UNIVERSITY OF RAJASTHAN
JAIPUR

SYLLABUS

B.Sc. PART-II

Examination-2020
Scheme of Examination
B.Sc. (Pass Course) Part-II

The number of paper and the maximum marks for each paper together with the minimum marks required for a pass are shown in the scheme of examination against each subject separately. It will be necessary for a candidate to pass in the theory part as well as the practical part of a subject/paper. Wherever prescribed separately. Classification of successful candidates shall be as follows:

First Division 60% of the aggregate marks prescribed at (a) Part first
Second Division 48% Examination excluding those obtained in the compulsory subject (b) Part Second Examination (c) Part Third Examination taken together.

All the rest will be declared to have passed the Examination. If they obtain a minimum pass marks in each subject viz 36% No division shall be awarded at the Part First and Part Second Examinations:

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University of Rajasthan
Jaipur
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B.Sc. Pt. II

1. PHYSICS

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Paper-I: Thermodynamics and Statistical Physics

Work Load: 2 hrs. Lecture/week

Examination Duration: 3 Hrs.

Scheme of Examination: First question will be of nine marks comprising of six parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit-1

Thermal and adiabatic interactions: Thermal interaction; Zeroth law of thermodynamics; System in thermal contact with a heat reservoir (canonical distribution); Energy fluctuations; Entropy of a system in a heat bath: Helmholtz free energy; Adiabatic interaction and enthalpy; General interaction and first law of thermodynamics; Infinitesimal general interaction; Gibb's free energy; Phase transitions. Clausius Clapeyron equation; Vapour pressure curve. Heat engine and efficiency of engine. Carnot's Cycle. Thermodynamic scale as an absolute scale: Maxwell relations and their applications.

Unit-2

Production of low temperatures and applications: Joule Thomson expansion and J 1 coefficients for ideal as well as Vander Waal’s gas, porous plug experiment. Temperature inversion. Regenerative cooling. Cooling by adiabatic expansion and demagnetization. Liquid helium, He I and He II. Superfluidity. Refrigeration through helium dilution. Quest for absolute zero. Nernst heat theorem


Transport phenomena: Mean free path, distribution of free paths, coefficients of viscosity, thermal conductivity, diffusion and their interaction.

Unit-3


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Unit-4


Paper- II: Mathematical Physics and Special Theory of Relativity

Work Load: 2 hrs. Lecture /week

Examination Duration: 3 Hrs.

Scheme of Examination: First question will be of nine marks comprising of six parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

UNIT-1

Orthogonal curvilinear coordinate system, scale factors, expression for gradient, divergence, curl and their application to Cartesian, circular cylindrical and spherical polar coordinate.

Coordinate transformation and Jacobian, transformation of covariant, contra-variant and mixed tensor; Addition, multiplication and contraction of tensors; Metric tensor and its use in transformation of tensors.

Dirac delta function and its properties.

UNIT-2

Lorentz transformation, Length Contraction, Time Dilation, Mass variation, rotation in space-time like and space-like vector, world line, macro-causality.

Four vector formulation, energy momentum four vector, relativistic equation of motion, invariance of rest mass, orthogonality of four force and four velocity, Lorentz force as an example of four force, transformation of four frequency vector, longitudinal and transverse Doppler's effect.

Transformation between laboratory and center of mass system, four momentum conservation, kinematics of decay products of unstable particles and reaction thresholds: Pair production, inelastic collision of two particles, Compton effect.

UNIT-3

(a) Transformation of electric and magnetic fields between two inertial frames. Electric field measured in moving frames. Electric field of a point charge moving with constant velocity.

(b) The second order linear differential equation with variable coefficient and singular points. Series solution method and its application to the Hermite's, Legendre's and Laguerre's differential equations. Basic properties like orthogonality, recurrence relation, graphical representation and generating function of Hermite, Legendre and Laguerre functions (simple applications).

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UNIT-4
Techniques of separation of variables and its application to following boundary value problems in Laplace equation in three dimensional Cartesian coordinate system: line charge between two earthed parallel plates. (i) Helmholtz equation in circular cylindrical coordinates (ii) Cylindrical resonant cavity. (iii) Wave equation in spherical polar coordinates the vibrations of a circular membrane. (iv) Diffusion equation in two dimensional Cartesian coordinate system heat conduction in a thin rectangular plate. (v) Laplace equation in spherical coordinate system (vi) Electric potential around a spherical surface.

Paper III: Electronics and Solid State Devices

Work Load: 2 hrs. Lecture/week
Examination Duration: 3 Hrs.

Scheme of Examination: First question will be of ten marks comprising of five parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit 1: Circuit analysis and PN junctions
Circuit analysis: Networks: some important definitions, loop and nodal equation based on D.C. and A.C. circuits (Kirchhoff's Laws). Four terminal network: Ampere volt conventions, open, close and hybrid parameters of any four terminal network, Input, output and mutual impedance for an active four terminal network. Various circuit theorems: Superposition, Thevenin, Norton, reciprocity, compensation, maximum power transfer and Miller theorems.
PN junctions: Charge densities in N and P materials; Conduction by drift and diffusion of charge carriers, PN diode equation, capacitance effects.

Unit 2: Rectifiers and transistors
Transistors: Notations and volt-ampere characteristics for bipolar Junctions transistor. Concept of load line and operating point. Hybrid parameters. CB, CE, CC configurations. Junction field effect transistor (JFET) and metal oxide semiconductor filed effect transistor (MOSFET). Circuit symbols, biasing and volt-ampere characteristics, source follower operation of JFET as variable voltage resistor.

Unit 3: Transistor biasing and amplifiers
Transistor biasing: Need of bias and stability of Q point, stability factors, and various types of bias circuits for thermal bias stability: fixed bias, collector to base feedback bias and four resistor bias.

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Unit 4: Oscillators and Logic Circuits


Reference Books:

**PRACTICAL**

Teaching : 4 hrs/week  
Practical One-Paper  
Min Pass Marks : 18  
Max Marks : 50  
3 hrs. duration  

Note: Total number of experiments to be performed by the students during the session should be 16 selecting any 8 from each section.

**Section-A**

2. Study of variation of reflection coefficient of nature of termination using torsional wave apparatus.
3. Using platinum resistance thermometer find the melting point of a given substance.
4. Using Newton's rings method find out the wavelength of a monochromatic source and find the refractive index of liquid.
5. Using Michelson's interferometer find out the wavelength of a monochromatic source (Sodium Light).
6. To determine dispersive power of prism.
7. To determine wave length of sodium-light using grating.
8. To determine wave length of sodium light using Biprism.
9. Determine the thermodynamic constant \( \gamma = \frac{C_p}{C_v} \) using Clements & Desorme's method.
10. To determine thermal conductivity of a bad conductor by Lee's method.
11. Determination of ballistic constant of a ballistic galvanometer.
12. Study of variation of total thermal radiation with temperature.

**Section-B**

1. Plot thermo emf versus temperature graph and find the neutral temperature (Use sand bath).
2. Study of power supply using two diodes/bridge rectifier with various filter circuits.

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Syllabus: B.Sc. Part-II

3. Study of half wave rectifier using single diode and application of L and π section filters.

4. To study characteristics of a given transistor PNP/NPN (common emitter, common base and common collector configurations).

5. Determination of band gap using a junction diode.

6. Determination of power factor (cos θ) of a given coil using CRO.

7. Study of single stage transistor audio amplifier (variation of gain with frequency).

8. To determine ε by Thomson's method.

9. Determination of velocity of sound in air by standing wave method using speaker, microphone and CRO.


11. Measurement of capacitance and dielectric constant of a liquid and gang condensor by de Sauty bridge.
2. CHEMISTRY

Scheme:
Max Marks: 150

<table>
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<th>Duration (hrs.)</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
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Note: Ten (10) questions are to be set taking two (02) questions from each unit. Candidates have to answer any 5 questions selecting at least one question from each unit.

CH-201 Paper-I: Inorganic Chemistry
(2 hrs or 3 periods/week)

Unit-I

Chemistry of Elements of First Transition Series:
Characteristic properties of d-block elements. Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Chemistry of Elements of Second and Third Transition Series:
General characteristics, comparative treatment with their 3d-analouges in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

Unit-II

Coordination Compounds:
Werner's Coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.

Unit-III

Chemistry of Lanthanide and Actinide Elements:
Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurence and isolation of lanthanide compounds.

General Features: Chemistry of separation of Ne, Pu and Am from 3d electronic configuration, oxidation states, magnetic properties, complexion behavior, comparison of lanthanides and actinides with heavy elements.

Unit IV

Oxidation and Reduction:

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Unit V

Acids and Bases:
Thermodynamics, Arrhenius, Bronsted-Lowry, Lewis concept of acids and bases.

Non-aqueous Solvents:
Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH₃ and liquid SO₂.

CH-202 Paper-II: Organic Chemistry
(2 Hrs. or 3 periods/week)

Unit I

Electromagnetic Spectrum: An Introduction

Absorption Spectroscopy
Ultraviolet (UV) spectroscopy - Absorption laws (Beer-Lambert Law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of solvents on transitions, effect of conjugation, concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones.

Infrared (IR) spectroscopy - Molecular vibrations, Hook's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristics of various functional groups and interpretation of IR spectra of simple organic compounds.

Unit II

Alcohols - Classification and nomenclature
Diol and diols - methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [H₃BO₃] and H₂O₂ and pinacol-pinacolone rearrangement.
Trihydric alcohols - methods of formation, chemical reactions of glycerol.

Phenols

Ethers and Epoxides
Unit-III

Aldehydes and Ketones

Unit-IV

Carboxylic Acids
Decarboxylic acids: methods of formation and effect of heat and dehydrating agents (succinic, glutaric and adipic acids).

Carboxylic Acid Derivatives
Preparation of carboxylic acid derivatives, chemical reactions, mechanisms of esterification and hydrolysis (acidic and basic).

Unit-V

Organic Compounds of Nitrogen
Amines. Structure, nomenclature and preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Physical properties, spectroscopy of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts. Gabriel synthesis, amidation reaction and Hoffmann bromamide reaction with mechanism.
Reactions of amines: electrophilic aromatic substitution in aryl amines, reactions of amines with nitro compounds, diazotisation and mechanism. Synthetic transformations of aryl diazonium salts, cyanauric chloride applications.

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UNIT-I

Thermodynamics - I
Definition of Thermodynamic Terms: System, surroundings, etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process, concept of heat and work.

UNIT-II

Thermodynamics - II
Concept of Entropy: Entropy as a state function, entropy as a function of $V,T$. entropy as a function of $P,V$. entropy change in physical change, Clausius inequality and entropy as a criterion of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.
Third Law of Thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions: Gibbs function ($G$) and Helmholtz function ($A$) as thermodynamic quantities. $A$ & $G$ as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of $G$ and $A$ with $P,V$ and $T$.
Chemical Equilibrium: Equilibrium constant and free energy. Thermodynamic derivation of law of mass action i.e Chatelet's principle. Reaction isotherm and reaction isochore. Clapeyron equation and Clausius-Clapeyron equation, applications.

