# Integral University, Lucknow
## Faculty of Science
## Department of Biosciences
### Study and Evaluation Scheme
### B.Sc. (Zoology, Botany, Chemistry)
### w.e.f. July, 2019

## SEMESTER I

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | LN104 | Essential Professional Communication | Foundation | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | BS161 | Non chordates- I "Protozoa to Helminthes" | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 3 | BS203 | Cell Biology and Genetics | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 4 | BS.162 | Algae, Fungi, Bryophyta | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 5 | CH117 | General Chemistry-I | Core | 2 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 2:1:0 | 3 |
| 6 | BS163 | Animal Diversity Lab-1 | Practical | 0 | 0 | 6 | 25 | 15 | 40 | 60 | 100 | 0:0:3 | 3 |
| 7 | CH118 | Chemistry Practical-I | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| | | **Total** | | **14** | **05** | **10** | **175** | **105** | **280** | **420** | **700** | **24** | **24** |

## SEMESTER II

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | ES115 | Fundamentals of Environmental Science | Foundation | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | BS171 | Pteridophytes, Gymnosperms, Palaeobotany | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 3 | CH119 | General Chemistry-II | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 4 | BS172 | Non Chordates- II "Annelida to Echinodermata" | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 5 | BS233 | Animal Physiology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 6 | BS174 | Plant Diversity Lab-I | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| 7 | CH120 | Chemistry Practical-II | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| | | **Total** | | **15** | **5** | **8** | **175** | **105** | **280** | **420** | **700** | **24** | **24** |

# SEMESTER III

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | BS263 | Chordates – "Agnatha to Mammals" | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | CH221 | Inorganic and Physical Chemistry-1 | Core | 2 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 2:1:0 | 3 |
| 3 | BS222 | Angiosperm Morphology and Taxonomy | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 4 | BS113 | Fundamentals of Microbiology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 5 | CH222 | Organic and Physical Chemistry-I | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 7 | CH223 | Chemistry Practical-III | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| 8 | BS262 | Animal Diversity Lab-II | Practical | 0 | 0 | 6 | 25 | 15 | 40 | 60 | 100 | 0:0:4 | 4 |
| | | **Total** | | **14** | **5** | **12** | **200** | **120** | **320** | **480** | **800** | **25** | **25** |

# SEMESTER IV

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | BS271 | Evolutionary Biology and Wildlife | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | BS322 | Comparative Anatomy and Developmental Biology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 3 | CH224 | Inorganic and Physical Chemistry-II | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 4 | CH225 | Organic and Physical Chemistry-II | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 5 | BS232 | Plant Physiology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 6 | BS272 | Cytogenetics and Angiosperm taxonomy Lab | Practical | 0 | 0 | 6 | 25 | 15 | 40 | 60 | 100 | 0:0:3 | 3 |
| 7 | CH226 | Chemistry Practical-IV | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| | | | | **15** | **05** | **10** | **175** | **105** | **280** | **420** | **700** | **25** | **25** |

## SEMESTER V (Botany, Zoology)

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | BS212 | Molecular Biology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | BS231 | Plant Ecology and Adaptation | Core | 2 | 0 | 0 | 25 | 15 | 40 | 60 | 100 | 2:0:0 | 2 |
| 3 | BS321 | Angiosperm Anatomy and Embryology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 4 | BS361 | Applied and Economic Zoology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 5 | BS362 | Genetics and Evolutionary Biology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 6 | BS363 | Fundamentals of Biomolecules | Core | 2 | 0 | 0 | 25 | 15 | 40 | 60 | 100 | 2:0:0 | 2 |
| 7 | BS364 | Applied Zoology Lab | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| 8 | BS365 | Applied Botany Lab | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| | | **Total** | | **16** | **04** | **08** | **200** | **120** | **280** | **480** | **700** | **26** | **24** |

## SEMESTER VI (Botany, Zoology)

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | BS371 | Immunology, Toxicology and Animal Behaviour | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | BS372 | Insects, Vectors and Diseases | Elective | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 3 | BS373 | Soil Science and Plant Pathology | Elective | | | | | | | | | | |
| 4 | BS202 | Biophysical Chemistry | Elective | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 5 | BS374 | Biological Techniques and Biostatistics | Elective | | | | | | | | | | |
| 6 | BS331 | Computational Sciences and Bioinformatics | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 7 | BS332 | Plant & Animal Biotech | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 8 | BS375 | UG Zoology/Botany Project | Core | 0 | 0 | 8 | 0 | 0 | 0 | 200 | 200 | 0:0:4 | 4 |
| | | **Total** | | **15** | **5** | **8** | **125** | **75** | **200** | **500** | **700** | **24** | **24** |

