



THE BHAWANIPUR EDUCATION SOCIETY COLLEGE

A MINORITY RUN COLLEGE. AFFILIATED TO UNIVERSITY OF CALCUTTA
RECOGNISED UNDER SECTION 2(F) & 12 (B) OF THE UGC ACT, 1956

B.SC. MID - TERM EXAMINATION SCHEDULE & SYLLABUS, SESSION 2017 - 2018

It is hereby notified to all B.Sc. 2nd year students that their Mid- Term Examination for Honours & General papers will be held as per schedule given below.

| Routine for B.Sc. (H) 2nd Year Mid-Term test- 2017 | | | | |
|--|----------------------------------|-----------------------|-----------------|-------------------|
| Honours Subjects | Days & Dates | Timings | Room No. | Full Marks |
| Chemistry | Wednesday, 22/11/2017 | 11:00am-3:00pm | 418 | 80 |
| Physics | | 11:00am-3:00pm | 418 | 80 |
| Mathematics | | 11:00am-3:00pm | 410 | 80 |
| Economics | | 11:00am-3:00pm | 425, 426 | 80 |
| Computer Science | | 11:00am-3:00pm | 410 | 80 |

Syllabus for Mathematics Honours and Marks Distribution

MODERN ALGEBRA II (6 MARKS)

ENTIRE SYLLABUS

LINEAR PROGRAMMING AND GAME THEORY (14 MARKS)

1. DEFINITION OF L.P.P. FORMATION OF L.P.P. FROM DAILY LIFE INVOLVING INEQUALITIES. GRAPHICAL SOLUTION OF L.P.P. BASIC SOLUTIONS AND BASIC FEASIBLE SOLUTION (BFS) WITH REFERENCE TO L.P.P. MATRIX FORMULATION OF L.P.P. DEGENERATE AND NON-DEGENERATE B.F.S.

2. HYPERPLANE, CONVEX SET, CONE, EXTREME POINTS, CONVEX HULL AND CONVEX POLYHEDRON. SUPPORTING AND SEPARATING HYPERPLANE. THE COLLECTION OF ALL FEASIBLE SOLUTIONS OF AN L.P.P. CONSTITUTES A CONVEX SET. THE EXTREME POINTS OF THE CONVEX SET OF FEASIBLE SOLUTIONS CORRESPOND TO ITS B.F.S. AND CONVERSELY. THE OBJECTIVE FUNCTION HAS ITS OPTIMAL VALUE AT AN EXTREME POINT OF THE CONVEX POLYHEDRON GENERATED BY THE SET OF FEASIBLE SOLUTIONS. (THE CONVEX POLYHEDRON MAY ALSO BE UNBOUNDED). IN THE ABSENCE OF DEGENERACY, IF THE L.P.P. ADMITS OF AN OPTIMAL SOLUTION THEN AT LEAST ONE B.F.S. MUST BE OPTIMAL. REDUCTION OF A F.S. TO A B.F.S.

3. SLACK AND SURPLUS VARIABLES. STANDARD FORM OF L.P.P. THEORY OF SIMPLEX METHOD. FEASIBILITY AND OPTIMALITY CONDITIONS.

ANALYSIS II (6 MARKS)

SERIES UPTO CAUCHY'S CONDENSATION TEST

DIFFERENTIAL EQUATIONS I (14 MARKS)

UPTO LINEAR 1ST ORDER DIFFERENTIAL EQUATION

REAL-VALUED FUNCTIONS OF SEVERAL REAL VARIABLES (12 MARKS)

