

VIDHYADEEP UNIVERSITY

B.Sc. CHEMISTRY (04)

Teaching & Evaluation Scheme

Semester – I & II

Course name: Bachelor of Science (Chemistry)			Semester I						
Grade System:									
Subject			Teaching Scheme		Examination Scheme		Passing Scheme		Total Marks
Subject Code	Paper No.	Paper Title	Hours/week	Credit	Theory		Passing Head		
			Theory	Theory	Internal	External	Internal	External	
1091104101	CHEM. 101	Inorganic & Physical Chemistry.	2	2	20	50	9	17	70
1091104102	CHEM. 102	Organic Chemistry	2	2	20	50	9	17	70
1091104103	CHEM.P 103	Practicals	4	2	20	40	9	14	60

Course name: Bachelor of Science (Chemistry)			Semester II						
Grade System:									
Subject			Teaching Scheme		Examination Scheme		Passing Scheme		Total Marks
Subject code	Paper No.	Paper Title	Hours/week	Credit	Theory		Passing Head		
			Theory	Theory	Internal	External	Internal	External	
1091204201	CHEM . 201		2	2	20	50	9	17	70
1091204202	CHEM . 202		2	2	20	50	9	17	70
1091204203	CHEM .P 203	Practicals	4	2	20	40	9	14	60

VIDHYADEEP UNIVERSITY
VIDHYADEEP INSTITUTE OF SCIENCE, ANITA(KIM)

DEPARTMENT OF CHEMISTRY(04)

F.Y. SEM-1

- **PAPER :-101- INORGANIC & PHYSICAL CHEMISTRY (TOTAL HOURS-30)**
- **UNIT-1 SOLID STATE (10-H)**
 - DEFINITION OF SPACE LATTICE, UNIT CELL, DIFFERENCE BETWEEN CRYSTALLINE AND AMORPHOUS STATE, TYPES OF CRYSTALS WITH ILLUSTRATIONS, LAW OF CRYSTALLOGRAPHY. STENO'S LAW AND LAWS OF SYMMETRY, LATTICE PLANES, MILLER INDICES, BRAVAIS INDICES, TYPE OF CUBIC SYSTEM, DIAGRAMMATIC REPRESENTATION OF CUBIC SYSTEM AND D_{100} , D_{110} , D_{111} , PLANES, BRAGG'S EQUATION. (X-RAY DIFFRACTION), CRYSTAL STRUCTURE OF NaCl, KCl, (NUMERICAL BASED ON BRAGG'S EQUATION AND MILLER INDICES)
 - **REFERENCE BOOKS:**
 1. ESSENTIALS OF PHYSICAL CHEMISTRY BY A.S. BHAL AND PUB. S. CHAND, G.D. TULI.
 2. ADVANCE PHYSICAL CHEMISTRY BY D.N. BAJPAI, SUB: S. CHAND
 3. NUMERICAL PROBLEMS BY DOGRA AND DOGRA (FOR NUMERICAL)
 - **UNIT-2(A) CO-ORDINATION CHEMISTRY (6-H)**
 - SHAPE OF d-ORBITALS, CFT-BASIC ASSUMPTION, SPLITTING OF d-ORBITALS IN OCTAHEDRAL, TETRAHEDRAL, SQUARE PLANER COMPLEXES, DISTRIBUTION OF d^x ELECTRONS IN OCTAHEDRAL AND TETRAHEDRAL COMPLEXES AND CFSE(calculation).
 - **REFERENCE BOOKS:**
 1. INORGANIC CHEMISTRY BY WAHID MALIK, G.D. TULI, R.D. MADAM : PUB. S. CHAND

2. COORDINATION CHEMISTRY BY GURDIP CHATWAL, M.S. YADAV : PUB. HIMALAYA PUB. HOUSE
3. ADVANCE INORGANIC CHEMISTRY (VOL.2) BY SATYA PRAKASH, G.D. TULI, S.K. BASU,R.D. MADAN : PUB. S. CHAND

- **UNIT-2(B) ACID-BASE THEORIES (4-H)**

- ACID AND BASE DEFINATION
- P^H OF ACIDS AND BASES
- PROPERTIES OF ACIDS AND BASES
- ARRHENIUS THEORY
- LOWRY BRONSTED THEORY
- LEWIS THEORY
- SOLVENT- SOLUTE CONCEPT OF ACID- BASE
- HARD-SOFT ACID BASE AND ITS APPLICATION

