

B.Sc. Semester - V

Scheme of examination

Continuous Assessment (CA)	=	15 Marks
Term Test	=	10 Marks
Home Assignment	=	05 Marks
Semester End Examination (SEE)	=	35 Marks
Total	=	50 Marks

B.Sc. Semester V Botany

PAPER CODE

22-5001

PLANT TAXONOMY

Scheme of examination:

MM: 35

1. In Semester-End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 will be compulsory having 07 short answer type questions (one mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

UNIT - I

Introduction, Principles of Taxonomy, Units of Classification, Concept of Genus and Species. Binomial Nomenclature, International Code of Botanical Nomenclature. Taxonomic Literature; Botanical Gardens and Herbaria.

UNIT - II

Development of Taxonomy and History of Different System of Classification. Bentham and Hooker's System of Classification. Engler and Prantle System of Classification. Evolutionary Trends in Angiosperms. Primitive and Advanced Characters.

UNIT - III

Diversity of flowering plants as illustrated by members of the families and economic importance of the following families: Ranunculaceae, Brassicaceae, Malvaceae, Fabaceae, Apiaceae, Rubiaceae, Asteraceae.

UNIT - IV

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Diversity of flowering plants as illustrated by members of the families and economic importance of the following families: Apocynaceae, Asclepiadaceae, Convolvulaceae, Solanaceae, Acanthaceae, Lamiaceae, Euphorbiaceae, Liliaceae and Poaceae.

Suggested readings:

- Naik, V.N. 2011. Taxonomy of Angiosperms. TATA McGraw Hill, New Delhi.
- Pandey, S.N. and Misra, S.P. 2008. Taxonomy of Angiosperms. Ane Books India, New Delhi.
- Saxena, N.B. and Saxena, S. 2011. Plant Taxonomy. Pragati Prakashan, New Delhi.
- Sharma, B.D. 1984. Flora of India vol. I. Botanical Survey of India, Calcutta.
- Sharma, O.P. 1996. Plant Taxonomy. TATA McGraw Hill, New Delhi
- Simpson, M.C. 2006. Plant Systematics. Elsevier, Amsterdam.
- Singh, G. 2001. Plant systematics. Oxford and IBH, New Delhi.
- Sivarajan, V.V. 1991. Introduction to Principles of Plant Taxonomy. Oxford and IBH, New Delhi.

PAPER CODE 22-5002

B.Sc. Semester V Botany Paper II

EMBRYOLOGY AND ECONOMIC BOTANY

Scheme of examination:

MM: 35

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 will be compulsory having 07 short answer type questions (one mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

UNIT - I

Ontogeny of the flower parts- development and variations.

Structure of anther and microsporogenesis (Tapetum- types and function, development of male gametophyte, structure of pollen grains.)

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Types of ovules & Megasporogenesis (development of female gametophyte (Embryosac) Pollination, Pollination types. Fertilization, double fertilization, significance of double fertilization.)

UNIT - II

Embryo: Development of Dicot and monocot embryo, Formation of embryo, Types of embryos.

Endosperm: Types of endosperms, Endosperm haustoria.

Polyembryony, Induced polyembryony. Parthenocarpy, Apomixis and adventive embryony.

UNIT - III

Basic concept of centre of origin of cultivated plants.

Food plants: rice, wheat, maize, potato, sugarcane.

Vegetables: General account with a note on radish, onion, garlic, cabbage, spinach, cauliflower, cucumber, tomato, lady finger and pea.

Fruits: General account with a note on apple, banana, ber, mango, mulberry, jamun, watermelon, muskmelon, guava and orange.

Vegetable oil: groundnut, mustard and coconut.

UNIT - IV

Spices: General account with an emphasis on those cultivated in Rajasthan: (Cumin, Capsicum, Coriander).

Beverages: Tea and coffee.

Medicinal plants: General account with an emphasis on plant species cultivated in Rajasthan (Senna, Isabgol, Safed musli).

Fibers: Cotton and jute.