1. POINT SETS IN TWO AND THREE DIMENSIONS: CONCEPT ONLY OF NEIGHBOURHOOD OF A



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POINT, INTERIOR POINT, LIMIT POINT, OPEN SET, CLOSED SET.
2. CONCEPT OF FUNCTIONS ON IRN.
3. FUNCTION OF TWO AND THREE VARIABLES: LIMIT AND CONTINUITY, PARTIAL DERIVATIVES, SUFFICIENT CONDITION FOR CONTINUITY, RELEVANT RESULTS REGARDING REPEATED LIMITS AND DOUBLE LIMITS.
APPLICATION OF CALCULUS (8 MARKS)
1. TANGENTS & NORMALS: SUB-TANGENT AND SUB-NORMALS. ANGLE OF INTERSECTION OF CURVES. PEDAL EQUATION OF A CURVE, PEDAL OF A CURVE
2. CONCAVITY, CONVEXITY, SINGULAR POINTS, NODES, CUSPS, POINTS OF INFLEXION, SIMPLE PROBLEMS ON SPECIES OF CUSPS OF A CURVE (CARTESIAN ONLY)
3. CURVATURE- RADIUS OF CURVATURE, CENTRE OF CURVATURE, CHORD OF CURVATURE, EVOLUTE OF A CURVE.
ANALYTICAL GEOMETRY OF THREE DIMENSIONS II (10 MARKS):
SPHERE, CONE
ANALYTICAL DYNAMICS OF A PARTICLE I (10 MARKS)
ENTIRE SYLLABUS

Syllabus for Physics Honours

Magnetic effect of steady current

Lorentz force and concept of magnetic induction; force on linear current element; Biot-Savart's law. $\nabla \cdot \mathbf{B} = 0$; magnetic vector potential; calculation of vector potential and magnetic induction in simple cases – straight wire, magnetic field due to small current loop; magnetic dipole; field due to a dipole; magnetic shell; Ampere's theorem; Ampere's circuital law – simple illustrations; force between long parallel current carrying conductors; $\nabla \times \mathbf{B} = \mu_0 \mathbf{j}$; comparison between static electric and magnetic fields.

Electromagnetic induction

Faraday's and Lenz's law; motional e.m.f.-simple problems; inductances in series and parallel; reciprocity theorem LR, CR and LCR circuits- transient and sinusoidal emf cases, calculation of self and mutual inductance in simple cases.

Interference of light waves

Young's experiment; spatial and temporal coherence; intensity distribution; Fresnel's biprism, interference in thin film; fringes of equal inclination and equal thickness; Newton's ring. Michelson's interferometer.

Multiple beam interference – reflected and transmitted pattern. Fabry-Perot interferometer

Old quantum theory

Planck's formula of black-body radiation. Photoelectric effect. Bohr atom and quantization of energy levels

Basic Concepts

Microscopic and macroscopic points of view : thermodynamic variables of a system, State function, exact and inexact differentials.

First Law of Thermodynamics

Thermal equilibrium, Zeroth law and the concept of temperature. Thermodynamic equilibrium, internal energy, external work, quasistatic process, first law of thermodynamics and applications including magnetic systems, specific heats and their ratio, isothermal and adiabatic changes in perfect and real gases.

Second Law of Thermodynamics

Reversible and irreversible processes, indicator diagram. Carnot's cycles-efficiency, Carnot's theorem. Kelvin's scale of temperature, relation to perfect gas scale, second law of thermodynamics – different formulations and their equivalence, Clausius inequality, entropy, change of entropy in



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simple reversible and irreversible processes, entropy and disorder; equilibrium and entropy principle, principle of degradation of energy.

Syllabus for Chemistry Honours

Inorganic Chemistry

CHT 21a

Unit II. Other Types of Bonding

Molecular orbital concept of bonding (elementary pictorial approach): sigma and pi-bonds, multiple bonding, MO diagrams of H_2 , F_2 , O_2 , C_2 , B_2 , CO, NO, CN^- , double salts and complex salts, Werner theory of coordination compounds. Ambidentate and polydentate ligands.

CHT 21b

Unit I. Chemistry of s- and p-block Elements

(i) Structure, bonding and reactivity of B_2H_6 ; $(SN)_x$ with $x = 2, 4$; phosphazenes; interhalogens. (ii) Structure of borates, silicates, polyphosphates, borazole.

