ANNEXURE-354

Bhagat Phool Singh Mahila Vishwavidyalaya Khanpur Kalan

Scheme and Syllabus of Botany Subject of 4 Year UG Programme
[redacted] (Multidisciplinary)
W.e.f. Academic session 2024-25

Scheme of Examination for 1st Semester

First Year: First Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-BOT-101	DSC	Cell & Molecular Biology	3	2	0	4	20	10	50	20	100
2	B-BOT-102	MIC	Fundamentals of Biochemistry	2	0	0	2	15	0	35	0	50
3	B-BOT-103	MDC	Fundamentals of Botany	2	2	0	3	15	10	35	15	75

Scheme of Examination for 2nd Semester

First Year: Second Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-BOT-201	DSC	Diversity of Microbes & Cryptogams	3	2	0	4	20	10	50	20	100
2	B-BOT-202	MIC	Plant Ecology	2	0	0	2	15	0	35	0	50
3	B-BOT-203	MDC	Plants for Human Welfare	2	2	0	3	15	10	35	15	75

Scheme of Examination for 3rd semester

First Year: Third Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-BOT-301	DSC	Diversity of Archegoniate and Seed Plants-I	3	2	0	4	20	10	50	20	100
2	B-BOT-302	MIC	Microbiology	3	2	0	4	20	10	50	20	100
3	B-BOT-103	MDC	Horticulture	2	2	0	3	15	10	35	15	75

Scheme of Examination for 4th Semester

First Year: Forth Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-BOT-401	DSC	Plant Anatomy and Reproduction	3	2	0	4	20	10	50	20	100
2	B-BOT-402	MIC (VOC)	Organic Farming	3	2	0	4	20	10	50	20	100

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Scheme of Examination for 5th semester

First Year: Fifth Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-BOT-501	DSC	Plant Taxonomy	3	2	0	4	20	10	50	20	100
2	B-BOT-502	MIC (VOC)	Gardening & Floriculture	3	2	0	4	20	10	50	20	100

Scheme of Examination for 6th semester:

First Year: Sixth Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-BOT-601	DSC	Plant Physiology	3	2	0	4	20	10	50	20	100
2	B-BOT-602	MIC	Economic Botany	3	2	0	4	20	10	50	20	100
3	B-BOT-603	MIC (VOC)	Mushroom Cultivation	3	2	0	4	20	10	50	20	100

Scheme of Examination for 7th semester

First Year: Seventh Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
								Internal Marks		External Marks		Total Marks
				L	P	T		T	P	T	P	
1	B-BOT-701	DSC-B1	Plant Development	3	2	0	4	20	10	50	20	100
2	B-BOT-702	DSC-B2	Plant Genetics	3	2	0	4	20	10	50	20	100
3	B-BOT-703	DSC-B3	Plant Biotechnology	3	2	0	4	20	10	50	20	100
4	B-BOT-704	DSC-B4	Plant Pathology	3	2	0	4	20	10	50	20	100
5	B-BOT-705	DSC-B5	Computational Biology	3	2	0	4	20	10	50	20	100
6	B-BOT-706	MIC	Ethnobotany	3	2	0	4	20	10	50	20	100

Scheme of Examination for 8th semester (4 Year UG Hon.)

First Year: 8th Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-BOT-801	DSC-B6	Research Methodology	4	0	0	4	30	0	70	0	100
2	B-BOT-802	DSC-B7	Tools& Techniques	3	2	0	4	20	10	50	20	100
3	B-BOT-803	DSC-B8	Biostatistics	3	2	0	4	20	10	50	20	100
4	B-BOT-804	DSC-B9	Plant Breeding	3	2	0	4	20	10	50	20	100
5	B-BOT-805	DSC-B10	Stress Physiology	3	2	0	4	20	10	50	20	100
6	B-BOT-806	MIC	Biodiversity & Conservation	3	2	0	4	20	10	50	20	100

Scheme of Examination for 8th semester (4 Year UG Hon. with Research)

First Year: Eighth Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-BOT-801	DSC- B6	Research Methodology	4	0	0	4	30	0	70	0	100
2	B-BOT-802	DSC- B7	Tools& Techniques	3	2	0	4	20	10	50	20	100
3	B-BOT-806	MIC	Biodiversity & Conservation	3	2	0	4	20	10	50	20	100
4	B-BOT-807	Dissertation	Research Project/ Dissertation				12					300

Cell and Molecular Biology
B-BOT-101

L – T – P
3 0 2

Total Credits: 4
External Marks: 50
Internal Marks: 20
Time allowed: 3 hrs

Course Outcomes:

CO1. Students will get knowledge about prokaryotic and Eukaryotic cells and the structure and functions of Cell Organelles.

CO2. By understanding the working of cells in healthy and diseased state, students will be helped in further research areas for higher studies.

CO3. It helps in understanding the pattern of inheritance of various life forms, DNA Structure and functions of genes.

CO4. It helps in understanding chromosomal structure and alterations, mutations and genetic engineering etc.

Unit- I

Basic cell structure, composition and cell division:- Prokaryotic & Eukaryotic cell system, Cell division: Amitosis, Mitosis & Meiosis.

Cell Envelops:- Structure and functions of cell wall and plasma membrane.

Unit- II

Cell Organelles:-Ultrustructure and function of nucleus, Golgi apparatus, Endoplasmic reticulum, Ribosomes

Unit- III

Cell Organelles:-Ultrustructure and functions of Chloroplast, Mitochondria, Lysosomes, Peroxysomes and Vacuoles.

Unit –IV

Biomolecules:- General account of Carbohydrate, Proteins and Lipids.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:-

1. Alberts, B.Bary, D. Lewis, J. Raff, M., Roberts, K. and Watson, I.D. 1999. Molecular Biology of Cell. Garland Publishing Co., Inc, New York. US.
2. Gupta , P.K. 1999 . A Text Book of Cell and Molecular Biology. Rastogi Publication, Meerut, India.
3. Kleinsmith L.J. and Kish, V.M. 1995. Principles of Cell and Molecular Biology (2nd Edition). Harper Collins College Publisher, New York, USA.

4. Lodish, H., Berk, A Zipursky, S.L. Matsudaira. P., Baltimoe , D. and Darnell, J.2000. Molecular Biology, W.H. Freeman and Co., New York., USA.
5. Powar, C.B. 1983. Cell Biology.(3rd Edition). Himalaya Publishing House.
6. Lehninger , A.L. , Nelson , D.K. and Cox , M.M. 1993. Principles of Biochemistry , CBS Publishers and Distributors , New Delhi.

Practical

External Marks: 20
Internal Marks: 10
Time Allowed: 2 hrs

Course Outcomes:

CO1. Students will learn about to prepare the slides of cell division and will be able to practically understand the cell division.

CO2. Students will understand the structure and functions of important biomolecules.

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1. Slide preparation from Onion root tips & identification of various mitotic stages
2. Study of meiosis from onion flower buds and identification of major stages.
3. Study of permanent slides of Mitosis and Meiosis.
4. Qualitative estimation of carbohydrates, proteins and lipids.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results.

Fundamentals of Biochemistry
B- BOT-102

Total Credits: 2
L – T – P
2 0 0

External Marks: 35
Internal Marks: 15
Time Allowed: 1.5 hrs

Course Outcomes:

CO1. Students will study and know about important plant biomolecules.

CO2. Students will know about enzymology, nitrogen and lipid metabolism to understand various biological mechanisms.