Wood: General account of sources of firewood, timber and bamboos;

Rubber.

Ethnobotany: a general account.

Suggested Readings

- Bhojwani, S.S. and Bhatnagar, S.P. 2004. The Embryology of Angiosperms. Vikas Publishing House, New Delhi.

- Davis, C.L. 1965. Systematic Embryology of Angiosperms. John Wiley, New York.
- Johri, B. D. 1984. Embryology of Angiosperms. Springer Verlag, Berlin.
- Maheswari, P. 1985. Introduction to Embryology of Angiosperms. Mac Graw Hill House (P) Ltd., New York.
- Raghavan, V. 2000. Developmental Biology of Flowering plants. Springer, Netherlands.
- Gupta, S.K. and Kaushik, M.P. 1973. An Introduction to Economic Botany. K. Nath and Co., Meerut.
- Hill, A.W. 1952. Economic Botany. McGraw Hill Book Co., New York.
- Jain, S.K. 1981. Glimpses of Indian Ethnobotany. Oxford and IBH, New Delhi.
- Jain, S.K. 1987. A Manual on Ethnobotany. Scientific Publisher, Jodhpur.
- Prakash, G., Sharma, S. K. 1975. Introductory Economic Botany. Jai Prakash Nath and Cosec, Meerut.
- Sambamurthy, A.V.V.S. and Subrahmanyam, N.S. 1989. A Text Book of Economic Botany. Wiley Eastern Ltd., New Delhi.
- Sen, S. 1992. Economic botany. New Central Book Agency, Calcutta.
- Singh, V., Pandey, P.C. and Jain, D.K. 1998-99. Economic Botany. Rastogi Publications, Meerut.
- Verma, V. 1974. A Text Book of Economic Botany. Emkay Publications, New Delhi.

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B.Sc. Semester - VI

Scheme of examination

Continuous Assessment (CA)	=	15 Marks
Term Test	=	10 Marks
Home Assignment	=	05 Marks
Semester End Examination (SEE)	=	35 Marks
Total	=	50 Marks

B.Sc. Semester VI Botany

PAPER CODE 22-6001

MOLECULAR BIOLOGY AND PLANT BIOTECHNOLOGY

Scheme of examination:

MM: 35

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 will be compulsory having 07 short answer type questions (one mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

Unit - I

History of molecular biology, work of Chargaff, Watson and Crick model of DNA, Meselson and Stahl replication experiment; Hershey and Chase experiment, Chromatin structure and gene expression, S. Benzer and gene concept.

Kary Mullis and Polymerase chain reaction, Application of PCR technique, an overview of DNA fingerprinting and its use.

Unit-II

Central dogma, Reverse transcriptase and its application,

Transcription in eukaryotes: RNA processing, capping, splicing and polyadenylation,

Translation: initiation, elongation and termination.

Jacob-Monod and Lac operon, Negative and positive control, attenuation and antitermination, structure of promoter.

Unit-III

29



Biotechnology: Functional definition. Basic aspects of Plant tissue culture, basal medium, media preparation and aseptic culture technique. Concept of cellular totipotency.

Differentiation and morphogenesis, Micropropagation and synthetic seeds. Protoplast culture and somatic hybridization. Anther culture for androgenic haploid. Ovule and embryo culture and their application.

Unit-IV

Recombinant DNA technology: Techniques used in rDNA technology. Restriction enzymes. Vectors for gene transfer, Plasmids and cosmids, cDNA library, gene amplification; Transgenic plants.

Suggested Readings:

- Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. The World of the Cell. 7th Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Brown, T. A. 2010. Gene cloning and DNA analysis: An Introduction. Blackwell Publication, USA.
- Buchanan, B., Gruissem, W. and Jones, R. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists., USA.
- Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press and Sunderland, Washington, D.C. Sinauer Associates, MA. 18
- De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology 8th edition. Lippincott Williams and Wilkins, Philadelphia.
- Glick, B.R. and Pasternak, J.J. 2003. Molecular Biotechnology: Principles and Applications of recombinant DNA. ASM Press, Washington.
- Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley and Sons. Inc. New jersey, USA.
- Mascarenhas, A.F. 1988. Hand book of Plant tissue culture. Publication and information. Div., ICAR, New Delhi.
- Purohit, S.S. and Mathur, S.K. 1996. Biotechnology Fundamental and Application. Agro Botanical Publisher, Bikaner.

