



SATPUDA EDUCATION SOCIETY, JALGAON JAMOD'S  
**Arts & Commerce College**  
Warwat Bakal Tq. Sangrampur Dist - Buldhana (M.S.)

- Principal -  
**Dr. Shriram Yerankar**  
M.A., M.Phil, Ph.D.  
9423722316

NAAC Reaccredited with 'B' Grade

College Code : 327

- President -  
**Shri. Krushnarao Ingle**  
(Ex. M.L.A.)  
07266-221449

Website : [www.acscwb.co.in](http://www.acscwb.co.in)

E-mail : [327accwb@gmail.com](mailto:327accwb@gmail.com)

**Criterion I : Curricular Aspects**

**1.3**

**Curriculum Enrichment**

**Session 2023-2024**

**Supporting Documents**

Metric No.	Sr.No.	Content/ File Description	Document Link
1.3.2	B	Course Featuring Experiential Learning : Project work, Field work, Internship	



  
**Principal**  
Arts & Commerce College  
Warwat Bakal Dist. Buldhana



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# Arts & Commerce College

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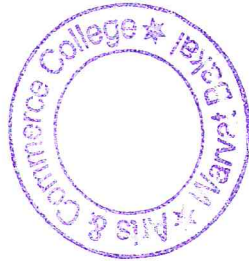
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## CERTIFICATE

This is to certify that the document attached as supporting document for Criterion I: Curricular Aspects are verified from the college record and found to be correct to the best of my knowledge.



Principal

Arts & Commerce College  
Warwat Bakal Dist. Buldhana

**Department of Chemistry**  
**Number of Students under Taking Project Work**  
**Session: 2023-2024**  
**Class B.Sc.**  
**Subject: Chemistry**

Years	Semester	Winter/Summer	N0. Of Students who completed project
2023-24	Sem V	Winter	45
	Sem VI	Summer	42
	MSC IV	Summer	19

**Department of Botany**  
**Number of Students under Taking Project Work**  
**Session: 2023-2024**  
**Class B.Sc.**  
**Subject: Botany**

Years	Semester	Winter/Summer	N0. Of Students who completed project
2023-24	Sem V	Winter	33
	Sem VI	Summer	33
	MSC IV	Summer	17



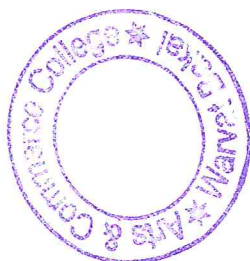
  
**Principal**  
**Arts & Commerce College**  
**Warvat Bakal Dist. Buldana**

**Department of Zoology**  
**Number of Students under Taking Project Work**  
**Session: 2023-2024**  
**Class B.Sc.**  
**Subject: Zoology**

Years	Semester	Winter/Summer	N0. Of Students who completed project
2023-24	Sem V	Winter	33
	Sem VI	Summer	33
	MSC IV	Summer	12

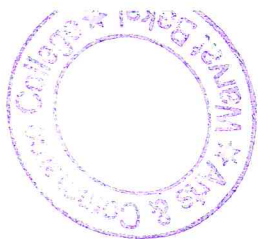
**Department of Commerce**  
**Number of Students under Taking Project Work**  
**Session: 2023-2024**  
**Class B.Com.**  
**Subject: Commerce**

Years	Semester	Winter/Summer	N0. Of Students who completed project
2023-24	Sem V	Winter	94
	Sem VI	Summer	85
	M.com	Summer	36
	Sem IV		



  
**Principal**  
**Arts & Commerce College**  
**Warvat Bakal Dist. Buldana**





**Syllabus of the courses that include experiential learning through project work**

**Environmental Studies (B.A, B.com, B.sc. II )**

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**%SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI  
ORDINANCE NO. 42 OF 2005**

**Examination in Environmental Studies leading to Bachelor Degree, Ordinance, 2005**

Whereas it is expedient to frame an Ordinance relating to Examination in Environmental Studies leading to Bachelor Degree level, hereinafter appearing, the Management Council is hereby pleased to make the following Ordinance.

1. This Ordinance may be called "Examination in Environmental Studies leading to Bachelor Degree, Ordinance, 2005."
2. This Ordinance shall come into force from the Academic session 2005-06.
3. In this Ordinance and in other ordinances relating to the examination, unless there is anything repugnant in the subject or context :-
  - (i) "Academic session" means a session commencing on such date and ending with such date of the year following as may be appointed by the Management Council.
  - (ii) "Admission to an examination" means the issuance of an admission card to a candidate in token of his having complied with all the conditions laid down in the relevant ordinance, by a competent officer of the University.
  - (iii) "Applicant" means a person who has submitted an application to the University in the form prescribed for admission to an examination.
  - (iv) "Candidate" means a person who has been admitted to an examination by the University.
  - (v) "Regular Candidate" means an applicant who has applied for admission to a University examination through an affiliated college, Department or Institute in which he/she has prosecuting a regular course of study.
  - (vi) "Examinee" means a person who present himself/herself for an examination to which he/she has been admitted.
  - (vii) "Examination" means an examination prescribed by the University under the relevant Ordinance.
  - (viii) "External Candidate" means a candidate who is allowed to take a University examination in accordance with the provision of Original Ordinance No. 151.
  - (ix) "Non-Collegiate Candidate" means a candidate who is not a collegiate candidate.

% Amended by Ordinance No. 7 of 2006, and 10 of 2007.

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- (x) An "Ex-student" is a person who having once been admitted to an examination of this University, is again required to take the same examination by reason of his failure or absence thereat and shall include a student who may have joined a college, Department or Institute again in the same class.
  - (xi) "Bachelor Degree Examination" means a examination leading to Bachelor Degree of the University.
  - (xii) "Previous Year" means a year following by final year of Bachelor Degree.
4. Save as otherwise specifically provided, the conditions prescribed for admission to the examination under this Ordinance shall apply to all persons who wish to take the examination to the Degrees of the University mentioned in para 5 below.
  5. The conditions prescribed for admission to examination under this Ordinance shall apply to following degrees of the University :-
    - 1) Bachelor of Arts
    - 2) Bachelor of Performing Arts
    - 3) Bachelor of Fine Arts
    - 4) Bachelor of Mass Communication
    - 5) Bachelor of Social Work
    - 6) Bachelor of Commerce
    - 7) Bachelor of Business Administration
    - 8) Bachelor of Science
    - 9) Bachelor of Computer Science
    - 10) Bachelor of Computer Applications
    - 11) Bachelor of Pharmacy
    - 12) Bachelor of Science (Home Science)
    - 13) Bachelor of Technology (Cosmetics)
    - 14) Bachelor of Engineering
    - 15) Bachelor of Engineering (Part Time) (Civil)
    - 16) Bachelor of Textile
    - 17) Bachelor of Technology (Chemical Technology)
    - 18) Bachelor of Technology (Chemical Engg.)
    - 19) Bachelor of Architecture, and
    - 20) Bachelor of Laws (Five Year Course)

6. i) Environmental Studies shall be a compulsory subject for a previous year examination of the following Bachelor Degrees of the University,
- 1) Bachelor of Arts
  - 2) Bachelor of Performing Arts
  - 3) Bachelor of Fine Arts
  - 4) Bachelor of Mass Communication
  - 5) Bachelor of Social Work
  - 6) Bachelor of Commerce
  - 7) Bachelor of Business Administration
  - 8) Bachelor of Science
  - 9) Bachelor of Computer Science
  - 10) Bachelor of Computer Applications
  - 11) Bachelor of Pharmacy
  - 12) Bachelor of Science (Home Science)
  - 13) Bachelor of Technology (Cosmetics)
  - 14) Bachelor of Engineering (Part Time) (Civil)
- ii) Environmental Studies shall be a compulsory subject for IIIrd & IVth Semester of the following Bachelor Degrees of the University,
- 1) Bachelor of Engineering
  - 2) Bachelor of Textile
  - 3) Bachelor of Technology (Chemical Technology)
  - 4) Bachelor of Technology (Chemical Engineering)
  - 5) Bachelor of Architecture, and
- iii) Environmental Studies shall be a compulsory subject for Vth & VIth Semester of the Degree of Bachelor of Laws (Five Year Course)
- iv) Students admitted to Second Year/Third Year/IVth Semester Vth Semester of various degree examination courses in different faculties in the academic session 2005-06 or thereafter shall have to appear for examination in the subject Environmental studies.
7. The main Examination leading to Environmental Studies shall be held in Summer and Supplementary examination in Winter every year, at such places and on such date as may be appointed by the Board of Examinations.
- Explanation :-** Examination shall be conducted on the basis of one common question paper for all Bachelor Degree examination courses irrespective of annual or semester pattern.

8. Scope of the subject for annual pattern examination and or semester pattern examination shall be as provided under the syllabus.
9. Common question paper for all courses covered under this Ordinance along with answer books shall be supplied by the University to the Colleges, Departments and Institutes for conducting the examination of the subject.
10. Valuation of the answer books relating to this subject shall be done at College/Department/Institution level only. Remuneration for valuation of answer books shall not be paid by the University.
- Provided that prescribed evaluation fee for evaluation of each answer Book/s of an external examinee/s appeared from the examination centre shall be paid to each examination centre.
11. It shall be obligatory on the part of the College/Department/Institute to submit candidate wise following information to the University on or before the date as may be prescribed by the University :-

Sr. No.	Grade/Category	Marks secured
1.	"A"	- 60 and above
2.	"B"	- 45 to 59
3.	"C"	- 35 to 44
4.	"D"	- 25 to 34
5.	"Fail"	- 24 and below
6.	"Absent"	

12. For the purposes of teaching, learning and examination, the Committee consisting of three teachers shall be appointed by the Principal/ Head of the Department/Head of the Institution under his/her Chairmanship/ Chairpersonship. While appointing three teachers on the said committee, the Principal shall take care that the teachers to be appointed on the committee, if necessary, shall be from different faculty.
13. i) Duration of theory examination of this subject shall be three hour.
- ii) For all Bachelor Degree examinations, common question paper of 100 marks shall be provided by the University.
- iii) Distribution of these 100 marks shall be as follows :-
- a) Part-A, Short Answer Pattern - 25 Marks
  - b) Part-B, Essay type with inbuilt choice - 50 Marks
  - c) Part-C, Essay on Field Work - 25 Marks

## 27. ENVIRONMENTAL STUDIES

Total Marks : 100

## PART-A

## SHORT ANSWER PATTERN

25 Marks

## 1. The Multidisciplinary nature of environmental studies

- . Definition, scope and importance.
- . Need for public awareness.

(2 lecture hours)

## 2. Social Issues and the Environment

- . From Unsustainable to Sustainable development
- . Urban problems related to energy
- . Water conservation, rain water harvesting, watershed management
- . Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- . Environmental ethics : Issues and possible solutions.
- . Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- . Wasteland reclamation.
- . Consumerism and waste products.
- . Environment Protection Act.
- . Air (Prevention and Control of Pollution) Act.
- . Water (Prevention and Control of Pollution) Act.
- . Wildlife Protection Act.
- . Forest Conservation Act.
- . Issues involved in enforcement of environmental legislation.
- . Public awareness.

(7 lecture hours)

## 3. Human Population and the Environment

- . Population growth, variation among nations.
- . Population explosion - Family Welfare Programme.
- . Environment and human health.
- . Human Rights.
- . Value Education.
- . HIV / AIDS.
- . Women and Child Welfare.
- . Role of Information Technology in Environment and human health.
- . Case Studies.

(6 lecture hours)

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## PART-B

## ESSAY TYPE WITH INBUILT CHOICE

50 Marks

## 4. Natural resources :

## . Renewable and non-renewable resources :

- . Natural resources and associated problems.
- . Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- . Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- . Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- . Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
- . Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
- . Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- . Role of an individual in conservation of natural resources.
- . Equitable use of resources for sustainable lifestyles.