UNIT-III

Phase Equilibrium: Statement and meaning of the terms: phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system - water, CO$_2$ and sulphur systems.
Phase equilibria of two component systems: solid-liquid equilibria simple eutectic BaCl$_2$, Ph-Ag systems, desalinization of lead.
Solid solutions: Compound formation with congruent melting point (Mg-Zn) and incongruent melting point (NaCl-H$_2$O) System. Freezing mixtures of copper-ice.
UNIT-IV

Electrochemistry - I
Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.
Migrration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald’s dilution law, its uses and limitations. Debye-Hückel-Onsager’s equation for strong electrolytes (elementary treatment only). Transport number, determination and determination by Hittorf’s method and moving boundary method.
Applications of conductivity measurements:
Determination of degree of dissociation, determination of $K_a$ of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

UNIT-V

Electrochemistry - II
Types of reversible electrodes: Gas-metal-ion, metal-metal ion, metal-insoluble salt anion and redox electrodes, electrode reactions. Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance.
Electrolytic and Galvanic cells - reversible and irreversible cells, conventional representation of electrochemical cells.
Concentration cell with and without transport. Liquid junction potential, application of concentration cells. Valency of ions, solubility product and activity coefficient, potentiometric titrations.
Definition of pH and $pK_a$, determination of pH using hydrogen quinhydrone and glass electrodes, by potentiometric methods.

Suggested Books:
3. A Text Book of Physical Chemistry, Kundu and Jain.

Inorganic Chemistry

1. Preparation of Standard Solutions
   Dilution from 1 M to 0.001 M solutions.

2. Volumetric Analysis
   a) Determination of acetic acid in commercial vinegar using NaOH
   b) Determination of alkali content in mark tablet using HCl
   c) Estimation of calcium content in milk or calcium oxalate by permanganate.

[Signatures]
Organic Chemistry

(i) Laboratory Techniques

A. Thin Layer Chromatography
   - Determination of Rf values and identification of organic compounds.
     (a) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone, 2-butanone, hexan-2-one and hexan-3-one using toluene and light petroleum (40-60) solvent system.
     (b) Separation of dye molecules using cyclohexane and ethyl acetate (8.5:1.5).

B. Paper Chromatography: Ascending and Circular
   - Determination of Rf values and identification of organic compounds.
     (a) Separation of mixture of phenylalanine and glycine alanine and aspartic acid, asparagine and glutamic acid.
     (b) Preparation of mixture of DL-alanine, glycine and l-leucine using n-butanol:acetone:water (4:1.5).
     (c) Spray reagent:ninhydrin

(ii) Qualitative Analysis
   - Identification of two organic compounds (one solid and one liquid) through the functional group analysis, determination of melting point, boiling point and preparation of suitable derivatives.

Physical Chemistry

(i) Transition Temperature
   - Determination of the transition temperature of the given substance by thermometric method (e.g. MnCl2.4H2O / SrBr2.2H2O).

(ii) Thermochemistry
   - To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
   - To determine the enthalpy of neutralization of a weak acid-weak base versus strong acid-strong base and determine the enthalpy of neutralization of the weak acid-weak base.
   - To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy of hydration from the Born-Haber cycle.

(iii) Phase Equilibrium
   - To study the effect of a solute (e.g. NaCl, sucrose) on the critical solution temperature of a partially miscible binary liquid-liquid system and to determine the critical solution of that solute in the given solvent-water system.
To construct the phase diagram of two components (e.g. diphenylamine-pbenzophenone) system by cooling curve method.

(iv) Distribution law

a) To study the distribution of iodine between water and CCl₄.
b) To study the distribution of benzoic acid between benzene and water.

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(Instructions to the Examiner)

B.Sc. Part II

CH-204 Chemistry Practical (Pass course)

Max. Marks: 50

Duration of Exam: 5 hrs.

Minimum Pass Marks: 18

Inorganic Chemistry

Ex. 1 Volumetric Analysis

or

Gravimetric Analysis as mentioned in the syllabus 16

Organic Chemistry

Ex. 2 Identification of two organic compounds (one solid and one liquid) through the functional group analysis, determination of melting point, boiling point and preparation of suitable derivatives.

or

Perform one experiment out of the experiments on thin layer and paper chromatography given in syllabus 12

Physical Chemistry

Ex. 3 Perform one of the physical chemistry experiments as mentioned in the syllabus 12

Ex. 4 Viva-voice 5

Ex. 5 Record 5

50

Books Suggested (Theory Course)

2. Concise Inorganic Chemistry, J.D. Lee, IBS
5. Inorganic Chemistry, W. W. Porterfield, Addison Wesley
6. Inorganic Chemistry, A.G. Sharpe, IBS
Books Suggested (Laboratory Courses)

1. Vogel's Qualitative Inorganic Analysis, revised. Svehla, Orient Longman.

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3. ZOOLOGY
B. Sc. Part II - 2020

Scheme:
Max. Marks: 100

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Min. Marks: 36

NOTE:

1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.

Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit /section out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.

2. The candidate has to answer all questions in the main answer book only.

PAPER – I: Z-201

STRUCTURE AND FUNCTION OF INVERTEBRATE TYPES

NOTE:

1. There will be two parts of this theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.

Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit /section, out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.

2. The candidate has to answer all questions in the main answer book only.
Section – A
Habit, Habitat, Morphology, Structure, Organs and Systems (Locomotion, Digestive, Circulatory, Respiratory, Excretory, Nervous & Reproductive), Life Cycle, *Affinities and *Adaptations.

Note:* indicates whenever required.

Arthropoda: Palaemon (Indian Fresh water Prawn), Scorpion, Periplaneta, Grasshopper, Apis. Onychophora: Peripatus.

Section – B
Habit, Habitat, Morphology, Structure, Organs and Systems (Locomotion, Digestive, Circulatory, Respiratory, Excretory, Nervous & Reproductive), Life Cycle, *Affinities and *Adaptations.

Note: * indicates whenever required.

Mollusca: Pila, Unio, Sepia
Echinodermata: Asterias, Echinus, Cucumaria
Hemichordata: Balanglossus and its phylogenetic significance

Section - C

Invertebrate Adaptations
1. Salient features of Hemichordata.
2. Evolution of canal system of sponges.
3. Parasitic adaptations in Helminthes.
4. Social organization in termites and honey bees.
5. Direct and indirect development in insects.
7. Crustacean larvae & mouth parts of insects.

PAPER – II: Z-202

ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

NOTE:
1. There will be two parts of this theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit /section, out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

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Section - A

Animal Physiology with special reference to mammals
1. Physiology of digestion: Various types of digestive enzymes and their digestive action in the alimentary canal.
2. Physiology of blood circulation: Composition and functions of blood; mechanism of blood clotting; heart beat; cardiac cycle; blood pressure; body temperature regulation.
3. Physiology of respiration: Mechanism of breathing; exchange of gases: transportation of oxygen and carbon dioxide in blood; regulation of respiration.
4. Physiology of excretion: Kinds of nitrogenous excretory end products (ammonotelic, uricotelic and ureotelic); role of liver in the formation of these end products. Functional architecture of mammalian kidney tubule and formation of urine; hormonal regulation of water and electrolyte balance (Homeostasis).

Section-B

Regulatory aspects of Animal Physiology
1. Physiology of nerve impulse and reflex action: Functional architecture of a neuron, origin and propagation of nerve impulse, synaptic transmission, reflex arc.
2. Physiology of muscle contraction: Functional architecture of skeletal muscles; chemical and biophysical events during contraction and relaxation of muscle fibers.
3. Types of endocrine glands, their secretions and functions: Pituitary, adrenal, thyroid, pancreas, testis and ovary.
5. Preliminary idea of neurosecretion, hypothalamic control of pituitary function.

Section-C

Biochemistry
1. Carbohydrates: Structure, function and significance; oxidation of glucose through glycolysis, Kreb’s cycle and oxidative phosphorylation; interconversion of glycogen and glucose in liver; role of insulin and glucagon.
3. Lipids: Structure, function and significance; Beta-oxidative pathway of fatty acids; brief account of biosynthesis of triglycerides. Cholesterol and its metabolism.
Paper – III: Z-203
Immunology, Microbiology & Biotechnology

NOTE:
1. There will be two parts of this theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 10 very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit/section, out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

Section - A

Immunology
1. Immunology: Definition, types of immunity: innate and acquired; humoral and cell mediated, Organs of immune system.
2. Antigen and antibody: Antigenicity of molecules, haptens, antibody types.
3. Antigen-Antibody reactions: Precipitation reaction, agglutination reaction, neutralizing reaction, complement and lytic reactions and phagocytosis.
4. Immunity Regulating Cells: Macrophages, lymphocytes (B and T-Types) T-helper cells, T-Killer cells, plasma cells and memory cells.
5. Mechanism of humoral or antibody mediated immunity and cell mediated immunity.

Section - B

Microbiology
2. The Prokaryota (Bacteria): Structural organization:
   (i) Size, shapes and patterns of arrangement.
   (ii) Structural organization: Slime layer (capsule), cell envelopes: cytoplasmic membrane (inner membrane). Cell wall (outer membrane) of Gram- negative and Gram-positive bacteria; mesosomes; cytoplasmic organization; cell projections: flagella and cilia.
3. Genetic material of Bacteria: Chromosome, replication of bacterial DNA.
4. Reproduction in Bacteria: Asexual reproduction, binary fission, budding, endospore formation, exospires and cyst formation; sexual reproduction, conjugation.
5. Microbial Nutrition: Culture of bacteria
   a. Carbon and energy source
   b. Nitrogen and minerals
   c. Organic growth factors
   d. Environmental factors: Temperature and pH

6. Bacteria of Medical Importance:
   (i) Gram-Positive
       a. Cocci: Staphylococci, Streptococci
       b. Bacilli: Diptheria, Tetanus.
   (ii) Gram-Negative
       a. Cocci: Gonorrhea, Meningitis
       b. Bacilli: Diarrhoea
   (iii) Mycobacteria: Tuberculosis, Leprosy

Section - C

Biotechnology

1. Definition, history, scope and application of biotechnology, major areas of biotechnology (microbial, plant and animal biotechnology).
2. Vectors for gene transfer.
3. Basic concepts of animal cell, tissue, organ and embryo culture.
4. Genetic engineering (outline idea only): Applications of genetic engineering, hazards and regulations.
5. Protoplast fusion in prokaryotes and eukaryotes.
6. Recombinant DNA technology; hybridomas and their applications, PCR. DNA finger printing, DNA foot printing, RFLP, RAPD & AFLP, Human genome project.
7. Monoclonal antibodies and their applications.
8. Brief account of cloning: its advantages and disadvantages.
9. Biotechnology in medicine (outline idea only), antibiotics, vaccines, enzymes, vitamins, artificial blood.
10. Environmental Biotechnology (outline idea only): Metal and petroleum recovery, pest control, waste water treatment.
11. Food, drink and dairy biotechnology (outline idea only): Fermented food production; dairy products, wine, beer, vinegar and food preservation.

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Jaipur
Practical - Zoology

Min. Marks: 18

I. Study of Museum Specimens:
   Onychophora: Peripatus
   Mollusca: Chiton, Aplysia, Cypraea, Mytilus, Pearl Oyster, Dentalium, Loligo, Nautilus.
   Echinodermata: Pentaceros, Echinus, Ophiothrix, Cucumaria, Antendon.
   Hemichordata: Balanoglossus.