- Razdan, M.K., 1993. An introduction to Plant tissue culture. Publication and Information Div., ICAR, New Delhi.
- Rana, S.V.S. 2012. Biotechnology theory and practice. (Third Ed.) Rastogi Publication, Meerut.
- Rastogi, V.B. 2008. Fundamentals of Molecular Biology. Ane Books, Meerut, India.
- Smith, R. H. 2000. Plant Tissue Culture: Techniques and Experiments. 2nd edition, Academic Press, USA.

PAPER CODE 22-6002

B.Sc. Semester VI Botany

PLANT ECOLOGY

Scheme of examination:

MM: 35

1. In Semester End Examination the candidate has to answer five questions in all. Each question will be of 7 marks. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 will be compulsory having 07 short answer type questions (one mark each) covering entire syllabus.
3. Each paper is divided in four units. There will be two questions from each unit. Student has to answer one question from each unit.

UNIT-I

Plants and Environment: Atmosphere (gaseous composition and properties of four distinct zone viz. stratosphere, troposphere, mesosphere and thermosphere).

Water (distribution in biosphere and properties of water cycle).

Morphological, anatomical and physiological responses of plants to water (Hydrophytes and Xerophytes).

Light: global radiation, photosynthetically active radiation.

UNIT-II

Zonation in water body: littoral, limnetic and profundal zones.

photoperiodism, heliophytes and sciophytes,

Temperature (Raunkier's classification of plants: megatherm, mesotherm, microtherm, heikistotherm; themoperiodicity and vernalisation).

Soil (soil profile, development - weathering and maturation. Soil texture, soil types, role of pH, organic matter, soil water, soil nutrients.

Interactions among organisms: Neutralism, amensalism, allelopathy, competition, predation, parasitism, proto cooperation, mutualism.

UNIT-III

Population, Community, Ecosystem and Phytogeography:

Population, ecotypes, ecades.

Community characteristics: stratification, life forms and biological spectrum, frequency density and cover.

Ecological succession: types (primary and secondary), mechanism: nudation, migration, ecesis, reaction and climax; xerosere, hydrosere.

UNIT-IV

Ecosystems: Structure, abiotic and biotic components,

Trophic level, food chain, food web, ecological pyramids.

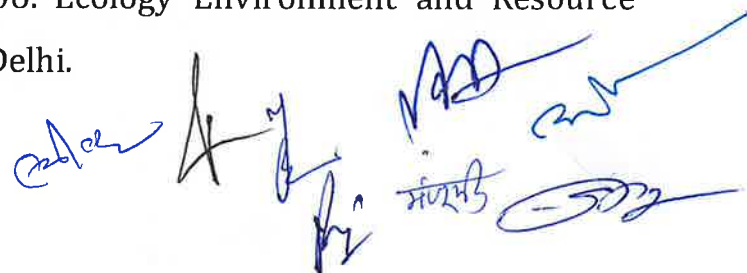
Energy flow (Box and Pipe model of Odum).

Biogeochemical cycles of carbon and phosphorus.

Vegetation types of India.

Suggested Readings:

- Banerjee, P.K. 2006. Introduction to Biostatistics. S. Chand and Co., New Delhi.
- Koromondy, E.J. 1996. Concepts of Ecology. 4th Edition Prentice-Hall of India Pvt. Ltd., New Delhi.
- Misra, K.C. 1988. Manuals of Plant Ecology. (3rd Edition) Oxford and IBH Publishing Co., New Delhi: 38
- Odum, E.P. 1983. Basic Ecology. 5th Edition Thomson Business International Waldis Pvt. Ltd., Baricahd.
- Odum, E.P. 2008. Ecology. Oxford and IBH Publisher. • Sharma, P.D. 2010. Ecology and Environment, (8th Edition) Rastogi Publications, Meerut.
- Singh, J.S., Singh, S.P. and Gupta, S. 2006. Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi.



