

**CHEMISTRY (CHEM)**

<b>Total no. of weeks for classes / Year:</b>	<b>36</b>	
<b>Classes per week:</b>	<b>6</b>	<b>Th=4      Practical =2</b>
<b>Total classes per year:</b>	<b>216</b>	<b>Th=144      Practical =72</b>
<b>Total marks:</b>	<b>100</b>	<b>Th= 70      Practical = 30</b>

<b>UNIT I</b>	<b>SOLID STATE</b>
<p><b>Introduction:</b> Classification of solids based on differences in binding forces: ionic, molecular, covalent, metallic solids (definition with example).</p> <p>Crystalline and amorphous solids (elementary idea with examples)</p> <p>Two dimensional and three dimensional lattices</p> <p>Unit Cell – cubic unit cell</p> <p>[Primitive, body centered and face centered)</p> <p>Number of atoms per unit cell in a cubic cell.</p> <p>Schottky defect and Frenkel defect.</p>	
<b>UNIT II</b>	<b>SOLUTION</b>
<p><b>Types of Solutions:</b> Solution of solids in liquids, solubility of gases in liquids, solid solutions.</p> <p>Colligative properties: relative lowering of vapour pressure – Raoult's Law; Elevation of Boiling Point; Depression of Freezing Point; Osmotic Pressure. Reverse Osmosis (qualitative idea)</p> <p>Determination of molar masses using colligative properties.</p>	
<b>UNIT III</b>	<b>ELECTRO CHEMISTRY</b>
<p><b>Oxidation</b> – reduction reaction:</p> <p>Concept of red – ox reaction</p> <p>Oxidation number and balancing of simple red – ox reactions by oxidation number method.</p> <p>Red – ox titration:-</p> <p>Oxalic Acid – <math>\text{KMnO}_4</math></p> <p><math>\text{KMnO}_4</math> – <math>\text{Fe}^{2+}</math></p> <p><math>\text{K}_2\text{Cr}_2\text{O}_7</math> – <math>\text{Fe}^{2+}</math></p> <p><b>Conductance in electrolytic solutions:</b></p> <p>Specific and molar conductivity (definition with example)</p> <p>Electrolysis – Laws of Electrolysis</p> <p>Electrolytic Cell</p>	

Galvanic Cell (Voltaic Cell)	
Half – cell reaction, cell reaction, emf of a cell, standard electrode potential	
Dry cell (dry cell battery)	
Primary dry cell battery	
Common dry cell battery	
Alkaline battery	
Mercury battery	
Lithium battery	
Secondary dry cell battery	
Lead storage battery (lead accumulator)	
Nickel – cadmium (“ni – cad”) battery	
(precaution in disposal)	
(Only electrodes, cell reactions and emf of cells)	
Fuel cell.	
<b>CORROSION:</b> Introduction	
Cause of corrosion	
Factors influencing corrosion	
Various methods of corrosion control	
<b>UNIT IV</b>	<b>CHEMICAL KINETICS</b>
<b>Rate of a reaction (average and instantaneous):</b>	
Factors influencing rate of a reaction: concentration, temperature, catalyst.	
Order and molecularity of a reaction.	
Rate law of first order, second order and zero order reaction.	
Definition of half life of a reaction.	
Concept of activation energy of a reaction	
<b>UNIT V</b>	<b>SURFACE CHEMISTRY</b>
<b>ADSORPTION:</b> Physisorption and chemisorption; factors affecting adsorption of gases on solid catalysis: homogeneous and heterogeneous	
<b>COLLOIDAL STATE:</b> Distinction between true solutions, colloids and suspensions; lyophobic and lyophilic colloids.	
<b>PROPERTIES OF COLLOIDS:</b> Tyndal effect, Brownian Movement, electrophoresis, coagulation	
<b>EMULSION:</b> Type of emulsion	
<b>UNIT VI</b>	<b>EXTRACTION OF METALS</b>
General principles and methods of extraction	
Ores and minerals	

Concentration: Froth floatation

Calcination, roasting

Flux and slag

Electrolytic reduction, carbon reduction

Self reduction

Occurrence and principles of extraction of aluminium, copper and iron (no technical details)

Distinction and uses of cast iron, wrought iron and steel.

**ALLOYS:** Purpose of making alloys

Composition and uses of Bronze, Brass, Bell Metal, Duralumin, Stainless Steel.