(8 lecture hours)

## 5. Ecosystems

- . Concept of an ecosystem.
- . Structure and function of an ecosystem.
- . Producers, consumers and decomposers.
- . Energy flow in the ecosystem.
- . Ecological succession.
- . Food chains, food webs and ecological pyramids.
- . Introduction, types, characteristic features, structure and function of the following ecosystem :-
- Forest ecosystem
- Grassland ecosystem
- Desert ecosystem
- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lecture hours)



## 6. Biodiversity and its conservation

- . Introduction - Definition : genetic, species and ecosystem diversity.
- . Biogeographical classification of India.
- . Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- . Biodiversity at global, National and local levels.
- . India as a mega-diversity nation.
- . Hot-spots of biodiversity.
- . Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- . Endangered and endemic species of India.
- . Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.  
(8 lecture hours)

## 7. Environmental Pollution

- . Definition
- . Causes, effects and control measures of :-
  - Air pollution
  - Water pollution
  - Soil pollution
  - Marine pollution
  - Noise pollution
  - Thermal pollution
  - Nuclear hazards
- . Solid Waste Management : Causes, effects and control measures of
  - . Role of an individual in prevention of pollution.
  - . Pollution case studies.
  - . Disaster management : floods, earthquake, cyclone and landslides.  
(8 lecture hours)

### PART-C

### ESSAY ON FIELD WORK 25 Marks

## 8. Field work

- . Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain
- . Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
- . Study of common plants, insects, birds.
- . Study of simple ecosystems - pond, river, hill slopes, etc.  
(5 lecture hours)

- (Notes : i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.
- ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and
- iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

### LIST OF REFERENCES:-

- 1) Agarwal, K.C., 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.
- 2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email : mapin@icenet.net (R)
- 3) Bruamer R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
- 4) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
- 5) Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T., 2001, Environmental Encyclopedia, Jaiso Publ. House, Mumbai, 1196p.
- 6) De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- 7) Down to Earth, Centre for Science and Environment (R)
- 8) Gleick, H.P. 1993, Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security, Stockholm Env. Institute, Oxford Univ. Press. 473p.
- 9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural Histroy Society, Mumbai (R)
- 10) Heywood, V.H. & Watson, R.T. 1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140p
- 11) Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi. 284 p.
- 12) Mckinney, M.L. & Schoch, R.M. 1996, Environmental Science Systems & Solutions, Web Enhanced Edition. 639 p.
- 13) Mhaskar A.K., Matter Hazardous, Techno-Science Publications (TB)
- 14) Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
- 15) Odum, E.P., 1971, Fundamentals of Ecology, W.B.Saunders Co., U.S.A., 574p.
- 16) Rao M.N. & Datta A.K., 1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
- 17) Sharma B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
- 18) Survey of the Environment, The Hindu (M)
- 19) Townsend C., Harper J., and Michael Begon, Essentials of Ecology, Blackwell Science (TB)



## B.Com. III Semester V e-COMMERCE - I

Time : 3 Hours

Marks: 60

**Objective:** The objective of the course is to familiarize the students with the essentials of internet based e-commerce and to make them comprehend its practical aspects as well as growth potential of e-commerce in India.

### Unit I: Basics of e-commerce:

Meaning of e-commerce, Essential components of e-commerce, four basic models/ concepts of e-commerce, Operational scheme of e-commerce, Benefits of e-commerce, Limitations of e-commerce and e-commerce v/s traditional commerce

### Unit II: e-commerce in India:

History of Internet, Initiation of internet in India, Growth of internet users in India, Current scenario of e-commerce in India, Government FDI policy about e-commerce in India, Future of e-commerce in India

### Unit III: Retail e-commerce:

Concepts of Business to Consumer (B2C), Consumer to Business (C2B) and Consumer to Consumer (C2C) e-commerce, Consumers shopping procedure on internet, Disintermediation and re-intermediation in B2C, E-auction procedure and benefits

### Unit IV: B2B e-commerce:

Meaning and characteristics of Business to Business (B2B) e-commerce, Key technologies for B2B e-commerce, E- Marketplace models of B2B- Supplier oriented marketplace, Buyer oriented marketplace and Intermediary oriented marketplace

### Unit V: e- Payment and e- Banking:

Indian Payment Models, e payments options: Electronic fund transfer (EFT), Credit cards and debit cards based payment, Use of mobile applications (apps) for e-payment, Meaning of electronic banking, online banking services, benefits of online banking, Future of online financial services in India

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### Books Recommended

1. Agrawala Kamallesh N and Agrawal Deeksha :  
Bride to Online Storefront, Macmillon India, New Delhi.
2. Agarwala Kamallesh N. and Agrawal Deeksha:  
Business on the Net- Introduction to e- Commerce; Macmillon India, New Delhi
3. Agarwala Kamallesh N. and Agrawal Deeksha:  
Bulls, Bears and The Mouse-An Introduction to Online Stock Market Trading; Macmillon India, New Delhi.
4. Tiwari Dr. Murlidhar Dr.:  
Education and E-Governance; Macmillon India, New Delhi.
5. Afuah A. and Tucci C.:  
Internet Business Models and Strategies; Mc Graw Hill, New York.

### Internal Assessment Scheme

1. Theory paper will carry 60 marks and internal assessment 40 marks
2. 40 % Marks will be based on continue evaluation of the student assignment, class test, seminar and web-site visit /Industrial visit and project report.
3. Student will have to work under the guidance of the teacher and submit project report before fifteen days of the commencement of the theory examination.



**B.Com. III  
Semester VI  
e-COMMERCE- II**

**Time : 3 Hours**

**Marks: 60**

**Objective:** The objective of the course is to acquaint the students with the internet- based e-commerce business models, internet marketing and e-governance.

**Unit I: Internet e-commerce Business Models:**

Social media model, advertising model, retail model, hybrid model, merchant model, informational model, drop-shipping model and revenue model.

**Unit II: B2C Internet Marketing**

Meaning of online marketing or internet marketing, online marketing strategies, marketing channels, internet branding, online publishing and advertising.

**Unit III: B2B Online Marketing**

Use of internet based electronic data interchange (EDI), Benefits of online marketing in B2B e-commerce, procurement reengineering, just in time delivery, online marketing issues.

**Unit IV: E-governance:**

Meaning of e-governance and e-government, Objectives of E-governance, Private sector interface in E-Governance, Concepts of government to Business (G2B), Business to Government (B2G), Citizen to Government (C2G).

**Unit V: E- Governance Models**

Application of Internet EDI in E-governance, E-governance in India, E-Governance Models, Comparative Analysis Model, Wider Dissemination Model, Critical Flow Model, E-advocacy Model

**Books Recommended**

1. Agrawala Kamalesh N and Agrawal Deeksha :  
Bride to Online Storefront, Macmillon India, New Delhi.
2. Agarwala Kamalesh N. and Agrawal Deeksha:  
Business on the Net- Introduction to e- Commerce; Macmillon India, New Delhi
3. Agarwala Kamalesh N. and Agrawal Deeksha:  
Bulls, Bears and The Mouse-An Introduction to Online Stock Market Trading; Macmillon India, New Delhi.
4. Tiwari Dr. Murli Dr.:  
Education and E-Governance; Macmillon India, New Delhi.
5. Afuah A. and Tucci C.:  
Internet Business Models and Strategies; Mc Graw Hill, New York.

**Internal Assessment Scheme**

1. Theory paper will carry 60 marks and internal assessment 40 marks
  2. 40 % Marks will be based on continue evaluation of the student assignment, class test, seminar and web-site visit /Industrial visit and project report.
  3. Student will have to work under the guidance of the teacher and submit project report before fifteen days of the commencement of the theory examination.
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## 13. BOTANY

There shall be following paper and practical for B.Sc. Part - I Semester one examination. The syllabus is based on six theory periods and six practical periods per week (Total 75 - 80 theory sessions and 25 practical sessions per complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for 4 hours. Every examinee shall offer the following paper of 100 marks (out of which 80 marks will be for written examination and 20 marks for internal assessment) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

	Paper - I	Marks
1.	a. Theory	80
	b. Internal Assessment	20
2.	Practical	50
	<b>Total</b>	<b>150 Marks</b>

## 1S - BOTANY

### Diversity & Applications of Microbes and Cryptogams

UNIT-I : Plant Diversity	(15)
1.1 Cynobacteria and its impact on origin of life	
1.2 Introduction to Plant Kingdom: Cryptogams	
1.3 Diversity of plants with respect to habitat, form, nutrition and ecological status	
1.4 General Account of Viruses and structure of TMV and HIV	
1.5 Bacteria: structure, Nutrition and reproduction	
1.6 Role of microbes in Agriculture, Medicine and Industries	
UNIT-II: Algae	(15)
2.1. Classification according to F. E. Fritsch and G. M. Smith up to classes	
2.2. General characters of algae with reference to Habitat, Thallus structure	

- (2) Study of Crustose, Fruticose & Foliose Lichen
- (3) Study of symptoms of fungal, viral, bacterial and Mycoplasma diseases
- (4) Collection of fungal specimen & infected plant part from local region
- (6) Demonstration of Mushroom Cultivation Technology

## III. BRYOPHYTES

Study of external and anatomy features of vegetative and reproductive parts of following genera - Marchantia, Anthoceros, Funaria, Polytrichum and Sphagnum

## IV. PTERIDOPHYTES

Study of Pteridophyte external and anatomy features of vegetative and reproductive parts of following genera - Lycopodium, Equisetum, Osmunda, Selaginella, Adiantum, Marsilea and any one fossil specimen

- Note:**
1. Omit the details of development of sex organs and sporophyte.
  2. Botanical excursion (Two local and one outside the state is compulsory)
  3. Common algal, fungal, pathological, bryophytic and pteridophytic collection and excursion report must be submitted at the time of practical examination.

## BOOKS RECOMMENDED

1. Dube, H. C. (1990). An Introduction to Fungi. Vikas Pub. House Ltd. New Delhi.
2. Gangulee, H. C. and Kar, A.K. (2001). College Botany Vol. II. Books and Allied Press Ltd. Kolkata.
3. Krishnamurthy, K. V. (2007). An advanced Text Book on Biodiversity: Principles and Practice. Oxford and IBH Publishing Kumar, H.D. (1988). Introductory Phycology. Affiliated East-West Press Ltd. New Delhi.
4. Kumar, H. D. and Singh, H.N. (1976). A Text Book of Algae. Affili-

## UNIT-III : Fungi (15)

- 3.1. Classification according to Ainsworth (1973)
- 3.2. General characteristics of following classes with special reference to examples mentioned -
  - 3.2.1. Mastigomycotina : Albugo (Cystopus)
  - 3.2.2. Ascomycotina : Aspergillus
  - 3.2.3. Basidiomycotina : Puccinia graminis-tritici
  - 3.2.4. Deuteromycotina : General characters
- 3.3. Lichen-Types & Economic importance

## Unit-IV : Bryophyte (15)

- 4.1. Classification according to G. M. Smith
- 4.2. General characters, thallus organization and life cycle of-
  - 4.2.1. Hepaticopsida - Marchantia
  - 4.2.2. Bryopsida - Funaria
- 4.3. Evolution of sporophyte in bryophytes
- 4.4. Affinities of bryophytes with algae and pteridophytes
- 4.5. Brief Account on some Indian Bryologist.

## Unit-V : Pteridophyte (15)

- 5.1. Pteridophytes as First Vascular Plants.
- 5.2. Classification according to G. M. Smith
- 5.3. General characters of the following classes with special reference to examples mentioned -
  - 5.3.1. Sphenopsida - Equisetum
  - 5.3.2. Filicopsida - Marattia
- 5.4. Spore types in pteridophytes
- 5.5. Heterospory and Seed Habit in Pteridophytes

## Unit-VI : Application of Microbes Cryptogams (15)

- 6.1. Economic Importance of Algae with special reference to Food, Industries, Agriculture and Harmful aspects
- 6.2. Mycorrhiza - Types and Application

Alage, Vikas Publishing House (P) Ltd. New Delhi.

10. Parihar, N.S. (1977). Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
11. Parihar, N.S. (1984). An Introduction To Embryophyta Vol. I Bryophyta. Central Book Depot, Allahabad
12. Rashid, A. (1996). An Introduction To Bryophyta. Vikas Publishing House Ltd. New Delhi.
13. Saxena, A.K. and Sarbhai, R.M. (1992). A Text Book of Botany Vol. II Embryophyta. Ratan Prakashan Mandir, Agra.
14. Sharma, O.P. (1989). A Text Book of Fungi. Tata Mc Graw-hill Publishing Company Limited, New Delhi.
15. Sharma, O.P. (1990). A Text Book of Algae. Tata Mc Graw-hill Publishing Company Limited, New Delhi.
16. Smith, G.M. (1995). Cryptogamic Botany. Vol. II (Bryophytes and Pteridophytes). Mc Graw-Hill Book Company, New York and London.
17. Sporne, K.R. (1995). The Morphology of Pteridophyta. The Hutchinson University Library, London, U.K.
18. Varma, P. S. and Agrawal, V. K. (2000). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Company (P) Ltd. New Delhi.
19. Vashistha, B.R. (1997). Botany For Degree Students-Bryophyta. S. Chand and company (P) Ltd. New Delhi.
20. Vashistha, P.C. (1984). Pteridophytes. S. Chand and company (P) Ltd. New Delhi.
21. Sharma, P.D. (1998). The Fungi. Rastogi Publications, Merrut.
22. Smith, G.M. (1995). Cryptogamic Botany. Vol. I (Algae and Fungi). McGraw-Hill Book Company, New York and London.
23. Vashistha, B.R. (1995). Botany for Degree Students-Algae. S. Chand and Company (P) Ltd. New Delhi.