II. Study of Microscopic Slides:
   Echinodermata: Larval forms

III. Anatomy:
   Prawn/Squilla: External features, appendages, alimentary canal and nervous system; Hastate Plate
   Pila: External features, pallial organs and nervous system; osphradium, radula.

Dy. Registrar (Academic-I)
University of Rajasthan
Jaipur
IV. Study of the Following Through Permanent Slide Preparation:
   (i) Study of different cell types - Blood smear (Wrights or Leishman stain).
   (ii) Osparadium, gill lamella and radula of pila.
   (iii) Statocyst and Hastate plate of Prawn/Squilla

V. Microbiology Immunology and Biotechnology:
   1. Preparation and use of culture media for microbes.
   2. Study of microbes in food materials like curd, etc (Gram +ve & Gram-ve bacteria, Aspergillus, Mucor, Rhizopus, Penicillium, Alternaria and Fusarium).
   3. Educational tour to any Microbiology laboratory/ Dairy/ Food processing factory/ Distillery. Collection of material may also be encouraged wherever possible. Candidates are required to submit a detailed report of the visit.
   4. Antigen-antibody reactions-precipitation, agglutination.

VI. Animal Physiology:
   1. Counting of red and white blood cells in the given blood sample.
   2. Estimation of hemoglobin in the given blood sample.
   3. Estimation of haematocrit value (PCV) in the given blood sample.
   4. Demonstration of enzyme activity (catalase) in liver.
   5. Study of salivary digestion of starch and the effect of heat and alcohol on salivary digestion of starch.

VII. Biochemistry:
   1. Detection of protein, carbohydrate and lipid in the animal tissue/food samples.
   2. Identification of different kinds of mono-, di- and poly-saccharides in the given food samples.

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\[ \text{University of Rajasthan} \]
\[ \text{Jaipur} \]

24
### Scheme of Practical Examination Distribution of Marks

**Time:** 4 Hrs.  
**Min. Pass Marks. :** 18  
**Max. Marks:** 50

<table>
<thead>
<tr>
<th></th>
<th>Regular</th>
<th>Ex. /N.C. Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anatomy (any system)</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>Permanent Preparation</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>Exercise in Microbiology/immunology/Biotechnology</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>Exercise in Animal Physiology</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>Exercise in Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>Identification and comments on Spots (1 to 8)</td>
<td>16</td>
</tr>
<tr>
<td>7.</td>
<td>Viva Voce</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>Class Record</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

**Notes:**

1. Anatomy: Study of systems of the prescribed types with the help of dissection.

2. With reference to microscopic slides, in case of non-availability, the exercise should be substituted with diagrams/photos.

3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.

4. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.

5. It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.

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Dy. Registrar (Academic-I)  
University of Rajasthan  
Jaipur
Recommended Books:

17. Grant: Biology of Developmental System
4. BOTANY

Scheme

Paper I 3 hrs duration
Max Marks: 100
Max Marks: 33
Max Marks: 33
Max Marks: 50
3 hours
4 hours

Paper II 3 hrs duration

Paper III 3 hrs duration

Practical Work (Marks: 18) 4 hrs. duration

Duration of examination of each theory paper-

Duration of examination of practicals:

Note:

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only.

2. Paper I and Paper II each have 18 very short answer type Questions i.e., not more than 20 words each, covering entire syllabus.

3. Paper III is divided into four units. There will be one question from each unit. These units 3 and 4 will have internal choice.
PAPER-I
Molecular Biology and Biotechnology

Unit-1

Genetic Material: Biological, chemical, and physical nature of heredity material. Structure of DNA and RNAs (mRNA, tRNA and rRNA). Watson and Crick model of DNA. Nucleosome model.

DNA replication: Meselson - Stahl experiment of semiconservative replication of DNA; RNA Primers, Okazaki-fragments, polymerases. DNA-Protein interactions.

Preliminary account of DNA damage and repair.

Unit-2

Central dogma of life. Transcription in eukaryotes: role of promoter, gene pre mRNA synthesis, pre mRNA processing, capping, splicing and polyadenylation.

Translation: genetic code decoding; Initiation, elongation and termination.

Regulation of gene expression in prokaryotes and eukaryotes: Negative and positive control, attenuation and attenuation, Reverse transcriptase and its application.

Unit-3

Biotechnology: Functional definition. Basic aspects of Plant tissue culture, basal medium, media preparation and aseptic culture technique. Concept of cellular totipotency; Callusing, Differentiation, and morphogenesis; Micropropagation; Tissue culture and its applications: Basic concept of Protoplast culture; Somatic culture. Embryo culture and their applications.

Unit-4

Recombinant DNA technology: Tools and techniques used in rDNA technology: Restriction enzymes, Vectors for gene transfer. Bacteriophage, plasmids, cosmid, and Artificial chromosomes. DNA technologies; Gene amplification; Polymerase chain reaction. Application of PCR technique. DNA fingerprinting and its uses. Application of Biotechnology and Transgenic plants.
2. Media preparation
3. Genetic transformation technique
4. Meristem culture-shoot tip, nodal segment
5. Propagation from plant parts
6. In vitro organogenesis technique

Suggested Books:


30
Paper-II
PLANT PHYSIOLOGY AND BIOCHEMISTRY
(2 hrs week)

Unit-1

Unit-2
Photosynthesis: Pigments, Photosynthetic apparatus, light reaction, photo system I & II, Z-scheme, photophosphorylation, C3 (Calvin cycle), C4 cycle, and factors affecting the photosynthesis.
Respiration: Aerobic and anaerobic respiration, RQ (Respiratory Quotient). Kreb's cycle, electron transport system, oxidative phosphorylation and factors affecting the process. Fermentation.

Unit-3
Introduction: Introduction, importance, nomenclature, classification, molecular structure & function of monosaccharides, disaccharides, polysaccharides, and glycogen. Nitrogenous acids, amino acids, nucleic acids, nucleotide, structure and classification of proteins, physical and chemical properties.
Polyketides: Production and application of secondary metabolites.

Unit-4
Physiological and developmental processes: Dormancy and germination, plant movement, Hormones and their regulatory factors.
Polyketides: Production and application of secondary metabolites.

Suggested Readings:

Drs. Regan

University of Rajasthan, Jaipur
Practical Exercises:

1. To determine the osmotic potential of vacuolar sap by plasmolytic method.
2. To study the permeability of plasma membrane using different concentrations of organic solvents.
3. To study the effect of temperature of permeability of plasma membrane.
4. To separate chloroplast pigments by solvent method.
5. To separate chloroplast pigments using paper chromatography.
6. To separate amino acids in a mixture by paper chromatography.
7. To prepare the standard curve of protein.
8. To demonstrate the tests for proteins in the unknown samples.
9. To demonstrate the enzyme activity—Catalase, peroxidase and amylase.
10. To demonstrate the tests for different types of carbohydrates and lipids.
11. Bioassay of growth hormone (auxin, cytokinin, gibberellin).
13. To demonstrate root pressure.
14. To demonstrate rate of transpiration by use of potometers.
16. To demonstrate anaerobic and aerobic respiration.
17. O.D. by Ganong's respirometer.
Paper III
Pteridophytes, Gymnosperms & Palaeobotany
(2 hrs. week)

Unit 1
- Characteristics of Pteridophytes: Classification (G.M. Smith).
- Morphology, anatomy and reproduction of Psilotum
- Selaginella, Equisetum and Marsilea.
- Characteristics of Gymnosperms, distribution and classification (K.R. Sporne).

Unit 2

Unit 3
Morphology, anatomy, reproduction and life cycle of Cycas, Pinus and Ephedra. Economic importance of Gymnosperms.

Unit 4
- Morphology, reproduction and life cycle of Gymnosperms. Geological time scale

Suggested Laboratory Exercises:
1. Study of external morphology, anatomy of vegetative and reproductive parts of Psilotum, Selaginella, Equisetum and Marsilea
2. Study of external morphology, anatomy of vegetative and reproductive parts of Cycas, Pinus and Ephedra
3. Study of fossils and studies of fossils
4. Preparation of charts on Geological time scale

Suggested Readings


## BOTANY PRACTICAL EXAMINATION B. Sc PART-II

### SKELETON PAPER

**M.M. 50**

**TIME: 4 Hours**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Practical</th>
<th>Regular</th>
<th>Ex NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Comment on the Tissue culture or Biotechnology technique</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>1(b)</td>
<td>Exercise based on molecular biology</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Perform the given physiological experiment and write the principle, procedure, results based on observations and precautions involved</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Perform the bio-chemical test of the given sample and discuss the observations giving reasons</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Make a suitable preparation of material 'A' (Pteridophyte vegetative/reproductive part). Draw a labelled sketch. Identify giving reasons.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Make a suitable preparation of material 'B' (Gymnosperm) (vegetative/reproductive part). Draw a labelled sketch. Identify giving reasons.</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Comment upon spots (1-5)</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Viva-Voce</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Practical record</td>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>

**TOTAL** 50 50


\[\text{Dr. Registrar} \]

\[\text{Academic} \]

\[\text{University of Rajasthan, Jaipur} \]

35
S. GEOLGY

Scheme

Min. Pass Marks : 36

Paper-I

Max. Marks : 100

3 hs. duration

Max. Marks : 50

Paper-II

Max. Marks : 50

3 hs. duration

Max. Marks : 50

Practical one

Max. Marks : 50

3 hrs. duration

Min. Pass Parks : 18
University of Rajasthan

Note: The paper will contain nine questions having three question in each section. Candidates are required to attempt five question in all taking at least one question from each section.

**Paper-I: Palaeontology and Structural Geology**

**Section-A**

Definition, Scope, sub-division, and relationship of palaeontology with other branches.

Fossils—condition necessary for preservation, modes of preservation, uses. Elementary ideas about origin of life, evolution and fossil records.

Skeletal morphology and geological distribution of following groups:

- Foraminifers, Brachiopods, Mollusca (Lamellibranchia, Gastropods and Cephalopods—Nautiloids, Ammonoids, Dibranchia), Trilobites, Echinoids, Graptoloids and Corals.

**Section-B**

Gondwaná Flora—morphological characteristics of the flora: Vertebraria, Glossopteris, Gangamopteris, Ptilophyllum.

Unconformity—its kinds, recognition in the field and geological significance. Overlap and Offlap.


**Section-C**

Attitude of planes (Bleeding Planes) and lines. Dip (true and apparent, Strike, Pitch and Plunge. Uses of Clinometer/Bed: apparent and vertical thickness. Criteria to determine top and bottom sequence, Morphology of folds and faults, their geometric and genetic classification and recognition in the field. Elementary ideas of the mechanics of folding and faulting.

Practical

Palaeontology: Identification, description and drawing of different views of the following fossils:

Perisphinctes, Belemnite, Cidaris, Hemiaster, Glossopteris, Gangamopteris, Vertebraria, Phyllophyllum.

Structural Geology: Study of physiographic features in topographical maps and use of clinometer compass, drawing profiles and geological section along given direction.

Simple dip and strike problems connected with true and apparent dips, trues and vertical, thickness and width of the outcrop by calculation and geometrical methods.

Completion of outcrops: Determination of thickness of beds, identification of structural features in hand specimen, drawing of profiles and sections showing the following features: Simple beds, folds, faults, unconformities, overlaps, offlap and intrusion.