## **UNIT VII | S – BLOCK & P – BLOCK ELEMENTS**

S – Block Elements (alkali and alkaline earth metals)

### **GROUP 1 AND GROUP 2 ELEMENTS**

General introduction

Elements of groups 1 & 2

Electronic configuration

Trends in variation in ionization enthalpy, atomic and ionic radii.

Trends in chemical reactivity with oxygen and halogens.

### **P – BLOCK ELEMENTS**

General introduction

Anomalous behavior of first period elements compared to heavier elements of each group – to highlight differences in oxidation states and composition of compounds.

### **GROUP 13 ELEMENTS**

Elements of Group 13, Valence Shell electronic configuration, possible oxidation states, natural occurrence comparative chemical properties of boron and aluminium - reaction with acids and alkalis.

Uses of some important compounds of boron and aluminium: boric acid, boron trifluoride, diborane, alumina, alums, anhydrous aluminium chloride

### **GROUP 14 ELEMENTS**

Elements of group 14

Valence Shell electronic configuration

Oxidation states

Natural occurrence

Carbon: catenation property; allotropic forms – physical properties and uses. Uses of silicon and carborundum.

### **GROUP 15 ELEMENTS**

Elements of group 15, valence shell electronic configuration, possible oxidation status with examples of respective compounds; natural occurrence; allotropy of phosphorous.

Comparative chemical reactivity of nitrogen and phosphorous with respect to reaction with oxygens & halogens

Important compounds of nitrogen and phosphorous; Nitrous acid & nitric acid; phosphine, phosphorous pentoxide, phosphorous pentachloride, phosphorous acid and phosphoric acid (preparation and uses only)

### **GROUP 16 ELEMENTS**

Elements of group 16, valence shell electronic configuration, possible oxidation status with examples of respective compounds, natural occurrence (chalcogens) (allotropy of Sulphur)

Preparation, physical properties and reaction of ozone (oxidation reaction with mercury, lead sulphide, lead sulphide and acidified KI)

Important compounds of Sulphur : Hydrogen Sulphide – use in analysis of basic radicals.

Sulfur dioxide and sulfur trioxide [preparation and uses]

Sulfur dioxide shows both oxidizing and reducing properties – explanation with examples.

### **GROUP 17 ELEMENTS**

Elements of Group 17, valence shell electronic configuration, possible oxidation status with examples of compounds; natural occurrence (halogens)

Preparation of halogens (only preparative reaction) and comparative reactions of halogens: oxidizing property, reaction with water and alkali.

Hydrohalic acid : preparation and reactions; detection of halides.

Bleaching powder – preparation and uses

### **GROUP 18 ELEMENTS**

Elements of group 18

General electronic configuration, chemical inertness, occurrence, important uses.

## **UNIT VIII**

**Compounds of xenon : xenon fluorides – preparation and structure only.**

**d- BLOCK ELEMENTS:** General introduction and electronic configuration, occurrence and characteristic of transition metals, general trends in properties of the first row transition metals – ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic property, alloy formation.

Preparation and properties of  $K_2Cr_2O_7$  and  $KMnO_4$

**UNIT IX      COORDINATION COMPOUNDS**

**Coordination compounds:** introduction with examples ligands, coordination number, shapes

Bonding: Werner's Theory and Simple Isomerism

A few important coordination complex (formula, structure, colour):

Brown ring compound, sodium nitroprusside, tetraamine copper (II) sulphate.

A few examples of coordination compounds, important in biological system: haemoglobin, chlorophyll, Vitamin  $B_{12}$  (nature and function)

**UNIT X      HALOALKANES AND HALOARENES**

**HALOALKANES:** Introduction

Preparation : Preparation from alcohols by reaction with  $PX_3$  ( $\alpha = Cl, Br$ ), Iodine and red phosphorous thionyl chloride.

Haloform reaction – preparation of chloroform and iodoform [preparative methods not required]

Physical properties

Chemical properties – hydrolysis and dehydrohalogenation

Reaction of methyl iodide with Mg – Grignard reagent

Uses of chloroform and iodoform

**FREONS:**

Introduction, examples, uses and environmental hazards.

DDT and its environmental hazards.

**HALOARENES:**

Introduction

Preparation of chlorobenzene and bromobenzene

Substitution reaction (directive influence of chlorine) : Nitration of chlorobenzene

**UNIT XI      ALCOHOLS, PHENOLS AND ETHERS**

**ALCOHOLS:**

Aliphatic alcohol and aromatic alcohol (benzyl alcohol)

Introduction

Primary, secondary and tertiary alcohols (examples)

Method of preparation (primary alcohol only): Hydrolysis of alkyl halides

Hydrolysis of esters

Reduction of esters

(Bouvault Blanc Reduction)

Preparation of methanol from water gas and synthesis gas .