Unit- I

Lipid metabolism- Structure and function of lipids, fatty acid biosynthesis; beta-oxidation; saturated and unsaturated fatty acids; storage and mobilization of fatty acids.

Nitrogen metabolism- Biology of nitrogen fixation; importance of nitrate reductase and its regulation; ammonium-assimilation.

Unit- II

Basics of Enzymes:-Discovery and nomenclature; characteristics of enzymes; concept of holoenzyme, apoenzyme, coenzyme and co factor, regulation of enzyme activity; mechanism of action.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 5 questions asking two questions of 12 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts of 11 marks covering entire syllabus. The examinee will be required to attempt 3 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Lehninger, A.L. Nelson, D.V. and Cox M.M. (1993). Principles of Biochemistry. C.B.S. Publishers and distributors, New Delhi.
2. Lea, P.J. and Leegood, R.C. 1999. Plant biochemistry and Molecular Biology, John Wiley and Sons , Chichester, England.
3. Trehan, Keshav 1990, Biochemistry, Wiley, Eastern New Delhi

Fundamentals of Botany
B-BOT-103

Total Credits: 3
L – T – P
2 0 2

External Marks: 35
Internal Marks: 15
Time Allowed: 2 hrs

Course Outcomes:

CO1. Students will gain a foundational understanding of the biology of microorganisms, algae, fungi and lichens.

CO2. Students will develop a conceptual understanding of bryophytes and pteridophytes.

CO3. Students will acquire knowledge about the fundamental characteristics of gymnosperms and the challenges related to their propagation. Students will acquire a basic understanding of angiosperm morphology.

Unit I

General characteristics and economic importance of viruses, bacteria algae, fungi and lichens.

Unit II

General characteristics and economic importance of Bryophytes and Pteridophytes.

Unit III

General characteristics and economic importance Gymnosperms and Angiosperms.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 7 questions asking two questions of 9 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will be of 8 marks covering entire syllabus. The examinee will be required to attempt 4 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Wiley, J.M., Sherwood, L.M. and Woolverton, C.J. (2019) Prescott's Microbiology. 11th Edition. McGraw Hill International.
2. Lee, R.E. (2018) Phycology. 5th Edition. Cambridge University Press.
3. Ahluwalia, A.S. (2020). Phycology: Principles, Processes and Applications. Daya Publishing House, New Delhi.
4. Dube, H.C. (2012). An Introduction to Fungi, Vikas Publishing House Pvt. Ltd., Delhi. 4th edition.
5. Mehrotra,R.S. and Aggarwal, Ashok (2013) Fundamentals of Plant Pathology, Tata McGraw-Hill Publishing company Ltd, New Delhi
6. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.
7. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
8. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi, India.
9. Sharma, O.P. (2017). Text Book of Pteridophyta, McMillan India Ltd.

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10. Thakur, A.K. and Bassi, S.K. (2008). Diversity of Microbes and Cryptogams. S. Chand & Co., Delhi.
11. Vanderpoorten, A. &Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.
12. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India
13. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Gymnosperms, S. Chand. Delhi, India
14. Pandey, B.P. (2001). A Textbook of Botany-Angiosperms, S. Chand. Delhi, India

Practical

External Marks: 15
Internal Marks: 10
Time Allowed: 2 hrs

Course Outcomes:

CO1. Students will be able to learn the practical aspects of microorganisms, algae and fungi.

CO2. Students will be able to identify the major groups of plants and compare the characteristics of lower plants (bryophytes and pteridophytes) and higher plants (angiosperms and gymnosperms).

1. Cynobacteria & Algae: Study of slides of *Nostoc* and *Volvox* through permanent slides.
2. *Penicillium*: Asexual stage and sexual structures through permanent slides.
3. *Agaricus*: Specimens of button stage and full grown mushroom.
4. *Marchantia* & *Funaria*- morphology of thallus through permanent slides.
5. *Selaginella* & *Equisetum*- morphology specimen study.
6. *Cycas* & *Pinus* - morphology specimen study.
7. Study of vegetative and floral characters of the one or two members of some important families
8. Excursion Report: Report on excursion tours with photographs, collection, preservation and preparation of herbarium sheets and specimens related to Archegoniates and Angiosperms. Mounting of a collected, properly dried and pressed specimen of minimum 20 wild plants with herbarium label.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results.

Diversity of Microbes and Cryptogams

B- BOT-201

Total Credits: 4
L – T – P
3 0 2

External Marks: 50
Internal Marks: 20
Time allowed: 3 hrs

Course Objectives:

CO1. Students will be able to understand the general characteristics of bacteria and viruses.
CO2. Students will develop a conceptual understanding of phycology.
CO3. Students will develop a conceptual understanding of fungi.
CO4. Students will be able to understand about the lichens, their dual nature and role in succession.

Unit- I

Bacteria- Structure, Nutrition Multiplication, and Economic Importance.
Algae - General Characters, Classification and economic importance.

Unit- II

Algae- Important features and Life History of Chlorophyceae (*Volvox, Chara)* Xanthophyceae (*Vaucheria*), Pheophyceae (*Ectocarpus*), Rhodophyceae (*Polysiphonia*).

Unit- III

Viruses - General account of Virus including structure of TMV and Bacteriophage.
Fungi- General Characters, Classification by Alexopoulas et al. (1996) and economic importance.

Unit- IV

Fungi- Important Features and Life History of Mastigomycotina- (*Phytophthora*), Zygomycotina (*Mucor*), Ascomycotina (*Penicillium*), Basidiomycotina (*Puccinia),* Deuteromycotina (*Colletotrichum*). Brief account of Lichens.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:-

1. Biswas S. B., Biswas Amita 1984. An Introduction to Viruses. Vikas Publishing House PVT LTD.
2. Smith, G.M. 1971. Cryptogamic Botany Vol. 1. Algea & Fungi. Tata Mc Graw Hill Publishing Co., New Delhi.
3. Sharma, O.P. 1992. Text Book of Thallophytes, McGraw Hill Publishing Co.
4. Sharma, P.D. 1991. The Fungi. Rastogi & Co Meerut.
5. Clifton, A. 1958. Introduction to the Bacterial. Mcgraw Hill & Co. New York.
6. Alexopoulas , C.J. , C.W. M. Mims , 1996. Introductory Mycology, 4th ed., John Wiley and Sons Inc.
7. Dube, H.C. 1990. An Intoduction to Fungi, Vikas Publishing House PVT. LTD. Delhi.

Practical

External Marks: 20
Internal Marks: 10
Time Allowed: 2 hrs

Course Outcomes:

CO1. Students will gain the knowledge of practical aspects of microorganisms and algae.
CO2. Students will gain the knowledge of practical aspects of fungi and Lichens.

1. Preparation of temporary slides of various members of Algae and Fungi (as per Syllabus) to study vegetative and reproductive structure.
2. Study of Permanent Slides of algae, fungi and lichens.
3. Collection of the Algae, diseased plants and fungi.
4. Preparation of Collection Report.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results.

Plant Ecology
B-BOT-202

Total Credits: 2
L – P – T
2 0 0

External Marks: 35
Internal Marks: 15
Time Allowed: 1.5 hrs

Course Outcomes:

CO1. Students study about importance of resource allocation, energy conservation, global warming, ozone depletion and pollution.

CO2. Ecological studies emphasize on organisms needs, their peaceful existence in environment and necessary steps towards its improvement.