## 7. BOTANY

### 3S- BOTANY

#### ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY

##### UNIT I: Angiosperm Systematics and Biodiversity.

- 1.1 Angiosperms: Origin and Evolution (Pteridospermean and Bennettitalean Theory)
- 1.2 Botanical Nomenclature: Principles of rules, Taxonomic Ranks, Type concept, Valid publication.
- 1.3 Herbarium – Concept & significance, Royal Botanical Garden, Kolkata.
- 1.4 Concept of biodiversity, Ex situ and In situ conservation
- 1.5 Concept & importance of Biodiversity.

##### UNIT II: Angiosperm Systematics

- 2.1 Systems of Classification: Bentham and Hooker's System, Engler and Prantle's system.
- 2.2 Systematic studies & economic importance of following Families  
Dicotyledons (Polypetalae): Malvaceae, Brassicaceae, Leguminosae, Apiaceae,

##### UNIT III: Angiosperm Systematics

- 3.1 Systematic studies & economic importance of following Families  
Dicotyledons (Gamopetalae): Asteraceae, Asclepiadaceae, Apocynaceae, Solanaceae, Verbenaceae, Lamiaceae.
- 3.2 Dicotyledons (Monoclamydeae): Euphorbiaceae.
- 3.3 Monocotyledons: Liliaceae, Poaceae.

##### UNIT IV: Anatomy

- 4.1 Types of Tissues:  
Meristematic – Types of meristems  
Permanent – Simple and complex.
- 4.2 Characteristics of growth rings, Sapwood and heartwood.
- 4.3 Anatomy of root: Primary structure in dicot and monocot root. normal secondary growth in dicot root.

stem, normal secondary growth in dicot stem.

- 5.2 Anomalies in primary structure in *Boerhavia* stem, secondary structure in *Bignonia* and *Dracaena* stem.
- 5.3 Leaf Anatomy: Internal structure in *Nerium* and *Maize* leaf.

##### UNIT VI : Embryology

- 5.1 Microsporangium, microsporogenesis, development of male gametophyte.
- 5.2 Megasporangium, types of ovules, megasporogenesis, development of female gametophyte (monosporic, Bisporic & tetrasporic).
- 5.3 Double fertilization and triple fusion.
- 5.4 Embryo – Classification of embryo.
- 5.5 Endosperm types & significance, Suspended animation

#### LABORATORY EXERCISES

- 1) Embryology of Angiosperms:
  - i) Observation of wide range of flowers available in the locality and methods of their pollination.
  - ii) Study through permanent slides of T.S. of anthers, microsporogenesis, L.S. of ovule, types of endosperms and embryo of *Capsella*.
  - iii) Mounting of T.S. of anthers, Pollen grains and pollinia.
- 2) Anatomy of angiosperms : Preparation of double stained slides of root, stem and leaves of angiosperms mentioned in the syllabus.
- 3) Taxonomy : Description of ten plants belonging to different families in technical language and identification upto family level.
- 4) Long and short excursion is essential

**Note :** Field tour reports should be supported by exhaustive field notes and photographic representation of plant species studied

**Brassicaceae-** *Brassica*, **Malvaceae-** *Hibiscus*, *Sida*, *Malvastrum*,  
**Fabaceae-** *Crotalaria*, *Indigifera*, *Tephrosia*, **Caesalpinoidae-**  
*Caesalpineae*, *Cassia*, **Mimosoidae-** *Prosopis*, *Acacia*, **Apiaceae-**  
*Corindrum*,

**Apocynaceae-** *Vinca*, *Thevetia*, **Asclepiadaceae-**  
*Cryptosteevia*, *Calatropis*, **Solanaceae-** *Datura*, *Solanum*, *Withania*.



14. Sabnis, F.F. (2000) Remote Sensing Principles and Interpretations. W.H. Freeman and Company, USA.
15. Lillesand, T.M. and Kiefer, R.W. (2000) Remote Sensing and Image Interpretation. John Wiley and Sons Inc., New York.
16. Drury, S.A. (1997) Image Interpretation in Geology. Chapman and Hall, London.
17. Todd, D.K. (1980) Ground Water Hydrology. John Wiley and Sons Inc. New York.
18. Karanth, K.R. (1989) Hydrogeology. Tata McGraw Hill Pub. Co. Ltd., New Delhi.
19. Nagabhushaniah, H.S. (2001) Groundwater in Hydrosphere (Groundwater Hydrology) CBS Publisher, New Delhi.
20. Karanth K.R. Groundwater, Assessment, Development and Management, Tata McGraw Hill Pub. Co. Ltd., New Delhi.
21. Raghunath : Ground Water Hydrology, New Age Publication, Pune

## SS - BOTANY PLANT PHYSIOLOGY AND ECOLOGY

### Unit - I: Plant Water Relations

- 1.1 Importance of water to plant life.
- 1.2 Imbibition, Diffusion, Osmosis, Plasmolysis.
- 1.3 Active and passive Absorption of water.
- 1.4 Ascent of sap - Root Pressure and Transpiration Pull Theory.
- 1.5 Transpiration - Types of transpiration, Stomatal movements, Mechanism of transpiration (Starch) sugar hypothesis, Significance. Antitranspirant, Guttation. Mineral uptake - Active uptake - Carrier Concept. Passive uptake - Ion Exchange.

Study of morphological and anatomical adaptations in xerophytes - *Asparagus, Nerium, Casuarina, Euphorbia, Cereus, Opuntia* (any two)

3. Study of community characteristics by quadrat method.
4. Determination of water holding capacity of different soils.
5. To determine the texture of different soils by sieve method.

### Ecology: Minor experiment (Any Two)

1. To determine the porosity of soil.
2. To determine the transparency and temperature of water bodies.
3. Estimation of salinity of different water samples
4. Determination of pH of different soils and water samples by pH papers/ pH meter.
5. Study of meteorological instruments - Rain gauge, Hygrometer, Barometer

### PRACTICAL EXAMINATION

Time: 4 Hours Marks: 50

- |  |    |
|--|----|
| Q. 1 - Physiology- major experiment.               | 15 |
| Q. 2 - Comment on one Minor Physiology experiment. | 5  |
| Q. 3 - Ecology major experiment.                   | 10 |
| Q. 4 - Ecology minor experiment.                   | 5  |
| Q. 5 - Viva - voce                                 | 5  |
| Q. 6 - Class record.                               | 5  |
| Q. 7 - Co-curricular Activity Report               | 5  |

Co-curricular Activity Report" which mean the report on the activity  
Such as Study Tour, Industrial visit to Research Institute, Excursion Tour to be submitted by the students at the time of practical examination.

### Books Recommended:

#### Plant Physiology and Ecology:

1. Curtis & Clark : Introduction of Plant Physiology.
2. H.N. Shrivastav : Plant Physiology
3. Devlin R.M. : Plant Physiology
4. Salisbury F.B and Ross C.W. (1992).: Plant physiology (Fourth Edition) Wadsworth Publishing Company, California, USA.
5. William G Hopkins. (1995): Introduction to Plant Physiology, Published by - John Wiley and Sons, Inc.
6. V. Verma : Plant Physiology Verlag, New York. Vol. II.

7. Mayer & Anderson : Plant Physiology.
8. Lincoln Taiz and Eduardo Zeiger (2003). Plant Physiology (3rd edition), Published by Panina Publishing Corporation
9. Galston, A. W. 1989: Life processes in plants. Scientific American Library, Springer
10. Jain V.K.: Fundamental of plant Physiology. S. Chand Publication New Delhi.
11. Koechar P.C.: Text Book of Plant Physiology.
12. Mohr, H. and Schopfer, P. 1995 : Plant Physiology 4th : Edition, Wordsworth
13. Moore, T.C. 1974: Research Experiences in Plant Physiology. A Laboratory Manual.
14. Mr./Mrs. Fillet : Plant Physiology New York, U.S.A.
15. P.S. Gill: Plant Physiology, S. Chand & Co. New Delhi, Edition - Pradip's, Botany
16. Purokar and Singh: Plant Physiology.
17. R. G. S. Bidwell (revised edn.)-Plant Physiology
18. Verma S.K. and Verma Mohit (2007). A Text Book of Plant Physiology, Biochemistry and Biotechnology, S. Chand Publications.
19. Dennis D.T., Turpin, D.H. Lefebvre D.D. and Layzell D.B. (eds) 1997, Plant Metabolism (Second Edition) Longman, Essex, England.
20. Galstone A.W. 1989. Life processes in Plants. Scientific American Library, Springer Verlag, New York, USA..
21. Moore T.C. 1989. Biochemistry and Physiology of Plant Hormones Springer - Verlag, New York, USA.
22. Singhal G.S., Renger G, Sopory, S.K. Irrgang K.D and Govindjee 1999, Concept in Photobiology; Photosynthesis and Photomorphogenesis. Narosa Publishing House, New Delhi
23. Verma S.K. and Mohit Verma 2007. A.T.B of Plant Physiology, Biochemistry and Biotechnology, S. Chand Publications.
24. Ambasthi. R.S. 1988.0 A Text Book of Plant Ecology Students Friends Co. Varanasi.
25. Sharma P.D. 2003, Ecology and environment. Rastogi publication.
26. Botkin, D.B. and Keller, E.A. 2000. Environmental Plane (2nd edition) John Wiley & Sons Inc. New York.
27. Chapman. J.L. and Raun. M.J. 1995. Ecology: Principles and Applications Cambridge University Press. College Publishers, USA.

## IS-ZOOLOGY

### LIFE AND DIVERSITY OF NON-CHORDATA

- UNIT-I :**
1. Classification of Non-Chordata.
  2. Phylum Protozoa: General characters.
  3. Type study: *Plasmodium vivax*: Structure, Life-cycle.
  4. Parasitic protozoan and human diseases: Malaria, Amoebiasis, Trypanosomiasis, Leishmaniasis.
- UNIT-II :**
1. Phylum Porifera: General Characters.
  2. Type study: *Scypha*: Habits and habitat, External features, cell types, spicules & Structure and significance of canal system.
  3. Phylum Coelenterata: General Characters.
  4. Type study: *Metridium*: Habits and habitat, External features, Gastro-vascular cavity, Mesenteries, Reproduction.
- UNIT-III:**
1. Phylum Platyhelminthes: General Characters.
  2. Type study: *Fasciola hepatica*: Habits and habitat, External features, Digestive, Excretory, Reproductive system and Life cycle.
  3. Phylum Aschelminthes: General Characters.
  4. Type study: *Ascaris lumbricoides*: Habits and habitat, External features, Digestive, Excretory, Reproductive system and Life cycle.
- UNIT-IV:**
1. Phylum Annelida: General Characters.
  2. Type study: *Leech*: External features, Digestive, Excretory and Reproductive system.
  3. Phylum Arthropoda: General Characters.
  4. Type study: *Cockroach*: Habits and habitat, External features, Digestive system, Respiratory system, Reproductive system.
- UNIT-V :**
1. Phylum Mollusca: General Characters.
  2. Type study: *Pila globosa*: Habits and habitat, External features (Shell and Body), Digestive, Respiratory and Repro-

physiological

4. Larval forms and their significance: Amphiblastula, Planula, Trochophore, Bipinnaria, Brachiolaria.

### LIFE AND DIVERSITY OF NON-CHORDATA

**Practical :** Two practical per week each of 3 period's duration. The Examination shall be of 4 hrs duration and of 50 marks.