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## SEMESTER V (Botany, Chemistry)

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | BS212 | Molecular Biology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | BS231 | Ecology and Adaptation | Core | 2 | 0 | 0 | 25 | 15 | 40 | 60 | 100 | 2:0:0 | 2 |
| 3 | BS321 | Plant Anatomy and Embryology | Core | 2 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 4 | CH314 | Advance Inorganic Chemistry | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 5 | CH315 | Advance Organic Chemistry | Core | 2 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 2:1:0 | 3 |
| 6 | CH319 | Basics of Chromatographic Techniques | Core | 2 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 2:1:0 | 3 |
| 7 | BOT365 | Applied Botany Lab | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| 8 | CH316 | Chemistry Practical-V | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| | | **Total** | | **16** | **6** | **8** | **200** | **120** | **320** | **480** | **800** | **24** | **24** |

## SEMESTER VI (Botany, Chemistry)

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | CH 308 | Spectroscopic Techniques | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | CH309 | Chemical Process Industry | Elective | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 3 | CH317 | Chemistry of Polymers | Elective | | | | | | | | | | |
| 4 | BS202 | Biophysical Chemistry | Elective | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 5 | BS373 | Soil Science and Plant Pathology | Elective | | | | | | | | | | |
| 6 | BS331 | Computational Sciences and Bioinformatics | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 7 | BS332 | Plant & Animal Biotech | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 8 | CH318 | UG Chemistry/ Botany Project | Core | 0 | 0 | 8 | 0 | 0 | 0 | 200 | 200 | 0:0:4 | 4 |
| | | **Total** | | **15** | **5** | **8** | **125** | **75** | **200** | **500** | **700** | **24** | **24** |

**L: Lecture, T: Tutorial, P: Practical**
**CT: Class Test, TA: Teacher Assessment, ESE: End Semester Examination**

## SEMESTER V (Zoology, Chemistry)

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | BS361 | Applied and Economic Zoology | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | BS362 | Genetics and Evolutionary Biology | Core | 2 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 2:1:0 | 4 |
| 3 | BS363 | Fundamentals of Biomolecules | Core | 2 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 2:1:0 | 2 |
| 4 | CH314 | Advance Inorganic Chemistry | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 5 | CH315 | Advance Organic Chemistry | Core | 2 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 2:1:0 | 3 |
| 6 | CH319 | Basics of Chromatographic Techniques | Core | 2 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 2:1:0 | 3 |
| 7 | BS364 | Applied Zoology Lab | core | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| 8 | CH316 | Chemistry Practical-V | Practical | 0 | 0 | 4 | 25 | 15 | 40 | 60 | 100 | 0:0:2 | 2 |
| | | **Total** | | **14** | **6** | **8** | **200** | **120** | **320** | **480** | **800** | **24** | **24** |

## SEMESTER VI (Zoology, Chemistry)

| SL. No | COURSE CODE | COURSE TITLE | Type of Paper | L | T | P | Evaluation Scheme | | | | Subject Total | Credit | Total Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CT | TA | Total | ESE | | | |
| 1 | BS371 | Immunology, Toxicology and Animal Behaviour | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 2 | CH-308 | Spectroscopic Techniques | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 3 | CH309 | Chemical Process Industry | Elective | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 4 | CH317 | Chemistry of Polymers | Elective | | | | | | | | | | |
| 3 | BS372 | Insects, Vectors and Diseases | Elective | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 4 | BS374 | Biological Techniques and Biostatistics | Elective | | | | | | | | | | |
| 5 | BS332 | Plant & Animal Biotech | Core | 3 | 1 | 0 | 25 | 15 | 40 | 60 | 100 | 3:1:0 | 4 |
| 6 | CH318 | U.G. Chemistry/ Zoology Project | Core | 0 | 0 | 8 | 0 | 0 | 0 | 200 | 200 | 0:0:4 | 4 |
| | | **Total** | | **15** | **5** | **8** | **125** | **75** | **200** | **500** | **700** | **24** | **24** |

**L: Lecture, T: Tutorial, P: Practical**
**CT: Class Test, TA: Teacher Assessment, ESE: End Semester Examination**

**Integral University, Lucknow**
**Department of Biosciences**
**B.Sc. Zoology, Botany, Chemistry**

**B.Sc BT/BC/LS/ZBC I yr** **I sem**
**Subject: Essential Professional Communication** **Subject Code: LN104**

**(w.e.f 2019-2020)**

**L T P**
**3 1 0**

**UNIT I** **4**
**Introduction to Communication:** Definition, Types of Communication, Channels of Communication, Language

