Devi Ahilya Vishwavidyalaya, Indore

Syllabus for B.Sc. Part– I, II, III, Life Science (as one subject),

2017 onwards

Class	Title of the Paper	Distribution of Marks		
		Theory	Internals	Total
B.Sc. I Year	I- Introduction to Biochemistry, Cell Biology, Plant & Animal Diversity	40	10	50
	II- Environmental Biology, Genetics & Evolution	40	10	50
	Practical	-	-	50
	Total			**150**

Class	Title of the Paper	Distribution of Marks		
		Theory	Internals	Total
B.Sc. II Year	I- Morphology, Developmental Biology and Physiology of Angiosperms	40	10	50
	II- Morphology, Developmental Biology and Physiology of Mammals	40	10	50
	Practical	-	-	50
	Total			**150**

Class	Title of the Paper	Distribution of Marks		
		Theory	Internals	Total
B.Sc. III Year	I- Microbiology, Immunology and Animal Cell Culture	40	10	50
	II- Molecular Biology, Genetic Engineering and Plant Tissue Culture	40	10	50
	Practical	-	-	50
	Total			**150**

Scheme of Practical Examination in Each Class/year		
Total Marks- 50 **Duration - 5 Hrs.**	1. Major exercise-1	12 Marks
	2. Major exercise-2	12 Marks
	3. Minor exercise	06 Marks
	4. Spotting	05 Marks
	5. Viva-Voce	05 Marks
	6. Practical record	05 Marks
	7. Project	05 Marks

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Project work
1 Ess only
in Final
Sem.

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Syllabus-B.Sc. Part – I (Life Science)

Paper – I: Introduction to Biochemistry, Cell Biology, Plant & Animal Diversity

Unit-I	Carbohydrates: Classification, Structure and function Lipids: Structure and function Vitamins: Occurrence and function
Unit-II	Amino Acids, Proteins, Structure and Function Enzymes, Classification, kinetics of enzyme catalysed reactions. Factors effecting enzymatic activity. Nucleic acids, structure and function of DNA , RNA
Unit-III	Structure of prokaryotic and eukaryotic cells. Structure and function of Plasma membrane, Endoplasmic reticulum, Golgi apparatus, Lysosomes , Ribosomes, Mitochondria, Chloroplast & Nucleus. Cell division (mitosis & meiosis)
Unit-IV	General Characteristics of Algae and Fungi, Lichens and their economic importance General characteristics, adaptation of Bryophytes, Pteridophytes & Gymnosperms General Characteristics and differences in moncot and dicot plants Anatomical features of woody plants. Economic importance of angiosperm plants
Unit-V	General characteristics of Annelida , Arthropoda, Mollusca, Pisces, Amphibians, Reptiles, Aves and Mammals. Osmoregulation in fishes. Parental care in amphibians. Salient feature of poisonous and non-poisonous snakes. Flight adaptation in birds.

List of Practicals

1. Qualitative tests for carbohydrates. Lipids and proteins.
2. Effect of temperature, pH and concentration on enzyme activity.
3. Chloroplast isolation from spinach leaves and demonstration of Hill's activity.
4. Study of different stages of mitosis and meiosis.
5. Paper chromatographic separation of amino acids.
6. Preparation of hemin or hemochromogen crystals.
7. Preparation of Herbarium.
8. Study and identify the given plant material by section cutting and double staining of Monocot and Dicot-Stem, Leaf and Root.
9. Study of Floral Organs by dissection of Flower and representing it by Floral diagram and Floral Formula.
10. An "animal album" containing photographs/cut outs with write up on different texa /topics.

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Recommended Books

1. Principles of Biochemistry, Lehniger 3rd edition by Nelson and Cox (Worth) ,2000
2. Biochemistry Stryer ,5th edition W.H. Freeman, 2001.
3. Harper's Biochemistry, 1999 (McGraw-Hill).
4. Cell Biology, Powar C.B. Himalaya Publishers, Students Edition.
5. Cell Biology, Rastogi, S.C. (Edn.3) ,New Age International, 2007.
6. Essential Cell Biology, by B. Alberts et al, Taylor & Francis Group, 2nd Edition.
7. Fundamentals of Biochemistry, Jain, J.L.
8. Biochemical Methods of Analysis: Theory and Applications, Saroj Dua S, Garg N, Nerosa Publishing House.
9. Biochemistry, Sharma, D.K. Narosa Publishing House.
10. Cell Biology for Biotechnology, Shaleesha A. Stanley, Narosa Publishing House.
11. Gangulee & Kar,(1998), College Botany, Vol. II. ,New Central Book Agency (P) LTD. ,Kalkota
12. Maheshwari, P., 1950, An Introduction to the embryology of Angiosperm, Mc Graw Hill Inc. New York.
13. R.L. Kotpal: Textbook of Zoology: Vertebrates: Rastogi Publications.
14. Dr. H. N. Baijal: Zoology: Arun Prakashan.
15. Jordan & Smith: Chordate Zoology.
16. Verma ,Tyagi and Agrawal: Chordate Embryology.