- **REFERENCE BOOKS:**

1. ESSENTIALS OF PHYSICAL CHEMISTRY BY A.S. BAHL AND G.D. TULI, PUB : S. CHAND

- **UNIT-3(A) CHEMICAL KINETICS (6-H)**

- CHEMICAL KINETICS AND IT'S SCOPE, RATE OF REACTION, FACTORS AFFECTING RATE OF REACTION : TEMPERATURE, CONCENTRATION, PRESSURE, SOLVENT, LIGHT AND CATALYST, MOLECULARITY OF REACTION, CLASSIFICATION OF CHEMICAL REACTION, ORDER OF REACTION WITH ILLUSTRATION. SECOND ORDER (a=b), HALF LIFE AND MEAN LIFE.

- **REFERENCE BOOKS:**

1. ESSENTIALS OF PHYSICAL CHEMISTRY BY A.S. BAHL AND AND G.D. TULI, PUB: S. CHAND
2. ADVANCE PHYSUCAL CHEMISTRY BY D.N. BAJPAI, PUB : S. CHAND
3. NUMERICAL PROBLEMS BY D.V.S. JAIN, PUB : MC GRAW HILL (FOR NUMERICAL)

- **UNIT-3(B) PERIODIC PROPERTIES (4-H)**

DEFINITION OF ATOMIC AND IONIC RADII, IONISATION ENERYGY, ELECTRON AFFINITY AND ELECTRONE NEGATIVITY.
S-BLOCK ELEMENTS : COMPARATIVE STUDY, DIAGONAL RELATION SHIP, SALIENT FEATURES OF HYDRIDES.

- **REFERENCE BOOKS:**

1. MODERN INORGANIC CHEMISTRY BY GURDEEP RAJ
2. PRINCIPALS OF INORGANIC CHEMISTRY BY PURI, SHARMA AND KALIA, PUB: VISHAL PUBLISHING
3. INORGANIC CHEMISTRY BY J.D. LEE

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F.Y. SEM-2

➤ **PAPER : 201- INORGANIC & PHYSICAL CHEMISTRY (TOTAL HOURS-30)**

- **UNIT-1(A) BASIC PRINCIPLES OF QUALITATIVE. (4-H)**

- DRY REACTION : THEORY BEHIND BORAX BEAD TEST WITH EQUATION, FLAME TEST (THEORY, STRUCTURE OF NON LUMINOUS BUNSEN FLAME)
- ANALYSIS OF CATION : APPLICATION OF COMMONION EFFECT, SOLUBILITY PRODUCT CONSTANT COMPLEXOMETRIC REACTIONS INVOLVED IN QUALITATIVE ANALYSIS.

(1) (1) FOR IDENTIFICATION (REACTION BETWEEN Cu (II) ION WITH AMMONIA

FE (III) WITH THIOCYANIDE NH_4^+ WITH NESSLER REAGENT)

(2) FOR MASKING (Cd^{+2} , Cu^{+2})

(3) SEPARATION OF TWO IONS (Ag-Hg , Zn^{+2} , Mn^{+2})

- **REFERENCE BOOKS:**

1. QUALITATIVE ANALYSIS BY R.A. DAY AND A.L. UNDERWOOD

2. VOGEL'S QUALITATIVE INORGANIC ANALYSIS

- **UNIT-1(B) ATOMIC STRUCTURE.**

(6-H)

- HISTORICAL PERSPECTIVE OF ATOMIC STRUCTURE : RUTHERFORD'S ATOMIC MODEL, BOHR'S THEORY AND ITS LIMITATION, SPECTRUM OF HYDROGEN ATOM (LYMAN, BALMER, PASCHEN, BRACKETT & P FUND), QUANTUM NUMBERS, AUFBAU, HUND AND PAULI EXCLUSION PRINCIPLES, PENETRATION AND SHIELDING, EFFECTIVE NUCLEAR CHARGE (SLATER RULE)

