzene
   - g) Phenol.

   ii) Nitrite Value :-
   - a) m – nitro aniline
   - b) Aniline

c) p – chloro aniline
d) o – toluidine
e) p – toluidine
f) Benzidine

iii) Coupling Value :-
a) phenyl methyl pyrazolone
b) 4 – hydroxy – N- methyl – quinolone
c) H acid
d) K acid
e) B – naphthol.
f)

ORGANIC

1. **Preparation of common Industrial Compounds**.
i) 4 – Aminobenzoic acid from 4- nitrotolune
ii) p – Dichlorobenzene from p – chloroaniline
iii) p – Iodonitrobenzene from p – Nitroaniline
iv) I – chloro – 2,4 dinitribenzene from chlorobenzene
v) o – chlorobenzoic acid from anthranitic acid.
vi) Aspirin from salicylic acid
vii) N , N – Dimethylaniline from aniline
viii) Paracetamol from p – amino phenol
ix) Cinnamic acid from benzaldehyde
x) Methyl orange
xi) Methyl red
xii) Orange II
xiii) Fluorescin

2. Estimations
i) Phenol by bromination Method
ii) Aniline by bromate , bromide method.
iii) Fomaldehyde Iodimetrically
iv) Acetone Iodometrically
v) Cinnamic acid (Olefin) by wij's
vi) Saponification Value of an oil.
vii) Ascorbic acid by cerric amminum sulphate
viii) Methyl Salicylate
ix) Formic acid.
x) Resolution of Racemic mizture of – Phenyl – ethyl amine.

3. i) Identification of polymers by simplo physical and chemical tests. Analysis of raw materials.
ii) Preparation of representative polymers .Bulk polymerization – Poly styrene , polyvinyl acetate .
Solution polymerization :- Phenol formaldehyde , urea formaldehyde, polysulphide Rubber.
iii) Determination of

a) Acid value of resin
b) Hydroxyl value of resin.
c) Iodine numer of linsed oil/ coconut oil.
d) Saponification Value of coconut oil, polyester
e) Melting point and softening point of polymer .

4 i) Paper chromatography of dyes.
ii) TLC method for identification (Intermediates , and drugs.)

5 (i) I.P. Monograph of drugs (Minimum - 3)
(ii) Evaluation of crude drugs microscopically .
a) Determination of Starch qrenules
b) Determination of Calcium oxalate.
c) Determination of Palisade retio.
d) Determination of Stomatal index.
(iii) Microbiological testing of some antibacterial drugs.

6 (a) Dyeing of the following dyes on cotton :
(i) Direct (ii) Azoics (iii) Acid.
(b) Dyeing of the following dyes on wool and silk.
(i) TPM – Silk (ii) Vat
(iii) Reactive (iv) Sulphur
(c) Evaluation of the fastness properties of dyes with respect to light , washing and sublimation.

PHYSICAL

Instrumental Exoperiments :-

1 Polarimetre :-

To determine the angle of retation of retation of tartaric acid solution and find out the concentration of unknown solution.

2. Potentiometer :-

To determine the amount of sodium borate present in the given solution.

3 Pycnometer :-

To determine the relative density of polymer by pycnometer .

4 Ostwald Viscometer :-

To determine the molecular weight of a polymer.

5 Redwood Viscometer :-

To determine the viscosity of petroleum product (Petrol, kerosene, diesel, oil).

6 Flash Point :-

To determine the flash point of petroleum product.

7 Stalagnometer :-

To determine the surface tension of petroleum products by Demonstration

Experiments :-

i) Pharmaceutical packaging of some materials

ii) Quality control test of some materials

iii) Cross breaking strength of polymers

iv) Coafficient if friction of polymers

v) Izod impact strength of polymers

vi) Shore hardness test of polymers

vii) Dart impact test of polymers

viii) Tensile strength of polymers .