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B.Sc. Part – I (Life Science)

Paper – II: Environmental Biology, Genetics & Evolution

Unit-I	Ecosystem concept- Structure and function, Factors of ecosystem (Abiotic and Biotic), Ecological pyramids, Energy flow in ecosystem. Food chain, food web and trophic levels. Ecological factors (Light, Ecological adaptation in plants and animals ,aquatic and desert adaptation. Ecological succession: Hydrosphere and Xerosphere.
Unit-II	Environmental pollution: Sources, nature and effects of air, water, soil, noise, radioactive and nuclear pollution. Ozone layer depletion, acid rain and global warming. Nitrogen, Carbon, Sulphur and Phosphorus cycles. Bio-fertilizers , Bio-pesticides
Unit-III	Mendelian laws of inheritance, Incomplete dominance, Co-dominance, epistasis, Complementary ratio and supplementary radio, Cytoplasmic inheritance, plastid and kappa particles. Linkage and crossing over (Coupling and repulsion hypothesis) Mechanism of sex determination (Chromosomal theory), sex linked inheritance.
Unit-IV	Structure of Chromosomes, Giant chromosome Polytene and Lampbrush Chromosome related disorders: Kleinfelter's syndrome, Turner's syndrome, Down's syndrome and Cri-du-chat syndrome Mutations- Spontaneous and induced, Chemical and Physical mutagens Molecular basis of mutation.
Unit-V	Theories of Organic evolution: Lamarckism and Neo Lamarckism, Darwinism and Neo Darwinism, Germplasm theory, Mutation theory. Gene pool, Random genetic drift, Hardy Weinberg law. Isolation and types of isolating mechanisms (Pre mating and post mating concepts) Instantaneous and gradual speciation.

List of Practicals

1. Determine frequency, density and abundance of vegetation by quadrate method.
2. Study of ecological adaptations in hydrophytes and xerophytes.
3. Soil analysis (pH, temperature, moisture content and inorganic radicals).
4. Water analysis (pH, Dissolved oxygen and Carbon dioxide).
5. Working out the laws of inheritance.
6. Study of Biogeochemical cycles using charts.

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Recommended Books

1. Cytogenetics: Darbeshwar Roy, Narosa Publishing House.
2. Environmental Science: A New Approach, Dahiya, P. and Ahlawat M., Narosa Publishers.
3. Ecology- Subrahmanyam, N.S. and Sambamurty, A.V.S.S. Narosa Publishing House.
4. Fundamentals of Genetics, Miglani, Gurbachan, S. Narosa Publishing House.
5. Genetics, Sambamurty, A.V.S.S. Narosa Publishing House.
6. Molecular Biology of Cell, Alberts B.D., Levis J. R., Ruberts, M. ,Walson Garland Pub.Co.
7. The Science of Genetics, Atherly A.G. ,Girton J.R. & McDonald, J.F. Saunders College Pub.
8. Environmental Studies, Basak, Pearson Publishers.
9. Principles of Cell and Molecular Biology Kleinsumith L.J and Kish, V.M. ,Harper Collins Pub.
10. Concepts of Genetics, Klug, Pearson Publishers.
11. Concepts of Ecology, Kormondy, E.J., Prentice-Hall India.
12. A Text Book of Cell and Molecular Biology, Gupta, P.K. ,Rastogi Publications, Meerut.
13. Genetics, Gupta P.K. ,Rastogi Publications, Meerut.
14. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, Verma, P.S. & Agrawal, V.K. , S. Chand Publications.
15. Environmental Science: Palanisamy, Pearson Publishers.