- **REFERENCE BOOKS:**

1. UNIVERSITY GENERAL CHEMISTRY BY C.N. RAO PUB: MC MILLAN
2. PRINCIPLES OF PHYSICAL CHEMISTRY BY MARON & PRUTON, 4TH EDITION PUB: OXFORD & IBH
3. PHYSICAL CHEMISTRY BY G.M. BARROW

- **UNIT-2(A) CHEMICAL BONDING.**

(5-

H)

- DEFINITION OF CHEMICAL BONDS (COVALENT, CO-ORDINATE COVALENT, IONIC, METALLIC, H-BOND, VAN-DERWAALS FORCES OF ATTRACTION), POLARISABILITY (FAJAN'S RULE), MOLECULAR ORBITAL THEORY, LCAO METHOD, BONDING MOLECULAR ORBITAL, NON-BONDING MOLECULAR ORBITAL, ANTI-BONDING MOLECULAR ORBITAL, BOND ORDER, MAGNETIC PROPERTIES AND MOLECULAR ORBITAL ENERGY LEVEL DIAGRAM OF HETERONUCLEAR DIATOMIC MOLECULE : CO AND NO VSEPR THEORY.

- **REFERENCE BOOKS:**

1. CONCISE INORGANIC CHEMISTRY (5TH ED) BY J.D. LEE.
2. BASIC INORGANIC CHEMISTRY BY COTTON & WILKINSON.

- **UNIT-2(B) THERMODYNAMICS .**

(5-

H)

1. BASIC CONCEPTS IN THERMODYNAMICS

- (1) TYPES OF SYSTEMS
- (2) PROPERTIES OF SYSTEM
- (3) STATE
- (4) TYPES OF PROCESSES

2. CONCEPT OF HEAT AND WORK

3. FIRST LAW OF THERMODYNAMICS

- (1) INTERNAL ENERGY, ENTHALPY (2) HEAT CAPACITY, RELATION BETWEEN C_p AND C_v IN GASEOUS STATE (3) JOULE-THOMSON EFFECT (QUALITATIVE DISCUSSION AND EXPERIMENTATION) (4) WORK DONE FOR ADIABATIC AND ISOTHERMAL PROCESSES.

- **REFERENCE BOOKS:**
 1. PHYSICAL CHEMISTRY BY ARUNBAHL, B.S. BAHL AND G.D. TULI, PUB: S. CHAND
 2. ADVANCE PHYSICAL CHEMISTRY BY D.N. BAJPAI, PUB: S. CHAND

- **UNIT-3(A) CONDUCTANCE AND IONIC EQUILIBRIUM. (5-H)**
- ELECTRICAL CONDUCTANCE, SPECIFIC CONDUCTANCE, EQUIVALENT CONDUCTANCE, MOLAR CONDUCTANCE, EFFECT OF DILUTION ON CONCENTRATION, CELL CONSTANT, DETERMINATION OF CELL CONSTANT, OSTWALD'S DILUTION LAW AND ITS LIMITATIONS, ACID AND BASIC BUFFER ACTIONS (HENDERSON- HASSELBACH EQUATION), BUFFER CAPACITY, NUMERICAL.

- **REFERENCE BOOKS:**
 1. TEXT BOOK OF PHYSICAL CHEMISTRY BY P.L. SONI, O.P. DHARMA, PUB: S. CHAND

- **UNIT-3(B) PHYSICAL PROPERTIES AND CHEMICAL CONSTITUTION. (5-H)**
- CLASSIFICATION OF PHYSICAL PROPERTIES (ADDITIVE, CONSTITUTIVE COLLIGATIVE ADDITIVE CONSTITUTIVE), ATOMIC VOLUME, MOLAR VOLUME AND CHEMICAL CONSTITUTION, KOPP'S LAW, SURFACE TENSION, DROP NUMBER METHOD, PARACHOR, VISCOSITY, DETERMINATION OF VISCOSITY BY OSTWALD VISCOMETER NUMERICAL.