B. Sc. BOTANY PRACTICAL EXAMINATION

SEMESTER V & VI

SKELETON PAPER

PAPER CODE P-22-6001

MAX. MARKS: 100

TIME 4 HOURS

Q. No.	Practical	Marks
1.	Plant Taxonomy 1. Taxonomy- Flower description 2. Study of reproductive organs of given flower	14 06
2.	Comment on the embryological exercise. Or Comment on the Tissue culture / Biotechnology technique.	10
3.	Plant Ecology (A) Ecological anatomy (B) Ecological exercise	14 06
4.	Economic Botany (A) Histochemical test OR (B) Comment on the botany and morphology of economic part of specimen	10
5.	Spotting (1-5 spots)	20
6.	Viva-Voce	10
7.	Practical Record	10
	Total	100

Suggested Laboratory Exercises:

- **Plant Taxonomy:** The following species are suitable for study. This list is only indicative. Teachers may select plants available in their locality.
 1. Ranunculaceae: Ranunculus, Delphinium
 2. Brassicaceae: Brassica, Iberis Papaveraceae: Argemone / Papaver.
 3. Malvaceae: Hibiscus, Abutilon
 4. Rubiaceae: Ixora,
 5. Fabaceae:
Faboideae: Lathyrus, Cajanus, Melilotus, Trigonella
Caesalpinioideae: Cassia, Caesalpinia
Mimosoideae: Acacia, Prosopis, Mimosa
 6. Apiaceae: Coriandrum, Foeniculum, Anethum
 7. Asteraceae: Helianthus, Ageratum, Sonchus, Tridax
 8. Acanthaceae: Adhatoda, Peristrophe
 9. Apocynaceae: Vinca, Thevetia, Nerium
 10. Asclepiadaceae: Calotropis
 11. Solanaceae: Solanum, Withania, Datura

12. Euphorbiaceae: Euphorbia, Phyllanthus, Ricinus
13. Lamiaceae: Ocimum, Salvia
14. Liliaceae: Asphodelus, Asparagus
15. Poaceae: Avena, Triticum, Hordeum

- **Embryological exercise**

1. T.S. of anther, to study the wall layers and pollen sac with pollen grains.
2. Study of different types of placentation.
3. Study of different types of ovules.
4. Study of female gametophyte through permanent slides/ photographs: types and ultra-structure of mature embryo sac.
5. Pollen germination test.
 - In vitro germination using sugar solution
 - Tetrazolium test
6. Study of monocotyledons and dicotyledons embryo of angiosperms through slides/photographs.

- **Biotechnology:**

1. Introduction of the instruments/techniques- laminar air flow/ sterile bench, Centrifuge, Autoclave, Incubator, Spectrophotometer, PH meter, Gel electrophoresis.
2. Preparation of M.S and P.D.A. culture media.
3. Explant culture- Shoot tip nodal segment
4. Callus culture
5. Protoplast isolation

- **Ecological anatomy**

1. Morphological & Anatomical adaptations in some hydrophytes & xerophytes: (Specimens/slides/section cutting) *Hydrilla, Typha, Eichhornia, Opuntia, Euphorbia, Capparis, Casuarina, Nerium, Calotropis*
2. Ecological instruments and their working

- **Ecological exercise**

1. To determine frequency of plant species of campus vegetation by quadrat method.
2. To determine density and abundance of plant species of campus vegetation by quadrat method.
3. To determine water holding capacity of soil of grass land or wood land
4. To determine the pH of given soil samples.
5. Study of soil moisture in relation to depth, bulk density, porosity and water holding capacity of different soil samples.
6. Find out transparency of a water body by secchi disc.
7. Determine the dissolved oxygen content in polluted and unpolluted water samples.