**UNIT II** **6**
**Interpersonal Communication:** Culture- Definition and Types, Communication and Culture including Cross Cultural Communication

**UNIT III** **8**
**Written Communication:** Letter Writing- Informal and Formal - Letters of Enquiry, Letters of complaint, Response to complaints and enquiries, Self Exploration through description

**UNIT IV** **12**
**Grammar through Worksheets:** Situational activities and modules- Parts of Speech, Tenses, Articles, Modals, Active and Passive, Subject-Verb Agreement, Direct and Indirect Speech, Degrees of comparison

**UNIT V** **10**
**Grammar through Worksheets Continued Sentences:** Simple, Compound, Complex, Declarative, Assertive, Negative, Interrogative, Exclamatory, Imperative

**Suggested Reading:**

1. Wren PC and Martin H, "High School Grammar and Composition", S. Chand and Co.
2. K. Floyd, "Interpersonal Communication: The Whole Story" (2009), McGraw Hill,
3. Greenbaum Sidney and Nelson Gerald, "An Introduction To English Grammar", Pearson
4. Swan Michael, "Practical English Usage" OUP, 2005
5. Raymond Murphy, "Intermediate English Grammar", (2007) Cambridge University Press.

**Integral University, Lucknow**
**Department of Biosciences**
**B.Sc. Zoology, Botany, Chemistry**

**B.Sc. ZBC 1 yr** **1 sem**
**Subject: Non Chordates-I "Protozoa to Helminthes"** **Subject Code: BS161**

**(w.e.f 2019-2020)**

**L T P**
**3 1 0**

**UNIT I** **8**
**Outline of classification of animals (Chordates and non chordates).Protozoa:** General characters and classification up to classes; Locomotory Organelles and Locomotion in Protozoa; *Plasmodium, Monocystis*: - Structure, Life-cycle and Control.

**UNIT II** **8**
**Porifera:** General characters and classification up to classes; *Sycon*: - Morphology, Different types of cells,Canal System in Porifera.

**UNIT III** **8**
**Cnidaria:** General characters and classification up to classes; *Obelia:* - Morphology of Obelia colony, Developmentof *Hydra*, Polymorphism in Hydrozoa.

**UNIT IV** **8**
**Platyhelminthes:** General characters and classification up to classes;*Fasciola hepatica, Taenia solium*: - Structure, Life cycle, Pathogenecity & control measures.

**UNITV** **8**
**Nematehelminthes:** *Ascaris* and *Ancylostoma*: - Structure, Life cycle, Pathogenicity & control measures.

**Suggested Reading:**

1. Biodiversity and Quality of Life. Sengupta. Mc Millan India Pvt. Ltd.
2. Biology: P. H. Raven& G. B. Jhonson
3. Barnes, B.D. (1987). Invertebrate Zoology. 5th Edition, Saunders College Publishing.
4. Kotpal, R. L. (1988). Protozoa. Rastogi Publications
5. Marshall, A.J. and Williams, W.D. (1979). Text Book of Zoology Vol. I-Invertebrates, Macmillan.
6**.** Noble, E. R. and Noble, G. A. (1982). Parasitology-The Biology of Animal Parasites, Lea and Febiger, Philadelphia.
**7.** Ruppert, E.E. and Barnes, R.D. (1994). Invertebrate Zoology. 6th Edition, Saunders College Publishing.
8**.** Webb, J.E., Wallwork, J.A. and Elgood, J. H. (1981). Guide to Invertebrate Animals, English Language Book Society and Macmillan.

**Integral University, Lucknow**
**Department of Biosciences**
**B.Sc. Zoology, Botany, Chemistry**

**B.Sc. ZBC 1 year** **I sem**
**B.Sc. BT/LS II year** **III sem**
**Subject Name: Cell Biology & Genetics** **Subject Code: BS203**

**(w.e.f 2019-2020)**

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**UNIT I** **8**

**Cell as a Basic unit of Living Systems:** Discovery of cell, The Cell theory Ultrastructure of an eukaryotic cell – (both plant and animal cell). Structure and functions of cell organelles, Cytoskeletal structures (Microtubules, Microfilaments); cell motility.