Organic Chemistry:

Electrophilic addition to $C=C$: Mechanism, reactivity, regioselectivity and stereoselectivity.

Reactions: halogenations, hydrohalogenation, hydration, hydrogenation, epoxidation, hydroxylation, ozonolysis, electrophilic addition to diene (conjugated dienes and allenes).

Radical addition: HBr addition. Dissolving metal reduction of alkynes and benzenoid aromatics (Birch). Pericyclic addition: Diels-Alder reaction. Addition of singlet and triplet carbenes.

1,2-shift: Rearrangement to electron-deficient carbon (Wagner-Meerwein rearrangement, pinacol rearrangement, dienone-phenol; Wolff rearrangement in Arndt-Eistert synthesis, benzil-benzilic acid rearrangement). Electron-deficient nitrogen (Beckmann rearrangement, Schmidt rearrangement, Hofmann rearrangement, Lossen rearrangement, Curtius rearrangement). Electron-deficient oxygen (Baeyer-Villiger oxidation, hydroperoxide rearrangement (cumene hydroperoxide-phenol rearrangement), Dakin reaction).

Physical Chemistry

CHT 23a

Unit I. Thermodynamics and Equilibrium

Open system, chemical potential and activity, partial molar quantities, chemical potential in terms of Gibbs' free energy and other thermodynamic state functions and its variation with temperature and pressure. Gibbs-Duhem equation; fugacity of gases and fugacity coefficient.

Thermodynamic conditions for equilibrium, degree of advancement. Van't Hoff's reaction isotherm (deduction from chemical potential). Explanation of the free energy versus degree of advancement plot. Equilibrium constant and standard Gibbs free energy change.

Definitions of K_P , K_C and K_x ; van't Hoff's reaction isobar and isochore from different standard states. Shifting of equilibrium due to change in external parameters e.g. temperature and pressure. Le Chatelier's principle and degree of advancement. Activity and activity coefficients of electrolyte / ion in solution. Debye-Huckel limiting law (statement and applications only). Solubility equilibrium and influence of common ions and indifferent ions thereon. PH, buffer solution, buffer capacity, salt hydrolysis (detailed treatment).

CHT 23b

Unit II. Electrochemistry

Types of electrochemical cells and examples, cell reactions, emf and change in free energy, ΔH and ΔS of cell reactions from emf measurements. Thermodynamic derivation of Nernst equation. Standard cells. Half-cells / electrodes, different types of electrodes (with examples). Standard electrode potential (IUPAC convention) and principles of its determination. Types of concentration cells. Liquid junction potential and its minimisation. Glass electrode and



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determination of pH of a solution. Potentiometric titrations: acid-base and redox.

Syllabus for Computer Science Honours

Discrete Mathematical Structures

Graphs: Introduction, Finite and Infinite Graphs, Directed and Undirected Graphs, Degree. Isolated vertex, Pendant vertex, Null graphs. Walks, Paths and Circuits, Connected and Disconnected graphs, Euler's graphs, Hamiltonian paths and circuits, Trees, Introduction and basic properties, Distance and contents, Matrix representation of graphs, Incidence, Adjacency and Circuit matrices

Mathematical Logic: Proposition, Predicates and Quantifiers. Sets. Functions, Growth of Functions, Big O Notation, Big Omega and Big-Theta Notations.

Numerical Methods and Algorithms

Interpolation: Newton Forward and Backward interpolation

Integration: Trapezoidal and Simpson's 1/3rd Rules and its Composite forms.

Formal Languages and Automata Theory

Introduction To Formal Languages, DFA, NFA and their Equivalence.

Data Structures-II

Trees: Introduction, Quantitative Properties, Binary Tree, Tree traversals, Internal and external path lengths: Properties, Minimum and maximum path length of a binary tree, Importance.