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- **REFERENCE BOOKS:**
 1. PRINCIPLES OF PHYSICAL CHEMISTRY BY PURI, SHARMA AND MADAN, PUB: VISHAL PUBLISHING
 2. ADVANCE PHYSICAL CHEMISTRY BY D.N. BAJPAI, PUB: S. CHAND

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F.Y. SEM-1**

- **PAPER:- 102- ORGANIC CHEMISTRY (TOTAL HOURS- 30)**
- **UNIT-1 ALKANES AND CYCLOALKANES. (10-H)**

(A) ALKANES : IUPAC NOMENCLATURE OF BRANCHED AND SIMPLE CHAIN ALKANES, CLASSIFICATION OF CARBON ATOMS IN ALKANES. ISOMERISM IN ALKANES, SOURCES, METHODS OF FORMATION SPECIAL. REFERENCE TO WURTZ REACTION, KOLBE REACTION AND COREY- HOUSE REACTION AND DECARBOXYLATION OF CARBOXYLIC ACIDS. PHYSICAL PROPERTIES AND CHEMICAL REACTIONS OF ALKANES. MECHANISM OF FREE REDICAL HALOGENATIONS OF ALKANES: ORIENTATION, REACTIVITY & SELECTIVITY.

(B) CYCLOALKANES : NOMENCLATURE, METHODS OF FORMATION, CHEMICAL REACTIONS, BAEYER'S STRAIN THEORY AND ITS LIMITATIONS RING STRAIN IN SMALL RINGS (CYCLO PROPANE AND CYCLO BUTANE , THEORY OF STRAINLESS RING. THE CASE OF CYCLO PROPANE RING, BANANA BONDS(CYCLOHAXEN-CHAIN AND BOAT FORM).

- **UNIT-2 (A) EMPIRICAL FORMULA, MOLECULAR FORMULA AND STRUCTURAL**

FORMULA.

(4-H)

- DETERMINATION OF EMPIRICAL FORMULA AND ITS RELATION WITH MOLECULAR FORMULA, DETERMINATION OF MOLECULAR WEIGHT OF **(A)** ORGANIC ACID BY SILVER SALT METHOD **(B)** ORGANIC BASE BY CHLOROPLATINATE METHOD AND ITS LIMITATIONS. NUMERICAL EXAMPLE.
- **(C)** C-H BOND AMPERICAL FORMULA METHOD.

UNIT-2 (B) CARBOHYDRATES : (6-H)

MODERN DEFINITION OF CARBOHYDRATES, CLASSIFICATION OF CARBOHYDRATES, FUNCTION OF CARBOHYDRATES, OPTICAL ISOMERS, DIASTEREOMERS, ENANTIOMERS RACIMATES OF GLUCOSE AND FRUCTOSE STRICTURE OF GLUCOSE AND FRUCTOSE ISOMERS, MUTAROTATION, GLUCOSIDE LINKAGE (PYRANOSE AND FURANOSE) D & L ISOMERS OF GLUCOSE AND FRUCTOSE, DERIVATIVES OF MONOSACCHARIDE STEP UP AND STEPDOWN SYNTHESIS, KILYANI SYNTHESIS, CONVERSION OF GLUCOSE TO FRUCTOSE AND CONVERSION OF FRUCTOSE TO GLUCOSE.

- **UNIT-3 (A) ORGANIC QUALITATIVE ANALYSIS. (2-H)**
 - (1) ELEMENTAL ANALYSIS (LASSAIGN'S TEST WITH EQUATION).
 - (2) SOLUBILITY OF ORGANIC COMPOUND (REF. VOGEL'S QUALITATIVE ORGANIC ANALYSIS).
 - CHEMICAL METHODS : SOLUBILITY IN NaHCO₃, NaOH AND HCL AND AMPHOTERIC COMPOUNDS (SULPHANILIC ACID AND ANTHRANILIC ACID).

- **UNIT-3 (B) HETROCYCLIC COMPOUNDS. (5-H)**
 - NOMENCLATURE AROMATICITY AND SYNTHESIS PROPERTIES USES AND CANONICAL STRUCTURES OF PYRROL, FURAN, THIOPHENE, PYRIDINE.

- **UNIT-3 (C) POLYNUCLEAR HYDROCARBONS. (3-H)**
 - CLASSIFICATION AROMATICITY AND INDUSTRIAL PREPARATION, PROPERTIES, USES AND CANONICAL STRUCTURES OF NAPHTHALENE, ANTHRACENE AND PHENANTHRENE.