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B.Sc. Part – II (Life Science)

Paper – I: Morphology, Developmental Biology and Physiology of Angiosperms

Unit-I	The Root system: Organization of root apex. Anatomy of root in monocotyledons and di-cotyledons. The Shoot system: Organization of shoot apex. Anatomy of shoot in monocotyledons and di-cotyledons. Anatomy of leaf in monocotyledons and di-otyledons. Stomata: Mechanism of stomatal movement. Secondary growth in di-cotyledons.
U nit-II	Morphology of flower. Microsporogenesis, Megasporogenesis, Pollination. Fertilization. Endosperm. Development of embryo in di-cotyledns and monocotyledons.
Unit-III	Plant Water Relations: Absorption of water, transpiration, ascent of Sap Photosynthesis: Photosynthetic apparatus and photosynthetic pigments. Factors affecting Photosynthesis.
Unit-IV	Respiration: Glycolysis, TCA cycle, Electron transport in Mitochondria, Pentosephosphate pathway in brief. Nitrogen metabolism: Biological nitrogen fixation. Nitrate reduction and its regulation. Ammonia assimilation.
Unit-V	Growth and development: Structure and functions of growth regulators. (Auxins, Cytokinins, Gibberelins, Ethylene and Abcicic acid) Concept of photoperiodism and vernalization. General idea of phytochrome. Plant movements: Autonomic or spontaneous movements, paratonic or induced movements.

List of Practicals

1. Perform histological study of root, stem and leaf for identification of monocotyledonous and dicotyledonous plant system.
2. Study of floral organs, representation of floral parts by floral diagram and floral formula.
3. Absorption spectra of chlorophylls.
4. Separation and identification of plant pigments by paper chromatography.
5. Isolation of viable chloroplast from spinach and demonstration of Hill's activity.
6. Study of plasmolysis and deplasmolysis using Tradescantia peel.
7. Effect of auxin, cytokinin and gibberellins on plant growth.

Recommended Books

1. An Introduction to Embyology of Angiosperms- Maheshwari, P. McGraw Hill Inc. ,N.Y.
2. Embryology of Angiosperms- Bhojwani, S.S. and Bhatnagar, S.P.
3. Anatomy- Singh V, Pandey P.C. and Jain, D.K.
4. Modern Plant Physiology- Sinha, R.K. , Narosa Publishing House.
5. Textbook of Plant Physiology – Verma V. Ane books Publishers.
6. An Introduction to Plant Anatomy-B.P. Pandey, S.Chand Publications.
7. Morphology and Evolution of Vascular Plants- Gfford, E.M. and Foster, A.S. Freeman & Co.
8. Introduction to Plant Physiology- Hopkins W.G., John Wiley & Sons., N.Y.
9. Embryology of Angiosperms- Johri, B.M. Sptinger Verlag. Berlin
10. Plant Physiology Pandey & Sinha, Vikas Publishing House.
11. Plant Physiology- Salisbury and Ross. C.W. Wadworth Pub. Co. ,California
12. Fundamental of Plant Physiology, Shukla&Chandel, S. Chand Publication.

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B.Sc. Part – II (Life Science)

Paper – II: Morphology, Physiology and Developmental Biology of Mammals

Unit-I	Digestive system of mammals: Structure and function, Digestion and absorption of Carbohydrates, Lipids and Proteins. Secretory function of alimentary canal. Excretory System of Mammals: Structure and function, Elementary Ideas of Formation of urea and Urine.
Unit-II	Respiratory system of mammals: Morphology of respiratory organs. Mechanism of respiration, transport of oxygen and carbon dioxide by blood. Circulatory system of mammals: Morphology of heart. Course of blood circulation. Composition of blood and its functions. General characters & Mechanism of blood clotting.
Unit-III	Muscular system of mammals: Types of muscles, their structure and function. Mechanism of muscle contraction. Nervous system of mammals: Structure of nervous tissue (neurons, nerve fibers and neuralgia). Mechanism of nerve impulse transmission, reflex action and neuromuscular junctions.
Unit-IV	Endocrine system of mammals: Structure and function of Pituitary, Hypothalamus Thyroid , Parathyroid, Pancreas and Adrenal glands. Disorders of these endocrine glands. Reproductive system of mammals: Structure of male and female reproductive organs. Female reproductive cycles (Menstrual cycle and estrous cycle).
Unit-V	Gametogenesis (Spermatogenesis and oogenesis). Fertilization; mechanism of fertilization and its significance. Types and patterns of cleavage. Process of blastulation and formation of germinal layers. Extra embryonic membranes and placentation in mammals.