Books recommended.


Paper-II: Petrology

Note: The paper will contain nine questions in each section. Candidates are required to attempt five questions and select at least one question from each section.

Section-A

Nature and composition of magmas, plutonic, hypabyssal and volcanic rocks, intrusive and extrusive forms, structure and texture. Elements of classification of igneous rocks.

Crystallization of basaltic magma, Bowen's Reaction Principle, differentiation and assimilation.

Crystallisation of unicomponent and bicomponent silicate melts. Diopside-Albite-Anorthite basalt system and variation of igneous rocks. Study of common igneous rocks-Granite, rhyolite, gabbro, basalt, Pegmatite, dolerite, syenite, diorite and peridotite.

Section-B

Process of formation of sedimentary rocks-Weathering, decomposition, disintegration, transportation and deposition. Concept of lithification and diagenesis.

Sedimentary rocks-Structure, texture, residual, mechanically transported, chemical and organic deposits. Elementary idea of sedimentary environments and provenance.
University of Rajasthan

Study of common sedimentary rocks: sandstone, limestone, shale, conglomerate and greywacke.

Section-C

Metamorphism: agents and types, Concept of grade and facies of metamorphism, Texture, structure and classification of metamorphic rocks.

Types of metamorphism and their products: Cataclastic, thermal and regional metamorphism. Dynamothermal metamorphism of argillaceous and calcareous rocks.

Retrograde metamorphism and metasomatism: anatexis. Study of important metamorphic rocks: slate, schist, gneiss, granite, marble.

Practical

Petrology: New drawing of different forms assumed by intrusive igneous rocks. Study and recording of the typical textures of plutonic, hypabyssal and volcanic rocks.

Megasopic study of the following igneous rocks: granite, pegmatite, aplite, syenite, nepheline-syenite, diorite, gabbro, norite, adamite, peridotite, basalts, obsidian, lamprophyre, phonolite and trachyte.

Microscopic study of the following rocks: Granite, syenite, diorite, gabbro, dunite, pyroxenite, dolerite, rhyolite and basalt.

Sedimentary and Metamorphic rocks: Study of typical textures of metamorphic rocks. Systematic megascopic and microscopic study of the following rocks: types: Conglomerate, breccia, sandstone, arkose, greywacke, shale, limestone, slate, phyllite, schist, gneiss, marble, quartzite, migmate and charnockite.

Book Recommended

3. William, Turner & Gilbert, Petrology CBS Publisher, Delhi.
5. Hatch & Wales, Petrology.
7. Kerr: Optical Mineralogy, CBS Publisher, Delhi.

Dr. Registrar
Academics
University of Rajasthan, Jaipur
6. MATHEMATICS
B.Sc. Part-II 2020

Teaching: 3 Hours per Week per Theory Paper.
2 Hours per Week per Batch for Practical

Examination Scheme:

<table>
<thead>
<tr>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
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<tbody>
<tr>
<td>Science – 54</td>
<td>150</td>
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<tr>
<td>Arts – 72</td>
<td>200</td>
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<table>
<thead>
<tr>
<th>Paper – I</th>
<th>Real Analysis</th>
<th>Duration</th>
<th>Max. Marks</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>3 hrs.</td>
<td>40 (Science)</td>
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<td>53 (Arts)</td>
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</table>

<table>
<thead>
<tr>
<th>Paper – II</th>
<th>Differential Equations</th>
<th>Duration</th>
<th>Max. Marks</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>3 hrs.</td>
<td>40 (Science)</td>
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<tr>
<td></td>
<td></td>
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<td>53 (Arts)</td>
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</table>

<table>
<thead>
<tr>
<th>Paper – III</th>
<th>Numerical Analysis</th>
<th>Duration</th>
<th>Max. Marks</th>
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<td></td>
<td></td>
<td>3 hrs.</td>
<td>40 (Science)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>54 (Arts)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practical</th>
<th>Duration</th>
<th>Max. Marks</th>
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<tbody>
<tr>
<td></td>
<td>2 hrs.</td>
<td>30 (Science)</td>
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<tr>
<td></td>
<td></td>
<td>40 (Arts)</td>
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</table>

Note:
1. Common paper will be set for both the Faculties of Social Science and Science. However, the marks obtained by the candidate in the case of Faculty of Social Science will be converted according to the ratio of the maximum marks of the papers in the two Faculties.

2. Each candidate is required to appear in the Practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University and internal examiner will be appointed by the Principal in consultation with Local Head/Head, Department of Mathematics in the college.

3. An Internal/external examiner can conduct Practical Examination of not more than 100 (Hundred) Candidates.

4. Each candidate has to pass in Theory and Practical examinations separately.
Paper – I: Real Analysis

Teaching: 3 Hours per Week

Duration of Examination: 3 Hours
Max. Marks: 40 (Science) 53 (Arts)

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Real numbers as complete ordered field, Limit point, Bolzano-Weierstrass theorem, closed and Open sets. Concept of compactness and connectedness. Heine-Borel theorem. Holder inequality & Minkowski inequality, Metric space – Definition and examples, Open and Closed sets, Interior and Closure of a set, Limit point of a set in metric space.


Unit 3: Properties of derivable functions, Darboux’s and Rolle’s theorem. Notion of limit, continuity and differentiability for functions of several variables. The directional derivative, the total derivative, expression of total derivative in terms of partial derivatives.


Unit 5: Sequence and series of functions – Pointwise and Uniform convergence, Cauchy’s criterion, Weierstrass M-test, Abel’s test, Dirichlet’s test for uniform convergence of series of functions, Uniform convergence and Continuity of series of functions, Term by term differentiation and integration.

Reference Books:

3. Charles G. Denlinger, Elements of Real Analysis, Jones and Bartlett (Student Edition), 2011.

Dy. Registrar (Academic-I)
University of Rajasthan
Jaipur
Paper – II: Differential Equations

Teaching : 3 Hours per Week
Duration of Examination : 3 Hours

Max. Marks:
40 (Science)
53 (Arts)

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations and equations reducible to homogeneous form. Linear equations and equations reducible to linear form. Exact differential equations and equations which can be made exact.

Unit 2: First order but higher degree differential equations solvable for x, y and p. Clairaut’s form and singular solutions with Extraneous Loci. Linear differential equations with constant coefficients, Complimentary function and Particular integral.


Unit 4: Linear differential equations of second order. Linear independence of solutions. Solution by transformation of the equation by changing the dependent variable/the independent variable, Factorization of operators, Method of variation of parameters, Method of undetermined coefficients.


Reference Books:

Paper – III: Numerical Analysis and Vector Calculus

Teaching : 3 Hours per Week
Duration of Examination : 3 Hours
Max. Marks: 40 (Science)
54 (Arts)

Note: (i) This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.
(ii) Non-Programmable Scientific Calculators are allowed.


Unit 3: Relation between the roots and coefficients of general polynomial equation in one variable, transformation of equations, Descarte’s rule of signs, solution of cubic equations by Cardon’s method, biquadratic equations by Ferari’s method. Numerical solution of Algebraic and Transcendental equations, Bisecion method, Secant method, Regula-Falsi method, Iteration method, Newton- Raphson Method (derivation of formulæ and rate of convergence only).

Unit 4: Gauss elimination and Iterative methods (Jacobi and Gauss Seidal) for solving system of linear algebraic equations. Partial Pivoting method, ill conditioned systems, Numerical solutions of ordinary differential equations of first order with initial condition using Picard’s, Euler and modified Euler’s method.

Unit 5: Scalar and Vector point functions. Differentiation and integration of vector point functions. Directional derivative. Differential operators. Gradient, Divergence and Curl. Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.

Reference Books:

Practical

Teaching: 2 hours per week per batch not more than 20 students.

Examination Scheme:

<table>
<thead>
<tr>
<th></th>
<th>Science</th>
<th>Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max.Marks</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Min.Pass Marks</td>
<td>11</td>
<td>15</td>
</tr>
</tbody>
</table>

Distribution of Marks:

Two Practicals one from each group

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>10 Marks each</td>
<td>20 Marks</td>
</tr>
<tr>
<td>Practical Record</td>
<td>05 Marks</td>
</tr>
<tr>
<td>Viva-voce</td>
<td>05 Marks</td>
</tr>
<tr>
<td>Total Marks</td>
<td>30 Marks</td>
</tr>
</tbody>
</table>

Duration: 2 Hours

The paper will contain TWO practical. The candidates are required to attempt both practical.

Practicals with Computer Programming in C Language.

Programming languages and problem solving on computers, Algorithm, Flow chart, Programming in C- Constants, Variables, Arithmetic and logical expressions, Input-Output, Conditional statements, Implementing loops in Programs, Defining and manipulation arrays and functions.

Group A:

1. Printing n terms of Fibonacci sequence.
2. Finding $n!$, $\sum n$, $\sum n^2$ etc.
3. Defining a function and finding sum of n terms of a series/sequence whose general term is given (e.g. $a_n = \frac{n^2+3}{n+1}$).
4. Printing Pascal’s triangle.
5. Finding gcd and lcm of two numbers by Euclid’s algorithm.
6. Checking prime/composite number.
7. Finding number of primes less than n, $n \in Z$.
8. Finding mean, standard deviation and $n^P_r$, $n^C_r$ for different n and r.

Group B:


Note:

1. Each Candidate (Regular/non-Collegiate) has to prepare his/her practical record.
2. Each Candidate has to pass in Practical and Theory examinations separately.
7. Economics

B.Sc. Part-II 2020

<table>
<thead>
<tr>
<th>Scheme:</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>72</td>
<td>200</td>
</tr>
<tr>
<td>Science</td>
<td>54</td>
<td>150</td>
</tr>
</tbody>
</table>

Each paper shall be of three hour duration and of 100 marks for Arts students and of 75 marks for Science students.

Paper – I  Introductory Macro Economics
Paper – II  
(a) Elements of Statistics and Mathematics
(b) History of Economic Thought

Note: There will be two papers of Economics. Each paper shall consist of three parts. Part A shall contain question No I consisting of very short type X (Ten) questions. The candidate is required to answer each question in 20 words. Part B shall contain question No 2 consisting of V (five) question. The candidate is required to answer each question in 100 words. Part C shall contain three essay type questions (one from each section) with internal choice.

A candidate will be required to attempt five questions in all. All questions of Part A and Part B are compulsory while rest 3 questions are to be attempted from parts C selecting one question from each section. All questions carry equal marks. Each question will carry 20 marks for Arts students and 15 marks for Science students.

Paper-I

Introductory Macro Economics

Section- A


Section-B


Section-C


Recommended Books:

5. Suraj B. Gupta: Monetary Economics, S. Chand and Co. Ltd.
7. Rana and Verma: Macroeconomic Analysis, Vishal Publications,

Paper –II (a): Elements of statistics and Mathematics

Duration: 3 hrs

Max Marks: 100

Section- A

Surds, Indices, Quadratic Equation, Logarithms, Permutation and Combination, Binomial Theorem, Arithmetic progression, Geometric Progression and Harmonic Progression, Analytical Geometry: Straight Line, Parabola and Hyperbola, Matrices and Determinants, solution of Simultaneous equations by Cramer’s rule and Matrix Inverse. Simple differentiation, Partial differentiation (involving two independent variables). Maxima, minima point of inflexion. Simple Integration involving one independent variable, Application in Economics (Elasticity, Average, Marginal Concepts)
Section – B
Statistics-definition, nature and importance, Uses and relevance of statistical methods, Census and Sample survey, Methods of data collection and tabulation, Diagrammatic and Graphical representation of data; Measures of Central Tendency: Arithmetic Mean, Mode, Median, Geometric Mean, Harmonic Mean. Concept and Measures of Dispersion and Skewness.