**UNIT II** **8**

**Cell Division:** Cell cycle, mitosis and meiosis, Membrane transport: active and passive transport, introduction to signal transduction and its molecular mechanism, cell scenescence, Programmed Cell Death.

**UNIT III** **8**

**Chromosomes:** Structural Organization: centromere, telomere, chromonema, euchromatin and heterochromatin, chemical composition and karyotype, nucleosome model, Special types of chromosomes: Salivary gland and Lampbrush chromosomes, Chromosomal Variations, Chromosome mapping, structural and numerical aberrations.

**UNIT IV** **8**

**Mendelism:** Mendels laws of heredity, Test cross, Incomplete dominance and simple problems, Interaction of Genes: Supplementary factors, Comb pattern in fowls, Complementary genes: Flower color in sweet peas, Multiple factors: Skin color in human beings, Epistasis: Plumage colour in poultry, Multiple allelism: Blood groups in human beings, Concepts of allosomes and autosomes, XX-XY, XX-XO, ZW-ZZ, ZO-ZZ type, Linkage and Crossing Over, Mechanism and importance.

**UNIT V** **8**

**Mutations:** Spontaneous and induced mutations, Physical and chemical mutagens, Mutation at the molecular level, Mutations in plants, animals, and microbes for economic benefit of man. Human Genetics: Karyotype in man, sex linked inheritance, inherited disorders: Allosomal (Klinefelter syndrome and Turner's syndrome), Autosomal (Down syndrome and Cri-Du- Chat syndrome). DNA Damage and Repair: Causes and Types of DNA damage, Major mechanisms of DNA repair: photoreactivation, nucleotide and base excision repairs, mismatch repair, SOS repair.

**Suggested Reading:**

1. Molecular Biology of cell – Bruce Alberts et al, Garland publications
2. Animal Cytology & Evolution – MJD, White Cambridge University Publicatins
3. Molecular Cell Biology – Daniel , Sceintific American Books.
4. Cell Biology – Jack D.Bruke, The William Twilkins Company.
5. Principles of Gene Manipulations – Old & Primrose, Black Well Scientific Publications.
6. Cell Biology – Ambrose & Dorouthy M Easty, ELBS Publications.

**Integral University, Lucknow**
**Department of Biosciences**
**B.Sc. Zoology, Botany, Chemistry**

**B.Sc. ZBC 1 yr** **I sem**
**Subject: Algae, Fungi, Bryophyta** **Subject Code: BS162**

**(w.e.f 2019-2020)**

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**UNIT I** **8**

**General features of algae, Classification, Range of thallus organization, Reproduction;** Classification of algae, Economic importance and life Cycle with special reference to *Chlamydomonas, Oedogonium, Vaucheria, Chara* and *Polysiphonia*.

**UNIT II** **8**

General features of fungi, Classification, range of thallus organization, cell wall composition, Reproduction, economic importance of fungi, life cycle with special reference to *Rhizopus* (Zygomycota), *Alternaria* (Ascomycota), *Puccinia, Agaricus* (Basidiomycota).

**UNIT III** **8**

**Lichens:** General account, classification, thallus organization, reproduction, physiology and role in environmental pollution; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.

**UNIT IV** **8**

General features of Bryophytes, Classification, Thallus organization, Reproduction and affinities of bryophytes, Economic importance of bryophytes with special reference to *Sphagnum*

**UNIT V** **8**

General characters and life cycle with special reference to Marchantiophyta – *Marchantia;* Bryophyta - *Pogonatum*; Anthocerotophyta – *Anthoceros*.

**Suggested Reading:**


1. Chapman V.J & Chapman D.J, The Algae, Macmillan India Ltd.
2. Fritsch F. B 1945, Structure and Reproduction of Algae Vol.I & II.Cambridge University Press.
3. Smith G.M 1955, Cryptogamic Botany Vol.I and II, McGraw Hill.
4. Vashishta B.R 1990, Botany for Degree Students, Vol 1,2 and 3. S.Chand & Co.
5. Singh V., Pandey P.C and Jain D.K 1998, A Text book of Botany for Undergraduate
6. Alexopoulos C.J & MIMS C.V 1988. Introductory Mycology, John Wiley & Sons.
7. Webster J 1970, Introduction to Fungi, Cambridge University Press.
8. Parihar N.S 1967, An Introduction to Embryophyta Vol I & II, General Book Depot.
9. Prempuri 1973, Bryophytes - A Broad perspective. Atmaram & Sons.