Preparation of ethanol by fermentation and hydration of ethene

Preparation of rectified spirit, absolute alcohol, spectroscopic alcohol, "super dry" alcohol.

Identification of methanol and ethanol

Physical properties

Chemical properties : oxidation; reaction with Na,  $\text{PCl}_5$ ,  $\text{SOCl}_2$ , esterification reaction, uses of methanol and ethanol.

### **PHENOLS:**

Introduction

Preparation (phenol) from aniline (laboratory process) by cumene process (industrial process)

### **CHEMICAL PROPERTIES:**

Acidic nature of phenol. Acetylation, Benzoylation reaction with  $\text{Br}_2$  – water, Reimer – Tieman reaction. Kolbe-Schmitt reaction. Phenol – formaldehyde resin.

Identification and uses of phenol.

### **ETHERS:**

#### ALIPHATIC ETHER AND AROMATIC ETHER (ANISOLE)

Introduction

Preparation of diethyl ether from ethanol (no experimental details)

Williamson Synthesis.

Preparation of anisole from phenol

Physical properties

Chemical properties: inflammability of diethyl ether (precaution to be taken)

Reaction with HI

Reaction of diethyl ether with aerial oxygen in the presence of light.

Preparation of peroxide – free diethyl ether

Uses of diethyl ether

<b>UNIT XII</b>	<b>ALDEHYDES, KETONES AND CARBOXYLIC ACIDS AND THEIR DERIVATIVES</b>
-----------------	--

### **ALDEHYDES:**

Aliphatic aldehydes and aromatic aldehyde (benzaldehyde)

### **KETONES**

Aliphatic ketones and aromatic ketone (acetophenone)

Introduction

Preparation

From:

Alcohols

Carboxylic acid

Acid chlorides (Rosemund reduction – aldehydes)

Gatterman – Koch and Gatterman aldehyde

Synthesis (benzaldehyde)

Friedel – craft acylation reaction (acetophenone)

Physical properties

Chemical properties

Oxidation reaction (including reaction of aldehydes with Fehling's and Tollens' Reagents)

Reduction reactions

Reduction with  $H_2$  / Catalyst;

Na – Hg,  $H_2O$ ; lithium aluminium hydride, sodium borohydride; Clemmensen reduction

Addition reaction : with HCN and  $NaHSO_3$

Hemiacetal and acetal formation

Reaction with hydroxylamine, hydrazine, phenylhydrazine, 2,4 – dinitrophenylhydrazine (Brady's Reagent), Semicarbazide

Aldol reaction

Cannizzaro and crossed cannizzaro reaction

Benzoin condensation

Perkin reaction

Distinction between aldehydes and ketones

Identification of acetaldehyde and acetone formation – uses.

### **CARBOXYLIC ACIDS:**

Aliphatic carboxylic acids and aromatic carboxylic acid (benzoic acid)

Introduction

Preparation

By the oxidation of alcohols and aldehydes, oxidation of toluene (benzoic acid).

By the hydrolysis of alkyl and aryl cyanides

By using Grignard reagent B

By the hydrolysis of esters.

Physical properties

Chemical properties

Acidic properties – reaction with alkali and  $NaHCO_3$ .

Reaction with  $\text{PCl}_3$ ,  $\text{PCl}_5$  and  $\text{SOCl}_2$

Esterification reaction

Hunsdiecker reaction

Hell – Volhard – Zelinsky reaction

Identification of formic acid and acetic acid.

Uses of Acetic Acid

**DERIVATIVES OF CARBOXYLIC ACIDS:**

Acetyl chloride, acetic anhydride, Acetamide ethyl acetate – preparation and uses

**UNIT XIII | ORGANIC COMPOUNDS CONTAINING NITROGEN**

**AMINES:**

Introduction

Classification – primary, secondary and tertiary amines (examples with structures)

Preparation of primary amines by

reduction of nitro compounds.

Gabriel's phthalimide synthesis.

Hofmann degradation reaction

**ANILINE**

Preparation from nitrobenzene

Physical properties

Chemical properties

Basic nature

Isocyanide (carbylamine) reaction

Diazo reaction.

**BENZENEDIAZONIUM SALTS:**

Preparation

Reactions involving replacement of diazo group by H, OH, Halogen, CN,  $\text{NO}_2$

Coupling reaction

Reduction

**CYANIDES AND ISOCYANIDES:** preparation

**NITRO COMPOUNDS:**

Introduction

Preparation of nitroethane

Nitrobenzene and 1,3-di-nitrobenzene

Reduction of nitrobenzene under different conditions.