Unit I

Introduction to Ecology: Definition scope and importance, level of organization
Environment: - Introduction; Environmental Factors-Climatic, edaphic factors, Biotic factors, topography.
Ecological Adaptations:-Morphological, Anatomical and Physiological responses of plants to water (hydrophytes & Xerophytes).
Population Ecology: - Growth curves, Species interactions, Ecotypes, Ecological indicators.
Community Ecology:-Community characteristics, frequency, density, cover, life and growth forms, Ecological succession.

Unit II

Ecosystem: Structure, abiotic & biotic components, food chain, food web, ecological pyramids, energy flow, biogeochemical cycles of carbon, nitrogen, phosphorous and water.
Environmental Pollution: Types of pollution, pollutants, acid rain and its effects, effects of pollution on plants
Global Warming: Greenhouse gases & their effect, depletion of ozone layer and climate change.

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 5 questions asking two questions of 12 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts of 11 marks covering entire syllabus. The examinee will be required to attempt 3 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Odum, E.P. 1983. Basic Ecology, Saunders, Philadelphia.
2. Kormondy, E.J. 1996. Concepts of Ecology, Prentice-Hall of India Pvt. Ltd. New Delhi.
3. Sharma, P.D. (1993) Ecology and Environment. Rastogi Publications, Meerut.
4. Khopkar, S.M. 1993. Environmental Pollution Analysis Wiley Eastern Ltd. New Delhi.
5. Misra, R. 1968. Ecology Workbook, Oxford and IBH Publishing Co. New Delhi.
6. Drummond, J.M.F. 2004. Ecology and Plant Diversities. Agrobios India.
7. Purohit, S.S. 2004. Environmental Pollution Causes, Effects and Control. Agrobios India.
8. Deo, P.P.2006. Plant Ecology . Egrobios India.

Plants for Human Welfare

B- BOT-203

Total Credits: 3
L – T – P
2 0 2

External Marks: 35
Internal Marks: 15
Time Allowed: 2 hrs

Course Outcomes:

CO1. Students will acquire a foundational understanding of plant diversity. Students will develop a conceptual grasp of plants utilized for human welfare.
CO2. Students will gain knowledge about the origins of certain cultivated plants.
CO3. Students will acquire a conceptual understanding of the utilization of fruits, nuts, and other plant components for human welfare. Students will acquire the knowledge about the economic valuable plants and their products

Unit I

Food Plants; economic importance of food plants – **Cereals-** (Rice, Wheat).
Pulses – (Grams and Pea).

Unit II

Fruits and nuts: Important fruit crops (Mango,Coconut) and their commercial importance.
Spices and condiments: (Coriander, Turmeric).
Wood and its uses (Shisham,Teak).

Unit III

Beverages: Important plants (Tea,Coffee) and their uses.
Medicinal Plants: Important Medicinal Plants (Neem, Sarpgandha) and their uses.

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 7 questions asking two questions of 9 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will be of 8 marks covering entire syllabus. The examinee will be required to attempt 4 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Singh, V., Pande, P.C., Jain, D.K. 2018. Economic Botany, Rastogi Publications.
2. Kocchar, S.L. 2016. Economic Botany: A Comprehensive Study, 5 Ed, Cambridge India.
3. Wickens, G.E. 2001. Economic Botany: Principles and Practices, Springer.
4. Singh, V., Pande, P.C., Jain, D.K. 2018. Economic Botany, Rastogi Publications.
5. Daubenmire, R.F. Plants & Environment (2nd Edn.,) John Wiley & Sons., New York 22
6. Odum E.P. 2005. Fundamentals of Ecology (5nd Edn.,) Saunders & Co., Philadelphia
7. S. Sundar Rajan-2007. College Botany Vol-V, Part 1: Taxonomy and Economic Botany Himalaya Publishing House.
8. Susil Kumar Mukharjee-2004. College Botany Vol-III. New Central Book agency, London

Practical

External Mark: 15
Internal Marks: 10
Time Allowed: 2 hrs

Course Outcomes

CO1. Students will acquire a foundational understanding of plant diversity.
CO2. Students will acquire the knowledge about the economic valuable plants and their products.

1. Identification and study of some important medicinal plants.
2. Identification and study of some common ornamental plants.
4. Identification and study of some important cereals.
5. Identification and study of some important pulses.
6. Identification and study of some important spice yielding plants.
7. Study of different types of woods.
8. Study of different fruit types.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results.

Bhagat Phool Singh Mahila Vishwavidyalaya Khanpur Kalan

Scheme and Syllabus of Zoology Subject for 4 Year UG Programme

Bachelor of Life Science (Multidisciplinary)

W.e.f. Academic session: 2024-25

Scheme of Examination for 1st semester

Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-101	DSC	Cell Biology and Immunology	3	2	0	4	20	10	50	20	100
2	B-ZOO-102	MIC	Biomolecules	2	0	0	2	15	0	35	0	50
3	B-ZOO-103	MDC	Basics of Zoology-I	2	2	0	3	15	10	35	15	75

Scheme of Examination for 2nd Semester

Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-201	DSC	Diversity of Non-Chordates-I	3	2	0	4	20	10	50	20	100
2	B-ZOO-202	MIC	Ecology	2	0	0	2	15	0	35	0	50
3	B-ZOO-203	MDC	Basics of Zoology-II	2	2	0	3	15	10	35	15	75

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Scheme of Examination for 3rd Semester

Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-301	DSC	Diversity of Non-Chordates -II	3	2	0	4	20	10	50	20	100
2	B-ZOO-302	MIC	Entomology	3	2	0	4	20	10	50	20	100
3	B-ZOO-303	MDC	Vermiculture	2	2	0	3	15	10	35	15	75

Scheme of Examination for 4th Semester

Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-401	DSC	Diversity of Chordates-I	3	2	0	4	20	10	50	20	100
2	B-ZOO-402	MIC (VOC)	Economic Zoology	3	2	0	4	20	10	50	20	100

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Scheme of Examination for 5th semester:

Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-501	DSC	Diversity of Chordates-II	3	2	0	4	20	10	50	20	100
2	B-ZOO-502	MIC (VOC)	Ethology	3	2	0	4	20	10	50	20	100

Scheme of Examination for 6th Semester:

Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-601	DSC	Mammalian Physiology	3	2	0	4	20	10	50	20	100
2	B-ZOO-602	MIC	Fundamentals of Epidemiology	3	2	0	4	20	10	50	20	100
3	B-ZOO-603	MIC (VOC)	Biodiversity conservation and Wildlife management	3	2	0	4	20	10	50	20	100

Scheme of Examination for 7th Semester:

Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-701	DSC-Z1	Developmental Biology	3	2	0	4	20	10	50	20	100
2	B-ZOO-702	DSC-Z2	Evolutionary Biology	3	2	0	4	20	10	50	20	100
3	B-ZOO-703	DSC-Z3	Genetics	3	2	0	4	20	10	50	20	100
4	B-ZOO-704	DSC-Z4	Molecular Biology	3	2	0	4	20	10	50	20	100
5	B-ZOO-705	DSC-Z5	Endocrinology	3	2	0	4	20	10	50	20	100
6	B-ZOO-706	MIC	Forensic science	3	2	0	4	20	10	50	20	100

Scheme of Examination for 8th Semester (4 Year UG Hon.)

Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-801	DSC-Z 6	Research Methodology	4	0	0	4	30	0	70	00	100
2	B-ZOO-802	DSC-Z 7	Tools and Techniques	3	2	0	4	20	10	50	20	100
3	B-ZOO-803	DSC-Z 8	Animal Biotechnology	3	2	0	4	20	10	50	20	100
4	B-ZOO-804	DSC-Z 9	Biostatistics and Bioinformatics	3	2	0	4	20	10	50	20	100
5	B-ZOO-805	DSC-Z 10	Microbiology	3	2	0	4	20	10	50	20	100
6	B-ZOO-806	MIC	Biosafety and Bioethics	3	2	0	4	20	10	50	20	100

Scheme of Examination for 8th Semester (4 Year UG Hon. with Research)

Sr. No.	Course Code	Course Type	Course Title	Work Load			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-ZOO-801	DSC-Z 6	Research Methodology	4	0	0	4	30	0	70	0	100
2	B-ZOO-802	DSC-Z 7	Tools and Techniques	3	2	0	4	20	10	50	20	100
3	B-ZOO-806	MIC	Biosafety and Bioethics	3	2	0	4	20	10	50	20	100
4	B-ZOO-807	Dissertation	Research Project/Dissertation				12					300

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Cell Biology and Immunology
B-ZOO-101

Total Credits: 4
L - T - P
3 - 0 - 2

External Theory Marks: 50
Internal Assessment Marks: 20
Time allowed: 3 Hrs

Course Outcomes:

CO1: Students will understand the nature and basic concept of cell biology.
CO2: Students will be able to apply the knowledge of internal structure of cell and their role in many metabolic function of organism.
CO3: Students will able to understand the basics of immunology.
CO4: Students will get knowledge about common disorders and their antibiotics and vaccines.

Unit I

General structure of animal cell, Plasma Membrane: Fluid mosaic model, various modes of transport across the membrane, mechanism of active and passive transport, endocytosis and exocytosis, Structure and functions of Endoplasmic reticulum(ER), Golgi complex, Ribosomes, Lysosomes, Mitochondria, cilia and Flagella

Unit II

Ultrastructure and functions of Nucleus, fine structure of chromosomes, Types of chromosomes, Euchromatin and heterochromatin, Animal Tissue: Epithelial, Connective, muscular and neural tissue, Cell division

Unit III

Overview of immune system, cells of immune system
Innate and of acquired immunity, Antigen and its types, Antibody and its types, B-cell epitopes, Lymphoid organs and their types, Antigen presenting cells (APCs), Major Histocompatibility complex (MHC)

Unit IV

Immune disorders (infectious and non-infectious), Auto - immune disorder, Antibiotics, vaccines

Cancer Biology: Types of cancer, an elementary idea of cell transformation, Cancer: Types of Tumor, Therapy of cancer

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Molecular Cell, Biology, J. Darnell, H. Lodish and D. Baltimore Scientific American Book, Inc., USA.

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2. Molecular Biology of the Cell, B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts and J.D. Watson. Garland Publishing Inc., New York.
3. Cell Biology and Genetics by P.K. Gupta.
4. Cell Biology and Genetics by Veer Bala Rastogi.
5. Immunology; Kubey
6. Cellular and Molecular Immunology, Andrew H. Lichtman, 1991
7. Immunobiology, Charles Janeway, 1994

Practical

External Practical Marks: 20
Internal Assessment Marks: 10
Time allowed: 2 Hrs

Course Outcomes:

CO1: Students will understand the practical aspect of cell biology.
CO2: Students will able to understand the antigen-antibody interactions and will get to know how the vaccines work in our body systems.

1. Cell division: Prepare slides of stages of mitosis and meiosis.
2. To study the Salivary gland and polytene chromosomes of Drosophila/ Chironomus
3. To study the antigen-antibody interactions.
4. To examine the percentage of HB in the blood sample.
5. Examine the blood group system by performing blood typing.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results.

– 1288.

Biomolecules
B-ZOO-102

Total Credits: 2
L - T - P
2 - 0 - 0

External Theory Marks: 35
Internal Assessment Marks: 15
Time allowed: 1:30 Hrs.

Course Outcomes:

CO1: Students will able to understand the role of biological molecules in body systems.

CO2: Students will able to understand the mechanisms of action of hormones and enzymes in our body systems.

Unit I

Introduction, classification, structure, function and general properties of proteins, carbohydrates, lipids

Unit II

Hormones and their mechanism of action, Vitamins, Enzymes: Nomenclature, classification and mechanisms of enzyme action; Enzyme Kinetics, factors affecting enzyme activity, inhibition of enzymes

Cancer Biology: Types of cancer, an elementary idea of cell transformation, Cancer : Types of Tumor, Therapy of cancer

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 5 questions asking two questions of 12 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts of 11 marks covering entire syllabus. The examinee will be required to attempt 3 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Agarwal R A, Srivastava A. K., Kumar K. Animal Physiology and Biochemistry; S Chand Publishing; Twenty Third edition, 1978.
2. Vasantika Kashyap (2021) A Text-Book of Animal Physiology and Biochemistry; Kedar Nath Ram Nath Publisher.

Basics of Zoology-I
B-ZOO-103

Total Credits: 3
L - T - P
2 - 0 - 2

External Theory Marks: 35
Internal Assessment Marks: 15
Time allowed: 2 Hrs.

Course Outcome:
CO1: Student will be able to learn about Kingdom Animalia.
CO2: Students will be capable to understand the role of non-chordates in their surroundings.
CO3: Students will be able to understand General characters of Arthropoda and Mollusca.

Unit I

Zoology: Definition and scope, introduction to Animal Kingdom, Animal characters, Non-Chordates and Invertebrates with examples, Invertebrate Phyla, General characters of Protozoa and Porifera; Study of Amoeba and sponges with special reference to its structure and economic importance.

Unit II

General characters of Coelentrata and Annelida; Ecological importance of corals; Morphology of earthworm and its ecological role; Economic importance of Leech.

Unit III

General characters of Arthropoda and Mollusca; Study of basic characters of insects and snails; Insects as pest: Grasshopper, Economic importance of Honey Bee; Snails as pest in Paddy fields, General characters of Echinodermata.

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 7 questions asking two questions of 9 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will be of 8 marks covering entire syllabus. The examinee will be required to attempt 4 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Jordan, E.L and P.S. Verma. 2009. Invertebrate Zoology, S. Chand and Co. Ltd. New Delhi.
2. Ayyar, E. K and T. Anantha krishnan. 1992. Manual of Zoology Vol. 1 Invertebrates Part I and II, S.Viswanathan Printers and Publishers Pvt. Ltd. Madras.
3. Kotpal, R.L. 2021. Zoology Invertebrates. Rastogi Publications, Meerut.
4. Rastogi V.B. 2021. Invertebrate Zoology. Kedar Nath Ram Nath, Meerut
5. Lal S.S. (2019) Practical Zoology Invertebrates. Rastogi Publications, Meerut

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Practical

External Practical Marks: 15
Internal Assessment Marks: 10
Time allowed: 2 Hrs

Course Outcomes:

CO1: Students will be able to learn about Kingdom Animalia.
CO2: Students will be capable to understand the role of non-chordates in their surroundings.

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1. To study the non-chordates from pond water.
2. To study the different parts of Insects by examining House fly, butter fly, beetles.
3. To study the characters of burrowing non-chordates e.g. Earthworm.
4. To study the life cycle of Butterfly/Mosquito.
5. To study various minor phyla as connecting link.
6. Identifications of Non-Chordates specimens of various phyla.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results.

Diversity of Non-Chordates-I
B-ZOO-201

Total Credits: 4	**External Theory Marks: 50**
L - T - P	**Internal Assessment Marks: 20**
3 - 0 - 2	**Time allowed: 3 Hrs.**

Course Outcomes:

CO1: Students will be able to understand classify, identify, diversity of lower animals.

