

## **BACHELOR OF SCIENCE BACHELOR OF EDUCATION (ZBC) – FIRST SEMESTER**

<b>First Semester</b>			
<b>S. No.</b>	<b>Name of Subject</b>	<b>Credits</b>	<b>Total Marks</b>
1	English	3	100
2	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons	4	100
3	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons Lab	3	100
4	Biodiversity (Microbes, Algae, Fungi and Archegoniate)	4	100
5	Biodiversity (Microbes, Algae, Fungi and Archegoniate) Lab	3	100
6	Animal Diversity	4	100
7	Animal Diversity Lab	3	100
8	Childhood and Growing Up	4	100
<b>Total</b>		<b>28</b>	

**Subject Name:** ENGLISH

**Unit 1: English Grammar**

- 1. An Introduction to Part of Speech :** Verb, Tenses, Voice, Direct and Indirect Forms of Speech.
2. Prepositions
3. List of Appropriate Preposition Used
4. Sentence
5. Synthesis of Sentences
6. Transformation of Sentences
7. Syntax
8. Punctuation
9. **Vocabulary :** Antonyms and Synonyms, Similar Words Distinguished, One Word Substitutions, More about words, Idioms & Phrases, Idioms.
10. **Common Error :** Some fundamental Rules for Correction, Sentences with error.
11. Comprehension

**Unit 2 : Composition**

1. Paragraph Writing
2. Letter writing

### 3. Essay Writing

### 4. The Essays

**Subject Name:** ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS

**Atomic Structure:** Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.

What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of  $\psi$  and  $\psi^2$ , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers  $m_l$  and  $m_s$ . Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number ( $m_s$ ).

Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

### Chemical Bonding and Molecular Structure

**Ionic Bonding:** General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

**Covalent bonding:** VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.

Concept of resonance and resonating structures in various inorganic and organic compounds. MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s-p mixing) and heteronuclear diatomic molecules such as CO, NO and  $\text{NO}^+$ . Comparison of VB and MO approaches.

### Fundamentals of Organic Chemistry

Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.

Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals.

Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule

### Stereochemistry

Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; *cis - trans* nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems)

### Aliphatic Hydrocarbons

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

**Alkanes:** (Upto 5 Carbons). *Preparation:* Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* Free radical Substitution: Halogenation.

**Alkenes:** (Upto 5 Carbons) *Preparation:* Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); *cis* alkenes (Partial catalytic hydrogenation) and *trans* alkenes (Birch reduction). *Reactions:* *cis*-addition (alk. KMnO<sub>4</sub>) and *trans*-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation.

**Alkynes:** (Upto 5 Carbons) *Preparation:* Acetylene from CaC<sub>2</sub> and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.

*Reactions:* formation of metal acetylides, addition of bromine and alkaline KMnO<sub>4</sub>, ozonolysis and oxidation with hot alk. KMnO<sub>4</sub>

### Reference Books:

1. Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3<sup>rd</sup> ed., Wiley.
3. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
4. Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Education India, 2006.
5. Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, John Wiley & Sons (2014).
6. McMurry, J.E. *Fundamentals of Organic Chemistry*, 7<sup>th</sup> Ed. Cengage Learning India Edition, 2013.
7. Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
8. Eliel, E.L. *Stereochemistry of Carbon Compounds*, Tata McGraw Hill education, 2000.
9. Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
10. Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
11. Bahl, A. & Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.

**Subject Name:** ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS-LAB

### Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with KMnO<sub>4</sub>.
3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO<sub>4</sub>.
4. Estimation of Fe (II) ions by titrating it with K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> using internal indicator.
5. Estimation of Cu (II) ions iodometrically using Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>

### Organic Chemistry

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)

2. Separation of mixtures by Chromatography: Measure the R<sub>f</sub> value in each case (combination of two compounds to be given)
  - (a) Identify and separate the components of a given mixture of two amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography
  - (b) Identify and separate the sugars present in the given mixture by paper chromatography.

**Reference Books:**

- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G.,
- *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.