• **Economic Botany:**

Histochemical test – Lignin, Cellulose, Starch, Fat, Protein and Tannin.

Study of starch grains in Wheat, Rice, Potato and Pea.


Utilization of plants

1. Food plants – Wheat, Maize, Rice, Potato, Sugarcane.
2. Fibres – Cotton, Jute
3. Vegetable oils – Ground nut, mustard and coconut
4. A general account of the fire wood, timber yielding plants and Bamboos
5. Spices and condiments – Clove, Black pepper, Cinnamon, Cardamom.
6. Medicinal Plants – *Rauwolfia, Withania, Cinchona, Papaver, Ocimum, Datura, Ephedra, Taxus, Aloe, Azadirachta*
7. Beverages – Tea, Coffee
8. Rubber – *Ficus elastica, Hevea*

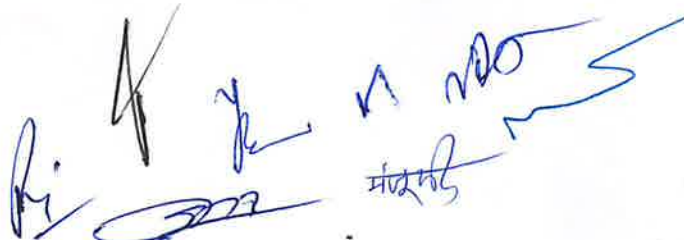
Approved,



CHAIRMAN
Academic Council
Raj Rishi Govt. Autonomous College
Alwar (Rajasthan)


(Dr. Seemata Agarwal)
HOB BOTANY


CHAIRPERSON
Governing Body
Raj Rishi Govt. Autonomous College
Alwar (Rajasthan)



Inorganic Chemistry

PAPER CODE
22-5004

Scheme of examination:

MM: 23

- 1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

Hard and Soft Acids and Bases (HSAB) : Classification of acids and bases as hard and soft. Pearson's HSAB concept acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Unit-II

Metal-Ligand Bonding in Transition Metal complexes: Limitations of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

UNIT – III

Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermo- dynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

UNIT - IV

Organometallic Chemistry-I: Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyl and aryls of Li, Al, Hg, Sn and Ti.

UNIT – V

Bioinorganic Chemistry I: Essential and trace elements to Biological processes, Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+} .

Organic Chemistry

PAPER CODE
22-5005

Scheme of examination:

MM: 23

- 1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT - I

Organometallic and Organosulphur Compounds: Organometallic Compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc Compounds: Formation and chemical reactions. Organolithium compounds: Formation and chemical reactions.

Organosulphur compounds: Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine.

Unit-II

Heterocyclic Compounds-I: Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions, with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

Unit-III

Carbohydrates: Classification and nomenclature monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+) - structures of glucose. Mechanism of mutarotation. Structure of



ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Unit-IV

Amino Acids: Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis.

Preparation and reactions of α -amino acids.

Unit-V

Synthetic Polymers: Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers.

Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes.

Natural and synthetic rubbers.



Physical Chemistry

PAPER CODE

Scheme of examination:

MM: 24

22-5006

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

Elementary quantum Mechanics-I: Black-body, radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects. Compton effect. De Broglie hypothesis Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator.

UNIT - II

Elementary quantum Mechanics-II: Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box. Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

Unit-III

(a) Spectroscopy: Introduction: Electromagnetic radiation, of the spectrum, basic features of different spectrometers, statement of the Born-Openheimer approximation, degrees of freedom.

(b) Electronic Spectrum: Concept of Potential Energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Frank Condon principle.

Qualitative description of σ , π and n M.O. their energy levels and the respective transitions.

UNIT – IV

Solutions, Dilute Solutions and Colligative Properties-I: Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient.

Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Experimental methods for determining osmotic pressure.