CO2: Knowing these students may engage themselves as a protector preserver and Promoter of life.

CO3: Students will be well equipped to become very competent in research or teaching fields.

Unit-I

General Characters and Classification up to Class level with examples, economic importance of Protozoa, Type study of *Plasmodium vivax*

Unit-II

Porifera- General characters and classification up to class level with examples, Type study - Sycon

Coelenterata- General characters and classification up to class level with examples, Type study- Obelia, Corals, Polymorphism in Coelenterates.

Unit-III

Platyhelminthes- General characters and classification up to class level with examples, Type study - Fasciola hepatica

Aschelminthes- General characters and classification up to class level with examples, Type study – Ascaris, Helminthes in general.

Unit-IV

Annelida- General characters and classification up to class level with examples, Type study – Hirudinaria. Economic importance of Annelids.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Jordan, E.L and P.S. Verma. 2009. Invertebrate Zoology, S. Chand and Co. Ltd. New Delhi.
2. Ayyar,E, K and T. Anantha krishnan. 1992. Manual of Zoology Vol. 1 Invertebrates Part I and II, S.Viswanathan Printers and Publishers Pvt. Ltd. Madras.
3. Kotpal, R.L. 2021. Zoology Invertebrates. Rastogi Publications, Meerut.
4. Rastogi V.B. 2021. Invertebrate Zoology. Kedar Nath Ram Nath, Meerut.
5. Lal S.S. (2019) Practical Zoology Invertebrates. Rastogi Publications, Meerut

1992

Practical

External Practical Marks: 20
Internal Assessment Marks: 10
Time allowed: 2 Hrs

Course Outcomes:

CO1: Students will be well equipped to become very competent in research or teaching fields.
CO2: Students will be capable to understand the role of non-chordates in their surroundings.
CO3: Students will get to know about internal structures of lower animals through permanent slides.

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1. Classification up to orders with ecological notes and economic importance of the following animals.
2. Protozoan Slides: Amoeba, Euglena, Trypanosomna. Noctiluca, Paramecium (Binary fission and Conjugation), Opalina, Vorticella, Balantidium, Nictothrus, Radularian and foraminiferan ooze.
3. Porifera Specimens: Sycon, Grantia, Euplectella. Hyalonema, Spongilla, and Euspongia.
4. Cnidaria Specimens: Porpita, Velella. Physalia. Aurelia Rhizostoma, Metridium, Millipora and Alcyonium, Tubipora, Madrepora and Astraea
5. Cnidaria Slides: Hydra (W.M.), Hydra with buds, Obelia (colony and medusa), Sertularia, Bougainvillea and Aurelia
6. Plathyhelminthes Specimens: Dugesia, Fasciola, Taenia and Echininococcus.
7. Plathyhelminthes Slides: Miracidium, Sporocyst, Redia, Ceraria of Fasciola, Scolex and Proglotids of Taenia (mature and gravid)
8. Aschelminthes: Ascaris (male and female), Trichinella and Ancylostoma.
9. Annelida: Pheretima, Nereis, Heteronereis, Hirudinaria, Chaetopterus, Arenicola, Tubifix and Potobdella.
10. Study of permanent slides: Study of T.S. through pharynx, gizzard and typhlosole, intestine of earthworm; T.S. through Pharynx and crop of leech.
11. L. S. and T.S. Sycon
12. T.S. of Ascaris (Male & Female)

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results.

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Ecology
B-ZOO-202

Total Credits: 2
L - T - P
2 - 0 - 0

External Theory Marks: 35
Internal Assessment Marks: 15
Time allowed: 1:30 Hrs.

Course Outcomes:
CO1: Students will know about basics of ecological science. Students will understand various strategies for research and development on ecological succession and dynamics.
CO2: Students will improve their knowledge about conservation science. Students will describe about various conservation projects.

Unit I

Environmental components: biotic and abiotic components and their interactions. Concept of habitat and niche; Major terrestrial biomes; Bio-geographical zones of India,

Population Ecology: Characteristics of a population; life history strategies (r and K selection); concept of meta-population, Species Interactions: Types of interactions, interspecific competition, Community Ecology: Nature of communities; community structure and attributes; edges and ecotones.

Unit II

Ecosystem: structure and function; energy flow and mineral cycling (C, N, P); productivity, decomposition, Ecological Successions, Environmental pollution; biodiversity and its conservation; Project Tiger, Biosphere reserves.

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 5 questions asking two questions of 12 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts of 11 marks covering entire syllabus. The examinee will be required to attempt 3 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:
1.H.R. Singh & Neeraj Kumar (2014) "Ecology and Environmental Science" Vishal Publishing Co.
2. P D Sharma (2017) "Ecology and Environment" Rastogi Publications
3. Eugene Odum (2017) "Fundamentals of Ecology" Cengage India Private Limited Publishers, Noida
4. Pranav Kumar and Usha Mina (2021) "Fundamentals of Ecology And Environment" 3 rd Edition, Pathfinder Academy
5. N. Arumugam "Concepts of Ecology" Saras Publication.

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Basics of Zoology II

B-ZOO-203

Total Credits: 3	**External Theory Marks: 35**
L - T - P	**Internal Assessment Marks: 15**
2 - 0 - 2	**Time allowed: 2 Hrs.**

Course Outcomes:
CO1: Students will be able to learn about Kingdom Animalia.
CO2: Students will be able to learn about Chordates.
CO3: Students will be capable to understand the role of chordates in their surroundings.

Unit I

Basics of Chordates: Define and Salient features of chordates, Difference between non-chordates and chordates. Characters of protochordates
Pisces (Fishes): Characteristic features of fresh water and marine fishes, Edible fishes of India, Composite fish culture.

Unit II

Class Amphibia: Features of amphibians, Parental care in amphibians, Role of amphibians in ecosystem, Identification of turtles and tortoise, Frog and Toad
Class Reptilia: Features of Reptiles, Common reptiles of India, Identification of Poisonous and non-poisonous snakes, Difference between crocodile and Gharial.

Unit III

Class Aves: Characteristic features of birds, Common birds of India, Flight Adaptations in birds, Commercial uses of birds, Role of birds in agriculture.
Class Mammals: Characters and economic importance of mammals.

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 4 questions asking two questions of 9 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will be of 8 marks covering entire syllabus. The examinee will be required to attempt 4 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:
1. R.L. Kotpal. Modern Textbook of Zoology.
2. E.L. Jordan and Verma. Chordate Zoology.
3. Barrington, E. J.W. The Biology of Hemichordata and Protochordata. Oliver and Boyd, Edinbourgh.
4. Walters, H.E. and Sayles, L.D. Biology of vertebrates. Mac Millan & Co., New York.
5. Kent, C.G. Comparative anatomy of vertebrates.
6. S.S. Lal. Practical Zoology Vertebrate

Practical

External Practical Marks: 15
Internal Assessment Marks: 10
Time allowed: 2 Hrs

Course Outcomes:

CO1: Students will understand various strategies for research and development on ecological succession and dynamics.
CO2: Students will improve their knowledge about conservation science.
CO3: Students will describe about various conservation projects.

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1. Identify feature of different class of chordates
2. Study of connecting links in chordates
3. Study of different types of feathers.
4. Study of different local species of fishes
5. Study of nesting pattern of some local birds, mammals

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results.