**Subject Name:** BIODIVERSITY (MICROBES, ALGAE, FUNGI AND ARCHEGONIATE)

**Unit 1: Microbes**

Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

**Unit 2: Algae**

General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: Nostoc, Chlamydomonas, Oedogonium, Vaucheria, Fucus, Polysiphonia. Economic importance of algae.

**Unit 3: Fungi**

Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of Rhizopus (Zygomycota) Penicillium, Alternaria (Ascomycota), Puccinia, Agaricus (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance

**Unit 4: Introduction to Archegoniate**

Unifying features of archegoniate, Transition to land habit, Alternation of generations.

**Unit 5: Bryophytes**

General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of Marchantia and Funaria. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of Sphagnum.

**Unit 6: Pteridophytes**

General characteristics, classification, Early land plants (Cooksonia and Rhynia). Classification (up to family), morphology, anatomy and reproduction of Selaginella, Equisetum and Pteris. (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economical importance of Pteridophytes.

## **Unit 7: Gymnosperms**

General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of Cycas and Pinus. (Developmental details not to be included). Ecological and economical importance.

**Subject Name:** BIODIVERSITY (MICROBES, ALGAE, FUNGI AND ARCHEGONIATE) LAB

### **Practical**

1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.
2. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
3. Gram staining 8. Study of vegetative and reproductive structures of Nostoc, Chlamydomonas (electron micrographs), Oedogonium, Vaucheria, Fucus\* and Polysiphonia through temporary.

**Subject Name:** ANIMAL DIVERSITY

**&**

**Subject Name:** ANIMAL DIVERSITY LAB

### **Unit 1. Protista**

General characters of Protozoa; Life cycle of Plasmodium

### **Unit 2. Porifera**

General characters and canal system in Porifera

### **Unit 3. Radiata**

General characters of Cnidarians and polymorphism

### **Unit 4. Aceolomates**

General characters of Helminthes; Life cycle of Taenia solium

### **Unit 5. Pseudocoelomates**

General characters of Nemethehelminthes; Parasitic adaptations

### **Unit 6. Coelomate Protostomes**

General characters of Annelida ; Metamerism.

### **Unit 7. Arthropoda**

General characters. Social life in insects.

### **Unit 8. Mollusca**

General characters of mollusca; Pearl Formation

### **Unit 9. Coelomate Deuterostomes**

General characters of Echinodermata, Water Vascular system in Starfish.

### **Unit 10. Protochordata**

Salient features

### **Unit 11. Pisces**

Osmoregulation, Migration of Fishes

### **Unit 12. Amphibia**

General characters, Adaptations for terrestrial life, parental care in Amphibia.

### **Unit 13.**

Amniotes; Origin of reptiles. Terrestrial adaptations in reptiles.

### **Unit 14. Aves:**

The origin of birds; Flight adaptations

### **Unit 15. Mammalia**

Early evolution of mammals; Primates; Dentition in mammals.

### **PRACTICAL**

1. Study of following specimens:

Non Chordates: Euglena, Noctiluca, Paramecium, Sycon, , Physalia, Tubipora, Metridium, Taenia, Ascaris, Nereis, Aphrodite, Leech, Peripatus, Limulus, , Hermitcrab, Daphnia, Millipede, Centipede, Beetle, Chiton, Dentalium, Octopus, Asterias, and Antedon. Chordates: Balanoglossus, Amphioxus, Petromyzon, Pristis, Hippocampus, Labeo, Ichthyophis/Uraeotyphlus, Salamander, Rhacophorus Draco, Uromastix, Naja, Viper, model of Archaeopteryx, any three common birds-(Crow, duck, Owl), Squirrel and Bat.

2. Study of following Permanent Slides:

Cross section of Sycon, Sea anemone and Ascaris (male and female). T. S. of Earthworm passing through pharynx, gizzard, and typhlosolar intestine. Bipinnaria and Pluteus larva.

3. Temporary mounts of

- Septal & pharyngeal nephridia of earthworm.
- Unstained mounts of Placoid, cycloid and ctenoid scales.