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F.Y. SEM-2

➤ **PAPER :- 202- ORGANIC CHEMISTRY** (TOTAL HOURS-30)

- **UNIT-1 REACTION MECHANISM** (10-H)

HOMOLYTIC AND HETEROLYTIC FISSION REACTIVE INTERMEDIATE(FREE RADICALS, CARBONIUMION(CARBOCATIONS)ANDCARBANIONS,CARBENES, ARYNES AND NITRENES)

(A)

(B) TYPES OF REAGENTS, ELECTROPHILES, NUCLEOPHILES

(C) ELECTROMERIC,INDUCTIVE, CONJUGATIVE EFFECT

(D) TYPES OF REACTIONS: ADDITION, SUBSTITUTION, ELIMINATION, REARRANGMENTS ADDITION AND SUBSTITUTION WITH RESPECT TO ELECTROPHILIC AND NUCLEOPHILIC REACTION, SN¹ & SN².

(E) MECHANISM OF (1)ADDITION REACTION TO ALKENES AND DIENES (2)SUBSTITUTION IN BENZENE RING, (NITRATION, SULPHONATION, ALKYLATION, ACYLATION, HALOGENATION, CYANOHYDRIN FORMATION AND ACETAL FORMATION).

(F) REACTION MECHANISM (PERKIN REACTION, BENZOIN CONDENSATION AND CANNIZARO'S REACTION).

- **UNIT-2 STREOCHEMISTRY.** (10-H)

(A) ISOMERISM- OPTICAL ACTIVITY, CHIRAL AND ACHIRAL MOLECULES.

(B) OPTICAL ISOMERISM OF TARTARIC ACID, ENANTIOMERS, DIASTEREOMERS

(THRE & ERYTHRO), MESO COMPOUNDS RESOLUTION OF RACEMATES, INVERSION RETENTION AND RACEMIZATION.

(C) GEOMETRICAL ISOMERISM : ALKENE DERIVATIVE & OXIMES E & Z SYSTEM AND NOMENCLATURE.

(D) RELATIVE AND ABSOLUTE CONFIGURATION,SEQUENCE RULES d & l AND R & S SYSTEM OF NOMENCLATURE.

- **UNIT-3 ALKENES, DIENES AND ALKYNES:.** **(10-H)**

(A) ALKENES : NOMENCLATURE, METHOD OF PREPARATION, PROPERTIES AND USES OF ETHYLENE AND PROPYLENE, MARKOVNIKOFFS RULE AND SATYRZEFF RULE, POLYMERIZATION OF ETHYLENE STYRENE AND VINYL CHLORIDE.

ALKENES REACTIONS : HYDROBORATION, OXIDATION, EPOXIDATION, OZONOLYSIS, OXYMERCURATION, HYDROXYLATION, HYDROHALOGENATION, DEHYDRAHALOGENATIONS, HYDRATION.

(B) DIENES : NOMENCLATURE, CLASSIFICATION OF DIENES METHODS OF FORMATION OF BUTADIENE CHEMICAL REACTIONS 1,2 AND 1,4 ADDITIONS, DIEL'S-ALDER REACTION.

(C) ALKYNES : NOMENCLATURE, METHOD OF FORMATION CHEMICAL REACTIONS : HYDROBORATION, OXIDATION, METAL AMMONIA REDUCTION, POLYMERIZATION, ELECTROPHILIC AND NUCLEOPHILIC ADDITION REACTIONS OF ACETYLENE.

- **REFERENCE BOOKS :**

(1) ORGANIC CHEMISTRY VOL. I & VOL.II BY I.L. FINAR

(2) ORGANIC CHEMISTRY BY P.L. SONI

(3) ORGANIC CHEMISTRY BY B.K. SHARMA

(4) ORGANIC CHEMISTRY BY BAHL AND BAHL

(5) ORGANIC REACTION MECHANISM BY MUKHARJI & SINGH

(6) FUNDAMENTALS OF ORGANIC CHEMISTRY BY SOLOMAN JOHN WIELY

VIDHYADEEP INSTITUTE OF SCIENCE, ANITA(KIM)
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F.Y. SEM-1 PRACTICAL -103