Binary Search Trees: Introduction, Searching, Insertion, Deletion.

Programming through C Language

Introduction: History, Basic Structure, Algorithms, Structured programming constructs.

C Programming elements: Character sets, Keywords, Constants, Variables, Data Types, Operators- Arithmetic, Relational, Logical and Assignment; Increment and Decrement and Conditional.

Syllabus for Economics Honours

Paper IIIA: Microeconomics

Unit I: Consumer Theory

1.1 Assumptions on preference ordering, indifference curve, marginal rate of substitution and convexity of IC, budget constraint, consumers's; equilibrium – interior and corner, Derivation of Demand Curves from ICs, composite good convention.

Application: Cash subsidy versus subsidy in kind.

1.2 Income and price consumption curves Price effect - substitution effect (Hicks and Slutsky), inferior goods and Giffen goods, income effect, ordinary and compensated demand curves.

1.3 Inter-temporal choice (saving and borrowing).

1.4 Revealed preference.

1.5 Choice under uncertainty- utility function and expected utility, risk aversion and risk preference (concepts only)

Paper IIIB: Macroeconomics

Unit 1: The Economy in the Long Run

1.1 The classical analysis of the real sector-determination of employment, income and interest rate.

1.2 Job Loss, Job finding and Natural Rate of Unemployment.

1.3 Money and Inflation - quantity theory of money, seigniorage and inflation tax,



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inflation and interest rates, nominal interest rate and demand for money.

Unit 2: The Economy in the Short Run

2.1 Simple Keynesian analysis of aggregate demand without and with the government sector, multiplier.

Paper IVA: Development Theory

Unit 1: Concepts and measures of development

1.1 Nature, Questions and Values of Development, Meanings of development – economic growth, redistribution from growth and capabilities approach to development, Objectives of development.

1.2 Measures of development – Purchasing power parity and Per capita income as an index of development, difference between growth and development, human development index.

1.3 Definition of developing economy.

1.4 Characteristics of a developing economy.

Unit 2: Process of Development – theoretical perspectives

2.1 Theories of transition – Clark and Fisher on change in sectoral share; Rostow's stages of growth; Kuznets's characteristics of Growth; Industrialisation, Growth and Kaldor's growth laws; The neo-classical approach of market and growth.

Paper IVB: Indian Economy Since Independence

Unit 1: Indian Economy at the time of Independence

Features of Indian Economy around 1947-1950 and characteristics of economic underdevelopment of India (with reference to colonial rule of India)

Unit 2: Planning: Evolution of India's Development Goal and Strategy

The background and Structure of Indian Planning.

Unit 3: Land and Agriculture

3.1 Land and tenancy system- sharecropping- Different dimensions of Land Reform – Productivity Debate – Marketable Surplus. Green Revolution – features of green revolution – positive and negative impacts of green revolution. Performance of Indian agriculture.

3.2 Green Revolution – features of green revolution – positive and negative impacts of green revolution. Performance of Indian agriculture.



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| Routine for B.Sc. (G) 2nd Year Mid-term test- 2017 | | | | | |
|--|--------------------------------|-----------------------------|----------------------------|-----------------|-------------------|
| General Subjects | Days & Dates | Timings | | Room No. | Full Marks |
| | | 1st half | 2nd half | | |
| Physics | Tuesday 24/11/2017 | 11:00am - 1:00pm | NA | 418 | 50 |
| Statistics | | NA | 1.30pm - 3.30pm | 418, 410 | 50 |
| Electronics | | | 1.30pm - 3.30pm | 425 | 50 |
| Chemistry | | | 1.30pm - 3.30pm | 425 | 50 |
| Computer Science | | | 1.30pm - 3.30pm | 425 | 50 |
| Mathematics | Saturday 25/11/2017 | 11:00am - 1:00pm | NA | 430, 425 | 50 |