**UNIT XIV | BIOMOLECULES**

**CARBOHYDRATES:**

Introduction

Classification (aldose and ketose)

Monosaccharides

Glucose and fructose structure (no elucidation) with D/L nomenclature

Oxidation and reduction reactions

Osazone formation

Identification

**OLIGOSACCHARIDES:**

Sucrose structure (no elucidation)

Non reducing sugar, hydrolysis

Identification

Polysaccharides:

Starch, Monomer units, Hydrolysis

Identification

**PROTEINS:**

Introduction

Elementary idea of  $\alpha$  - amino acids (examples: glycine, alanine, cysteine, serine, methionine, aspartic acid) zwitterionic structure, isoelectric point.

Peptide bond, polypeptides

Primary structure of proteins

Identification

**NUCLEIC ACID:**

DNA & RNA

Nucleotides and nucleosides

**UNIT XV**

**POLYMERS**

Natural and synthetic polymers

Homopolymer and copolymer

Polymerization reaction : addition and condensation polymerization

Thermoplastics and thermosetting plastics (definition with examples)

Preparation (no technical details) and uses of polyethylene, Teflon, Bakelite, Nylon, Terylene (synthetic fibres)

Hazards of using plastic materials

Biodegradable polymers

**UNIT XVI**

**CHEMISTRY IN EVERY DAY LIFE**

**CHEMICALS IN MEDICINES:**

Analgesics, antipyretics, tranquilisers, antimicrobials, antifungals, antifertility drugs, anti viral drugs, antacids, antihistamines, antimalarials, antiseptics, disinfectants (examples only)

Side effects of aspirin and paracetamol

**CHEMICALS:**

In food preservatives, artificial sweetening agents

**CLEANSING AGENTS:**

Soaps and detergents – their chemical composition and cleansing action.

**UNIT WISE DISTRIBUTION OF MARKS AND PERIODS**

UNIT	MARKS	NO. OF PERIOD
I	03	08
II	04	08
III	06	10
IV	04	08
V	04	10
VI	04	08
VII	08	16
VIII	04	08
IX	03	08
X	04	10
XI	05	08
XII	06	08
XIII	04	08
XIV	04	10
XV	04	08
XVI	03	08
<b>16</b>	<b>70</b>	<b>144</b>

Total

**PRACTICALS (72 periods)**

**CHEMISTRY PRACTICAL LAB**

Practical (72 Pds)

**LIST OF EXPERIMENTS:**

**EXPERIMENT 1**

- 1.1 To prepare starch sol (hydrophilic sol)
- 1.2 To prepare hydrated ferric oxide sol (hydrophobic sol)

## **EXPERIMENT 2**

- 2.1 To prepare potash alum
- 2.2 To prepare ferrous ammonium sulfate (Mohr's Salt)
- 2.3 To prepare acetanilide
- 2.4 To prepare 1-phenylazo-2-naphthol dye (2-naphtholamine dye)

## **EXPERIMENT 3**

To identify one of the following functional groups present in a solid organic sample:-

Aromatic primary amino (azodye test)

Phenolic- OH (FeCl<sub>3</sub> test)

Carboxylic acid group (NaHCO<sub>3</sub> test)

Aldehyde and Ketonic groups (Brady's Reagent and Tollen's Reagent test)

## **EXPERIMENT 4**

- 4.1 To prepare methyl orange indicator solution
- 4.2 To prepare BDS indicator solution
- 4.3 To prepare Fehling's Solution A and Fehling's Solution B
- 4.4 To prepare 0.1 M Mohr's Salt Solution in 0.5 – 1 M H<sub>2</sub>SO<sub>4</sub>

## **EXPERIMENT 5**

To identify carbohydrates, fats and proteins given as pure samples.

## **EXPERIMENT 6**

General acquaintance with chemical balance – sartorius / bunge / electronic (preferably electronic )

- 6.1 To prepare ~ 0.1 N standard sodium carbonate solution
- 6.2 To determine the strength of unknown ~ 0.1N HCL/H<sub>2</sub>SO<sub>4</sub> (in normality, molarity and g/l) by titration with the standard ~ 0.1 N Na<sub>2</sub>CO<sub>3</sub> solution.
- 6.3 To prepare standard 0.1 N oxalic acid solution
- 6.4 To determine the strength of unknown 0.1N NaOH solution (in normality, molarity and g/l) by titration with the standard ~ 0.1N oxalic acid solution.
- 6.5 To determine the strength of unknown ~ 0.1 N KMnO<sub>4</sub> solution (in normality, molarity and g/l) by titration with the standard ~ 0.1 N oxalic acid solution.