#### I-Life and diversity of non-chordata

1. Observation, Classification up to classes and sketching of the following animals, (Specimens or Models):
  - Phylum Protozoa: *Plasmodium trophozoite*, *Euglena*, *Entamoeba histolytica*.
  - Phylum Porifera: *Sycon*, Bath sponge, *Euplectella*.
  - Phylum Coelenterata: *Obelia*, *Aurelia*, *Tubipora*.
  - Phylum Helminthes: *Taenia*, *Ascaris* (male & female).
  - Phylum Annelida: *Nereis*, Earthworm, *Leech*.
  - Phylum Arthropoda: Prawn, *Limulus*, *Aranca*, *Scalopendra*, *Julus*, Moth, Mosquito.
  - Phylum Mollusca: Chiton, *Pila*, Dentalium, *Unio*, Octopus.
  - Phylum Echinodermata: *Asterias*, *Holothuria*, *Echinus*, Sea star, Brittle star.
  - Phylum Hemichordata: *Balanoglossus*.
2. Study of Permanent slides:
  - L.S. Sycon, nematocyst, *Ascaris* egg, T.S. *Ascaris* through gonads, T.S. *Leech* through crop, Compound eye of insect, *Radula*, Gill lamella and Oosphradium of *Pila*, *Scotex* and Gravid Proglottid of *Taenia*.
3. Anatomical Study through Computer Aided Techniques, Video Clipping Models, Photographs and other available resources :
  - a) *Leech/Earthworm*: Alimentary canal, Reproductive system, Nervous system,
  - b) *Crustacean/Coelenterate*: Digestive system, Nervous system

**Distribution of Marks during Practical Examination: Time : 4 hrs.**

- |   |          |
|---|----------|
| i) Identification and comments on spots (1-8) |          |
| • 4 specimens, 4 slides                       | 12 Marks |
| ii) Labelling of Anatomical diagrams          |          |
| provided (Two)                                | 10 Marks |
| iii) Permanent stained micro preparation      | 08 Marks |
| iv) Study tour diary                          | 04 Marks |
| v) Permanent stained micro preparation        |          |
| Submitted by examinee                         | 04 Marks |
| vi) Certified class record                    | 05 Marks |
| vii) Check list of 20 locally                 |          |
| available invertebrate fauna                  | 02 Marks |
| viii) Viva-voce                               | 05 Marks |

Total : ..... 50 Marks

#### Note:

- 1) One or two short excursion / study tours are compulsory for observation of animals in their natural habitat.
- 2) Candidates shall be required to produce at the practical examination the following.
  - Practical record book duly signed by the teacher in charge and Certified by the Head of the department as bonafide work of the Candidate.
  - Five permanent stained micro preparations.
  - Study tour report and field diary duly signed by the teacher.

#### Reference Books Recommended (All latest editions):

- 1) Hickman, C.P. Jr.F.M. Hickman and L.S.Roberts, Integrated principles of Zoology Mosby College publication St.Louis.
- 2) Anwar F.K. and T.N. Ananthakrishnan Manual of Zoology Vol I/In.

- 8) Majumdar : Invertebrate Zoology.
- 9) Dhami and Dhami : Non-chordate Zoology.
- 10) Bains Prasad : Indian Zoological memoir. Pila.
- 11) R.L.Kotpal : Modern Text Book of Invertebrate Zoology.
- 12) Mulviya M.K. Invertebrate Zoology, by Rajdhool publications.
- 13) S.S.Lal, Practical Zoology, Invertebrate.
- 14) Bhamrah H.S. and Kavita Juneja A text book of Invertebrate Zoology, Anmol Publication Pvt. Ltd., New Delhi.
- 15) Verma and Agarwal Practical Zoology, Invertebrate
- 16) - Barnes R.D. Invertebrate Zoology (W.B. Saunders Co.)
- 17) P.G.Puranik and Thakur, Invertebrate Zoology.

### 17. INDUSTRIAL FISH AND FISHERIES

(vocational)

There shall be a following paper and practical for B.Sc.Part-I Semester One examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory periods and 25 practical during the complete semester). There shall be one compulsory paper of 3 hours duration, in theory as stated below and practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks, (Out of which 80 marks will be for written examination and 20 marks for internal assessments) and practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

	Marks
1) Paper-I: FISH BIOLOGY	
Theory (Written)	80
Internal assessments	20
2) Practical:	50
<b>Total:</b>	<b>150 Marks</b>

Theory (Written)	80
Internal assessments	20
2) Practical:	50

Total : 150 Marks

## 2S-ZOOLOGY

### CELL AND DEVELOPMENTAL BIOLOGY

- UNIT-I:**
1. General organization of Prokaryote and Eukaryote Cell.
  2. Ultra structure and functions of, Plasma membrane
  3. Ultra structure types and functions of, Endoplasmic reticulum
- UNIT-II:**
1. Ultra structure and functions of, Golgi complex
  2. Ultra structure and functions of Ribosome
  3. Ultra structure and functions of Mitochondria.
  4. Ultra structure and functions of Lysosomes.
- UNIT-III:**
1. Ultra structure and functions of nucleus and nucleolus.
  2. Chromosome and its general organization.

3. Permeability tests using erythrocytes.
4. Preparation of Polytene chromosome in Chimomous or Drosophila larva.
5. Preparation of various stages of mitosis in Onion root tip.
6. Preparation of various stages of meiosis in insect's testis.

### II) Developmental Biology.

1. Study of stages of Gametogenesis in rat/frog. (Permanent Stained Slides)
2. Study of different types animal eggs
3. Study of developmental stages (Life Cycle) of Cockroach, Housefly, mosquito, Butterfly, Moth, Frog (Any Four).
4. Sperm in physiological saline using phase contrast optics.
5. Demonstration of developing chick through available resources.
6. Developmental stages of frog: Cleavage, blastula, gastrula, neurula, and tadpoles through available resources.
7. Permanent slides of chick embryos at 24, 36, 48, 72 hrs of incubation.
8. Study of different types of placenta with suitable histological slides or visual diagrams.

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Distribution of Marks during Practical Examination: Time : 4 hrs.

- i) Identification and comments on spots (1-8)  
- 4 Cytological, 4 Embryological 16 Marks
- ii) Cytological Preparation 10 Marks
- iii) Comments on given Life Cycle 10 Marks
- iv) Certified class record - 05 Marks
- v) Submission of photographs of any three crop posts 04 Marks

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- 11 Hot air oven.
- 12 Weighing Balance (Single Pan Balance)
- 13 Refrigerator

## 17. INDUSTRIAL FISH AND FISHERIES

(vocational)

There shall be a following paper and practical for B.Sc. Part-I Semester Two examination. The syllabus is based on 6 theory periods and



**BSc.II Semester III  
10. ZOOLOGY**

There shall be the following paper and practical for B.Sc. Part-II Semester III examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory sessions and 25 practical sessions during the complete semester). There shall be one compulsory theory paper of 3 hours duration, as stated below and a practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks (80 for written examination and 20 marks for internal assessment) and a practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

**Semester III**

1) Paper-I: Life and diversity of Chordata and concepts of evolution Written examination..... Internal assessment.....	<b>Marks Allotted</b>  80 20
2) Practical:	50
<b>Total: .....</b>	<b>150 Marks</b>

**Paper -3 S-Zoology**

**LIFE AND DIVERSITY OF CHORDATA AND CONCEPT OF EVOLUTION**

**Unit I : Phylum Chordata;**

Origin of Chordata.

**Protochordates:-** Type study: Amphioxus: Habits and habitat, External Characters - Digestive system and feeding, Excretory organs, gonads- Affinities of Amphioxus.

**2. General characters and Classification up to orders of the following chordates or as per the availability in the laboratory from the major orders, (Specimens or Models):**

**Protochordata:** Herdmania, Dolioletta, Salpa, Amphioxus.

**Agnatha:** Petromyzon, Myxine.

**Pisces:** Scoliodon, Torpedo, Acipenser, Exocoetis, Hippocampus

**Amphibia:** Ichthyophis, Salamander, Bufo, Hyla.

**Reptilia:** Varanus, Phrynosoma, Chameleon, Cobra, krait, Russell's viper, Typhlops, Hydrophis

**Aves:** Duck, Woodpecker, Kingfisher, Parrot.

**Mammalia:** Mongoose, Squirrel, Manis, Bat., monkey.

**B) Dissections:**

1. Dissection - afferent and efferent branchial vessels, cranial nerves, internal ear of scoliodon.
2. Dissection - Digestive system, Arterial system, venous system, reproductive system of rat.
3. Permanent micro-preparations .a. Fish scales. b. Ampullae of Lorenzini. c. Eyeball muscles.
4. Observations of air bladder in air breathing fishes.

**C) Osteology, Rabbit, Varanus (excluding loose bones of skull).**

**D) Evolution:**

1. Study of fossils, including living fossils.
2. Study of Evidences of evolution.
  - i) Analogous and Homologous organs.
  - ii) Connecting links (Peripatus, Archaeopteryx, Limulus)
  - iii) Embryological evidences
3. Application of Hardyweinberg's law
4. Study of Mesozoic Reptiles (By Models/Charts).
5. Mimicry, coloration in animals.
6. Beak and Leg modifications with reference to: Parrot, Woodpecker, Kingfisher, Heron, Duck, Sparrow/Pigeon

organ and mechanism of respiration, circulatory System: Structure and working of Heart, major arteries and veins, Lateral line receptors, Migration in fishes-Types, causes and significance.

**Unit II : Class Amphibia:**

Type Study - *Rana tigerina*, Habits and habitat, external characters. Respiratory organs- Circulatory system; Structure of Heart, major arteries and veins, urinogenital system.. Parental care in amphibia.

**Class Reptilia:**

Type study- *Calotes versicolor*- Habits and habitat, External characters, circulatory system- Structure of Heart, major arteries and veins. Urinogenital system, snake venom and anti-venom,

**Unit III : Class Aves:**

Type study: Pigeon-*Columba livia* Habits and habitat, External characters, Respiratory system, urinogenital system. Flight adaptations, Migration in birds.

**Class Mammalia:**

Primitive mammals: salient features of Prototheria and Metatheria, Morphology of mammalian endocrine glands. Aquatic mammals.

**Unit IV : Evolution: Meaning and scope,**

**Indirect Evidences of evolution:** Evidences of organic evolution- morphological and anatomical, physiological and biochemical, embryological.

**Direct evidences of evolution:** Paleontological evidences: Fossils and fossilization: petrified fossils and preserve bodies cast and moulds, trails and foot prints, condition for fossilizations-., Radioactive carbon dating of fossils - Living fossils, Importance of fossil record. Evidence from

**Amphioxus:** T.S. Oral hood, Pharynx, Tail

**Frog :-** T.S. lung, Stomach, Kidney, T.S. Intestine,

**Rat:-** T.S. Liver, Pancreas, Ovary, Testis, Pituitary, Thyroid, Adrenal

**DISTRIBUTION OF MARKS FOR  
PRACTICAL EXAMINATION.**

1. Dissection -	10
2. Permanent stained micro preparation.	05
3. Spotting. (Specimens, Slides, bones, fossil)	10
4. Practical on evolution -	10
5. Class record	05
6. Viva - Voce	05
7. Submission of study tour report.	05
<b>Total Marks:</b>	<b>50</b>

**BSc.II Semester IV**

**ZOOLOGY**

There shall be the following paper and practical for B.Sc. Part-II Semester IV examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory sessions and 25 practical sessions) during the complete semester. There shall be one compulsory theory paper of 3 hours duration the semester, as stated below and a practical examination extending for four hours. Every examinee shall offer the following paper of 100 marks (80 for written examination and 20 marks for internal assessment) and a practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.



**B.SC. FINAL, SEMESTER-V  
10 : ZOOLOGY**

There shall be the following paper and practical for B.Sc. Part-III Semester V examination. The syllabus is based on 6 theory periods and six practical periods per week (Total 75-80 theory sessions and 25 practical sessions during the complete semester). There shall a compulsory theory paper of 3 hours duration, as stated below and a practical examination extending for five hours. Every examinee shall offer the following paper of 100 marks (80 for written examination and 20 marks for internal assessment) and a practical examination of 50 marks. Candidates are required to pass separately in theory and practical examination.

**Theory -5 S-ZOOLOGY:  
(ANIMAL PHYSIOLOGY AND ECONOMIC ZOOLOGY)**

	Marks Allotted
1) Written examination.....	80
Internal assessment.....	20
2) Practical:	50
Total: .....	150 Marks

**Paper 5 S-ZOOLOGY  
(ANIMAL PHYSIOLOGY AND ECONOMIC ZOOLOGY)  
Max. Marks - 100 Total Period - 75**

- iii) Those Institutions which are already having Zoology museums should not procure museum specimens now onwards and should use charts / slides / models / photographs and digital alternatives in case of need. Those new institutions which are not having Zoology museum in their department should provide learning related to zoological specimens with the help of charts / slides / models / photographs and digital alternatives / and arrange visit of students to already established museums.

