FD-608

M.Sc. 3rd Semester
Examination, Dec.-Jan., 2021-22

CHEMISTRY

Paper - I

Resonance Spectroscopy,
Photochemistry and Organocatalysis

Time : Three Hours] [*Maximum Marks* : 80
[*Minimum Pass Marks* : 16

Note : Answer **all** questions. The figures in the right-hand margin indicate marks.

Unit-I

1. (*a*) Explain the principle of ESR spectroscopy. Describe spin polarization of atoms and metal ions. 12

(*b*) Discuss application of ESR spectroscopy to transition metal complexes. 8

OR

Write notes on the following :

(*a*) Quadrupole moment 7

(*b*) Electric field gradient 7

(*c*) Coupling constant 6

Unit-II

2. (*a*) How would you determine dipole moment by photoelectron spectroscopy ? 10

(*b*) Discuss basic principle of photoacoustic spectroscopy. 10

OR

(*a*) What is Auger Effect ? Describe KLL Auger process and list out the applications of AES. 10

(*b*) Discuss chemical and surface applications of photoacoustic spectroscopy. 10

Unit-III

3. Write notes on the following : 5×4

(*a*) Stern-Volmer equation

(*b*) Photo-Fries reaction of anilides

(*c*) Photodegradation of polymer

(*d*) Quantum yield

OR

(*a*) Discuss the effect of light intensity on rate of reaction. 6

(*b*) Write a note on photo-chemical formation of smog. 7

(*c*) Describe a method for determination of rate constant of a reaction. 7

Unit-IV

4. (*a*) Describe various types of organometallic reactions. 10

(*b*) Write brief notes on the following : 5×2

(*i*) Alkene polymerization

(*ii*) Oxidative elimination

OR

(*a*) Discuss Wacker oxidation of alkenes. 10

(*b*) Write notes on the following : 5×2

(*i*) Asymmetric oxidation

(*ii*) Nature of heterogenons catalysis

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Paper - II

Chemistry of Biomolecules

Time : Three Hours] [*Maximum Marks* : 80
[*Minimum Pass Marks* : 16

Note : Answer **all** questions. The figures in the right-hand margin indicate marks.

Unit-I

1. (*a*) Discuss the role of ATP in biological system. 10

(*b*) Explain the statement that copper containing proteins are capable of catalyzing the disproportionation of superoxide ion. 10

OR

(*a*) Explain the standard free energy change in any one biochemical reaction. 8

(*b*) Write short notes on the following : 6×2

(*i*) Relation between Heme protein and oxygen intake

(*ii*) Synthetic model of cobalt complex

Unit-II

2. (*a*) Write the structure and importance of cytochrome P450. 8

(*b*) What is the difference between chiral recognition and molecular recognition ? Give suitable example. 8

(*c*) How the enzyme having Zn^{2+} lower the energy of transition state ? 4

OR

Write notes on any **two** of the following : 10×2

(*a*) Host-guest chemistry of enzyme

(*b*) Superoxide dismutase copper enzyme

(*c*) Biomimetic chemistry

Unit-III

3. (*a*) Give the classification of enzyme in detail. 10

(*b*) Give mechanism of reaction catalyzed by NAD+ and pyridoxal phosphate. 10

OR

Write notes on any **two** of the following : 10×2

(*a*) Structure and biological function of coenzyme A

(*b*) Effect of immobilization of enzyme activity

(*c*) Enzyme and recombinant DNA technology

Unit-IV

4. (*a*) What is muscular contraction ? Discuss its molecular mechanism, energy sources and molecular compound. 10

(*b*) Explain the structure and function of cell membrane. 10

OR

Write notes on any **two** of the following : 10×2

(*a*) Hydrogen ion titration curve

(*b*) Thermodynamics of membrane equilibrium

(*c*) Ion transport through cell membrane

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Paper - IV

Analytical Techniques and Data Analysis

Time : Three Hours] [*Maximum Marks* : 80
[*Minimum Pass Marks* : 16

Note : Answer **all** questions. The figures in the right-hand margin indicate marks.

Unit-I

1. (*a*) What is Sampling ? Discuss in brief the methodology used for sampling of pond water. 10

(*b*) Explain the following : 5×2

(*i*) Types of errors

(*ii*) t-tests

OR

(*a*) Explain principle, methodology and applications of base digestion. 10

(*b*) Explain the following : 5×2

(*i*) F-tests

(*ii*) Significant figures

Unit-II

2. (*a*) What is Extraction ? Discuss the methods of extraction. 10

(*b*) Discuss technique and applications of HPLC. 5

(*c*) Discuss the classification of chromatography. 5

OR

(*a*) Discuss technique and application of Thin-layer chromatography. 10

(*b*) Explain efficiency and selectivity of extraction. 5

(*c*) Define the term counter current extraction and retardation factor. 5

Unit-III

3. (*a*) Discuss the principle, instrumentation and application of DTA. 10

(*b*) Explain Automated methods. 5

(*c*) Discuss the principle and instrumentation of FIA. 5

OR

(*a*) Discuss the principle, methodology and application of Flow Injection Analysis. 10

(*b*) Discuss the principle, instrumentation of DSC method. 5

(*c*) Discuss the factors affecting DTA. 5

Unit-IV

4. (*a*) Discuss the principle, instrumentation and application of conductometry. 10

(*b*) Explain the following : 5×2

(*i*) Dropping mercury electrode

(*ii*) Polarized electrode

OR

(*a*) Discuss the principle, instrumentation and application of pH potentiometry. 10

(*b*) Explain the following : 5×2

(*i*) Cyclic voltammetry

(*ii*) Micro electrode

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Paper - III

Catalysis, Solid State and Surface Chemistry

Time : Three Hours] [*Maximum Marks* : 80
[*Minimum Pass Marks* : 16

Note : Answer **all** questions. The figures in the right-hand margin indicate marks. Log table or non-programmable calculator can be used.

Unit-I

1. (*a*) Explain nucleophilicity scales. 4

(*b*) Describe mechanism of Acid-Base dissociation. 8

(*c*) Describe electronic and structural effect on acidity and basicity. 8

OR

(*a*) What is acidity and basicity ? Explain with examples. 4

(*b*) Explain ambivalent nucleophile with examples. 4

(*c*) Describe Bronsted acid and base catalysis. 12

Unit-II

2. (*a*) Describe the effect of electrolyte on critical micelle concentration (CMC). 6

(*b*) Explain the thermodynamics of micellization. 6

(*c*) Describe the Laplace's equation. How many solutions does Laplace equation have ? 8

OR

(*a*) Describe Gibbs adsorption isotherm. 10

(*b*) Discuss the factors affecting the critical micelle concentration (CMC) value. 10

Unit-III

3. (*a*) Explain Non-stoichiometry imperfect and perfect crystals with example. 8

(*b*) Discuss thermodynamics of Schottky defect. 8

(*c*) Explain formantion of color centres. 4

OR

(*a*) Explain Schottky and Frankel defects with example. 4

(*b*) Give the thermodynamics of Frenkel defect. 8

(*c*) Describe electronic properties and band theory of semiconductors. 8

Unit-IV

4. (*a*) Define polymers. Mention various types of polymers. Discuss the free radical mechanism of polymerization. 12

(*b*) Describe the viscometry method of determination of molecular mass. 8

OR

(*a*) Discuss the kinetics of polymerization. 4

(*b*) Give brief account of chain topology and crystal structure of polymers. 6

(*c*) Derive expression for calculation of average dimensions of various chain structures. 10

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