UNIT - V

Solutions, Dilute Solutions and Colligative Properties-II: Elevation of boiling point and depression in freezing point. Thermodynamic derivation of relation between molecular weight and elevation of boiling point and depression in freezing point. Experimental methods for determining elevation of boiling point and depression in freezing point. Abnormal molar mass, degree of dissociation and association of solutes.



Deepan Pillu
21/21

Inorganic Chemistry

PAPER CODE 22-6004

Scheme of examination:

MM: 23

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

Magnetic Properties of Transition Metal Complexes: Types of magnetic behavior, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of μ_s values and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

UNIT II

Electron Spectra of Transition Metal Complexes: Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series, Orgel-energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.

UNIT III

Organometallic Chemistry-II: A brief account of metal ethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

UNIT IV

Bioinorganic Chemistry-II: Metalloporphyrins with special reference to haemoglobin and myoglobin. Nitrogen fixation.

UNIT V

Silicones and Phosphazenes: Silicones and phosphazenes as example of inorganic polymers, nature of bonding in triphosphazenes.




Scheme of examination:

MM: 23

1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

NMR Spectroscopy: Nuclear magnetic resonance (NMR) spectroscopy. Proton Magnetic Resonance (H-NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constant, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

UNIT II

Heterocyclic Compounds-II: Introduction to condensed five and six-membered heterocycles. Preparation and reactions of indole, quainoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

UNIT III

Organic Synthesis via Enolates: Acidity of α -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate : the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes. Alkylation and acylation of examines.

UNIT IV

Peptides, Proteins and Nucleic Acids: Structures and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure. Protein denaturation / renaturation.

Nucleic acids: Introduction. Constituents of nucleic acids.

Ribonucleosides and ribonucleotides. The double helical structure of DNA.

UNIT V

Fats, Oils and Detergents: Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value, Soaps, synthetic detergents, alkyl and aryl sulphonates.

Synthetic Dyes: Colour and constitution (electronic concept).

Classification of dyes. Chemistry and synthesis of Methyl orange. Congo red. Malachite green. Crystal violet, Phenolphthalein. Fluorescein. Alizarin and Indigo.



Deepan Jais
21/07

Physical Chemistry

PAPER CODE
22-6006

Scheme of examination:

MM: 24

- 1 In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT – I

Molecular orbital theory, basic ideas-criteria for forming M.O. from A.O. construction of M.O's by LCAO - H_2^+ ion, calculation of energy levels from wave functions, Hybrid orbitals - sp , sp^2 , sp^3 calculation of coefficients of A. O.'s used in these hybrid orbitals. Introduction to valence bond model of H_2 , comparison of M.O. and V.B. models.

UNIT II

Rotational Spectrum: Diatomic molecules, Energy levels of a rigid rotator (semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotator, isotope effect.

UNIT III

Vibrational Spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups. Raman Spectrum concept of polarizability, pure rotational and pure vibrational Raman Spectra of diatomic molecules, selection rules.

UNIT IV

Photochemistry: Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus-

Draper law, Stark -Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simplex examples).

UNIT V

Physical Properties and Molecular Structure: Optical activity, polarization - (Cauchy-Mossotti equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment temperature method and refractivity method, dipole moment and structure of molecules, magnetic properties - paramagnetism, diamagnetism and ferromagnetism.



Aditya Kishore
21/11/21

CHEMISTRY PRACTICAL B.Sc. PT-III

5 hrs. Duration

4 hrs./week

Max. Marks: 100

Min. Marks: 36

PAPER CODE ..P-22-6004

Inorganic Chemistry**Synthesis and Analysis**

- (a) Preparation of sodium trioxalato ferrate (III) $\text{Na}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$ and determination of its composition by permanganometry.
- (b) Preparation of Ni-DMG complex, $[\text{Ni}(\text{DMG})_2]$
- (c) Preparation of copper tetraammine complex $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$.
- (d) Preparation of cis-and trans-bisoxalato diaqua chromates (III) ion.