**Practicals:**

1. Detection of blood groups in human being.
2. Differential counts of blood.
3. Estimation of hemoglobin percentage with the help of haemocrometer.
4. R.B.C. count.
5. W.B.C. count.
6. Preparation of haemin crystals
7. Measurement of blood pressure.
8. Action of salivary amylase on starch.
9. Qualitative detection of nitrogenous waste products (Ammonia, urea, uric acid) in given sample.
10. Demonstration of kymograph unit, Respirometer through available resources.
11. Observation and identification of Insect Pests of local crops, and predator insects.
12. Life Cycles of Honey bee, Lac insect, Silk Moth.
13. Histological Slides of major organs of Respiratory systems, circulatory system, Nervous system, Different types of Muscles, Endocrine glands, testis, ovary.
14. Study of locally available fishes, Indian major carps, Exotic carps, Common carp.

**UNIT II: Muscle Physiology:**

Types of Muscles: striated, non-striated and cardiac muscles  
E.M. Structure and Chemical Composition of striated muscle, Neuromuscular junction.  
Mechanism of muscle contraction by Sliding filament theory  
Physical and Chemical changes during muscle contraction: muscle twitch, tetanus, isometric and isotonic contraction, summation of Stimuli, all or none law, fatigue, rigor mortis.

**UNIT III : Nerve Physiology: Neuron: E.M. Structure of neuron and Types: Myelinated and non-Myelinated nerve fibres.**

Conduction of Nerve impulse, Resting potential, initiation and propagation of action potential, Saltatory transmission, Neurotransmitters (Acetylcholine, dopamine, GABA, Serotonin, Epinephrine, Nor-Epinephrine), Synapse and synaptic transmission

**Chemical co-ordination:** Endocrine system: Hormones and their physiological roles of-

Pituitary, Thyroid, Parathyroid, Adrenal, Islets of Langerhan's, Hormonal disorders: Dwarfism, Gigantism, Acromegaly, Goiter, Myxoedema, Cretinism, Osteoporosis,

**UNIT IV : Reproductive Physiology: Estrous and menstrual**

a) Spotting (A-F)	12
b) Description and Comments on Topic from Unit V and VI	08
04. Class record duly signed by teacher in charge and certified by H.O.D.	05
05. Study tour report.	05
06. Viva - voce	05

Total Marks 50

**REFERENCES**

1. Prosser and Brown : Comparative Animal Physiology
2. Histological Slides of Respirator systems, circulatory system, Muscles, Nervous system Endocrine glands, Gonads, placenta
3. Guyton : Physiology
4. Best and Taylor : Physiological basis of Medical practice
5. C Hoar, W.S.. General and comparative Physiology. Prentice Hall of India.
6. Lehninger, L.. Biochemistry, W.H. Freeman & co.
7. Nagabushnam, R.. Animal physiology, S.Chand & co.
8. Martin, D.W.P.A. Mayes and W.W. Rodwell, Harper's Review of Biochemistry lange Medical Publications.
9. Prosser, C.L. and F.A.Brown Comparative Animal physiology. W.B. Saunders.
10. Rama Rao, A.V.S.S.. Biochemistry: UBSPD.
11. Stryer, L. Biochemistry Wiley International
12. Verma, P.S. and V.K. Agarwal.. Animal physiology. S.Chand & co.
13. Wilson, J.A., Principles of Animal Physiology, Macmillan
14. Chatterjee, C.J.; Human Physiology(Vol-I and II)
15. Economic Zoology, G.S. Shukla, V.B. Upadhyay (2006)
16. Text Book of Applied Zoology, Pradip. V Jabde (2005).
17. Mac E. Hadley: Endocrinology, Prentice Hall, International Edi-

## Unit V

14L

## A) Thermodynamics and Equilibrium:

[10]

(i) Gibb's and Helmholtz's free energy function. Physical significance of Gibb's free energy. Change in free energy as a criteria of spontaneity and equilibrium. Variation of free energy  $G$  with  $P$  &  $T$ . Gibb's-Helmholtz's equation in terms of  $G$  and its application. (ii) Partial molal function, chemical potential, derivations of Gibb's-Duhem equation. Chemical potential of an ideal gas in gaseous mixture. Derivation of vant Hoff's isotherm and its application to equilibrium state. Derivation of vant Hoff's equation and its applications. (iii) Numericals.

## B) Phase Equilibrium:

[4]

(i) Immiscible liquids, Nerst distribution law and its application to association and dissociation of solute in one of the solvent. Process of extraction, derivation of formula for the amount of solute left unextracted after  $n^{\text{th}}$  extraction. (ii) Phase transition - Clausius-Clapeyron equation (only qualitative statement). (iii) Partially miscible liquids - Phase diagram of phenol-water, triethyl amine - water and nicotine-water systems. (iv) Numericals.

## Unit VI

14L

## A) Liquid state:

[4]

(i) Surface tension, determination and its S.I. Unit. Effect of temperature on surface tension, derivation of expression for relative surface tension by Drop number method. Application of surface tension. (ii) Viscosity, determination and its S.I. Unit. Effect of temperature on viscosity, derivation of expression for relative viscosity by Ostwald's viscometer method. Applications of viscosity.

## B) Electrochemistry:

[10]

(i) Conductance of electrolyte solution. Specific, equivalent and molar conductance. Determination of conductance of electrolyte solution. variation of specific and equivalent

## Semester-III

## 3S Chemistry Practicals

Total Laboratory sessions: 26

Marks: 50

## Exercise I:

## a) Volumetric Analysis

(Standard solutions to be prepared by students only)

## 16 Laboratory sessions

- 1) Prepare 0.1N oxalic acid standard solution and find out the acid neutralizing capacity of an antacid using NaOH as an intermediate solution.
- 2) Prepare 0.1N  $H_2SO_4$  solution and find out its exact normality using NaOH as an intermediate solution and 0.1N oxalic acid as standard solution.
- 3) To determine the strength of oxalic acid by titration with  $KMnO_4$ .
- 4) To determine percentage purity of Ferrous Ammonium Sulphate (FAS) by titration with  $KMnO_4$ .
- 5) To determine strength of FAS by titration with  $K_2Cr_2O_7$  using internal indicator.
- 6) To determine strength of  $K_2Cr_2O_7$  by titration with FAS using internal indicator.
- 7) Estimation of copper (II) in commercial copper sulphate sample by iodometric titration.

## b) Gravimetric Analysis

Estimation of  $Ba^{2+}$  as  $BaSO_4$ ,  $Fe^{3+}$  as  $Fe_2O_3$  using china and silica crucible and  $Ni^{2+}$  as Ni-DMG using sintered glass crucible.

## Exercise II: Physical Chemistry experiments

## 10 Laboratory sessions

- 1) To determine refractive index by Abbe's refractometer.
- 2) To construct phase diagram of phenol-water system and to determine consolute temperature for the system.

**3 : CHEMISTRY**  
**Semester-V**  
**5S Chemistry**  
**(Effective from session 2015-16)**

The examination in Chemistry of Fifth semester shall comprise of one theory paper, internal assessment and practical examination. Theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of 6 hours duration and carry 50 marks.

The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units. There shall be one question in every unit with internal choice for each of 12 marks & one compulsory question covering all the syllabus of Semester-V (8 marks).

**5S Chemistry**

**Total Lectures: 84**

**Marks: 80**

**Note:** Figures to the right hand side indicate number of lectures.

**Unit I**

**14L**

**A] Coordination Compounds:** Important terms namely molecular or addition compounds, double salts, complex salts, complex ion, ligand, coordination number, central metal ion, etc. Werner's theory of coordination and its experimental verification on the basis of conductance data and formation of AgCl precipitate in case of cobaltammines. Sidgwick's electronic interpretation and its drawbacks, effective atomic number. IUPAC rules for nomenclature of coordination compounds. Structural isomerism-ionization, linkage and coordination in complexes. Geometrical isomerism in octahedral complexes of the type  $Ma_4b_2$ ,  $Ma_3b_3$ ,  $Ma_2b_2c_2$ ,  $Ma_2b_2c$ ,  $M(AA)_2b_2$ . Square planar complexes of the type  $Ma_3b$  and  $Ma_2b_2$ . Optical isomerism in octahedral complexes of type  $Ma_2b_2c_2$  and  $M(AA)_2b_2$  and tetrahedral complexes of the type  $Ma_4$  and  $M(AA)_2$ . Optical isomerism in square planar complexes. Valence bond theory as applied

**B] Chelates :** Definition, classification and applications of chelates in analytical chemistry. Stability of chelate with special reference to chelate effect. **[3]**

**Unit II**

**14L**

**A] Crystal Field Theory (CFT):** Postulates of CFT, Crystal field splitting in octahedral, distorted octahedral, square planar tetrahedral complexes, concept of CFSE, high spin and low spin complexes on the basis of  $\Delta_o$  and pairing energy, distribution of electrons in  $t_2$  and  $e_g$  orbitals in high spin and low spin octahedral complexes. Factor affecting magnitude of crystal field splitting in octahedral complexes. **[8]**

**B] Electronic Spectra of Transition Metal Complexes :** Introduction to spectra, selection rules for d-d transitions, spectroscopic terms-determination of ground term symbols for  $d^1$  to  $d^{10}$ , spectra of  $d^1$  and  $d^8$  octahedral complexes, Orgel diagram for  $d^1$  and  $d^8$  states, electronic spectrum of  $[Ti(H_2O)_6]^{3+}$  complex ion. Spectrochemical series. **[6]**

**Unit III**

**14L**

**A] Heterocyclic compounds:** Nomenclature, Pyrrole: Synthesis from acetylene, succinimide and furan, Basicity, Electrophilic substitution reactions (orientation) – nitration, sulphonation, acetylation and halogenation, Molecular orbital structure. **[4]**

**Pyridine:** Synthesis from acetylene and pentamethylene diamine hydrochloride, Basicity, Electrophilic substitution reactions (orientation) – nitration, sulphonation, Nucleophilic substitution reactions (orientation)- with  $NaNH_2$ ,  $C_6H_5Li$  and  $KOH$ . **[3]**

**B] Organometallic compounds:** Grignard reagents: Methyl magnesium bromide- Synthesis from methyl bromide (only reaction) Synthetic applications: Electrophilic substitution reactions-formation of alkanes, alkenes, higher alkynes and other organometallic compounds, Nucleophilic substitution



## 20. COMPUTER SCIENCE

OR

## 20. COMPUTER APPLICATION

OR

## 20. INFORMATION TECHNOLOGY

The examination in Computer Science will comprise One theory Paper and Practical examination for each semester. The theory paper will be of 3 Hours Duration and carry 80 marks. The Practical examination will be of 4 Hrs duration and carry 50 marks.

The distribution of marks in Practical examination is given as :

- |   |            |
|---|------------|
| 1) Program writing / execution (on group A & B) | : 30 marks |
| 2) Practical / Record                           | : 10 marks |
| 3) Viva-voce                                    | : 10 marks |

Total	50 marks
-------	----------

2S : Computer Science or

Computer Application or

Information Technology

Data Structure and Advance C

**UNIT-I :** Introduction to Data structure, type of data structures, list, array, stack and Queue; Algorithms of traversing, insertion and deletion operation on it.

**UNIT-II:** Linked list & its implementation, traversing, insertion, deletion algorithms, circular Queue.

**UNIT-III:** Tree : Binary, Binary search tree, tree Traversing : inorder, preorder and postorder, sorting and searching Techniques : Bubble sort, insertion sort and selection sort, linear search, Binary search.

5. S.C.Gupta, V.K. Kapoor: Fundamentals of Applied Statistics, Sultan Chand and sons.
6. Cochran W.G and Cox G.M.(1937): Experimental Designs, John Wiley and Sons.
7. Das M.N. and Giri (1986): Design and Analysis of Experiments, Springer Verlag.
8. Goon A.N., Gupta M.K., DasGupta B.(1986): Fundamentals of Statistics, Vol.II, World Press Calcutta.
9. Kempthorne O. (1965): The Design and Analysis of Experiments, Wiley Eastern.
10. Clark: Statistics and Experimental Designs.