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List of Practicals

1. Study and comment on the histological slides and charts/models related to:
   Digestive system, Excretory system, Respiratory system, Circulatory system, Muscular system, Nervous system, Endocrine system, Reproductive system and Developmental biology.
2. Hematological experiments:
   a. Blood grouping
   b. Differential count of R.B.C. and W.B.C.
   c. Clotting time and bleeding time.
   d. Estimation of hemoglobin.
3. Study of different developmental stages of click embryo.

Recommended Books

1. Chordate Zoology and elements of Animal Physiology, By janardan and Verma P.S.,S. Chand & Company Ltd. New Delhi.
2. An Introduction to Embryology. Balinsky. B.I. Saunders Co. USA.
3. Human reproductive and Developmental Biology. Bagley, D.J. Frith J.A. and Hoult. J.R.S., Mac Millan Press, London.
4. A Text Book of Comparative Endocrinology. Gorbman, A and Bern. H.A. Willy Estern, New Delhi.
5. Developmental Biology, Virbal Rastogi
6. Animal Physiology, Sobti, R.C. Narosa Publishing House.

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B.Sc. Part – III (Life Science)

Paper – I: Microbiology, Immunology and Animal Cell Culture

Unit-I	Microbial classification, Bacterial classification (3kingdom, 5kingdom, 3domain) Bergey's classification. Nutritional classes of bacteria, Microbiological media and its type, pure culture isolation techniques, culture maintenance Staining techniques: Simple, Differential- structural, Gram's and acid fast staining. Bacterial Growth – phases of growth cycle, factors affecting growth, batch and continuous culture, measurement of bacterial growth.
Unit-II	Plasmids: Definition, types, identification and classification of plasmids. Bacterial conjugation: F-mediated, merozygotes. Transformation and Transduction: (General and specialized) in bacteria. Viruses: General characteristics, Classification and Replication of bacteriophages. Principle types of fermentation process- batch and continuous fermentations.
Unit-III	Cells and organs of immune system and their functions. Types of immunity: innate and acquired immunity , Primary and secondary immune responses. Humoral and cell mediated immunity.
Unit-IV	Antigens: Types, haptens , epitopes. Antibody: Structure, types, properties and functions of immunoglobulins. Antigen- antibody reactions. Quantitative precipitin titration. Immunological Techniques: Haemoagglutination, ELISA and Ochterlony Double Diffusion (ODD) Radial Immunodiffusion. Vaccines and immunization.
Unit-V	Animal cell culture: Culture media, primary culture, secondary culture, cell lines, growth curve of animal cells in culture. Transfection of animal cell lines, HAT selection and selectable markers, Antibiotic resistance, expressions of clone proteins in animal cells and its uses. Stem cell culture and its applications.

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List of Practicals

1. Study and working of instruments: Compound Microscope, Autoclave, Hot air oven, pH meter, Laminar air flow bench, Laboratory centrifuge.
2. Staining techniques: Monochrome staining, Gram's staining, Acid fast staining, Negative staining, Endospore staining.
3. Media preparation: Nutrient agar and Nutrient broth.
4. Cultivation techniques: Streak plate method, pour plate method.
5. Isolation of microorganisms from soil, air and water.
6. Isolations of amylase and protease producer from soil.
7. Isolation of antibiotic producing microorganisms from soil.
8. Physical and chemical control of microorganism.
   (i) Effect of UV radiation on microorganisms (ii) Use of ethyl alcohol as sterility
9. Antibiotic sensitivity test.
10. Blood grouping.
11. WIDAL, VDRL Test.
12. Enumeration of RBC.
13. Differential WBC count.
14. DOT ELISA.
15. Ochterlony double diffusion (ODD)
16. Radial immune diffusion (RID)