- 6.6 To determine the amount of iron in g/l present in the unknown  $\sim 0.1N$  Mohr's Salt Solution by titration with the standardised  $0.1N$   $KMnO_4$  solution.
- 6.7 To prepare standard  $\sim 0.1 N$   $K_2Cr_2O_7$  solution.
- 6.8 To determine the amount of iron in g/l in the unknown  $\sim 0.1N$  Mohr's Salt Solution by the standard  $\sim 0.1N$   $K_2Cr_2O_7$  solution.

### MARKS DISTRIBUTION

SL NO	DESCRIPTION	MARKS
01	One Expt. From Expt. 1 (any one) or Expt. 2 (any one) [Both the expts will be set and the candidate will choose one by lottery].	6
02	One Expt from Expt. 3 or Expt.4 (any one) or Expt.5 [All three Expts. will be set and the candidate will chose one by lottery].	5
03	Expt. 6 (any one)	12
04	Viva Voce	3
05	Laboratory Note Book	4
<b>TOTAL MARKS</b>		<b>30</b>

**Physics (PHYS)**

<b>Total no. of weeks for classes / Year:</b>	<b>36</b>		
<b>Classes per week:</b>	<b>6</b>	<b>Th=4</b>	<b>Practical =2</b>
<b>Total classes per year:</b>	<b>216</b>	<b>Th=144</b>	<b>Practical =72</b>
<b>Total marks:</b>	<b>100</b>	<b>Th= 70</b>	<b>Practical = 30</b>

Sl. No.	TOPIC	PERIODS
<b>UNIT I</b>	<b>ELECTROSTATICS</b>	15
	<p>Electric charge; conservation of charge, Coulomb's Law – force between two point charges; principle of superposition – force due to multiple charges.</p> <p>Electric field - electric field due to a point charge, electric field lines; electric dipole – field due to a dipole, torque on a dipole placed in uniform electric field.</p> <p>Electric flux – Gauss' theorem and its applications to find field due to uniformly charge infinite plane sheet and uniformly charged thin spherical shell [field inside and outside].</p> <p>Electric potential, potential difference, relation between intensity of electric field and potential, potential due to a point charge, equipotential surface. Potential energy of two point charges.</p> <p>Conductors and insulators, free charge and bound charge inside a conductor. Dielectrics and electric polarization. Capacitor and capacitance, combination of capacitors in series and in parallel. Parallel plate capacitor, energy stored in a capacitor, Van De Graff generator.</p>	
<b>UNIT II</b>	<b>CURRENT ELECTRICITY</b>	10
	<p>Electric current, flow of electrons in a metallic conductor, drift velocity, and its relation with electric current, volume density of current; Ohm's law, electrical resistance. V-I characteristics [linear and non-linear] electrical energy and power, units of power, electrical resistivity and conductivity.</p> <p>Carbon resistors, colour code for carbon resistors, series and parallel combination of resistors; temperature dependence of resistors. Potential difference and e.m.f. of cells, internal resistance of a cell, series and parallel combination of cells, secondary cell.</p>	