**List of Practicals : (6S Statistics)**

1. Solution of LPP by graphical method.
2. Solution of LPP by simplex method.
3. Computation of initial basic feasible solution to transportation problem by various methods.
4. Problems on assignment problem.
5. Problems on sequencing problem with n jobs with two machines.
6. Problems on two-person zero sum games with saddle points.
7. ANOVA: One way classification.
8. ANOVA: Two way classification with one observation per cell.
9. ANOVA: Two way classification with multiple but equal number of observations per cell.
10. Analysis of completely randomised design.
11. Analysis of randomised block design.
12. Analysis of Latin square design.
13. Analysis of 2<sup>2</sup> and 2<sup>3</sup> factorial experiments arranged in RBD.

Note : The above practicals may be performed by using various statistical softwares.

List of equipments and instruments required for a batch of students in U.G. statistics laboratory.

- |  |    |
|--|----|
| 1. Twelve digit desk model electronic calculators. | 20 |
| 2. Biometrical tables Vol. I and Vol. II           | 02 |

fgetc(), fputc(), fputs(), fgets(), fscanf(), fscanf(), fprint(), fread(), fwrite().

**Practical : Minimum 16 Practical based on**

- A. Data structure using C Language
- B. C language covering aspects of syllabus.

**Study Tour :** Study tour may be arranged to computer industry or software development organisation or software technology Park Or IT park

**Hardware :**

- I) List of Equipment :
  - a) No. of Computers 10 Nos. Desirable configuration
  - b) Printer - Minimum 2 Nos.
- II) Accessories
  - 1) Pen. Drives 2 Nos.
  - 2) Printer Ribbon / Tonner
  - 3) Stabilizer / UPS
  - 4) Internet facility

• Legal Software for the syllabus.

• List of books.

- 1) Introduction to Data structure : Tremble, Sorenson.
- 2) Introduction to Data structure : Bhagat Singh, Mops.
- 3) Fundamentals of Comp Algorithm : Horowitz & Sahani.
- 4) Introduction to Data Structure in C : Pearson.
- 5) Programming in C : E Balguruswami : TMH Publication.
- 6) Programming with C : Venugopal K.R. TMH, Publication.
- 7) Programming in ANSIC : Ramkumar and Rakesh Agrwal
- 8) Programming with C : Byson Gottfried, Schaum Series Publication.

## 21. COMPUTER APPLICATION (VOCATIONAL)

7. Statistical poster and chart
8. Statistical softwares like SPSS, SAS, MS Excel and R

02

**12 : COMPUTER SCIENCE****5S-COMPUTER SCIENCE  
RDBMS AND VISUAL BASIC**

**UNIT-I :** Fundamental of DBMS : Architecture of a database system., data independence, database models; Relational Hierarchical, network; data dictionary.

**UNIT-II:** Relational Model : Relations, Domains and Attributes keys, E-R diagrams, Reducing E-R diagrams to tables, function dependency, Normalization Process, Normal forms : 1NF, 2NF, 3NF, 4NF, BCNF.

**UNIT-III :** Introduction to SQL : Components of SQL, data types, operators, DDL Commands : CREATE, ALTER, DROP, for tables & views. DML Commands : SELECT, INSERT, DELETE & UPDATE; Clauses : ORDER BY, GROUP BY and HAVING;

**UNIT-IV :** Introduction to Visual Basic : Visual programming, event driven programming, VB Environment : New Project window, property window, Form layout window, toolbar, menu bar, tool box, form window;  
**Managing Control :** Form properties, pointer tool, label control, text box, command button, picture box, image control, event procedure.

**UNIT-V:** Creating Menus : Application wizard for menu, menu editor, creating menu, adding code to menus, data types & variables.

**Operators :** Conditional operators, logical operators, control structures : If else, Nested If—else, select case, goto, do loop, for loop, nested for loop.

**UNIT-VI :** Introduction to Internal Functions : MsgBox(), named constant, default buttons, specifying icons.



*Sud*  
Principal

Arts & Commerce College  
Warwat Bakal Dist. Buldana



(Diversity of soil Macroinvertebrate arounding in Telhara Tehsil of Akola District )

Project Submitted for the Fulfillment of the Degree of  
**Master Of Science**

In Zoology in the Faculty of Science  
Sant Gadge Baba Amravati University, Amravati



By

(Komal Girish Tinwar)

M.Sc. II (SEM-IV)

Under the Supervision of

(Miss. Sonali Tayade)

Assistant Professor  
Department of Zoology  
&

(Miss. Namrata Dhole)

Co-Supervisor  
Assistant Professor  
Department of Zoology

Post Graduate Department of Zoology

Art's & Commerce College Warwat (Bakal)

Dist. Buldhana  
(2023-2024)

**ART'S & COMMERCE COLLEGE WARWAT BAKAL**  
**DEPARTMENT OF ZOOLOGY**



**PRACTICAL RECORD**

**Practical – VIII**

**PROJECT WORK**

**M. Sc. (Zoology) Semester - IV**

**2023-2024**

*Submitted by*

**Komal Girish Tinwar**

**Roll No.**

## CERTIFICATE

This is to certify that Komal Girish Tinwat has worked under my guidance for her M.Sc. (Zoology) Semester-IV project entitled, Diversity of soil for the Master Degree of Zoology in the faculty of Science, Art's & commerce college warwat Bakal.

She has completed her project work satisfactorily and it is ready for evaluation.

Date:

Place: Warwat (Bakal)

Dhore

(Signature of the Co-Supervisor)

Miss. S. N. Khumkar  
Miss Namrata Dhore

Tayade  
18/04/24

(Signature of the Supervisor)

Dr. M. R. Solanke  
Miss-Sonali Tayade.

Chh  
19/4/2024

External Examiner

Solanke

Internal Examiner

Dr. M. R. Solanke.  
Assistant Professor &  
Head of Zoology Department  
Art, Science & Commerce Warwat (Bk.)  
Telangana - 506002



## ACKNOWLEDGEMENTS

---

It is rightly said that complements require no occasion but occasions are simply made for complements.

I take opportunity to thank all the people who have extended their cooperation in many ways.

My sincere gratitude goes to my supervisor Assistant Professor, Department of Zoology, Art's & commerce college, Warwat Bakal for his constant guidance, encouragement and inspiration throughout my project work.

I sincerely thanks to Dr. Assistant Prof. and Head, Department of Zoology for making available for consultation at all times and providing all the necessary facilities throughout this work.

I am also thankful to all my colleagues M.Sc. (Zoology) Semester-II and IV for their valuable support throughout this project.

I can't forget to pray my divine sources of inspiration to my parents whose blessings are always with me.

Date: 19/4/2024

  
(Komal G. Tinwar)

## CONTENTS

Sr. No.	Name of the Chapter	Page No.
1.	Introduction	
2.	Material and Methods	
3.	Result	
4.	discussion	
5.	Conclusion and Summary	
6.	References	

## INTRODUCTION

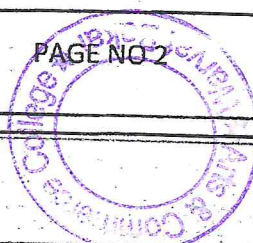
Soils are home to enormously biodiverse communities, estimated to make up as much as *c.* 40% of the total species on Earth (Orgiastic et al., 2016). The greater part of this diversity remains unknown or undescribed, especially among the smaller organisms (Deacons, 2010). Invertebrates are classified on the basis of size as micro-fauna (<0.2 mm), mesofauna (0.2–2 mm) and macro fauna (>2 mm) and are key determinants of self-organization in soils, a process whereby interactions at discrete scales among biotic and abiotic components create structures that have positive feedback on soil organism fitness (Lavelle et al., 2016; Perry, 1995). This important position is mediated through the control they exert on other soil community members and through their ecosystem engineering activities (Lavelle et al., 2016). We still lack a comprehensive study that characterizes their communities precisely at a world-wide scale. Macroinvertebrates, here defined as the invertebrates that can be seen with the naked eye, comprise a broad range of taxonomic groups with widely diverse ecologies and multiple influences on soil processes. Although their detailed roles as bio-chemical, physical and community engineers have been described in a wide range of publications (e.g., Blouin et al., 2013; Brussaard et al., 2006; Jouquet et al., 2011; Medina-Sauza et al., 2019), general models of soil function and management options still largely ignore these organisms (Barot et al., 2007; Bottinelli et al., 2015; Filser et al., 2016). This might be because of a general ignorance of their quantitative and functional roles in the soil. Such ignorance might be a consequence of their distribution across a wide range of publications and the distributions of data among many orders and families. It is even more surprising to see that soil biologists, specialists in other groups (microflora, micro fauna or meso fauna),

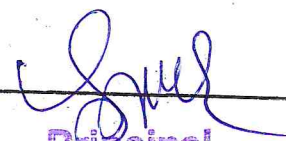


## 2. MATERIALS AND METHODS

A standard method used at all sampling points provided a homogeneous set of data. Multivariate and network analyses provided the means to obtain a clear picture of the general patterns observed in macroinvertebrate communities and of their main drivers. These authors and Jiménez et al. (2006) found that the efficiency of the hand-sorting technique varied greatly with organism size, colour and mobility and also differed among operators. Ruiz et al. (2008) and Velasquez (2020) found that it was important to follow the separation technique described in the ISO/TSBF method accurately and consistently to attain extraction efficiencies close to 100% for most invertebrates. Although differences in the individual efficiencies might, theoretically, affect the comparison among sites, we believe that they balance out owing to the high number of operators in all the >50 different projects, with an estimated 500 operators in total. Nonetheless, an effort has been made to provide people, whenever possible, with detailed technical documents and videos (Ruiz et al., 2008; Velasquez, 2020).

Nonetheless, the method is sensitive to the effects of differing soil conditions and land-use treatments on macroinvertebrate communities, has low operating costs and uses simple protocols. This has resulted in it becoming a standard method for the characterization of soil macroinvertebrate communities and a basis for the design and evaluation of synthetic indicators of soil biodiversity (Ruiz et al., 2011; Velasquez et al., 2007). It has been adopted as a tool for the description of soil quality in a large number of studies (Grimaldi et al., 2014; Lavelle et al., 2014; Rousseau et al., 2013; Velasquez and Lavelle, 2019). Although it was designed initially as part of a programme focused on tropical areas, it has since been adopted in large projects developed in Europe, China and the USA by local universities and research institutes.



  
Principal

Arts & Commerce College  
Warwat Bazar, Dist. Buldana

Name - Sakshi Baban Gore

std - Bsc III<sup>rd</sup>

Sem - VI<sup>th</sup>

Sub - Zoology Project -

Recent Advances In Epigenetics

23-24



Sant Gadge Baba Amravati University, Amravati  
Satpuda Education Society, Jalgaon Jamod's  
Arts Commerce College Warvat Bakal Tq. Sangrampur

**Department of Zoology**

**2023 - 2024**

**Project**

**Topic : Recent Advances In Epigenetic**

**Submitted by : Sakshi Baban Gore**

**Class : B. Sc. III**

**Semester : VI**

**Dated : 18/03/2024**

*S. A. Tayade*  
**Teacher Incharge**  
**Miss S. A. Tayade**

*Dr. M. R. Solanke*  
**HOD**  
**Dr. M. R. Solanke**

*Dr. M. R. Solanke*  
**Dr. M. R. Solanke**  
**Head of the Department**  
**26/3/24**



## CERTIFICATE


This is to certify that **Miss/Mr. Sakshi Baban Gore** from  
B.Sc. III Semester V from department of Zoology, Arts and Commerce college,  
Warwat Bakal has completed project entitled,  
"Recent Advances in Epigenetics" for the  
fulfillment of internal assessment.

She/He has completed her/his project work satisfactorily.

Date: 18/03/2024

Place: Warwat Bakal

Teacher In charge  
Miss S. A. Tayade

  
HOD  
Dr. M. R. Solanke

Dr. M. R. Solanke.  
Assistant Professor &  
Head of Zoology Department  
P. G. College, Warwat Bakal, Warwat  
Tal. Warwat, Dist. Solapur

## Table of Contents:

- 1) Introduction of DNA
- 2) Defination of DNA
- 3) Structure of DNA
- 4) Types of DNA
  - B-DNA
  - A-DNA
  - C and E-DNA
  - Z-DNA
- 5) Types of DNA Table
- 6) Different forms of DNA
- 7) Reference

## • Introduction Of DNA

**\*DNA:** Deoxyribonucleic acid. It is an organic compound that has a unique molecular structure. It is found in all prokaryotic cells and eukaryotic cells. DNA is double standard structure. Watson and crick in 1933 designed the structure of DNA. It is called the Watson and Crick Double Helical Model of DNA. They were awarded with the Nobel prize in 1962 for this work.