Section – C
Simple Correlation: karl Pearson’s and Rank Correlation, Regression analysis, Fitting of Linear Regression lines using Least Square Method, Analysis of Time Series, Determination of trend by straight line trend equation, Index numbers, Interpolation (Binomial Expansion and Newton’s method), Association of Attributes.
(Note: Use of non-programmable calculator is permitted)

Books Recommended:
7. भी सी मेहता एंड जी एम के मदनानी अर्थशास्त्र में प्रारंभिक गणित लक्ष्मीनारायण अग्रवाल आगरा।
8. कैलाशानाथनागर साध्यकी के मूलतत्व मीनाक्षीप्रकाशन मेंठ।

Paper- II (b) History of Economic Thought
Section – A

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Section-B

Section C

Books Recommended:
1. Louise Haney, History of Economic Thought, Surjit Publication, New Delhi
2. Enc Roll: History of Economic Thought, Faber and Faber (Rupa)
3. Gide and Rist: History of Economic Doctrine
### Scheme of Examination

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts/Social Science</td>
<td>72</td>
<td>200</td>
</tr>
<tr>
<td>Science</td>
<td>54</td>
<td>150</td>
</tr>
<tr>
<td>Paper I</td>
<td>Resources Geography</td>
<td>Arts 75</td>
</tr>
<tr>
<td>Paper II</td>
<td>Human Geography</td>
<td>Science 50</td>
</tr>
<tr>
<td>Practical</td>
<td>18</td>
<td>Arts 75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science 50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science 50</td>
</tr>
</tbody>
</table>

**Notes**

1. Students are permitted to use the stencils, simple calculator and log tables wherever needed in both theory and practical examinations.

2. There will be a common paper for Arts and Science.

3. (a) Paper I will be compulsory and will cover the entire course of the paper.
   
   (b) Part (a) will have ten items for locating on a map (to be supplied by examination centre) carrying 10% marks of the maximum marks and candidates shall attempt any five items.

4. Remaining 9 questions carrying equal marks will be set with three questions from each section of the syllabus.

5. Candidate will attempt 5 questions in all including question No. 1 selecting at least one question from each section.

6. Practical examination will be conducted by the board of examiners.

7. The candidate will have to pass in theory and practical separately.

8. The non-collegiate candidates will have to attend a practical training camp of 48 hours at a college affiliated to the University of Rajasthan, Jaipur notified by the University from time to time in which Geography subject is taught on payment of fee fixed by the University. The candidates appearing at examination from any examination centre located in Jaipur City will attend the practical camp at the University Post Graduate Department on payment of fee fixed by the University. The candidate will procure Certificate of Successful completion of practical training camp from the College/Department of Geography and produce the same at the time of practical examinations.

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Dy. Registrar  
(Academic)  
University of Rajasthan  
JAIPUR
Paper I: Resources Geography

Section A

Nature, scope and significance of resources geography, definition and classification of resources: renewable and non-renewable resources, resource classification of Zimmerman.
Natural Resources: Distribution, exploitation, uses and conservation of forest, water, soils, fisheries, mineral resources, energy resources (coal, petroleum, natural gas and non-conventional energy resources).

Section B

Human resources: Population growth, distribution and density, causes of inequalities, population-resources relationship and problems, Agricultural resources: fisheries and cereal crops: rice, wheat, maize and barley; beverages: tea, coffee and tobacco, commercial crops: cotton, rubber, jute, sugarcane, silk and artificial fibres. Agricultural regions of the world.

Section C

Concepts of Resources utilization, their conservation, environmental and cultural constraints in resource utilization, water conservation and rainwater harvesting, soil and forest resources conservation, land capability classes, resources regions of the world, resources regions of the India, economic regions of the India, sustainable development.

Recommended Readings:

कैथन, अ. 2010: संसाधन पूँजी। सत्त्वती पब्लिकेशन्स, मेरठ।
महेंद्र, वी. 1996: संसाधन पूँजी। सत्त्वती प्रकाशन, मेरठ।

Paper II: Human Geography

Section A

according to Brunhes and Huntington, schools of man-environment relations: determinism possibilism and neo determinism.

Section B


Section C

Migration of population: causes, types and impact; population regions and population policies in India. Rural settlements: factors affecting development of rural settlement, types and patterns of rural settlements, building materials and house types, urban settlements: process of urbanization, urban problems in India, impact of human activities on environment.

Recommended Readings:


Practicals

Scheme of examination

Min. Pass Marks: 18

<table>
<thead>
<tr>
<th>Written test</th>
<th>Bifurcation of Marks</th>
<th>Max. Marks: 50</th>
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</thead>
<tbody>
<tr>
<td>Field survey and viva voce</td>
<td>24</td>
<td>Time</td>
</tr>
<tr>
<td>Record and viva voce</td>
<td>10 - 04</td>
<td>3 hrs.</td>
</tr>
<tr>
<td></td>
<td>08 - 14</td>
<td>2 hrs.</td>
</tr>
</tbody>
</table>
N.B. I. There shall be 6 questions in written paper selecting at least two questions from each section. Candidates are required to attempt 3 questions selecting 1 question from each section. All question carry equal marks.

Section A

Definition of cartography, types of cartographic symbols and their uses, drawing instruments and materials, classification and representation of data with the help of squares, rectangles, circles, spheres, ring, pyramids, wheel diagrams, traffic flow diagram, isochronic chart.

Section B

Classification and uses of maps, drawing of isopleth, choropleth, chorochromatic, choroschematic and dot maps (simple, multiple and multi colour), measures of central tendency and dispersion: mean, median, mode, quartiles, standard deviation.

Section C

Elements of map reading. History of topographical maps in India. Scheme of topographical mapping in India as per National Map Policy, 2005. Conventional symbols and interpretation of physical and cultural features on topographical maps.

Prismatic Compass survey: equipments, methods of measurement of bearings, correction of bearings, record of survey closing error and its corrections.

Recommended Readings:

Sarkar, J. P. 2011: प्राचीन नृत्य की सुरेखा। संगीत पुस्तकालय, मुंबई।
<table>
<thead>
<tr>
<th>Paper</th>
<th>Nomenclature</th>
<th>Mark Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper I</td>
<td>Statistical Inference</td>
<td>50 marks</td>
</tr>
<tr>
<td>Paper II</td>
<td>Statistical Applications in Society and Industry</td>
<td>60 marks</td>
</tr>
<tr>
<td>Paper III</td>
<td>Practical based on Paper I</td>
<td>50 marks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70 marks</td>
</tr>
</tbody>
</table>
University of Rajasthan

Total 150 200 Marks

Note: In each Question paper, 10 (ten) questions will be set having 2 (Two) from each unit. Candidates have to answer five questions in all, taking not more than one from each unit.

Paper I

(Statistical Inference)

Unit-I


Unit-II

t-Distribution: Definition of Student's t & Fisher's t Statistic and derivations of their distributions. Constants & Limiting Property of t-distribution. Applications—Testing of Single mean, Difference of two means, paired t-test, and sample correlation coefficient. F-Distribution: Definition, Derivation, Constants, Application—Testing of equality of two variances, Relationship between t, F and Chi-square Distributions, 18 hours

Unit-III

Theory of Estimation: Point Estimation, Concept and Problem for Point Estimation; Criterion of a good estimator (Unbiasedness, Methods of Maximum likelihood, Consistency, Efficiency, Sufficiency), MVUE. Method of moments. Interval Estimation—Concept, Confidence Interval, Confidence Coefficient, Construction of Confidence Interval for Population Mean, Variance, Difference of Population Means & Ratio of Variances for Normal Distributions, 18 hours

Unit-IV

Testing of Hypothesis: Simple, Composite, Null and Alternative Hypothesis. Types of error, Critical region. BCR, Neyman-Pearson's Lemma for BCR, BCR in case of Binomial, Poisson, and Normal and Exponential Population, 18 hours
Syllabus: B.Sc. Part-II

Unit-V

Large sample tests: Testing of single mean, proportion. Testing of difference of means and proportions. Non-Parametric Tests: Definition, Merits & Limitations: Sign test for one sample and two sample cases, Run Test, Median test. 18 hours

REFERENCES

ADDITIONAL REFERENCES

Paper II

STATISTICAL APPLICATIONS IN SOCIETY AND INDUSTRY

Unit-I

University of Rajasthan

Crude birth rate, General fertility rate, Specific fertility rate, Total fertility rate, Gross Reproduction Rate, Net Reproduction Rate.

18 hours

Unit II


18 hours

Unit III

Time Series Analysis: Definition & its different components, Illustrations; additive and multiplicative models. Different methods for determination of trends & seasonal fluctuation along with their merits & demerits.

18 hours

Unit IV

Educational Statistics: Methods of standardization of scales and tests, Z-scores, t-scores, Standard scores, Percentile score, Intelligence Quotient and its measurement and uses. Validity of test scores, reliability of scores and their determination.

18 hours

Unit V


18 hours

REFERENCES:

Syllabus: B.Sc. Part-II


ADDITIONAL REFERENCES:

Paper III

Practical Paper
1. Tests of significance based on t, Chi-square, F: Testing of significance of sample correlation coefficient. Use of Z-transformation.
2. Large sample tests for means and proportions. Tests of goodness of fit and independence of attributes in contingency tables.
3. Non parametric tests: Sign, Runs, Median (for large samples).
5. Construction of Index Numbers by Laspeyres, Paasche's, Fisher's, Chain Base Indices, Consumer-price-index.
6. Tests for Index numbers.
7. Determination of trend in a time series and construction of seasonal indices.
8. Drawing of \( \bar{X}, R, np, p \) and C-Charts.

Dr. Registrar
Academic
University of Rajasthan, Jaipur
10. APPLIED STATISTICS

Marks Scheme

<table>
<thead>
<tr>
<th>Paper</th>
<th>Nomenclature</th>
<th>Science</th>
<th>Arts</th>
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</thead>
<tbody>
<tr>
<td>Paper I</td>
<td>Statistical Inference</td>
<td>50 mark</td>
<td>65 marks</td>
</tr>
<tr>
<td>Paper II</td>
<td>Statistical Applications in</td>
<td>50 mark</td>
<td>65 marks</td>
</tr>
<tr>
<td></td>
<td>Society and Industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper III</td>
<td>Practical based on</td>
<td>50 mark</td>
<td>70 marks</td>
</tr>
</tbody>
</table>
University of Rajasthan

Paper I, II

Total 150 200 Marks

Note: In each Question paper, 10 (ten) questions will be set having 2 (Two) from each unit. Candidates have to answer five questions in all, taking not more than one from each unit.