	Kirchhoff's laws and simple applications. Wheatstone bridge, metre bridge, potentiometer-principle and its applications to measure potential difference and for comparing emf of two cells, measurement of internal resistance of a cell. Household wiring, three pin plug point, miniature circuit breaker [MCB].	
<b>UNIT III</b>	<b>MAGNETIC EFFECT OF CURRENT &amp; MAGNETISM</b>	16
	<p>Concept of magnetic field, Oersted's experiment. Biot Savart Law and its application to current carrying circular loop at the centre, magnetic moment due to a current carrying circular loop. Ampere's circuital law and its applications to infinitely long straight wire, straight and toroidal solenoids. Force on a moving charge in uniform magnetic and electric fields. Force on a current carrying conductor in a uniform magnetic field. Force between two parallel current carrying conductors (no deduction) – definition of ampere. Torque on a current carrying loop in uniform magnetic field; moving coil galvanometer and its conversion to ammeter and voltmeter.</p> <p>Earth's magnetic field and magnetic elements. Dia, para- and ferro-magnetic substances. Electro magnet and permanent magnet.</p>	
<b>UNIT IV</b>	<b>ELECTROMAGNETIC INDUCTION &amp; ALTERNATING CURRENTS</b>	16
	Electromagnetic induction; Faraday's laws, induced e.m.f and current; Lenz's law; eddy currents, self and mutual inductance. Alternating current, peak and rms values of alternating current and voltage; reactance and impedance; series LCR circuit, resonance, power in AC circuits, Wattless Current. AC generator and transformers, its different types; power station-thermal and hydel; transmission and distribution of power, renewable energy (basic principle only).	
<b>UNIT V</b>	<b>ELECTROMAGNETIC WAVES</b>	7
	Need for displacement current; Electromagnetic waves and their characteristics; Transverse nature of electromagnetic waves. Electromagnetic spectrum.	
<b>UNIT VI</b>	<b>OPTICS</b>	25
	<p>Reflection of light, spherical mirror, mirror formula, refraction of light, total internal reflection and its application, optical fibres. Refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, combination of thin lenses in contact. Refraction and dispersion of light through a prism, dispersive power of prism.</p> <p>Scattering of light – blue colour of the sky and reddish appearance of the sun at sun rise and sun set.</p> <p>Optical instruments: Microscopes and astronomical telescopes [reflecting and refracting] and their magnifying powers (no deduction), human eye – image formation and accommodation, correction of eye defects using lenses.</p> <p>Wave optics: wave front and Huygens' principle. Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light.</p> <p>Diffraction due to a single slit, width of central maxima (no deduction).</p>	

Polarization: plane polarized light, Brewster's law, uses of plane polarized light and polaroids.		
<b>UNIT VII</b>	<b>DUAL NATURE OF MATTER &amp; RADIATION</b>	10
Dual nature of radiation, photoelectric effect, Einstein's photoelectric equation, particle nature of light. Matter waves – wave nature of particles, de Broglie relation.		
<b>UNIT VIII</b>	<b>ATOMS &amp; NUCLEI</b>	10
Bohr's model, energy level, hydrogen spectrum. Continuous and characteristic x rays spectra. Composition and size of nucleus, atomic masses, isotopes, isobars, isotones. Radio activity – alpha, beta and gamma particles / rays and their properties; radioactive decay law.  Mass energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission and fusion.		
<b>UNIT IX</b>	<b>ELECTRONIC DEVICES</b>	20
Energy bands in solids – conductors, insulators and semiconductors; pn junction diodes – I-V characteristics in forward and reverse bias; diodes as rectifier – half wave, full wave and bridge rectifier; filter. I-V characteristics of LED, Zener diode, voltage regulator, three-pin voltage regulator.  Junction transistor, transistor action, transistor configurations, input and output characteristics of a transistor in common emitter [CE] configuration. Transistor as an amplifier in CE configuration – diac, triac, SCR, LDR, Photodiodes, Phototransistor, solar cell. Logic gates – OR, AND, NOT, NAND and NOR gates. NAND & NOR gate as universal gate. Transistor as a switch.		
<b>UNIT X</b>	<b>COMMUNICATION SYSTEM</b>	15
Elements of a communication system [block diagram only], band width of signal [audio, video and digital]; bandwidth of a transmission medium, transmission media. Noise, Signal to noise [S/N] ratio.  Propagation of electromagnetic waves – ground, sky and space waves.  Need for modulation – production and detection of amplitude modulated wave, satellite communication.		

### UNIT WISE DISTRIBUTION OF PERIODS AND MARKS

UNIT	TITLE	Periods	Marks
I	Electrostatics	15	08
II	Current Electricity	10	05
III	Magnetic effect of Current & Magnetism	16	08
IV	Electromagnetic induction and Alternating Current	16	08
V	Electromagnetic Waves	07	03
VI	Optics	25	12

VII	Dual Nature of Radiation & Matter	10	05
VIII	Atoms & Nuclei	10	05
IX	Electronic Devices	20	10
X	Communication Systems	15	06
<b>TOTAL</b>		<b>144</b>	<b>70</b>

### MARKS DISTRIBUTION

Units	Titles	MCQ [1 Mark]	Very short answer type question [1 mark]	Short answer type question [3 marks]	Long answer type question [5 marks]	Total marks
I	Electrostatics	1 x 3	1 x 2	3 x 1		08
II	Current Electricity	1 x 4	1 x 1			05
III	Magnetic effect of current & magnetism			3 x 1	5 x 1	08
IV	Electromagnetic induction and alternating current	1 x 1	1 x 1	3 x 2		08
V	Electromagnetic waves			3 x 1		03
VI	Optics	1 x 1	1 x 3	3 x 1	5 x 1	12
VII	Dual nature of radiation & matter	1 x 1	1 x 1	3 x 1		05
VIII	Atoms & Nuclei	1 x 2		3 x 1		05
IX	Electronic Devices	1 x 1	1 x 1	3 x 1	5 x 1	10
X	Communication System	1 x 2	1 x 1	3 x 1		06
<b>TOTAL NO.OF QUESTIONS</b>		<b>15</b>	<b>10</b>	<b>10</b>	<b>03</b>	<b>70</b>