Instrumentation**Calorimetry**

- (a) Job's (b) Mole-ratio method
Adulteration-Food stuffs
Effluent analysis water analysis

Solvent Extraction

Separation and estimation of Mg (II) and Fe(II)

Ion Exchange Method

Separation and estimation of Mg(II) and Zn(II)

ORGANIC CHEMISTRY**Laboratory Techniques****Steam Distillation**

- Naphthalene from its suspension in water
Clove oil from Clove
Separation of o-and p-nitrophenols.

Column Chromatography

- Separation of fluorescein and methylene blue
Separation of leaf pigments from spinach leaves.
Resolution of racemic mixture of (=) mandelic acid.

Qualitative Analysis

Analysis of an organic mixture containing two solid components using water, NaHCO_3 , for separation and preparation of suitable derivatives.

Synthesis of Organic Compounds

- (a) Acetylation of salicylic acid, aniline, glucose and hydroquinone.
Benzoylation of aniline and phenol.
- (b) Aliphatic electrophilic substitution
Preparation of iodoform from ethanol and acetone...
- (c) Aromatic electrophilic substitution
Nitration
Preparation of m-dinitrobenzene
Preparation of p-nitroacetanilide
Halogenation
Preparation of p-bromoacetanilide
Preparation of 2,4,6-tribromophenol
- (d) Diazotization/coupling
Preparation of methyl orange and methyl red
- (e) Oxidation
Preparation of benzoic acid from toluene

- (f) Reduction
Preparation of aniline from nitrobenzene
Preparation of m-nitroaniline from m-dinitrobenzene.

Stereochemical Study of Organic Compounds via Models

- R and S configuration of optical isomers.
E,Z configuration of geometrical isomers.
Conformational analysis of cyclohexanes and substituted cyclohexanes.

Physical Chemistry

Electrochemistry-I

- (a) To determine the strength of the given acid conductometrically using standard alkali solution.
(b) To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.
(c) To study the saponification of ethyl acetate conductometrically.

Refractometry, Polarimetry

- (a) To verify law of refraction of mixtures e.g. of glycerol and water) using Abbe's refractometer.
(b) To determine the specific rotation of a given optically active compound.
(c) To determine the ionisation constant of a weak acid conductometrically.
(d) To titrate potentiometrically the given ferrous ammonium sulphate solution using $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ as titrant and calculate the redox potential of $\text{Fe}^{++}/\text{Fe}^{+++}$ system on the hydrogen scale.

Molecular Weight Determination

- (a) Determination of molecular weight of a non-volatile solute by Rast method/Backmann freezing point method.
(b) Determination of the apparent degree of dissociation of an electrolyte (e.g. NaCl) in aqueous solution at different concentrations by ebullioscopy.

Colorimetry

To verify Beer-Lambert law $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ and determine the concentration of the given solution of the substance.

20/02/2015
CHAIRPERSON
Governing Body
Raj Rishi Govt. Autonomous College
Alwar (Rajasthan)

20/02/2015
Chairman
CHAIRMAN
Academic Council
Raj Rishi Govt. Autonomous College
Alwar (Rajasthan)

CHORDATES

MM: 35

Scheme of examination:

1. In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT - I

- Classification and characters of phylum Chordata (excluding extinct forms) up to orders (up to subclass in mammals).
- Habit, habitat and Salient features of Herdmania, Branchiostoma and Petromyzon :
- Ascidian tadpole larva and its metamorphosis
- Ammocoete larva.

UNIT - II

Comparative Anatomy (with special reference to *Scoliodon*, Frog, *Varanus*, *Columba* and Rabbit)-

- Integument - skin structure and development of placoid scales, feathers and hair.
- Basic plan of vertebrate endoskeleton
- Alimentary canal

UNIT - III

Comparative Anatomy (with special reference to *Scoliodon*, Frog, *Varanus*, *Columba* and Rabbit)-

- Origin and evolution of Heart and aortic arches.
- Respiratory system.