Bhagat Phool Singh Mahila Vishwavidyalaya Khanpur Kalan

Scheme and Syllabus of Chemistry Subject for 4 Year UG Programme
Common for [redacted] and Bachelor of Physical Science
w.e.f. Academic session 2024-25

Scheme of Examination for 1st Semester

First Year: 1st Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-CHE-101	DSC	Chemistry-I	3	2	0	4	20	10	50	20	100
2	B-CHE-102	MIC	Minor Chemistry - I	2	0	0	2	15	0	35	0	50
3	B-CHE-103	MDC	Introductory Chemistry-I	2	2	0	3	15	10	35	15	75

Scheme of Examination for 2nd Semester

First Year: 2nd Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-CHE-201	DSC	Chemistry-II	3	2	0	4	20	10	50	20	100
2	B-CHE-202	MIC	Minor Chemistry - II	2	0	0	2	15	0	35	0	50
3	B-CHE-203	MDC	Introductory Chemistry-II	2	2	0	3	15	10	35	15	75

Scheme of Examination for 3rd Semester

Second Year: 3rd Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-CHE-301	DSC	Chemistry-III	3	2	0	4	20	10	50	20	100
2	B-CHE-302	MIC	Minor Chemistry – III	3	2	0	4	20	10	50	20	100
3	B-CHE-303	MDC	Introductory Chemistry-III	2	2	0	3	15	10	35	15	75

Scheme of Examination for 4th Semester

Second Year: 4th Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-CHE-401	DSC	Chemistry-IV	3	2	0	4	20	10	50	20	100
2	B-CHE-402	MIC (VOC)	Chemistry of Fertilizers and Pesticides	3	2	0	4	20	10	50	20	100

Scheme of Examination for 5th Semester

Third Year: 5th Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-CHE-501	DSC	Chemistry-V	3	2	0	4	20	10	50	20	100
2	B-CHE-502	MIC (VOC)	Green Chemistry	3	2	0	4	20	10	50	20	100

Scheme of Examination for 6th Semester

Third Year: 6th Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-CHE-601	DSC	Chemistry-VI	3	2	0	4	20	10	50	20	100
2	B-CHE-602	MIC	Minor Chemistry-IV	3	2	0	4	20	10	50	20	100
3	B-CHE-603	VOC	Chemistry of Cosmetics and Perfumes	3	2	0	4	20	10	50	20	100

Scheme of Examination for 7th semester

Fourth Year: 7th Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-CHE-701	DSC-C1	Organic Chemistry-I	3	2	0	4	20	10	50	20	100
2	B-CHE-702	DSC-C2	Organic Chemistry-II	3	2	0	4	20	10	50	20	100
3	B-CHE-703	DSC-C3	Physical Chemistry-I	3	2	0	4	20	10	50	20	100
4	B-CHE-704	DSC-C4	Physical Chemistry-II	3	2	0	4	20	10	50	20	100
5	B-CHE-705	DSC-C5	Inorganic Chemistry-I	3	2	0	4	20	10	50	20	100
6	B-CHE-706	MIC	Inorganic Chemistry-II	3	2	0	4	20	10	50	20	100

Scheme of Examination for 8th Semester(4 year UG Hon.)

Fourth Year: 8th Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-CHE -801	DSC-C6	Advanced Chemistry-I	3	2	0	4	20	10	50	20	100
2	B-CHE -802	DSC-C7	Advanced Chemistry-II	3	2	0	4	20	10	50	20	100
3	B-CHE-803	DSC-C8	Organic Chemistry-III	3	2	0	4	20	10	50	20	100
4	B-CHE-804	DSC-C9	Physical Chemistry-III	3	2	0	4	20	10	50	20	100
5	B-CHE-805	DSC-C10	Inorganic Chemistry-III	3	2	0	4	20	10	50	20	100
6	B-CHE-806	MIC	Biochemistry	3	2	0	4	20	10	50	20	100

Scheme of Examination for 8th semester (4 years UG Hon. with Research)

Fourth Year: 8th Semester												
Sr. No.	Course Code	Course Type	Course Title	Workload			Credits	Division of Marks				
				L	P	T		Internal Marks		External Marks		Total Marks
								T	P	T	P	
1	B-CHE -801	DSC-C6	Advanced Chemistry-I	3	2	0	4	20	10	50	20	100
2	B-CHE -802	DSC-C7	Advanced Chemistry-II	3	2	0	4	20	10	50	20	100
3	B-CHE-803	MIC	Research Methodology	4	0	0	4	30	0	70	0	100
4	B-CHE-804	Dissertation	Research Project/ Dissertation				12					300

Chemistry-I
B-CHE-101

Total Credits: 4
L - T - P
3 - 0 - 2

External Theory Marks: 50
Internal Assessment Marks: 20
Time allowed: 3 hrs

Course outcomes:
After completing this course, the learner will be able to:

CO1 Enable to understand the basis of quantum mechanics and structural idea and relevance in describing shapes of s, p and d orbitals.

CO2 To learn about role of temperature and pressure to establish the state of gases and describe the concept of critical constants of real gases.

CO3 Get knowledge about the electrophile/nucleophile and its role in mechanism of preparation of organic compounds.

CO4 To know the physical properties, morphology and crystalline study of liquid and different type of solids.

Unit – I

Atomic Structure: Dual behaviour of matter and radiation, de Broglie's relation, Heinsenberg's uncertainty principle, concept of atomic orbitals, significance of quantum numbers, radial and angular wave functions, normal and orthogonal wave functions, significance of Ψ and Ψ^2, shapes of s, p, d, f orbitals, Rules for filling electrons in various orbitals, effective nuclear charge, Slater's rules.

Periodic table and atomic properties: Classification of periodic table, definition of atomic and ionic radii, ionisation energy, electron affinity and electronegativity, trend in periodic table (in s and p-block elements), Pauling, Mulliken, Allred Rachow and Mulliken Jaffe's electronegativity scale, Sanderson's electron density ratio.

Unit – II

Gaseous State: Kinetic theory of gases, Maxwell's distribution of velocities and energies (derivation excluded) Calculation of root mean square velocity, average velocity, and most probable velocity. Collision diameter, collision number, collision frequency and mean free path (Derivations excluded), Deviation of Real gases from ideal behaviour, Derivation of Vander Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor)

Critical Phenomenon: Concept of Critical temperature, critical pressure, critical volume, relationship between critical constants and Van der Waal's constants (Derivation excluded).

Unit – III

Structure and Bonding: Localized and delocalized chemical bond, Van der Waals interactions. Concept of resonance and its applications, hyperconjugation , inductive effect, Electromeric effect and their comparison.

Mechanism of Organic Reactions: Curved arrow notation, homolytic and heterolytic bond fission. Types of reagents: electrophiles and nucleophiles. Types of organic reactions: Substitution, Addition, Condensation, Elimination, Rearrangement, Isomerization and Pericyclic reactions. Reactive intermediates: Carbocations, carbanions, free radicals, carbenes (structure & stability).

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Unit - IV

Liquid State: Structure of liquids, Properties of liquids – surface tension, refractive index, viscosity, vapour pressure and optical rotation.
Solid State: Classification of solids, Law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry and symmetry elements, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of Laue method, rotating crystal method and powder pattern method.

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 9 questions asking two questions from each unitand one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Recommended Books/e-resources/LMS:

1. Lee, J.D.; (2010), Concise Inorganic Chemistry, Wiley India.
2. Kapoor, K.L. (2015), A Textbook of Physical Chemistry, Vol 1, 6th Edition, McGraw HillEducation.
3. Clayden, J.; Greeves, N.; Warren, S. (2012), Organic Chemistry, Oxford.
4. Morrison, R. N.; Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

Practical

External Practical Marks: 20
Internal Assessment Marks: 10
Time allowed: 2hrs

Course Outcomes:
CO1: Hand on practice in preparation of solutions, compounds
CO2: Estimation and determination of physical properties of some compounds.