Recommended Books

1. The genetics of Bacteria and their Viruses- William Hayes Blackwell Scientific Publishers.
2. General Microbiology-Rober Boyd.
3. Microbiology- Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. McGraw Hill.
4. General Microbiology – Stanier, R.V. Ingharam, J.L. Wheelis, M.L. McMillan Edu. Ltd.
5. General Microbiology-Robert Boyd.
6. An Introduction to Microbiology- Tauro, P. Kapoor, K.K. and Yadav, K.S. New Age International (P) Ltd. New Delhi.
7. Essentials of Imunology, Roitt, I.M. ELBS Blackwell Scientific Publishers. London.
8. Immunology II Edition, Author, Kuby, J. WH Freeman and Company, New York.
9. Immunology, Author- Klaus D. Elgert, Wiley-Liss NY.
10. Fundamental Immunlogy, Author-W.E. Paul, Raven Press, New York.
11. Immunology, Authors- D.M. Weir and J. Steward 7th Ed. (1993).
12. Principals of Fermentation Technology. Stanbury PFA Whitaker and Hall 1995.
13. Animal cell culture: concept and Application- Sheelendra M.Bhat, Narosa Publishers.
14. Immunology: A Text Book- Rao, Narosa Publishing House.

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B.Sc. Part – III (Life Science)

Paper – II: Molecular Biology, Genetic Engineering and Plant Tissue Culture

Unit-I	DNA replication in prokaryotes and eukaryotes. Semi conservative nature of DNA replication. Transcription in Prokaryotes and Eukaryotes RNA processing -5 cap formation, Transformation termination3, end processing, polyadenylation and splicing. Transposable elements: Definition, types of bacterial transposons and applications of transposons.
Unit-II	Genetic code- Important characteristics. Prokaryotic and eukaryotic Translation (Mechanism of initiation, elongation and termination) Regulation of gene expression in prokaryotes. Operon concept (Lac and Trp). Gene regulation in eukaryotic system-promoters, enhancers elements and gene amplification
Unit-III	Genetic engineering Isolation of genomic and plasmid DNA from bacteria, Isolation of genomic DNA from plant and animal cells. Recombinant DNA technology – cloning vectors (pUC19, phage 2, Cosmid and M13); Restriction enzymes & other enzymes of genetic engineering ligation tech. Introduction of DNA into living cells, methods of gene transfer, expression and detection of clones. Introduction to blotting technique: western, Southern and Northern Blots. Introduction to PCR, RAPD and RFLP.
Unit-IV	Terms and definition of plant tissue culture, Media ingredients (inorganic and organic nutrients, role of growth regulators- auxins and cytokinins), Various media and sterilizing agents. Cell culture: Initiation of callus isolation of single cells, suspension cultures batch cultures. Protoplast culture cybrids. Application of tissue, cell and protoplast fusion in agriculture, horticulture and pharmaceutical industry.
Unit-V	Clonal propagation: General techniques, factors affecting clonal propagation, applications, Production of haploid plants, Factors affecting androgenesis, limitations and applications. Plant transformation: methods of gene transfer, *Agrobacterium tumefaciens* mediated transformation, Direct gene transfer methods, selection and identification of transformed cells, applications.

List of Practicals

1. Isolation of genomic DNA from bacteria, plant leaves, bacteria animal cells and its analysis by agarose gel electrophoresis.
2. Restriction digestion DNA using restriction enzymes EcoRI and HindIII and observe its restriction pattern by agarose gel electrophoresis.
3. Bacteria Transformation.
4. Preparation and sterilization of MS media for explants culture.
5. Germination of seed in *in vitro* for axenic cultures.
6. Primary establishment of culture (Callus induction from leaf and stem explants)
7. Clonal propagation using ap
8. Anther and pollen culture and check the viability of pollens.

Recommended Books

1. Current protocols in molecular biology, 2000. Ausbel et. al.
2. Principles of gene manipulation. 1994 Old and Primrose, Blackwell Scientific Publications.
3. Molecular Cloning 3 volumes Sambrose and Russelll, 2000 CSH Press.
4. Plant tissue culture: Theory and practice Bhojwani S.S. and Razdon. M.K. Elsevict Holland
5. Plant cell and Tissue culture, Narayanswami, S. Tata, McGraw Hill co. New Delhi
6. An Introduction to Plant Tissue culture, Razdan, M.K., Oxford & IBH Publ., New Delhi
7. Greenhouse Technology for Controlled Environment- Tiwari, G.N. Narosa Publishing House
8. Plant Cell, Tissue and Organ Culture Fundamental Methods Eds. Gamborg, O.L. and Phillips, G.C. Narosa Publishing House.
9. Molecular Biology- Sambanmurty, A.V.S.S., Narosa Publishing House.
10. Molecular Genetics- Sambamurty A.V.S.S. Narosa Publishing House.
11. Molecular Biology- Freifelder D Narosa Publishing House.