- MCQ should have 4 options with only one correct answer.
- Alternative questions should be from the same unit.
- For short answer type question, marks [3] should be divided into smaller parts like 1+2 or 1+1+1
- For long answer type question, marks [5] should be divided into smaller parts like 1+4 or 2+3 or 1+1+3.

### OPTION PATTERN

SL NO	QUESTION PATTERN	NO. OF OPTIONS
01	Very short answer type questions	At least 5
02	Short answer type questions	At least 6
03	Long answer type questions	3

## PRACTICALS (72 periods)

### PHYSICS PRACTICAL LAB

#### **Practical (72 Pds)**

Every student has to perform at least 10 (Ten) experiments out of the list of following experiments and to carry out one project under the guidance of teacher.

#### **LIST OF EXPERIMENTS**

- 1) To measure resistance of a given wire using metre bridge and hence to find the specific resistance of its material.
- 2) To compare the emf of two given primary cells using potentiometer.
- 3) To verify the laws of series and parallel combination of resistance using post office box.
- 4) To determine resistance of a galvanometer by half deflection method and to find its figure of merit.
- 5) To convert the given galvanometer of known resistance and figure of merit into an ammeter and voltmeter of desired range and to verify the same.
- 6) To find the focal length of a convex lens by plotting  $1/u$  against  $1/v$ .
- 7) To determine refractive index of a glass slab using a travelling microscope.
- 8) To construct a full wave rectifier using pn junction diodes with capacitor filter and to draw load current – load voltage graph and hence to find percentage regulation using bread board.
- 9) To draw the I-V characteristics of a Zener Diode in the reverse bias and to find the break down voltage.
- 10) To draw the output characteristics of a pnp/npn transistor in the common –emitter configuration and to find the current gain.
- 11) To verify the truth table of NAND / NOR gate and to show that they are universal gate [using bread board].
- 12) To study the variation of resistance of a LDR with intensity of light from LED as a source [using bread board]
- 13) Use of solar cell as generator of energy.
- 14) To fabricate and test a circuit consisting of two lines, one with two bulbs and a fan and the other with a high current plug point using a MCB and feed by AC mains.

**Students should be conversant with the use of multi-meter.**

#### **EVALUATION SCHEME FOR PRACTICAL EXAMINATION**

01	One experiment to be performed	15 marks
02	Practical record	05 marks
03	Project	05 marks
04	Viva voce on experiment and project	05 marks
<b>TOTAL</b>		<b>30 marks</b>

**MATHEMATICS (MTH2)****Total no. of weeks for classes / Year: 36****Classes per week: 5                      Th=4                      Practical/Project=1****Total classes per year: 180                      Th=144                      Practical/Project =36****Total marks: 100                      Th= 80                      Project = 20****COURSE CONTENTS:****Theory: (144 Pds)**

	CONTENT [NAME OF THE TOPIC]		PERIODS
UNIT I	ALGEBRA [MARKS : 10]		20
	1.1	Concept, notation, order, equality, types of matrices, zero matrix, transpose, symmetric and skew symmetric matrices, operations on matrices, invertible matrices [upto 3 <sup>rd</sup> order]	
	1.2	Determinant of a square matrix [upto 3 <sup>rd</sup> order], properties of determinant, minor, co-factor and application in calculating the area of triangle. Adjoint and inverse of a square matrix, Cramer's rule [unique solution].	
UNIT II	DIFFERENTIAL CALCULUS [MARKS:25]		44
	2.1	INTUITIVE IDEA OF LIMIT AND CONTINUITY $\lim_{x \rightarrow a} (x^m - a^n) / (x - a)$ , $\lim_{x \rightarrow 0} (\sin x / x)$ , $\lim_{x \rightarrow 0} (e^x - 1) / x$ , $\lim_{x \rightarrow 0} (a^x - 1) / x$ , $\lim_{x \rightarrow 0} \ln(1+x) / x$ Testing of continuity problems	
	2.2	<b>DEFINITION</b> – derivative of standard function, rules for differentiation, differentiation of parametric, logarithmic and implicit functions.	
	2.3	Successive differentiation upto 2 <sup>nd</sup> order problems	