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1. Acid/Base titration: Determination of strength of NaOH using oxalic acid.
2. Redox titrations: Determination of Fe^{2+} ions using $KMnO_4$.
3. To determine the surface tension of given liquid using Stalagmometer by drop no. methods.
4. Preparation of *m*-Dinitrobenzne from Nitrobenzene (use 1:2 conc. HNO_3-H_2SO_4 mixture if fuming HNO_3 is not available).
5. Preparation of p-Bromoacetanilide from Acetanilide

Instructions for External Practical Paper Setter/Examiner:
The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results.

- 1302

Minor Chemistry – I
B-CHE-102

Total Credits: 2
L - T - P
2 - 0 - 0

External Theory Marks: 35
Internal Assessment Marks: 15
Time allowed: 1:30 hrs

Course Outcomes:

After completing this course, the learner will be able to:

CO1 To understand the basics of Covalent bonding in simple molecules and to get the basics of rates of chemical reactions and factors affecting it.

CO2 To learn about the nomenclature, classification and methods of preparation of alkenes and conductors, semiconductors and insulator.

Unit - I

Covalent Bond: Valence bond theory approach, shapes of simple inorganic molecules and ions based on valence shell electron pair repulsion (VSEPR) theory and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonalbipyramidal and octahedral arrangements. Molecular orbital theory of homonuclear (N_2, O_2) and heteronuclear (CO and NO) diatomic molecules, dipole moment and percentage ionic character in covalent bond.

Chemical Kinetics: Concept of reaction rates, rate equation, factors influencing the rate of reaction, Order and molecularity of a reaction, integrated rate expression for zero, first, second order reactions (for equal conc. of reactants), Half-life period of a reaction

Unit - II

Alkanes (upto 5 carbon atoms): Alkanes, nomenclature, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation: Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids, physical properties. Mechanism of free radical halogenation of alkanes: reactivity and selectivity.

Metallic Bond and semiconductors: Metallic bond – Qualitative idea of valence bond and Band theories of metallic bond (conductors, semiconductors, insulators). Semiconductors – Introduction, types, and applications.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 5 questions asking two questions of 12 marks from each unit and one compulsory question by taking course outcomes (CO) into consideration. The compulsory question (Question No. 1) will contain 5 parts of 11 marks covering entire syllabus. The examinee will be required to attempt 3 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. DhawanS.N.,Organic Chemistry, Vol 1 Pardeep Publication.
2. J.D. Lee, Concise Inorganic Chemistry (4th Edition), Chapman and hall Publications.

— 1303 -

Introductory Chemistry-I
B-CIIE-103

Total Credits: 3
L - T - P
2 - 0 - 2

External Theory Marks: 35
Internal Assessment Marks: 15
Time allowed: 2 hrs

Course Outcomes:
After completing this course, the learner will be able to:

CO1 To get knowledge about structure and bonding.
CO2 To learn about hydrocarbons and their applications.
CO3 To get aware about different polymers and preservative.

UNIT-I

Atomic Structure and Bonding: Introduction, Elementary introduction of atomic structure and chemical bonding, Representation of elements/ atoms, Lewis structure, electronic configurations.

UNIT-II

Carbon and Its Compounds: Introduction, Tetravalency of Carbon, allotropes of carbon and their properties, hydrocarbons, nomenclature (linear compounds), Applications of hydrocarbons.

UNIT-III

Polymers: Introduction, elementary idea of synthetic and natural polymers, Homo polymers and copolymers, uses and properties (Natural rubber, Vulcanized rubber, Polyethene, PVC, Styrene, Teflon, PAN, Nylon-66).
Food Preservatives: Elementary idea of natural and synthetic food preservatives, rancidity, uses and properties, different food preservation processes (pickle, Jam), artificial sweeteners, uses and properties.

Instructions for External Theory Paper Setter/Examiner:
The examiner will set 7 questions asking two questions from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 4 questions, selecting one question from each unit and the compulsory question.

Recommended Books/e-resources/LMS:

1. Lee, J.D.; (2010), Concise Inorganic Chemistry, Wiley India.
2. Morrison, R. N.; Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. B. Sivasankar, Food processing and preservation, Prentici Hall India learning private limited.
4. ManasChanda, 2013, Introduction to Polymer Science and Chemistry 2nd Edition, Making Rayon Fiber - Artificial silk, chemical experiment.
5. Neelam Seedher, Basic Concepts: Physical Chemistry Experiments, Kindley Edition

-1304-

Practical

External Practical Marks: 15
Internal Assessment Marks: 10
Time allowed: 2 hrs

Course Outcomes:

CO1: To get knowledge about experiments related to daily life.

1. Identify the pH of the given samples through pH strip.
2. Experiments related to persevering food items.
3. Preparation of Artificail Silk.
4. To senthesize some polymers asper available resources.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results

Chemistry-II
B-CHE-201

Total Credits: 4	**External Theory Marks: 50**
L - T - P	**Internal Assessment Marks: 20**
3 - 0 - 2	**Time allowed: 3 hrs**

Course Outcomes:

CO1 Able to understand the theories which governs the shape, structure and ionic behavior, polarizability, ionic structures and concept of Lattice energy of crystals of molecules.

CO2 To know the basics of rates of chemical reactions ,the laws and solubility behavior of solutes in different compositions of solvents

CO3 To know about alkanes, alkene, cycloalkanes and their chemical reactions.

CO4 To understand about weak interactions and bonding in metals.

UNIT-I

Ionic Solids: Ionic structures (NaCl, CsCl, ZnS (Zinc blende), CaF_2) size effects, radius ratio rule and its limitations, Concept of Lattice energy, Born- Haber cycle, Solvation energy and its relationship with solubility of Ionic solids, Polarizing power and Polarisability of ions, Fajan's rule.

UNIT-II

ChemicalKinetics: Concept of reaction rates, rate equation, factors influencing the rate of reaction,Order and molecularity of a reaction, integrated rate expression for zero, first, Half-life period of a reaction, Arrhenius equation.

Distribution Law: Nernst distribution law – its thermodynamic derivation, Nernst distribution law after association and dissociation of solute in one of the phases, of distribution law: (i) Determination of degreeof hydrolysis and hydrolysis constant of aniline hydrochloride

UNIT-III

Alkanes and Cycloalkanes: Nomenclature, classification of carbon atoms in alkanes and its structure. Isomerism in alkanes, sources. Methods of formation: Wurtz reaction, Kolbe reaction, Corey- House reaction and decarboxylation of carboxylic acids, physical properties. Mechanism of free radical halogenation of alkanes: reactivity and selectivity: Nomenclature of Cycloalkanes, Baeyer's strain theory and its limitations, theory of strainless rings.

Alkenes: Nomenclature of alkenes and its structure. Methods of formation: dehydration of alcohols, dehydrohalogenation of alkyl halide, Hofmann elimination and their mechanism. The Saytzeff rule and relative stabilities of alkenes. Chemical reactions: electrophilic and free radical additions, addition of halogens, halogen acids, hydroboration–oxidation, oxymercuration-reduction, ozonolysis and hydration, Markownikoff's rule of addition.