Paper I

Statistical Inference

Unit-I


18 hours

Unit-II

t-Distribution: Definition of Student s-t & Fisher’s r-Statistic. Property and Applications of t-distribution for testing: Single mean, difference of two means, observed sample correlation coefficient, Paired t-test. F-Distribution: Definition of Mean, Variance & Mode, Application of F-distribution- Testing of equality of two variances. Relationship between t, F and chi-square Distributions: (without proof)

18 hours

Unit-III


18 hours

Unit-IV

Testing of Hypothesis: Simple, Composite, Null and Alternative Hypothesis. Types of error, Critical region. BCR, Neyman-Person’s Lemma (statement only) and its application. BCR in case of Binomial, Poisson, and Normal Population.

18 hours

Unit-V

Large sample test—Testing of single mean, proportion. Testing of difference of means and proportions. Non-Parametric Tests—Definition, Merits & Limitations, Sign test (for one sample and two sample cases) Run Test, Median test.

18 hours

Dr. Registrar

Academic

University of Rajasthan, Jaipur
REFERENCES

ADDITIONAL REFERENCES

Paper II
STATISTICAL APPLICATIONS IN SOCIETY AND INDUSTRY
(Course contents are same as that of subject statistics)

Unit-I

Unit-II
Economic Statistics: Index numbers - definition, applications of index numbers, price relatives, quantity & value relatives, link and chain relatives. Problems involved in computation of index number. Use of averages, simple aggregate and weighted average.
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methods. Laspeyre's Paasche's and Fisher's index-number. Tests for
index numbers. Consumer price index.

Unit-III

Time Series Analysis: Definition and its different components,
illustrations, additive and multiplicative models. Different Methods for
determination of trend & seasonal fluctuations along with their merits
& demerits.

Unit-IV

Educational Statistics: Methods of standardization of scales and
tests, Z-scores, t-scores, Standard scores, Percentile scores, Intelligence
Quotient and its measurement and uses. Validity of test scores.
Reliability of Test scores and their determination.

Unit-V

Statistical Quality Control: Concepts of SQC, Process control &
Product control. Causes of variation in quality, General theory of
control charts, control limits, sub-grouping, Summary of out-of-control
criteria. Control charts for variables, Construction of Mean and Range
charts. Concept of Defects and Defectives. Control Charts for attributes:
Construction of np-chart, p-chart, c-chart and their merits
and demerits.

REFERENCES:
Prentice Hall of India.
Taraporewala and Sons.
Sultan Chand and Sons, New Delhi.

ADDITIONAL REFERENCES:
Publishing Co.
Syllabus: B.Sc. Part-II


PAPER III
Practical Paper

(Gourse contents are same as that of subject statistics)

1. Tests of significance based on t-Chi-square, F; Testing of significance of sample correlation coefficient matrix.
2. Large sample tests for means and proportions; tests of goodness of fit and independence of attributes in contingency tables.
3. Non-parametric tests: Sign, Run, Median (for large samples).
5. Construction of Index Numbers by Laspeyre's, Paasche's, Fisher's, Chain Base indices; Consumer price index.
6. Tests for Index numbers.
7. Determination of trend in a time series and construction of seasonal indices.
8. Drawing of $\bar{X}$; R, np, p and C-Charts.
11. PSYCHOLOGY

B.A. /B.Sc. Pass Course Part-II

SCHEME OF EXAMINATION:

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Max. Marks</th>
<th>Min. Passing Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>200</td>
<td>72 (Th.54 Pr.18)</td>
</tr>
<tr>
<td>Science</td>
<td>150</td>
<td>54 (Th.36 Pr.18)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paper</th>
<th>Nomenclature</th>
<th>Duration</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Arts</td>
</tr>
<tr>
<td>I</td>
<td>Abnormal Psychology</td>
<td>3 Hrs.</td>
<td>75</td>
</tr>
<tr>
<td>II</td>
<td>Psychological Statistics</td>
<td>3 Hrs.</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Practical</td>
<td>3 Hrs.</td>
<td>50</td>
</tr>
</tbody>
</table>

NOTE:-

1. There will be three papers in Psychology. Each paper will be of 3 hours. There will be a common paper for Arts and Science. In I and II Papers there will be 3 Sections A, B and C and will cover the entire course content of the paper.

Section-A Will contain 10 questions of 20 words each. Each question will be of 1.5 marks for Arts students and 1 mark for Science students. Thus, Part-A will be of 15 marks for Arts students and of 10 marks for Science students.

Section-B Will contain 7 questions of 50 words each, out of which students are required to attempt 5 questions. Each question will be of 3 marks for Arts students and of 2 marks for Science students. Thus, Part-B will be of 15 marks for Arts student and of 10 marks for Science students.

Section-C Will contain 3 long questions each with internal choice. Each question will be of 15 marks for Arts students and 10 marks for Science students. Thus, Part-C will be of 45 marks for Arts students and 30 marks for Science students.
For clarification the distribution of marks is tabulated as below:-

<table>
<thead>
<tr>
<th>ARTS</th>
<th>No. of Questions</th>
<th>Marks</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Section A</td>
<td>10</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>Section B</td>
<td>5 (Out of 7)</td>
<td>0.3</td>
<td>15</td>
</tr>
<tr>
<td>Section C</td>
<td>3 (with internal choice)</td>
<td>1.5</td>
<td>45</td>
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<td></td>
<td>Total Marks 75</td>
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</table>

<table>
<thead>
<tr>
<th>SCIENCE</th>
<th>No. of Questions</th>
<th>Marks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section A</td>
<td>10</td>
<td>0.1</td>
<td>10</td>
</tr>
<tr>
<td>Section B</td>
<td>5 (Out of 7)</td>
<td>0.2</td>
<td>10</td>
</tr>
<tr>
<td>Section C</td>
<td>3 (with internal choice)</td>
<td>1.0</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total Marks 50</td>
</tr>
</tbody>
</table>

2. Use of simple calculator will be allowed for statistical portions of all papers.

Paper I - Abnormal Psychology

Section: A

1. Mental Disorder: Definition, Indicators of Abnormality, DSM-5 and ICD-10
   Classification Systems, Mental Health Professionals.

2. Causal Factors and Viewpoints: Risk Factors and Causes; Necessary, Sufficient
   and Contributory causes; Diathesis - Stress Models, Biological, Psychological
   and Social perspectives.

3. Clinical Assessment and Diagnosis: Basic elements in Assessment, Physical and Psychosocial
   Assessment.

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Section: B

4. Anxiety, Obsession Compulsion and Trauma and Stress or Related Disorders:
   Types, Clinical Picture and Causal Factors.

5. Mood Disorders and Suicide: Types, Clinical Picture and Causal Factors.


Section: C

7. Feeding and Eating Disorders: Types, Clinical Picture and Causal Factors

<table>
<thead>
<tr>
<th>$8$</th>
<th>Schizophrenia and Other Causal Factors.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychotic Disorders: Types, Clinical picture and</td>
<td></td>
</tr>
<tr>
<td>Therapies: Behavioral Therapy, Cognitive and</td>
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</tr>
<tr>
<td>Humanistic - Existential Therapies</td>
<td></td>
</tr>
<tr>
<td>Psychodynamic Therapies.</td>
<td></td>
</tr>
</tbody>
</table>

Books Recommended:


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University of Rajasthan
Jalpur
Paper II - Psychological Statistics

Section-A


3. Measurement of Central Tendency: Purpose and Types; Characteristics and Computation of Mean, Median and Mode.

Section-B

4. Measures of Variability: Concept and Uses; Characteristics and Computation of Range, Quartile Deviation, Average Deviation and Standard Deviation.

5. Correlation: Concept and Types- Pearson’s Product Moment Correlation (for Ungrouped Data by Assumed Mean and Actual Mean); Spearman’s Rank Order Correlation.

6. Hypothesis Testing and Inferences Making: Population and Sample, Types of Sampling, Standard error of Mean, ‘t’ test (Independent group), Interpretation of ‘t’ values, levels of Significance.

Section-C

7. Non Parametric Tests: Nature and Assumptions of Distribution-free Statistics; Chi-Square; Equal Probability, 2 x 2 Contingency Table; Median Tests.

8. ANOVA: Purpose and Assumptions of ANOVA. One way ANOVA


Books Recommended:

Practical
1. Assessment of Mental Health
2. Assessment of State and Trait Anxiety
3. Measurement of Depression
4. Measurement of Coping – Styles
5. Assessment of Family Pathology
6. Word – Association Test
7. Eight-State Questionnaire
8. Neuropsychological Assessment
9. Stress: Measurement and Analysis of Group Data (Mean and Median)
10. Stress: Measurement and Analysis of Group Data (‘t’ test)
ELECTRONICS

Scheme

Min. Pass Marks 36
Max. Marks: 100

Paper-I
3 hrs. duration
Max. Marks: 33

Paper-II
3 hrs. duration
Max. Marks: 33

Paper-III
3 hrs. duration
Max. Marks: 33

Practical Min.-18
5 hrs. duration
Max. Marks: 50

Paper-I: Amplifier Circuits

Max. Marks-33
Time: 3 Hours
Syllabus : B.Sc. Part-II

Five questions are to be set taking one from each unit (each question will have an internal-choice). Student will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-1

Q-point, Stability of Q-point, Various types of transistor biasing circuits, Thermokbias stability, Arrangement of feedback, gain, stabilization, Reduction of non-linear distortion by negative feedback, Effect of feedback on input and output impedances.

Unit-2

Frequency response of linear amplifiers and noise distortion, current and voltage, series and parallel feedback, Examples of positive and negative feedback, Emitter follower, Differential amplifiers with balanced and unbalanced single input and double input (DC and AC analysis), common mode rejection ratio.

Unit-3

Operational amplifiers, Differential amplifier, operational amplifiers as an integrator, differentiator, inverting amplifier, adder and subtractor amplifier, voltage comparator and logarithmic amplifier, Ideal and practical operational amplifier for offsets, input offset current and voltage, power supply using 741 operational amplifier, uses of operational amplifier as oscillator.
Unit-4

Class A, B, and C operating conditions for power amplifiers, condition of maximum power transfer, special features of transistors used for power amplification. Need of impedance matching in power amplifiers, shunt feed power amplifier, efficiency, distortion, power dissipation and power amplification, phase inverters, push-pull amplifiers. Class A, B, and D push-pull amplifiers using transistors.

Unit-5

Problems in amplifier circuit elements at high frequency, equivalent circuit, wide band amplifiers, high and low frequency compensation, pulse response and testing of an amplifier. Tuned amplifiers (single and double tuned) and their uses. Self amplification in radio and TV receivers. (No mathematical derivations, only qualitative description)

Paper-II - Rectifiers and Oscillators

Marks: 33

Time: 3 Hours

Five questions are to be set taking one from each unit (each question will have internal choice). Student will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-1

Unit-2

Zener diode, Electronically regulated power supplies, voltage multipliers, Trouble in low and high voltage power supply.


Unit-3

Bistable multivibrator, Monostable, and Bistable multivibrator (Collector coupled), Improvement of multivibrator response, synchronization Triggering-in-relaxation oscillators.

Unit-4

Response of sinusoidal, Triangular and Rectangular waves into CR and LR circuits. Their uses in integrating and differentiating circuits.

Non-linear wave shaping circuits, Clipping and clamping circuits, Slicer limiters circuits, Limiting and clipping amplifier, peaking circuits.