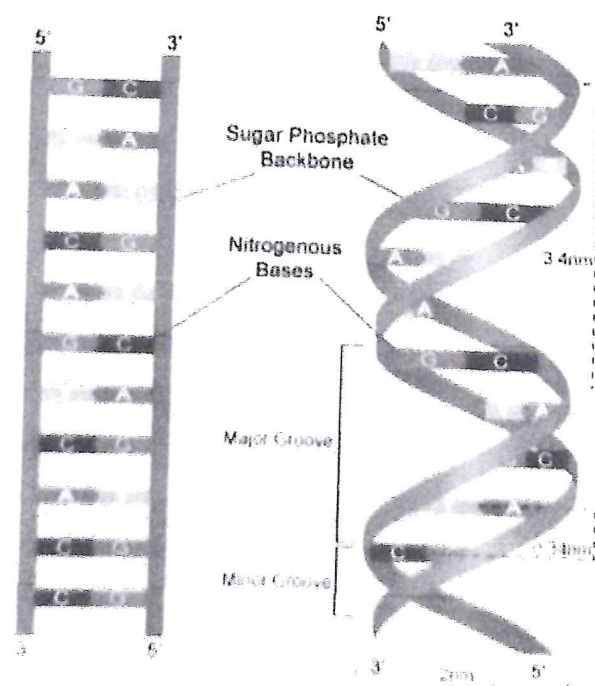
## \*Definationof DNA:

"DNA is a group of molecules that is responsible for carrying and transmitting the hereditary materials or the genetic instructions from parents to offspring."

## \*Structure of DNA :

The DNA structure can be thought of as a twisted ladder. This structure is described as a double-helix, as illustrated in the figure above. It is a nucleic acid, and all nucleic acids are made up of nucleotides. The DNA molecule is composed of units called nucleotides, and each nucleotide is composed of three different components such as sugar, phosphate groups and nitrogen bases.

The basic building blocks of DNA are nucleotides, which are composed of a sugar group, a phosphate group, and a nitrogen base. The sugar and phosphate groups link the nucleotides together to form each strand of DNA. Adenine (A), Thymine (T), Guanine (G) and Cytosine (C)



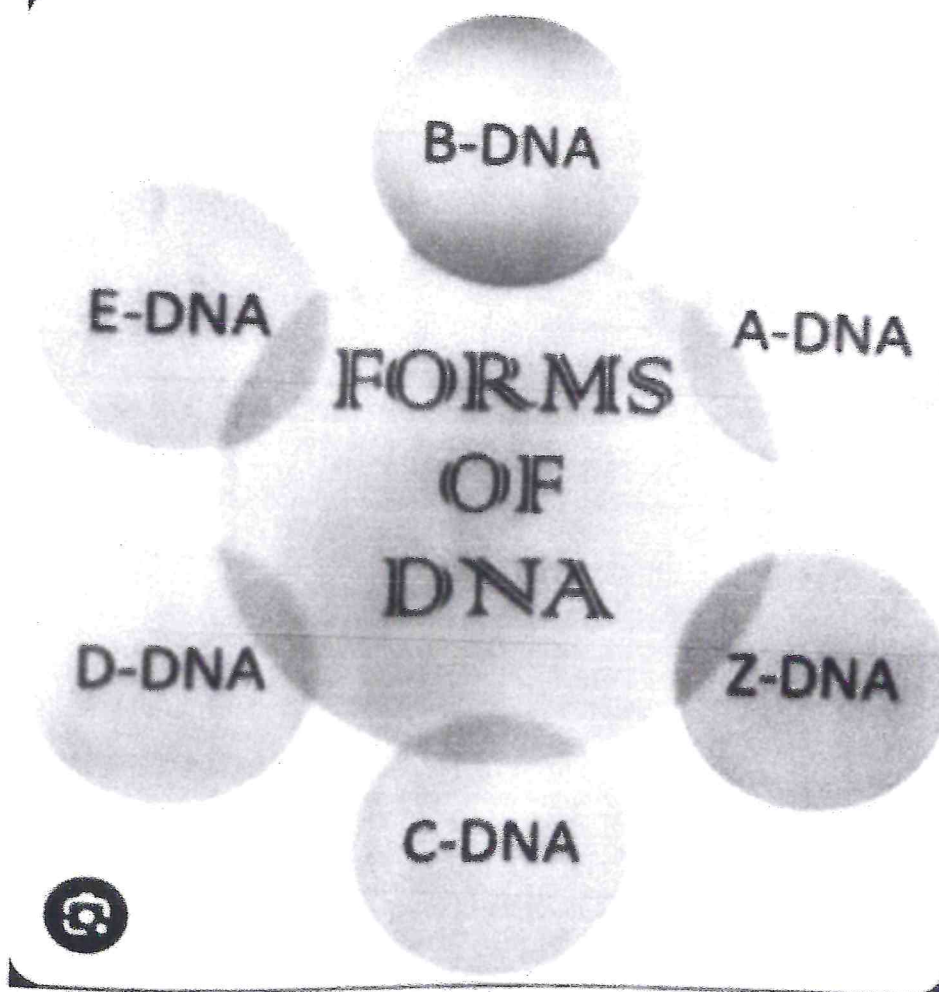


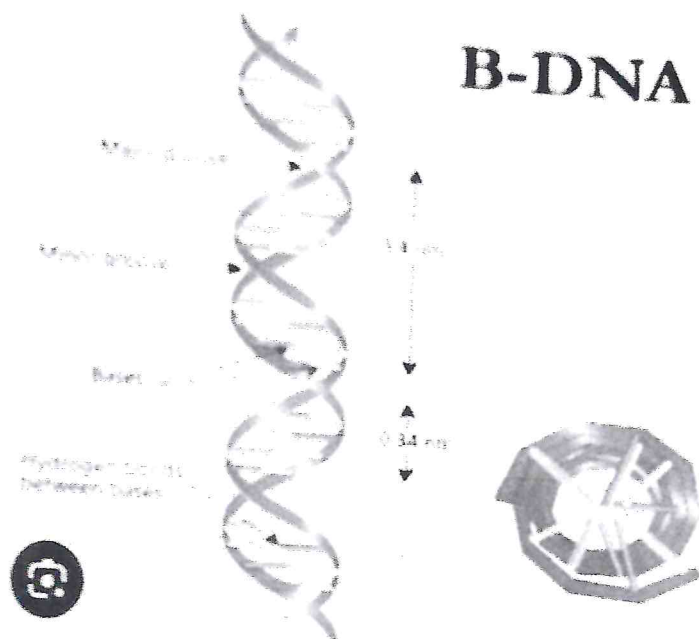
are four types of nitrogen bases.

### \*Types of DNA

There are six different types of DNA.

- 1) A-DNA
- 2) B-DNA
- 3) C-DNA
- 4) D-DNA
- 5) E-DNA
- 6) Z-DNA





- 1) **B-DNA:** 1) B-DNA is right handed DNA OR Clockwise DNA.
- 2) This form of DNA occurs in all living beings under normal conditions.
- 3) Its each coil or turn measures  $34\text{\AA}$ .
- 4) Each turn has 10 base pairs and each base occupies  $3.4\text{\AA}$ .
- 2) **A-DNA:**
- 1) A-DNA is right handed DNA.
- 2) A DNA is the dehydrated Form of DNA.
- 3) It occurs in an environment richer in  $\text{Na}^+$  and less of water.
- 4) It is a right handed double helix similar to the more common and well known B-DNA form, but has a shorter more compact helical structure.
- 5) Each turn has 11 base pairs.
- 6) A-DNA major groove is narrow and deep and minor groove is wide and shallow.

### 3) C-DNA and E-DNA:

- 1) these are right handed DNA with a slightly different confirmation. What are seen under very special environmental circumstances.
- 2) Therefore , these DNA do not occur in vivo.
- 3) C-DNA diameter is 19 Å.
- 4) C-DNA base pairs per turn 9,33.

### 4) Z-DNA:

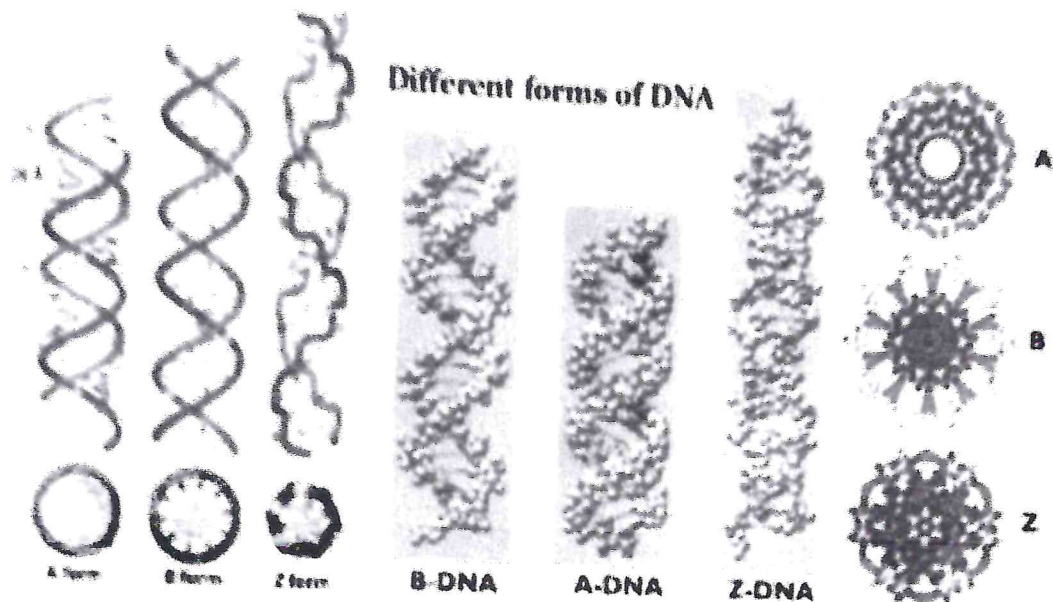
- 1) It is left handed DNA or anticlockwise DNA.
- 2) Z-DNA was discovered by Rich.
- 3) It is the skinniest DNA having 12 base pair per turn.
- 4) It has only one groove.
- 5) It has zig -zag sugar-phosphate back bone.
- 6) The diameter of Z-DNA is 18Å.
- 7) It has major groove is flat.
- 8) It has minor groove is narrow and deep.

## Types of DNA

Property	A-DNA	B-DNA	Z-DNA
Helix Handedness	Right	Right	Left
Base Pairs per turn	11	10.4	12
Rise per base pair along axis	0.23nm	0.34nm	0.38nm
Pitch	2.46nm	3.40nm	4.56nm
Diameter	2.55nm	2.37nm	1.84nm
Major Groove	Present	Present	Absent
Minor Groove	Present	Present	Deep Cleft



# Different forms of DNA



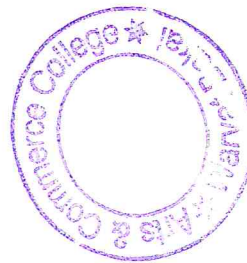
X-ray analysis of the DNA crystals at atomic resolution have revealed that DNA exhibits much more structural diversity than formally envisaged. Such variations are

- 1. **A-DNA**: Most common, originally deduced from X-ray diffraction of sodium salt of DNA fibres at 92% relative humidity.
- 2. **B-DNA**: Originally identified by X-ray diffraction of analysis of DNA fibres at 75% relative humidity.
- 3. **Z-DNA**: Left handed double helical structure winds to the left in a zig-zag pattern.
- 4. **C-DNA**: Formed at 66% relative humidity and in presence of  $\text{Li}^+$  and  $\text{Mg}^{2+}$  ions.
- 5. **DNA**: Rare variant with 8 base pairs per helical turn, forms a structure devoid of guanine.
- 6. **E-DNA**: Extended or eccentric DNA.

Reference:

- A Text book of zoology Bsc III year  
( Molecular biology and biotechnology)

*Thank  
you!*



*Singh*  
Principal

Arts & Commerce College  
Warvat Bakal Dist. Buldana

Name - Sakshi Baban Gore

std - Bsc III<sup>rd</sup>

sem - V<sup>th</sup>

sub - Zoology & 'seminar'.