**Integral University, Lucknow**
**Department of Biosciences**
**B.Sc. Zoology, Botany, Chemistry**

**B.Sc. PCM/ZBC, 1yr** **1 Sem**
**Subject Name: General Chemistry-I** **Subject Code: CH117**
**(w.e.f. 2019-2020)**

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**Unit-1 Inorganic Chemistry** **07**

**Atomic Structure:** Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of $\Psi$ and $\Psi^2$, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements.

**Unit-2** **07**

**Periodic Properties** Atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, effective nuclear charge, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behavior.

**Unit-3 Organic Chemistry** **07**

**Structure Bonding** Hybridization and its effect on bond length and bond angles, bond energy, localized and delocalized chemical bond, inductive, resonance, hyperconjugation, hydrogen bonding, van der Waals interactions.

**Unit-4** **07**

**Mechanism of Organic reactions** Homolytic and heterolytic bond breaking. Types of reagents-electrophiles and nucleophiles, Types of organic reactions. Energy considerations. Reactive intermediates-carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges in intermediates and other ionic species.

**Unit-5 Physical Chemistry** **07**

**Gaseous State** Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state. *Critical Phenomena:* PV isotherms of real gases, continuity of states, the isotherms of van der Waals equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state. Problems Molecular velocities: Root mean square, average and most probable velocities.

**Suggested Readings**


1. New Concise Inorganic Chemistry by J.D. Lee Edition III Compton Printing Ltd
2. Principles of Inorganic Chemistry by HR Puri, R. Sharma & S.P. Jauhar, Vishal Publications Jalandhar.
3. Organic Chemistry, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International).
4. Modern Organic Chemistry, M. K. Jain and S.C. Sharma, Vishal Publications Jalandhar.
5. Physical Chemistry, P.W. Atkins, Oxford University Press.
6. Principles of Physical Chemistry, B.R. Puri & L.R. Sharma, Shoban Lal Nagin Chand & Co.

**Integral University, Lucknow**
**Department of Biosciences**
**B.Sc. Zoology, Botany, Chemistry**
**PRACTICALS**

**B.Sc. ZBC 1 year** **1 sem**
**Subject: Animal Diversity Lab-1** **Subject Code: BS163**
**(w.e.f 2019-2020)**

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1. Examination of pond water for different kinds of protozoans.
2. Permanent preparation of gemmule of *Spongilla*.
3. Permanent preparation of parapodium of *Neries*.
4. Permanent preparations of Septal nephridia of *Pheretima*.
5. Permanent preparations of gill lamella of *Pila*.
6. Dissections: *Palaemon* and *Pila.*
7. Glycerine preparation of Proboscis of *Musca*.
8. Mouth parts of male and female *Anopheles* and *Culex*.
9. Study of the following specimens: *Euplectella, Spongilla, Euspongia, Physalia, Euspongia, Corallium, Fungia, Madrepora, Metridium, Pennatula, Fungia, Neries, Hetroneries, Pheretima.*
10. Study of the following permanent slides: Different kinds of sponge spicules and sponging fibres of *Euspongia*, *Amoeba, Euglena, Paramecium, Obelia, Aurelia*, T.S. and L.S. of *Sycon*, Study of life history stages of *Taenia*, T.S. of Male and female *Ascaris.*

**Suggested Reading:**


1. Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
3. Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
   Pough H. *Vertebrate life,* VIII Edition, Pearson International.
4. Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.

**Integral University, Lucknow**
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**B.Sc. Zoology, Botany, Chemistry**

**B.Sc. PCM/ZBC 1 yr** **1 Sem**
**Subject Name: Chemistry Practical-I** **Subject Code: CH118**
**(w.e.f. 2019-2020)**

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## List of Experiments:

### Inorganic Chemistry

1. Qualitative analysis of inorganic mixtures containing not more than four ionic species (excluding insoluble substances) out of the following radicals;
    a) **Analysis of acid radicals:** $CO_3^{2-}$, $NO_2^-$, $S^{2-}$, $SO_3^{2-}$, $SO_4^{2-}$, $NO_3^-$, $CH_3COO^-$, $F^-$, $Cl^-$, $Br^-$, $I^-$, $PO_4^{3-}$, $BO_3^{3-}$, $C_2O_4^{2-}$.
    b) **Analysis of basic radicals:** $NH_4^+$, $Ag^+$, $Hg_2^{2+}$, $Hg^+$, $Pb^{2+}$, $Bi^{3+}$, $Cu^{2+}$, $Cd^{2+}$, $Sn^{2+}$, $Fe^{3+}$, $Al^{3+}$, $Cr^{3+}$, $Co^{2+}$, , $Ni^{2+}$, $Mn^{2+}$, $Zn^{2+}$, $Ba^{2+}$, $Sr^{2+}$, $Ca^{2+}$, $K^+$, $Na^+$.