(A) ORGANIC SPOTTING

- PRIMARY TESTS, IGNITION TEST, DETECTION OF ELEMENTS NATURE OF THE SUBSTANCE (SOLUBILITY TEST), FUNCTIONAL GROUP TESTS, C.T., MOLECULAR FORMULA, STRUCTURAL FORMULA & M.P. / B.P. OF THE GIVEN SUBSTANCE.
 - **ACID** – BENZOIC ACID, PHTHALIC ACID, SALICYLIC ACID
 - **BASE** – ANILINE, P&O NITRO ANILINE
 - **PHENOL** – α -NAPHTHOL, β -NAPHTHOL
 - **NEUTRAL** –
 - **CARBOHYDRATE** – GLUCOSE, FRUCTOSE
 - **KETONE** – ACETONE, ACETOPHENONE
 - **ESTER** – ETHYLE ACETATE, METHYL ACETATE
 - **ALCOHOL** – METHANOL, ETHANOL
 - **HYDROCARBON** – TOLUENE, NAPHTHALENE
 - **HALOGENATED HYDROCARBON** – CARBON TETRACHLORIDE
CHLOROBENZENE
 - **NITRO HYDROCARBON** – NITROBENZENE M-DINITRO
BENZENE
 - **AMIDE** – UREA
 - **ANILIDE** – ACETANILIDE
- N.B. CANDIDATE SHOULD PERFORM THE ANALYSIS OF AT LEAST 8 SUBSTANCES.

(B) VOLUMETRIC EXERCISE

H ₂ SO ₄	NaHCO ₃	HNO ₃
KMnO ₄	H ₂ C ₂ O ₄ .7H ₂ O	KOH
KMnO ₄	FeSO ₄	K ₂ Cr ₂ O ₇
K ₂ Cr ₂ O ₇	Fe-NH ₄ -SO ₄	KMnO ₄
H ₂ C ₂ O ₄	KMnO ₄	FeSO ₄

N.B. CANDIDATE SHOULD PERFORM AT LEAST 4 VOLUMETRIC EXERCISE.

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F.Y. SEM-2 PRATICAL (203)

(A) INORGANIC QUALITATIVE ANALYSIS

LIST OF INORGANIC CHEMICALS :

CHLORIDES : Cu^{+2} , Fe^{+3} , Mn^{+2} , Co^{+2} , Ni^{+2} , Ca^{+2} , Sr^{+2} , Na^{+} , K^{+} , NH_4^{+} , Ba^{+2}

BROMIDE : Na^{+} , K^{+} , NH_4^{+}

IODIDE : K^{+}

NITRATE : Pb^{+2} , Co^{+2} , Ni^{+2} , Ba^{+2} , Sr^{+2} , Na^{+} , K^{+}

SULPHIDE : Zn^{+2}

SULPHATE : Cu^{+2} , Al^{+3} , Fe^{+2} , Zn^{+2} , Mn^{+2} , Ca^{+2} , Ni^{+2} , Mg^{+2} , Na^{+} , K^{+} , NH_4^{+}

CHROMATE : Na^{+} , K^{+}

CARBONATE : Cu^{+2} , Zn^{+2} , Mn^{+2} , Co^{+2} , Ni^{+2} , Ca^{+2} , Ba^{+2} , Sr^{+2} , Mg^{+2} , Na^{+} , K^{+} , NH_4^{+}

PHOSPHATE : Cu^{+2} , Al^{+3} , Fe^{+3} , Zn^{+2} , Mn^{+2} , Mg^{+2} , Na^{+} , K^{+} , NH_4^{+}

N.B. CANDIDATE SHOULD PERFORM THE ANALYSIS OF AT LEAST 8 COMPOUNDS.

(B) PREPERATION OF STANDARD SOLUTION (BY STUDENT) OF FOLLOWING

1. 0.1 N SUCCINIC ACID AGAINST NaOH
2. 0.1 N KHP AGAINST NaOH / KOH
3. 0.01 N $\text{Na}_2\text{S}_2\text{O}_3$ AGAINST I_2 SOLUTION
4. 0.1N $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ AGAINST KMnO_4 SOLUTION
5. 0.1 N $\text{K}_2\text{Cr}_2\text{O}_7$ AGAINST $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

(OR)

$\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ SOLUTION

N.B. CANDIDATE SHOULD PERFORM AT LEAST 3 VOLUMETRIC EXERCISE.