

M.Sc. (Industrial Chemistry) III<sup>rd</sup> SemesterIC 301 - SPECTROSCOPY

INDUSTRIAL CHEMISTRY  
 M.A. M.Sc. Exam. Dec., 2016 (2016)  
 First/Third Semester (Third Sem)  
 Pages 01 to 11

UNIT - IUV-visible Spectroscopy

Theory, Instrumentation, Characteristic absorption of organic compounds. Woodward and Fieser rules for calculating  $\lambda_{max}$ . Interpretation of spectra. Application of UV-visible spectroscopy.

Photo electron spectroscopy

general theory and application of UV and X-Ray photo electron spectroscopy (UV PES and ESCA) a general idea of Auger photoelectron spectroscopy, application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

UNIT - IIInfrared Spectroscopy

Theory, vibration modes, instrumentation (Dispersive and non dispersive instrument), applications and interpretation of spectra  
 Brief idea of Raman Spectroscopy

UNIT - IIINuclear Magnetic Resonance Spectroscopy

Theory of NMR, Chemical Shift, Spin-spin splitting, environmental effect on NMR spectra. Instrumentation, CW or FTNMR instrument, rules governing the interpretation of  $H^1$  NMR spectra. Application in quantitative analysis, spectroscopy of other important nuclei.  $^{15}N$ ,  $^{19}F$ ,  $^{29}Si$ ,  $^{31}P$

$^{13}C$  NMR : Historical Development, various terms used in  $C^{13}$  NMR, application of  $C^{13}$  NMR to structure determination, two dimensional NMR spectroscopy, principle, the COSY experiment, COSY (DQF) and NOESY experiment, three dimensional NMR experiment

2  
 SS. 194 =  
 2  
 2.14  
 2.15  
 2.16

IC 382 - UNIT OPERATIONS

**UNIT - IV**

Concept, instrumentation & use of ESR spectroscopy, ENDOR, ELDOR

NQR: Theory, Instrumentation & application of nuclear quadrupole resonance spectroscopy.

**UNIT - V**

**Mass Spectroscopy**

Concepts in Mass spectroscopy, Instrumentation, rules of spectral interpretation and application of Mass spectroscopy, McLafferty rearrangement.

**Massbaur (Fe & Sn)**

General theory, instrumentation and important applications of Massbaur Spectroscopy.

5/19/21  
 2/14  
 -S.A.  
 -A.A.  
 2/18

3

## IC 302 - UNIT OPERATIONS

### UNIT - I

#### Distillation

Introduction; VLE, Batch and continuous distillation, McCabe Thiele method, Reflux ratio, q-line, Azeotropic, Steam and extractive distillation.

Equipment: plate columns and packed columns.

#### Absorption

Introduction, Liquid gas equilibrium selection criteria for solvent minimum gas liquid ratio type of packing. Equipments – packed columns, spray columns, bubble columns, packed bubble columns, mechanically agitated contactors.

### UNIT - II

#### Evaporation

Introduction; Equipments short tube (standard) evaporator, forced circulation evaporator, falling film evaporators, climbing film (upward flow) evaporators, wiped (agitated) film evaporators.

#### Heat Exchanger

Introduction; Equipments double pipe, Shell and tube, U-tube, Fine tube Heat exchanger

### UNIT - III

#### Crystallization

Introduction : Solubility, super saturation, nucleation, crystal growth, Equipment – tank crystallizer, agitated crystallizer, evaporator crystallizer, draft tube crystallizer.

#### Extraction

Introduction : selection of solvents, Equipments – spray column, packed column rotating disc column, mixer settler.

$$\frac{85.195}{2}$$

=  
214  
215  
216

(4)

## UNIT – IV

### Filtration

Introduction, Filter media and filter aids, Equipment – Plate and frame filter press, itch filter, rotatory drum filter, sparkler filter, candle filter, bag filter, centrifuge.

### Size Reduction and size Separation

Definition, objectives of size reduction, factors affecting size reduction, Law governing energy and power requirement of mills including ball mill, hammer mill, fluid energy mill etc.

### Mixing

Theory of mixing, solid – solid, solid-liquid and liquid – liquid mixing equipments

## UNIT – V

### Drying

Introduction; free moisture, bound moisture, drying curve, Equipments – tray drier, rotary dryer, flash dryer and spray dryer.

### Ideal Reactors

Performance equation for ideal CSTR & PFR, Batch reactor, Reactor fundamentals, Constant and Variable volume Batch reactor.

IC 303 A - POLYMER SCIENCE IIUNIT - IPolymer Rheology and Morphology

Introduction stress and strain, ideal elastic solid, Newtonian and non-newtonian fluid. Apparent viscosity the power, low molecular weight concept, weissenberg effects, rheological properties of fluid, melt fracture and irregular, time dependent flow, viscoelastic behaviour, mechanical model of a viscoelastic material relaxation enhancement under constant stress. Hysteresis, creep and relaxation of typical plastics.

Physical & mechanical testing of Polymer

Stress-strain measurement, dynamic mechanical behaviour, stress cracking, hardness, tear strength or tear resistance, resilience's, flex cracking resistance, abrasion resistance, impact resistance.

UNIT - IIPolymer processing

Compression moulding, casting, extrusion, Fiber-spinning, injection moulding, thermoforming

Polymer Products

Belting, hoses, rubber footwear, Rubber to metal bonded components, cellular rubbers, sports goods, cables, latex products, rubber rollers, extruded and moulded products.

UNIT - IIIFunctions and example of compounding ingredients

- |                     |                      |
|---------------------|----------------------|
| (1) Activators      | (2) Accelerators     |
| (3) Blowing agents  | (4) Softners         |
| (5) Pigments        | (6) Tactifers        |
| (7) Release agents  | (8) Reclaimed rubber |
| (9) Tactics         | (10) Ground crumb    |
| (11) Mineral rubber | (12) Retardec        |