### Organic Chemistry:

1. Calibration of Thermometer:
    a) $80\text{-}82^0$ (Naphthalene), $113.5\text{-}114^0$ (Acetanilide)
    b) $132.5\text{-}133^0$ (Urea), $100^0$ (Distilled Water)
2. Determination of melting point:
    a) Naphthalene $80\text{-}82^0$, Benzoic acid $121.5\text{-}122^0$
    b) Urea $132.5\text{-}133^0$, Succinic acid $184.5\text{-}185^0$
    c) Cinnamic acid $132.5\text{-}133^0$, Sallicylic acid $157.5\text{-}158^0$
    d) Acetanilide $113.5\text{-}114^0$, m-Dinitrobenzene $90^0$
    e) *p*-Dichlorobenzene $52^0$, Aspirin $135^0$
3. Determination of boiling point:
    a) Ethanol $78^0$
    b) Cyclohexane $81.4^0$
    c) Toluene $110.6^0$
    d) Benzene $80^0$

### Physical Chemistry:

1. To study the distribution of iodine between water and $CCl_4$.

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**B.Sc. Zoology, Botany, Chemistry**

**B.Sc BC/BT/LS/ZBC I yr** **II sem**
**Subject: Fundamentals of Environmental Studies** **Subject Code: ES115**

**(w.e.f 2019-2020)**

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**UNIT I** **(10hrs)**

Environment its components & segments, Physical, Chemical and biological study of Environment, Multidisciplinary nature of environmental studies, Concept of Sustainable development & Sustainable life styles, Public awareness & Environmental movements like Chipko, Silent valley, Narmada Bachao Andolan.

**Natural Resources:**

**Renewable and non-renewable resources:** Natural resources and associated problems.

a. **Forest resources**: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people.
b. **Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. **Mineral resources**: Use and exploitation, environmental effects of extracting and using mineral resources.
d. **Food resources**: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
e. **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
f. **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.

**UNIT II** **(8hrs)**

**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:
  a. Terrestrial Ecosystem
  b. Aquatic ecosystems

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**UNIT III** **(8hrs)**

**Biodiversity and its conservation:**

- Introduction – Definition: genetic, species and ecosystem diversity.
- Bio-Geographical 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-sports 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.

**UNIT IV** **(8hrs)**

**Environmental Pollution**

Definition:

- Cause, effects and control measures of
  - a ) Air pollution
  - b ) Water pollution
  - c ) Soil pollution
  - d) Marine pollution
  - e ) Noise pollution
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Diaster management : floods, earthquake, cyclone and landslides.

**UNIT V-**

**( 6 h r s ) 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.
- Green house effect and global warming, effects of acid rain and their remedial measures and ozone layer depletion.
- Ill-effects of fire works
- 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. Case studies.

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**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.

**Suggested Reading:**


1. Environmental Studies by Benny Joseph, Tata McGraw Hill, 2005.
2. Environmental Studies by Dr. D.L. Manjunath, Pearson Education, 2006.
3. Principles of Environmental Science and Engineering by P. Venugopal Rao, Prentice Hall of India.
4. Environmental Science and Engineering by Meenakshi, Prentice Hall of India.

**Integral University, Lucknow**
**Department of Biosciences**
**B.Sc. Zoology, Botany, Chemistry**

**B.Sc. ZBC 1 year** **II sem**
**Subject: Pteridophytes, Gymnosperms, Palaeobotany** **Subject Code: BS171**

**(w.e.f 2019-2020)**

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**UNIT I** **8**
General features of Pteridophytes, Classification, Stelar organization; Homospory and Heterospory; Economic importance and life cycle of pteridophytes with special reference to *Pteris.*

**UNIT II** **8**
Morphology, anatomy, development, vegetative and reproductive parts in Psilopsida - *Rhynia*; Lycopsida - *Selaginella*; Sphenopsida - *Equisetum*; Filicopsida - *Adiantum, Marsilea*.

**UNIT III** **8**
General characterstics of Gymnosperms, classification, resemblances and differences of Gymnosperms with Pteridophytes and Angiosperms. Economic importance and life Cycle with special reference to *Cycas*.