\* Harmful Insects. \*

Roll No. → 3





Sant Gadge Baba Amravati University, Amravati

Satpuda Education Society, Jalgaon Jamod's

Arts Commerce College Warvat Bakal

Department of Zoology

2023 -2024

Seminar

Topic: Harmful Insects.

Submitted by: Sakshi Baban Gore

Class: B. Sc. III

Semester: V

Dated: 05/10/2023

*S. A. Tayade*  
5/10/23

Teacher Incharge  
Miss S. A. Tayade

*Dr. M. R. Solanke*  
14/12/23  
HOD

Dr. M. R. Solanke

Dr. M. R. Solanke,  
Assistant Professor &  
Head of Zoology Department  
Arts, Commerce College, Warwat (Bk.)  
Tq: Sangrampur Dist: Buldhana 444202



## Rice Weevil : *Sitophilus oryzae*



**Occurance** - Throught India, cosmopolitan

**Identification:** 1)The adult is a small beetle about  $\frac{1}{6}$  th-  $\frac{1}{8}$  th of inch in length and reddish brown,dark brown or almost black in colour.

2)The wings have four light reddish or yellowish spots.

3)They are always found inside the kernels of grain .it is commonly found in the store cereals such as rice ,wheat ,maize,Jowar Barley, bajra, etc.

**Injuries-** adults and grubs feed voraciously on grains living behind only skin of the grains.Both adults and larvae feed voraciously on grains so much so that the grain become unfit not only for consumption but also for seed purposes.

### **Control –**

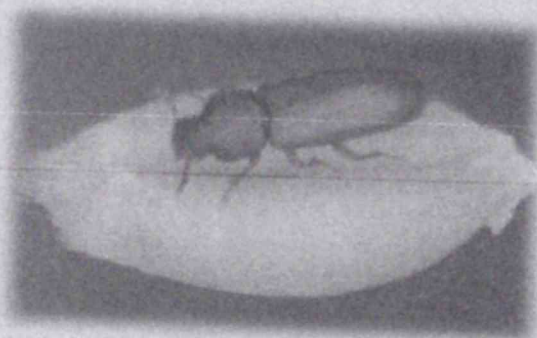
1) Primary measures: Sundrying of the storing grains. The broken Grace must be godowns should be grains can be mixed with dry Neem leaves.

2) Chemical measures: Grains to be mixed with 5% BHC by weight of grains.Empty godowns should be sprayed with 4%BHC or 0.02%malathion before storage.

3) Fumigation of grains by HCN for 18 hrs in the closed godown.



## Red Flour Beetle : *Tribolium castaneum*



**Occurance** -- Throughout India, cosmopolitan

### Identification:

- 1) it is 4 mm in length and reddish brown in colour.
- 2) head and dorsal side of the thorax covered with minute punctures.

\*Injuries- adult and larva which feed mainly on the germ of the cereal.

Eat feeds on powder products produced by other based after feeding the grains or broken grains specially rice Miller products like atta, maida and suji.

### Control:

**Primary measures:** sun drying of the storing grains. Godowns should be clean. Grace can be mixed with dry clean Neem leaves.

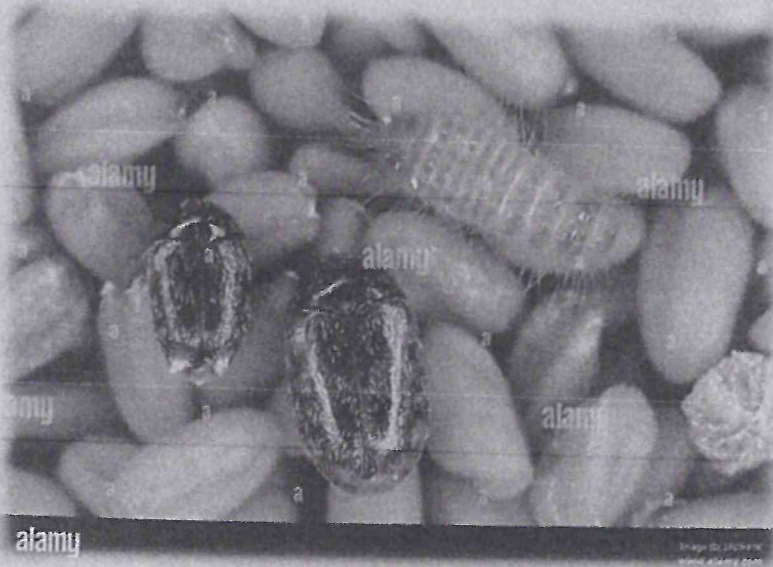
**Chemical measures:** empty godowns should be sprayed with 4% BHC or 0.02 % malathion before storage.

**Fumigation** Grace by HCL for 18 hours in the closed Of godowns.

Used for candom



### **Khapra Beetle - *Trogoderma granarium***



**Occurance** – Throughout India, cosmopolitan

#### **Identification-**

- 1) The adult beetle is brownish black, oval and about 3-4mm long.
- 2) The body is covered with very fine hairs.
- 3) Males are smaller than female.

#### **Injuries-**

- 1) The khapra beetle is a primary pest of stored grain particularly wheat, rice, corn, pulses, dried fruits, etc.
- 2) Only the larvae feed on grains right from superficial layer to the internal embryo and the grains become useless for germination.

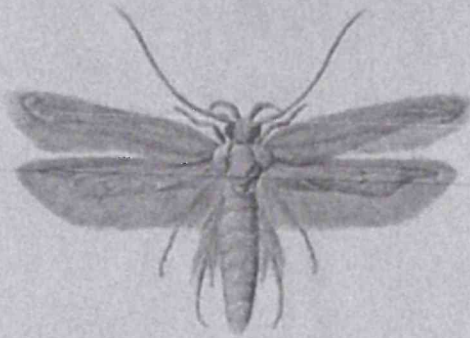
**Primary measures** – Sun drying of the storing grains. Godowns should be clean.

**Chemical measures-** Empty godowns should be sprayed with 4%BHC or 0.02% malathion before storage.

Fumigation of grains by HCN for 18hrs in the closed godown.



**Angoumois Grain Moth – *Sitotrog acerealella***



**Occurance-** Throughout India, cosmopolitan.

Severe attack occurs during rainy season.

**Identification-**

1) The adult moth is small, 8-10mm in length, with narrow wings fringed with hairs.

2) While sitting the wings are completely folded over back in a sloping manner. 3) The wings span is 10-14mm.

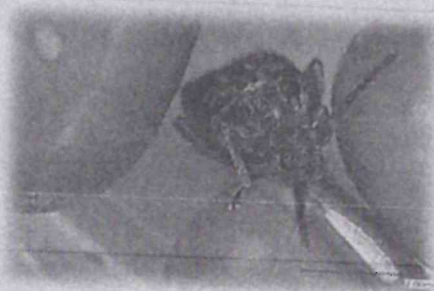
**Injuries-** Caterpillars bore the cereal grains. The infested grains are hollowed out and filled by excreta and webbing by the larvae. Grains become unfit for consumption.

1) Primary measures – Sun – drying of storing grains. Godowns should be clean. Before storing the grains, godowns to be heated to 150°(F) at least for 10-12 hours. Grains can be mixed with dry neem leaves.

2) Fumigation of grains by HCN for 18 hrs in the closed godown



## **The pulse beetle —**



**Occurance** - Native of China but distributed in India, Myanmar, Japan, Africa, USA, Philipines, etc.

**Identification**-Adult beetle is reddish Brown, measuring 3-4mm in length

Having long serrated antennae. There is only generation per year.

**Injuries**-It is o major paste of pulses particularly pea, lentil, beans, etc.

The groups eat of the interior of the grain and make them unless for human use .The beetle also infest the grains in field.The adults do not feed on stored products at all.

**Control**-1) Primary measures-Sun-drawing of the storing grains.Godowns should be clean.Before storing the grains, godowns to be heated to 150°F at least for 10-12 hours.Grains can be mixed with dry Neem leaves.

Fumigation of grains by HCN for 18 hrs in the closed godown.

**Injuries**- Caterpillars bore the cereal grains. The infested grains are hollowed out and filled by excreta and webbing by the larvae. Grains become unfit for consumption.

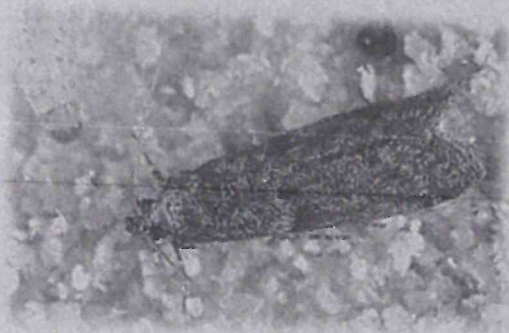
### **Primary measures —**

Sun — drying of storing grains. Godowns should be clean.Before storing the grains, godowns to be heated to 150°F at least for 10-12 hours. Grains can be mixed with dry neem leaves.

2) Fumigation of grains by HCN for 18 hrs in the closed godown.



## **The Almond Moth-**



**Occurrence** –Cosmopolitan

Host Complex-Commonly in flour Mills.

Injuries- Caterpillars feed on food stuff,

Grains, flour. They form massive webs and clogging making grains, flour useless for human use.

**Control** –

1) Primary measures –Sun- drying of the storing grains. Godown should be clean. Before storing the grains, godowns to be heated to 150°F at least for 10-12 hours. Grains can be mixed with dry neem leaves.

2) Fumigation of grains by HCN for 18 hrs in the closed godown.



## Reference :-

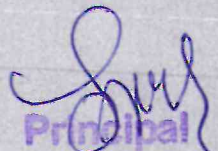
- A Text Book of Zoology
- Animal physiology and Economic Zoology

Or

- <http://byjus.com>biology>harm>

**Thank You**



  
**Principal**  
Arts & Commerce College  
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**Arts & Commerce College, Warwat Bakal**  
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**Department of Chemistry**

# **CERTIFICATE**

This is to certify that Mr./Ms. Shivani vijay Gange A student of B.Sc.-III (Sem-V/VI), bearing Roll No. 2 Studying in the academic year 2023-2024 of this institute has completed seminar based on syllabus and given satisfactory account of it in this book.

Date: -

 30/10/23  
Teacher in-charge

  
HOD



## ●●Role of drugs In Human being ●●

❓Definition drugs :- Drugs affect the way your body and mind function; they can change how you feel, think and behave. People take drugs for different reasons and in different ways. Find out about legal and illegal drugs.

### ❓Types of drugs:-

- General Sales List (GSL) GSLs are a type of medicine that have few legal restrictions. ...
- Pharmacy Medicines. Pharmacy Medicines are only available to purchase behind the counter at a pharmacy. ...
- Prescription Only Medicines. ...
- Controlled Drugs.

### ❓Drugs interaction :-

Drug interaction is defined as the pharmacological activity of one drug is altered by the concomitant use of another drug or by the presence of some other substance

## Types of drug Interactions

1. Drug-drug interactions.
2. Drug-food interactions.
3. Chemical-drug interactions.
4. Drug-laboratory test interactions.
5. Drug-disease interactions.

## Factors contributing to drug interactions:

1. Multiple drug therapy.
2. Multiple prescribers.
3. Multiple pharmacological effects of drug.
4. Multiple diseases/predisposing illness.
5. Poor patient compliance.
6. Advancing age of patient.

people. The effects of drugs are different for each person and drug

### ■ Drugs Abuse:-

- Drug abuse may be defined as the habitual use of drugs not needed for therapeutic purposes, solely to alter one's mood, affect of state of consciousness, or to affect a body function unnecessarily.
- Continued use of drugs can lead to drug dependence, a state of physical & mental dependence.
- Commonly abused drugs:
- Marijuana, Cocaine, Heroin, Alcohol.

### □ Sign & Symptoms of drug abuse

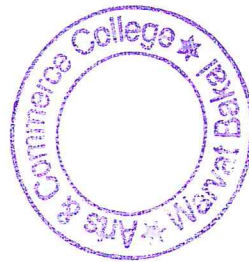
#### ✓ Physical warning:

- Bloodshot eyes,
- Pupils larger or smaller than usual,
- Changes in appetite or sleep patterns,
- Sudden weight loss or weight gain,
- Deterioration of physical appearance,
- Unusual smells on breath,
- Impaired coordination.



✓ Behavioral warning:

- Poor work,
- Decline in performance,
- Financial Problems,
- Secretive behaviors,
- Sudden change in friends and associates,
- Accident or trouble prone,
- Lack of motivation and withdrawn,
- Unexplained anxiety.



  
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