Unit-5

Terminology used to describe sweep generator, Fundamental sweep voltage generator, Transistor constant current sweep generator.
University of Rajasthan

References

1. Electron tube circuits J. Seeley
2. Engineering Electronics R. Ryder
3. Handbook of Electronics Gupta & Kumar
4. Applied Electronics G.K. Mishal
5. Electronics W.P. Atora

Paper-III: Digital Computer and Programming

Max. Marks: 34

Time: 3 Hours

Five questions are to be set, taking one from each unit (each question will have an internal choice). Students will attempt all the five questions. 40% weightage will be given to problems and numericals.

Unit-1


Unit-2

Central Processing Unit, I/O units, Arithmetic logic unit, Internal Storage. Auxiliary storages like HDD, FDD, CD etc. Read only memory, Random Access Memory. Computer generations and classification.
Unit 3

Algorithm-Definition and properties of algorithms. Flowchart, symbols of flowchart, converting a flowchart into a high-level language. Examples of simple algorithms. Low-level language, viz. machine language, assembly language, high-level language like BASIC.

Unit 4

BASIC: BASIC characters, arithmetic constants and variables, arithmetic operators, expressions and functions, character strings, constants and variables, string operators, expressions and functions. Terminal features, system commands and editing, PRINT, REM, INPUT, OUTPUT statements.

Elementary BASIC programmes for numeric and string processing.

Unit 5

Flow of control, unconditional conditional branching, relational, logical operators, two-way and multi-way selection statements, nesting, repetition statements.


Experiments for Practical work

Note:

A candidate has to perform at least sixteen experiments in all taking eight experiments from each section 'A' and 'B'.

7.3
In practical examination the candidate will be required to perform two experiments: one from section 'A' and the other from section 'B'. The distribution of marks will be as follows:

- Time duration: 5.00 Hrs. Expts. (two) - 30 (15 for each exp)
- Viva-Voce - 10 marks
- Practical record - 10 marks
- Total - 50 marks

**Section-A**

1. To study high-pass frequency filter.
2. To study low-pass frequency filter.
3. To study RC differentiating circuit.
4. To study RC integrating circuit.
5. To study bridge rectifier with L & C filter.
6. To study transistor biasing circuits.
7. To study counters and shift registers.
8. To study bistable multivibrator (collector coupled).
9. To study Exclusive OR (XOR) gate and verify its truth table.
10. Solution of simple equations using analog computer.

**Section-B**

1. To study analog to digital converter circuit.
2. To study digital to analog converter circuit.
3. To study negative feedback amplifier.
4. To study triode value characteristics and calculate its parameters.
5. To study OP Amp as summing amplifier.
6. To study OP Amp as an inverter.
7. To study OP Amp as a non-inverter.
8. To study push-pull amplifier using transistor.
9. To study emitter follower and its frequency response.

Syllabus : B.Sc. Part-II
13. Textile Craft

B.Sc. Part-II 2020

SCHEME: B.A/B.Com/B.Sc. PART-II

1. Theory:
   - Paper-I: 3 Hrs
   - Paper-II: 3 Hrs

2. Practical:
   - Paper-I: 3 Hrs
   - Paper-II: 3 Hrs

3. Submission:
   - Paper-I: 35
   - Paper-II: 35

Paper-I: Weaving Theory-I

UNIT-I
Yarn numbering system – Indirect (cotton, metric, woollen and worsted count) and Direct (Tex and Denier)
   Yarn Twist and their types, Balance of fabric
   Methods of fabric construction: Braiding & Lacing, knitting, felting and weaving

UNIT-II
Types of loom– Shuttle & Shuttle less; introduction to shuttleless looms- airjet, waterjet, projectile and rapier loom
   Preparation of Warp and Weft for weaving
   Draft, Peg plan, Weave, Repeat, Design

UNIT-III
Derivatives of Plain weave- Rib and Basket
Derivative of twill weave- Regular, Irregular, Left hand, Right hand, Pointed and curved twill
Fabric defects, Selvedge, Types of Selvedge’s

Paper-II: Dyeing Theory –I

UNIT-I
Difference between dyeing and printing
Mechanical finishes- basic process of beating, singeing, napping, calendaring and embossing.

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UNIT-II
Stages of Dyeing (fibre, yarn & fabric)
Wool dyeing and silk dyeing
Dyeing machines- Jigger and Winch dyeing machine

UNIT-III
Steps of printing- preparation of cloth & colour
Methods of Direct printing- Block & Roller printing
Thickeners and types of thickeners

Practical (Paper-I)
1. Thread count and Balance of the cloth
2. Weave samples of derivatives of plain and twill weave

Practical (Paper-II)
1. Introduction to motif, repeat and layout
2. Block printing- samples preparation
3. Batik-spot, crack, scratch and painting (samples)

Submission (Paper-I)
1. Assessment of samples
2. Preparation of weave samples

Submission (Paper-II)
1. Any one article using block
2. Any one article using batik

Examination Scheme:
One Major Problem: 20 Marks
One Minor Problem: 15 Marks

Reference books:
Kulkarni, M.M., Weaving technology, Virindra publication, Jalgan
14. Garment Production & Export Management
B.Sc. Part-II 2020

B.A/B.Com.– Maxium Marks 40
B.Sc. Maximum Marks 50 Hrs.3

THEORY PAPER – 1
Fashion and Apparel Design

OBJECTIVES :-

1. To Develop Sensitivity & Understanding towards Historical World Costumes.
2. To Focus on Design Elements & Principles and their Details on Garments.
3. To Create Awareness About the Techniques of Pattern Making & Principle of Fittings.

SECTION –A

TRADITIONAL COSTUMES

1. Study of traditional costumes of various regions of India.
2. History of costumes of Indian civilization.
3. Brief knowledge of world costumes ; French, German, Greek, European

SECTION –B

TECHNIQUES IN PATTERN MAKING

5. Pattern making techniques- drafting, draping, flat pattern.
6. Colour and colour schemes, psychological effects of colour on clothes.
7. Fitting – principles of fitting, factors to be considered while fitting, common fitting problems, remedying fitting defects of bodice, sleeves, and skirts.

SECTION – C

DESIGN

8. Classification of design – structural and decorative
9. Elements and principles of design.

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References:

THEORY PAPER – 11
ELEMENTS OF MARKETING AND FINANCE
B.A./B.Com.-Maxmium Marks 40
B.Sc. – Maxmium Marks 50
Hrs. – 3

OBJECTIVES:
1. To create awareness about the procedures to select, proceed & start the Small Scale Industry.
2. To guide the process of product development according to the market needs.
3. To become familiar with the methods of payment in foreign trades & about types or bills.

SECTION A
1. Market structure- Types of market, market survey, elements of cost.
2. History of readymade garment industry, Problem and prospects in global market
4. Types of garments exported.

SECTION B
5. Elementary knowledge of working capital factors affecting working capital, operating cycle.
6. Sources of finance.
7. Letter of credit
8. Methods of payment in foreign trade
10. Insurance

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SECTION C

Brief study of:
11. ECGC (export credit and guarantee corporation)
12. EIC (export inspection council)
13. IIP (Indian institute of packaging)
14. ICA (Indian of arbitration)

References:
1. Srivastav, & Aggarwal. (). Vipdan prabandh.
3. Satya narayan; Sales management.

PRACTICAL - 1
APPAREL DESIGNING

B.A/B.Com.–Maxmium Marks 60
B.Sc. – Maxmium Marks 25

OBJECTIVES:
To familiarize with basics of color
To develop expertise in drawing croquis and draping dresses on them.

Contents:
1. Colour wheel and colour scheme.
2. Introduction to eight head theory and stick figure 9.5", 10.5".
3. Developing an adult croquis from block figure.
4. Draping of garments on croquis (at least 8 sheets) using different colours schemes and occasions.
5. Preparation of a portfolio.

80.

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Examination Scheme:

B.A./B.COM:-Max Marks:-60
1. Major Problems:-30
2. Minor Problems:-20
   Internal:-10

B.SC:-Max Marks:-25
1. Major Problem:-10
2. Minor Problems:-10
   Internal:-5

PRACTICAL – II
CLOTHING CONSTRUCTION

B.A./B.Com.–Maximum Marks 60
B.Sc. – Maximum Marks - 25
Hrs- 4

OBJECTIVES:

1. To be able to make basic drafts of bodice, sleeve and collar.
2. To learn the knowhow of stitching and all basic processes and ornamentation techniques.

Contents:

1. Pattern making
   1. Child basic block and sleeve block.
   2. Sleeve variations; slash and spread method-puff, bell, legomutton, bishops sleeves.
   3. Sleeve bodice combination; Magyar, raglan, dolman sleeves.
   4. Different types of collars.
   5. Different types of yokes.
2. Stitching of each sleeve, collar and yokes on bodice block.
3. Fashion designing (5 each) on sheet baby frocks, a line frocks, rompers, sun suits skirts and tops, bush-shirts with shorts.
4. Redesigning of old garment using the idea such as; to consider factors such as money, creativity, individuality, skills, needs,
   (i) Patchwork
   (ii) Ornamental fabric.
   (iii) Decorative embroideries
   (iv) Trims
   (v) Paints and dyes
   (vi) Introduction of fashion designing in fashion shows.
5. Introduction fashion designing in fashion shows.

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References:

Examination Scheme:

B.A./B.Com.-Max Marks:-60
1. Major Problems:-30
2. Minor Problems:-20
   Internal:-10

B.Sc.-Max Marks:-25
1. Major Problem:-10
2. Minor Problems:-10
   Internal:-5

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Geology and Mining

Scheme:

Theory: Max-Marks 100 Minimum Pass marks: 36

Paper I: Petrology

Practical(one)

Paper II: Principles of Stratigraphy and Geology of India

3 hrs duration Max Marks 50

3 hrs duration Max Marks 50

Paper I: Petrology

Section-A - Igneous Rocks

Composition of magmas; intrusive and extrusive rocks; structure and texture;
Classification

Crystallization of basaltic magma; Bowen Reaction Principle; differentiation;
Study of common igneous rocks: granite, rhyolite, gabbro, basalt, diorite, syenite and peridotite

Section-B - Sedimentary Rocks

Process of formation of sedimentary rocks; lithification and diagenesis;
Structure and texture of rocks; Elementary idea of sedimentary deposits, sedimentary environments and provenance.

Study of common sedimentary rocks: sandstone, limestone, shale, conglomerate and breccia
Section-C - Metamorphic Rocks

Agents and types of metamorphism; concept of grade and facies; structure and classification.

Types of metamorphism and their products; metasomatism and anatexis.

Study of common metamorphic rocks: Marble, schist, gneiss, quartzite, slate. Agate...

Paper II: Principles of Stratigraphy and Geology of India

Section-A

Principles of stratigraphy; standard stratigraphic scale; principles of correlation.

Paleogeography of India in Permo-Carboniferous period; Physiographic subdivisions of India.

Stratigraphic divisions in India and their equivalents.

Section-B

Stratigraphy, distribution, lithology and correlation of the Aravalli-Delhi and Vindhyan Supergroups of rocks.

Distribution, succession, climate, correlation, fossil content, and mineral resources of the Gondwana Supergroup.