**UNIT IV** **8**
Morphology, anatomy, development, vegetative and reproductive parts in Coniferales – *Pinus.*

**UNIT V** **8**
Elementary Palaeobotany**:** General account, types of fossils, methods of fossilization and geological time scale.

**Suggested Reading:**


1. Smith G.M 1955, Cryptogamic Botany Vol.I and II, McGraw Hill.
2. Vashishta B.R 1990, Botany for Degree Students, Vol 1,2 and 3. S.Chand & Co.
3. Singh V., Pandey P.C and Jain D.K 1998, A Text book of Botany for Undergraduate
4. Parihar N.S 1967, An Introduction to Embryophyta Vol I & II, General Book Depot.
5. Sporne K.R 1976, Morphology of Pteridophytes, B1 Publications.
6. Sharma O.P: Text book of Pteridophyta II edition:McMillan India Ltd.
7. Bhatnagar, S.P. and Moitra1996. Gymnosperms. New Age International Limited, New Delhi.

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**Department of Biosciences**
**B.Sc. Zoology, Botany, Chemistry**

## B.Sc. PCM/ZBC 1 yr II Sem

**Subject Name: General Chemistry-II** **Subject Code: CH119**

**(w.e.f. 2019-2020)**

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**Unit-1 Inorganic Chemistry** **08**

**Ionic Solids:** Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule. Metallic bond-free electron, valence bond and band theories.

**Unit-2 Organic Chemistry** **08**

**Chemical Bonding:** Covalent Bond; Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to $NH^3$, $H_3O^+$, $SF_4$, $ClF_3$, $ICl_2$- and $H_2O$. MO theory, homonuclear and heteronuclear (CO and NO) diatomicmolecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

**Unit-3** **08**

**Introduction to Stereochemistry of organic Compounds:** Concept of isomerism. Optical isomers, enantiomers and diastereomers, chiral and achiral moecules with two stereogenic centres, absolute configuration, sequences rules, D & L and R & S systems of nomenclature. Geometrical isomerism - E & Z system of nomenclature, in alkenes oximes and cyclopropane derivative compounds.

**Unit-4 Physical Chemistry** **08**

**Colloidal State:** Definition of colloids, classification of colloids. Sols: properties -kinetic, optical and electrical; stability of colloids, protectivecolloids, Hardy- Schulze rule, gold number. Emulsions: types of emulsions, preparation. Gels: classification, preparation and properties

**Unit-5** **08**

**Thermodynamics** First law of thermodynamics: statement, definition of internal energy and enthalphy, Heat capacity. Heat capacities at constant volume and pressure and their relationship. Joule-Thomson coefficient and inversion temperature. Calculation of w,q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. Problems

**Suggested Redaings:**


1. New Concise Inorganic Chemistry by J.D. Lee Edition III Compton Printing Ltd London.
2. Principles of Inorganic Chemistry by HR Puri, R. Sharma & S.P. Jauhar, Vishal Publications Jalandhar.
3. Basic Inorganic Chemistry F.A. Cotton and G. Willkinson III Edition.
4. Organic Chemistry, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International).
5. Modern Organic Chemistry, M. K. Jain and S.C. Sharma, Vishal Publications Jalandhar.
6. Physical Chemistry, P.W. Atkins, Oxford University Press.

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**B.Sc. Zoology, Botany, Chemistry**

**B.Sc. ZBC 1 year** **II sem**
**Subject: Non Chordates-II "Annelida to Echinodermata"** **Subject Code: BS172**

**(w.e.f 2019-2020)**

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**UNIT I** **8**

**Annelida**: General characters and classification up to classes; *Nereis* and *Hirudinaria*: - Habits and Morphology; Metamerism in Annelida.

**UNIT II** **8**

**Arthropoda**: General characters and classification up to classes; *Palaemon*:-Habits andMorphology*, Apis*:-Colony; Metamorphosis in Insects.

**UNIT III** **8**

**Mollusca:** General characters and classification up to classes; *Lamellidens* and *Pila*:-Habits and Morphology, Torsion in Gastropods.

**UNIT IV** **8**

**Echinodermata**: General characters and classification up to classes; *Pentaceros*: - Habits and Morphology; Water-vascular system in Asteroidea.

**UNIT V** **8**

**Protochordates**: General features of Protochordata; General Characters of Hemichordata and Affinities of *Balanoglossus*.