UNIT-IV

Hydrogen Bonding and Van der Waals forces Hydrogen Bonding – Definition, types, effects of hydrogen bonding on properties of substances, application and Brief discussion of various types of Van der Waals forces.

Metallic Bond and semiconductors: Metallic bond – Qualitative idea of valence bond and Band theories of metallic bond (conductors, semiconductors, insulators), Semiconductors – Introduction, types, and applications.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions from each unitand one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

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RecommendedBooks/e-resources/LMS:

1. Lee,J.D.;(2010),Concise Inorganic Chemistry,Wiley India.
2. Kapoor, K.L. (2015),A textbook of Physical Chemistry, Vol1, 6th Edition, McGraw Hill Education.
3. Clayden,J.;Greeves,N.;Warren,S.(2012), OrganicChemistry, Oxford.
4. Morrison,R.N.;Boyd,R.N.Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education)
5. Khosla, B.D. ;Garg,V.C.;Gulati,A.(2015), Senior Practical Physical Chemistry ,R. Chand & Co, New Delhi.
6. Jeffery,G.H.;Bassett,J.;Mendham,J.;Denney,R.C.(1989),Vogel'sTextbook of Quantitative Chemical Analysis, John Wiley and Sons.

Practical

External Practical Marks: 20
Internal Assessment Marks:10
Time allowed: 2 hrs

Course Outcomes:

CO1: Hand on practice for estimation and determination of viscosity, specific refractivity properties of some compounds.

1. Complexometric titrations: Determination of Mg^{2+} by EDTA.
2. Paper Chromatography: Qualitative Analysis of any one of the following Inorganic cations and anions by paper chromatography (Pb^{2+}, Cu^{2+}, Ni^{2+}, Cl^-, Br-, and PO_4^{3-} and NO^3).
3. To determine the viscosity of given liquid using Ostwald's Viscometer.
4. To determine the specific refractivity of at least two liquids by Refractometer.
5. Separation of mixture of two Organic Compounds by TLC.

Instructions for External Practical Paper Setter/Examiner:

The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results

Minor Chemistry II
B-CHE-202

Total Credits: 2	**External Theory Marks: 35**
L - T - P	**Internal Assessment Marks: 15**
2 - 0 - 0	**Time allowed: 1:30 hrs**

Course Outcomes:

After completing this course, the learner will be able to:

CO1 To know the basics of periodic properties, hybridization and Ionic Solids.

CO2 Get the knowledge of metallic bonds and stereochemistry of simple organic molecules.

UNIT – I

Periodictable and atomic properties

Atomic properties: atomic and ionic radii, ionisation energy, electron affinity and electronegativity definition, methods of determination or evaluation, trend in periodic table, effective nuclear charge, Slater's rules. Directional characteristics of covalent bond, various type of hybridisation and shapes of simple inorganic moleculesand ions (BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7, SO_4^{-2}, CO_3^{-2}, NO_3^{-1}

Ionic Solids: Stoichiometric and Non-stoichiometric defects in crystals, Lattice energy and Born- Haber cycle, Solvation energy and its relationship with solubility of Ionic solids, Polarizing power and Polarisability of ions, Fajan's rule. Metallic bond – Qualitative idea of valence bond and Band theories of metallic bond (conductors, semiconductors, insulators)

UNIT – II

Metallic Bond

Localized and delocalized chemic al bond, Van der Waal's interactions, resonance: conditions, resonance effect and its applications, hyperconjugation, inductive effect, Electromeric effect & their comparison.

Stereochemistry of OrganicCompounds

Concept of isomerism.Types of isomerism. Optical isomerism, element s of symmetry, enantiomers, stereogenic centre,optical activity, properties of enantiomers, chiral and achiral molecules (upto two stereo genic centres), diastereomers, threo and erythro-diastereomers, meso compounds Relative and absolute configuration, sequence rules, R & S systems of nomenclature, Geometrical isomerism.Determination of configuration of geometric isomers.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 5 questions asking two questions of 12 marks from each unit and one compulsory question by taking course outcomes (CO) into consideration. The compulsory question (Question No. 1) will contain 5 parts of 11 marks covering entire syllabus. The examinee will be required to attempt 3 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Huheey,J.E.;Keiter,E.A.;Keiter;R.L.;Medhi,O.K.(2009),Inorganic Chemistry-Principles of Structure and Reactivity,Pearson education.
2. Atkins, P.W.; Paula, J.de.(2014), Atkin's Physical Chemistry Ed., 10th Edition,Oxford University Press.
3. Kapoor,K.L.(2015),A Textbook of Physical Chemistry ,Vol1, 6thEdition,McGraw Hill Education.
4. Nasipuri,D.(2018),Stereochemistry of Organic Compounds: Principles and Applications, 3 rd Edition, New Age International.
5. Gunstone,F.D.(1975),GuidebooktoStereochemistry,PrenticeHallPress.

Introductory Chemistry-II
B-CHE-203

Total Credits: 3
L - T - P
2 - 0 - 2

External Theory Marks: 35
Internal Assessment Marks: 15
Time allowed: 2 hrs

Course Outcomes:

After completing this course, the learner will be able to:

CO1 To learn about role of Indian scientists in the upliftment of research
CO2 To learn about classification of elements with their properties
CO3 To learn about three states of matte and role of fertilizers in fertility of soil

UNIT-I

Renowned Indian Scientists

Brief Biography of Renowned Indian Scientists (Hargobind Khurana, Dr. P.C. Ray, Sir C.V. Raman, Dr. A.P.J. Abdul Kalam, C. N. R. Rao, Dr. Vikram Sara Bhai, Dr. Homi Jahangir Bhabha, Dr. J.C. Bose, Dr. S. N. Bose)

UNIT-II

MetalandNon-Metals

Periodic table, classification of elements, physical andchemical aspects of metals and non-metals, Ore and Minerals of Iron, Copper, Aluminium, alloys

UNIT-III

Physical Properties of Matter

Classification of matter, properties, uses, ideal gas equation, real gas equation, some important compounds (baking soda, washing soda, plaster of Paris, gypsum, glass)

Soil and fertilizers

Green revolution, soil: types of soil and their components for fertility, grow condition, pH, irrigation, bio-fertilizers, chemical fertilizers and their uses, acid rain.

Instructions for External Theory Paper Setter/Examiner:

The examiner will set 9 questions asking two questions of 7 marks from each unit and one compulsory question by taking course outcomes (COs) into consideration. The compulsory question (Question No. 1) will beof 7 marks covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Recommended Readings:

1. Chemistry In Daily Life:Third Edition by Kirpal Singh, PHI Learning
2. General Chemistry: Principles, Patterns ,and Applications, Bruce Averill, Strategic Energy Security Solution, Patricia Eldredge, R.H. Hand, LLC, Copyright Year: 2011
3. The Great Indian Scientists Paperback-1 January2017, Cengage Learning India

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Practical

External Practical Marks: 15
Internal Assessment Marks: 10
Time allowed: 2 hrs

Course Outcomes:
CO1: To learn about acid- base reaction in daily life

1. To prepare Plaster of Paris
2. To prepare Potash Alum
3. To study the effect of acid on Baking and washing soda
4. To perform the action of water on quick lime and identify the nature of reaction (Exo/Endothermic)

Instructions for External Practical Paper Setter/Examiner:
The examiner will set 2 Experiments at the time of practical examination by taking course outcomes (CO) into consideration. Equal weightage will be given to both the Experiments. The evaluation will be done on the basis of practical record, viva-voce, write up and experimental results