UNIT - IV

Comparative Anatomy (with special reference to *Scoliodon*, Frog, *Varanus*, *Columba* and Rabbit)-

- Brain
- Urinogenital system.

UNIT - V

- Pisces – Types of scales and fins, Migration Parental care.
- Amphibia - Parental care.
- Reptilia - Poisonous and non-poisonous snakes,
- Aves - Flight adaptation, Bird migration.
- Mammals - Dentition.

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DEVELOPMENTAL BIOLOGY

Scheme of examination:

1. In Semester End Examination there will be 10 questions in all, 2 from each unit.
Candidate has to answer any 5 questions, taking one from each unit.

MM: 35

UNIT - I

- Historical review: types & scope of embryology
- Gametogenesis: Spermatogenesis and oogenesis
- Fertilization mechanism & its significance,
- Parthenogenesis

UNIT - II

- Types of eggs
- Planes and patterns of cleavage
- Morulation and blastulation
- Gastrulation - Fate maps, morphogenetic cell movements, significance.

UNIT - III

- Development of chick up to 4 – somite stage.
- Extra-embryonic membranes in chick.
- Mammalian placentation - types, classification & functions.

UNIT - IV

- Embryonic induction;
- primary organizer,
- differentiation,
- competence;
- Regeneration in vertebrates
- Apoptosis

UNIT - V

- Metamorphosis in Frog.
- Embryonic stem cells.
- Aging,
- Teratogenesis,
- Therapeutic cloning.

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EVOLUTION AND ETHOLOGY

Scheme of examination:

MM: 35

1. In Semester End Examination there will be 10 questions in all, 2 from each unit. Candidate has to answer any 5 questions, taking one from each unit.

UNIT - I

- Chemical origin of Life.
- Lamarckism & Darwinism.
- Natural selection, Genetic basis of evolution.

UNIT II

- Variation and Speciation.
- Isolation
- Adaptations.
- Palaeontology: fossils; Geological time scale, Fossils dating.

UNIT III

- Zoogeographical distribution: Principal zoogeographical regions of the world with reference to their mammalian fauna.
- Continental drift.
- Study of Extinct forms: Dinosaurs, Archaeopteryx

UNIT IV

- Introduction of Ethology.
- Concept of Ethology: Fixed action pattern, Sign stimulus, Innate releasing mechanism, Action specific energy, motivation, imprinting & learning.
- Methods of studying brain behaviour: Neuroanatomical, neurophysiological, neurochemical techniques

UNIT V

- Pheromones and their role in alarm spreading.
- Hormones - Biological rhythms & Biological clock.
- Societies: Characteristics & advantages with special reference to Honey Bee, Deer & Monkey.

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ECOLOGY AND BIOSTATISTICS*Scheme of examination:***MM: 35**

1. In Semester End Examination there will be 10 questions in all, 2 from each unit.
Candidate has to answer any 5 questions, taking one from each unit.

UNIT - I

- Basic concepts of ecology & limiting factors.
- Biotic and Abiotic Factors.
- Ecosystem- Components of ecosystem,
- Energy flow,
- Ecological pyramids,
- Food chain and Food web

UNIT II

- Biogeochemical cycles (O₂, CO₂, H₂O, N and P).
- Populations- Characteristics, Growth and its analysis.
- Intraspecific & interspecific: Commensalism & Mutualism.
- Community ecology: Characteristics & structure, Ecotone, Edge effect

UNIT III

- Ecological Succession (Xerosere and Hydrosere).
- Major Biome.
- Habitat Ecology-Aquatic, Marine, Terrestrial - Desert, Forest.

UNIT IV

- Conservation and management of natural resources.
- Pollution.
- Green house effect, El-Nino and La-Nino effects.
- Wild life conservation and management.
- Biodiversity of Rajasthan, Concept of threatened species.

UNIT V

- Introduction, scope and application of Biostatistics.
- Frequency distribution,
- Graphical presentation of data.
- Mean, mode, median and their significance.
- Standard deviation and standard error.

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