**Suggested Reading:**


1. Biodiversity and Quality of Life. Sengupta. Mc Millan India Pvt. Ltd.
2. Biology: P. H. Raven& G. B. Jhonson
3. Barnes, B.D. (1987). Invertebrate Zoology. 5th Edition, Saunders College Publishing.
4. Kotpal, R. L. (1988). Protozoa. Rastogi Publications
5. Marshall, A.J. and Williams, W.D. (1979). Text Book of Zoology Vol. I-Invertebrates, Macmillan.
6.Noble, E. R. and Noble, G. A. (1982). Parasitology-The Biology of Animal Parasites, Lea and Febiger, Philadelphia.
**7.** Ruppert, E.E. and Barnes, R.D. (1994). Invertebrate Zoology. 6th Edition, Saunders College
Publishing.
8.Webb, J.E., Wallwork, J.A. and Elgood, J. H. (1981). Guide to Invertebrate Animals, English Language Book Society and Macmillan.

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**B.Sc. Zoology, Botany, Chemistry**

**B.Sc. ZBC 1 yr** **II sem**
**B.Sc. LS II yr** **IV/ II sem**
**Subject Name: Animal Physiology** **Subject Code: BS233**

**(w.e.f 2019-2020)**

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**UNIT I** **8**
**Digestion and absorption:** Role of salivary glands, liver, pancreas and intestinal glands. Digestion and absorption of carbohydrates, lipids and proteins.
**UNIT II** **8**
**Blood:** Composition of blood, blood cells, plasma proteins and Rh factor; Blood coagulation – mechanism and regulation.
Circulatory & Cardiovascular System: Heart and circulation; cardiac cycle.
**UNIT III** **8**
**Respiration:** Respiratory volumes, Haemoglobin and oxygen transport, carbon dioxide transport, Bohr's effect and chloride shift.
Excretion and osmoregulation: Structure of nephron, urine formation and its regulation ; excretory product.
**UNIT IV** **8**
**Muscle system:** Muscles and Movement, Skeletal, cardiac and smooth muscle.
Nervous system: central and peripheral nervous system, nerve impulse – its conduction and synaptic transmission, neurotransmitters.
**UNITV** **8**
**Endocrine system :** Endocrine glands and their functions; Nature of hormones; Regulation of hormone secretion; Mode of action of hormones.
**Reproductive system:** testis, ovary, Spermatogenesis, Oogenesis, Totipotency.

**Suggested Reading:**


1. Textbook of Medical Physiology by Guyton. A.C., H. Sanders Philadelphia. 1988.
2. Physiological basis of Medical practice, West J.B., Best and Taylor.
3. Introduction to Physiology by Davidson H and Segal M.B. Academic Press.
4. Fox S I – Human Physiology, (McGraw Hill, 1998, ISBN: 0071157069)
5. Moffett D and Schauf C L – *Human Physiology: Foundations & Frontiers*, (Mosby, 1993, ISBN: 801669030)
6. Seeley R, Stephens T and Tate P – *Anatomy & Physiology*, (McGraw-Hill, 1999, ISBN: 0071169881)
7. Sherwood L – Human Pysiology*: From Cells to Systems*, (Wadsworth Publishing, 2000,ISBN: 0534568262)

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**B.Sc. Zoology, Botany, Chemistry**

**PRACTICALS**

**B.Sc. ZBC 1 yr** **II sem**
**Subject Name: Plant Diversity Lab-I** **Subject Code: BS174**

**(w.e.f 2019-2020)**

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**1.** Transverse section of dicot and monocot roots
**2.** Transverse section of dicot and monocot stems
**3.** Transverse section of dicot and monocot leaves
**4.** Study of one example each of algae and fungi
**5.** Study of one example each of bryophyte, pteriodophyte, gymnosperm
**6.** Morphology study of flower parts, inflorescence, seed, fruit types

**B.Sc. PCM/ZBC 1 yr** **II Sem**
**Subject Name: Chemistry Practical-II** **Subject Code: CH120**

**L T P 0 0 4**

## List of Experiments

1. To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
2. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber Cycle.
3. To determine the heat of solution of $KNO_3$ by solubility method.
4. Estimation of hardness of water by EDTA.
5. Determination of R*f* values and identification of organic compounds

(a)Separation of green leaf pigments (spinach leaves may be used).

(b) Preparation of separation of 2, 4-dinitrophenylhydrazones of acetone, 2-butanone, hexan-2, and 3-one using toluene and light petroleum (40:60).

6. Determination of R*f* values and identification of organic compounds:Separation of a mixture of D, L – alanine, glycine, and L-Leucine using nbutanol: acetic acid:water (4:1:5), Spray reagent – ninhydrin.