Section-C

Lithology, succession, distribution and fossil content of Triassic of Spiti; Jurassic of Kachchh, Tertiary period, Siwalik Supergroup.

Origin, composition, distribution and age of Deccan Traps; Tectonic framework of India.
Practical

Study of typical textures of rocks; Megascope study of common igneous, sedimentary and metamorphic rocks; Microscopic studies of granite, rhyolite, gabbro, dolerite, limestone, sandstone, schist, gneiss, and marble.

Making drawings of paleogeographical maps of India during Varan and Carboniferous; Distribution of various geological formation in outline map of India; Identification and description of the representative stratigraphic rocks.

Geological field work and collection of samples.
16. ENVIRONMENT SCIENCE

B.Sc. Pt II- 2020

Scheme:

Theory
Max Marks: 100

<table>
<thead>
<tr>
<th>Paper</th>
<th>Duration</th>
<th>Min. Marks</th>
<th>Max Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper 1</td>
<td>3 hours</td>
<td>36</td>
<td>50</td>
</tr>
<tr>
<td>Paper 2</td>
<td>3 hours</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Practical</td>
<td>4 hours</td>
<td>18</td>
<td>50</td>
</tr>
</tbody>
</table>

Note:

1. Two types of Question papers for each theory paper will be applicable. Total duration of 3 hours for each paper. One question paper will comprise of the objective questions and the other will be of descriptive type question.

2. Descriptive type question paper (to be given during 1st 2 hours of examination) will have 9 questions from each section out of which a student is supposed to attempt 4 questions selection at least 1 from each section. This portion of the paper will carry maximum 30 marks. Each descriptive question will be of 7.5 marks.

3. The objective question paper will be given after 2 hours of commencement of descriptive type paper and will have 35 questions of the objective type. This portion of the paper will carry 20 marks. The objective type questions will be of the following types:
   a. Multiple choice type questions: 20 questions of ½ marks each.
   b. Fill in the blanks/one word/true or false type questions: 10 questions of ½ mark each.
   c. Very short answer type questions: 5 questions of 1 mark each

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Paper I: Environmental Pollution

Section-A
1. Sources and Classification of Air pollutants; aerosols, gases, vapors.
2. Meteorological Aspects; Factors affecting Air Pollution, wind roses, plume behavior, estimation of plume rise.
3. Air Pollution modeling; Dispersion models, Pasquill model, ASME model, Gaussian plume model, assumption, limitation applications.
4. Effects of Air Pollution; effects on economics, effects on environment and effects on human beings.
5. Global effects of Air Pollution, Greenhouse effect, Global warming, climate change, Acid rains, Ozone depletion.
6. Air Pollution due to automobile; Vehicular emissions, Motor fuel combustion, automobile emission mechanism from various vehicles.

Section-B
2. Different types of sources of water pollution.
3. Types of wastewater and its quantum.
4. Effects of water pollution on Environment(Soil, organisms, vegetation, crop plants)
5. Effects of water pollution on human beings.
6. Pollution of water by Industries and power plants.
7. Marine pollution; quantum, types of pollutants, effects on water quality, organisms and ultimate effects on human beings.

Section-C
1. Various sources of Noise Pollution.
2. Methods of measurements of Noise Pollution.
3. Temporary effects of Noise Pollution on human beings.
4. Permanent effects of Noise Pollution on human beings.
5. Land pollution due to Municipal solid waste.
6. Pollution due to agricultural chemicals on land and crop plants.

Suggested Readings:
- Environmental Radiation and Thermal Pollution and their control, Acol Publication, New Delhi.

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Paper II: Computer Techniques, Environmental Biotechnology and Environmental Microbiology

Section A

1. Biotechnology and its possible role in Environmental conservation.
2. Oil Slicks, oil spills, pesticide, tannery food industries and applications of biotechnology.
5. Air Pollution abatement and Biotechnology (Bio scrubbers, Bio beds, Bio trickling filters).

Section B

1. Microbiology and its possible role in solution of Environmental Challenges.
2. Air borne diseases and causal organisms.
3. Water borne diseases and causal organisms.
4. Role of microbes in metal recovery.
5. Role of microbes in pest control.

Section C

1. Software MS Word and its possible role in environmental challenges.
2. Software XP and environmental Challenges.
3. Role of Websites and internet in environmental conservation.
4. Wind rose formation and its application in environmental monitoring.
Suggested readings:

Suggested Field and Laboratory Exercises

1. Estimation of SPM (Suspended Particulate Matter) from heavy traffic and busy areas.
2. Estimation of CO₂.
4. Estimation of NOₓ.
5. Preparation of pollution roses.
6. Estimation of Noise Levels from busy areas.
7. Estimation of Noise Levels from Silence zone (Hospital area, sanctuaries, National Parks)
8. Estimation of pH of water.
10. Estimation of TDS of water.
12. Visit to various water harvesting structures (traditional water harvesting structures), ponds, bawries, kunds, kacchatanka, puccatanka.

13. Collection of water from surface water sources, tankas etc.

14. Estimation of pH, EC, TDS, Chlorides, Oxygen, alkalinity etc. from surface water sources of different locations.

15. Estimation of pH, EC, TDS, Chlorides, Oxygen and fluoride determination of ground water collected from different sources.


17. E-coil count and other microbe identification.
BIO-TECHNOLOGY

Scheme:

Min. Pass Marks: 36
Max. Marks: 100
Paper-I 3 hrs. duration  Max. Marks: 50
Paper-II 3 hrs. duration  Max. Marks: 50
Practical Min. Marks: 18 5 hrs. duration  Max. Marks: 50
Paper-I: Biophysics and Molecular Biology  Max. Marks: 50

Section - A

Energetics of living bodies - sources of heat, limits to temperature, heat dissipation and conservation.

Lambert-Beer law, spectrophotometry and colorimetry. Primary elements in photosynthesis.

Strategies of light reception in microorganisms, plants and animals.

Correlation of size, shape, and electrical properties of biological membranes. Electrochemical potentials and signal transmission.

Generation and reception of sound vibrations. Hearing aids.

Intra- and inter-molecular interactions in biological systems. Spatial and charge compatibility as determinant of molecular interactions.

Physical methods applied to find out molecular structure: X-ray crystallography, and NMR.

General spectroscopy - UV, visible, fluorescence, atomic absorption, IR, Raman, spectra.

Physical methods of imaging in biological systems: biological structures - Ultrasound, optical filters, X-ray, CAT scans, PET, MRI, NMR imaging.

Section - B

Molecular basis of life: Structure and function of DNA, RNA replication, DNA recombination, molecular mechanisms in prokaryotes and eukaryotes.

Insertion elements and transposons.

Structure of prokaryotic genes.

Prokaryotic transcription.

Prokaryotic translation.

Prokaryotic gene expression (lac, his, trp, catabolic repression).

Section - C

Structure of eukaryotic genes.

Bukaryotic transcription.

Bukaryotic translation.
Eukaryotic gene expression transcription factors etc.
Gene expression in yeast.
Gene expression in protozoan parasites.
Gene organization and expression in mitochondria and chloroplasts.
Post-translational regulation of gene expression.
Development and environmental regulation of gene expression.

B.Sc. Part II

Unit - II: Immunology - Animal Cell Culture and Recombinant DNA Technology

Max. Marks: 50

Section A

The immune system and its components, along with historical perspective.
Antigen-antibody and their structure.
The organs and the cells of the immune system and their function.
Antigen-antibody interaction.
Humoral and cell-mediated immunity (role of MHC and genetics).
Immunity to infectious diseases: vaccines.

Section B

History and development of cell cultures: The natural surrounding of animal cells.
Metabolic capabilities of animal cells: Simulating natural conditions for growing animal cells.
Importance of growth factors of the serum.
Primary cultures: Anchorage dependence of growth. Non-anchorage dependent cells.
Secondary cultures: Transformed animal cells - Established/continuous cell lines.
Commonly used animal cell lines: their origin and characteristics.
Growth kinetics of cells in culture.
Application of animal cell culture for studies on gene expression.
Organ culture
Transfusion of animal cells: Selectable markers, HAT selection, antibiotic resistance etc.
Cell fusion: Transplantation of cultured cells. Differentiation of cells.
Section - C

- What is gene cloning and why do we need to clone a gene?
- Tools and techniques - plasmids and other vehicles, genomic DNA, RNA, CDNA, RT
- Enzymes and other reagents technique, laboratory requirements
- Safety measures and regulations for recombinant DNA work
- Choice and selection of the tools and the techniques
- Vectors - Plasmids, phagemids, cosmid, viruses
- Purification of DNA from bacteria, plant and animal cells
- Manipulation of plasmid DNA, introduction of DNA into cloning cells
- Cloning vectors (E. coli, yeast, fungi, plants, agrobact, plant viruses, animal viruses)
- Application of cloning in gene analysis: How to obtain a clone of a specific gene
- Studying gene location, structure, studying gene expression
- Gene cloning and expression of foreign genes in research and biotechnology
- Production of proteins from cloned genes
- Gene cloning in medicine - Pharmaceutical compounds, artificial insulin, gene, recombinant vaccine, diagnostic reagents

Practical - Bases on theory syllabus
COMPUTER APPLICATION
(Common for B.A./B.Com./B.Sc.)

Science  Com./Arts  Science  Com./Arts

Paper I Data Base Management System  50  65
Paper II Structured Programming  50  65
and Computer Graphics
Practical Programming Laboratory  50  70
On-the-Job training (4 weeks)
The duration of these papers will be 3 hours.

Paper I: Data Base Management System
Categorization of DBMS Systems, Network, Hierarchical and
relational databases, Application of DBMS systems.
Relational database management system, Why to use them
and where. Data Description Language, Data Manipulation Lan-
guage and Data Control Language.
Introduction to DBASE, DBASE commands. Development of
an application under DBASE using forms, screens and PRG. files.
Security considerations in database management systems.
Performance improvement in databases.
Relational databases, advanced concepts. Introduction to ORA-
CLE/INGRES or a similar RDBMS on a multiuser environment.
Structured query language. Form design on an advanced RDBMS.
Report generator, Query by example and Report by form. Accessing
RDBMS using programming languages.
Syllabus B.A. Part-II

System management, User management, Security considerations
Practical.

Design of a database for a business application. Design of data
entry forms and report layouts for this database. Creation of pro-
grams to access and manipulate database.

Development of a business application in RDBMS.

Paper-II: Structured Programming and Computer Graphics
Introduction. Need of structured programming. Methods of
documentation. Methods of analyzing a program requirements. Data

Various categories of programming language (3GL, 4GL, etc.),
introduction to C and COBOL. Program development in C using
structured programming concepts.

Why Graphics: Various types of graphics programs. Drafting
packages. DTP packages. Microsoft Windows. Various documenta-
tion. DTP packages e.g. Wordperfect, Microsoft Word etc.

Introduction to a Pagemaker/Ventura or a similar package. Prepa-
ation of documents using DTP package. Formatting. Various fonts
and characters set. Various type of printers used in DTP. Introduction
to commercial DTP system available in market. Indian language fonts.

Practical

Development of a business application using C.
Preparation of a document and publishing it using a DTP Sys-
n. Creation of fonts.

Managing a Microsoft Window session. Creating groups and
program items under Window. Turning Windows for a computer

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