	<b>2.4</b>	<b>Application of derivative:</b> a) Maxima-Minima, simple problems [that illustrate basic principles and understanding of the subject as well as the real life situations]. b) Tangent Normal: Equation of tangent and normal for standard curves and its condition.		
<b>UNIT III</b>	<b>INTEGRAL CALCULUS [MARKS:25]</b>		<b>30</b>	
	<b>3.1</b>	Integration as the inverse process of differentiation, list of formulae for integration – substitution, by parts and evaluation of integrals by these methods.		
	<b>3.2</b>	Definite integral – rules and properties of definite integral [statement only] – evaluation of definite integral.		
	<b>3.3</b>	Application of definite integral in finding the area under simple curves [specially lines, circle, parabola, ellipse] area between the two above said curves [region should be clearly identified].		
<b>UNIT IV</b>	<b>DIFFERENTIAL EQUATION [MARKS:10]</b>		<b>25</b>	
	<b>4.1</b>	Definition, order and degree of a differential equation – solution of differential equation of 1 <sup>st</sup> order by the method of separation of variables, solution of homogeneous differential equation of 1 <sup>st</sup> order and 1 <sup>st</sup> degree.		
<b>UNIT V</b>	<b>VECTOR [MARKS:10]</b>		<b>25</b>	
	<b>5.1</b>	Vector and scalar, magnitude and direction of a vector, types of vector [equal, unit, zero, parallel and co-linear vectors], position vector of a point, negative of a vector, addition of vectors, multiplication of vectors by scalar, position vector of a point dividing a line segment in a given ratio. Scalar [dot] product of vectors, projection of a vector on a line, vector [cross] product of two vectors.		
<b>UNIT VI</b>	<b>PROJECT [MARKS:20] [ANY TWO]</b>		<b>36</b>	

6.1	Determination of area bounded by a known curve [straight line, circle, parabola, ellipse] by definite integral [using graph paper].		
6.2	Detail discussion on maxima and minima of a given function.		
6.3	Discussion on origin and formation of differential equation and its solution.		
6.4	History, development and application of matrix and matrix algebra.		

**MATH QUESTION PATTERN**  
**CLASS XII**

CHAPTER	NO. OF QUESTION	MARKS ALLOTTED	
<b><u>ALGEBRA</u></b> <ul style="list-style-type: none"> <li>Matrices</li> <li>Determinant</li> </ul>	LA-1(Out of 2) SA – VSA – 1(Out of 2) MCQ – 3	05 - 02 03	} 10
<b><u>DIFFERENTIAL CALCULUS</u></b> <ul style="list-style-type: none"> <li>Limit Continuing</li> <li>1<sup>st</sup> Order derivative</li> <li>2<sup>nd</sup> Order derivative</li> <li>Maxima – minima</li> <li>Tangent Normal</li> </ul>	LA – 2 (Out of 4) SA – 2 (Out of 4) VSA – 2(Out of 4) MCQ – 3	10 08 04 03	} 25
<b><u>INTEGRAL CALCULUS</u></b> <ul style="list-style-type: none"> <li>Indefinite integral</li> <li>Definite integral</li> <li>Area evaluation</li> </ul>	LA – 1 (Out of 3) SA – 3 (Out of 5) VSA – 2 (Out of 4) MCQ – 4	05 12 04 04	} 25
<b><u>DIFFERENTIAL EQUATION</u></b> <ul style="list-style-type: none"> <li>Order degree of differential equation</li> <li>Solution of 1<sup>st</sup> order differential equation by separation of variable.</li> <li>Solution of homogeneous differential equation of 1<sup>st</sup> order and 1<sup>st</sup> degree</li> </ul>	LA – SA – 2 (Out of 4) VSA – 1 (Out of 2) MCQ	- 8 2 -	} 10
<b><u>VECTOR</u></b> <ul style="list-style-type: none"> <li>Magnitude, direction, different types of vector, position vector of a point etc.</li> <li>Scalar (dot) and vector (cross) product of two vectors.</li> </ul>	LA – SA – 2 (Out of 4) VSA – 1 (Out of 2) MCQ	- 8 2 -	} 10

MCQ – 10 X 1 = 10 (No. of alternatives)

VSA – 7 X 2 = 14 (Total 14 Questions)

SA – 9 x 4 = 36 (Total 17 Questions)

LA – 4 X 5 = 20 (Total 9 Questions)

80 Total 50 Questions