4. Dissections of

- Digestive and nervous system of Cockroach.
- Urinogenital system of Rat

### **SUGGESTED BOOKS**

- Barnes, R.D. (1992). Invertebrate Zoology. Saunders College Pub. USA.
- Ruppert, Fox and Barnes (2006) Invertebrate Zoology. A functional Evolutionary Approach 7th Edition, Thomson Books/Cole
- Campbell & Reece (2005). Biology, Pearson Education, (Singapore) Pvt. Ltd.
- Kardong, K. V. (2002). Vertebrates Comparative Anatomy. Function and Evolution. Tata McGraw Hill Publishing Company. New Delhi.
- Raven, P. H. and Johnson, G. B. (2004). Biology, 6th edition, Tata McGraw Hill Publications. New Delhi.

## **Subject Name: CHILDHOOD AND GROWING UP**

### **Unit 1: Learner as a Developing Individual**

- Growth and Development
- Developmental Influences: Development as a resultant of interactions between individual potential (innate, acquired) and external environment (physical, socio-cultural, ecological, economic and technological). Nature and nurture, continuity and discontinuity issues, growth and maturation. (The focus is on understanding the key cognitive and affective processes influencing the development of the learner and their applications in classroom teaching. The innate and environmental influences shaping development would help foster an understanding of learner as a situated individual).

### **Unit 2: Development and Learning**

- Meaning and principles of development, relationship between development and learning.
- Dimensions of individual development: physical, cognitive, language, affective, social and moral, their interrelationships and implications for teachers (relevant ideas of Piaget, Erikson and Kohlberg).
- Stages of development—developmental tasks with focus on processes growth and development across various stages from infancy to post adolescence.
- Meaning of 'cognition' and its role in learning.
- Socio-cultural factors influencing cognition and learning.
- Facilitating holistic development (for self and society).

(The focus is on understanding the key concepts of development and cognition, different stages and dimensions of development and their applications in teaching–learning contexts).

### **Unit 3: Understanding Childhood in Socio Cultural Perspectives**

- Concept of Childhood (Criticality of the misperception that childhood is a homogenous entity).
- Childhood across cultures and societies (examining children perspectives, experiences and actions in which they construct and re constructs their lives).
- Impact of diversity, differences, marginalisation on childhood.
- Childhood in difficult circumstances (jail, war affected families; conflict situation, very poor families; urban slum), growing up as girls, growing up in dalit /tribal households etc.

### **Unit 4: Understanding Adolescence: Issues and Concerns**

- Realistic and contextual frames of growing up in Adolescence
  - Cultural differences and Adolescence
  - Impact of economic changes and urbanisation
  - Impact of Media
  - Adolescence in difficult circumstances
- Issues and Concerns
  - Problems of adjustment
  - Understanding of emotional disturbance and risk behaviour
  - Identity Crisis
  - Parent child conflict
  - Drug addiction and Abuse
  - Bullying
  - Juvenile delinquency
  - Health awareness –personal hygiene, nutrition, disease prevention and control.

### **Unit 5: Understanding Stages of Child Development Implications for Teachers**

- Need of understanding Human development in the classroom.

- Problems resulting from lack of understanding of Human development.
- Promoting development of all children in the classroom (Positive classroom environment; social and emotional wellbeing of all children; addressing diversity and equality).

The student teacher will read about childhood from diverse contexts through biographies, stories, narrations of growing up in different cultures, children's diaries and the media. They will be used as a resource themselves and their own experiences will be utilized in classroom discussions.

The student teachers will observe children in their natural settings, especially at play or in a community setting and to interact with children through activities.

### **Practicum**

1. Observe children during their playtime in your practicing school (or nearby school) for a week; observe their play activities, relationships, communication with their peers. On the basis of that prepare a report about understanding childhood.
2. Prepare a case study of a girl child from a minority community or a dalit household or a tribal community.
3. Observe and interact with ten adolescent children living in different contexts (rural areas, urban slum, dalit household, urban area, and working/street people) and compare their characteristics and problems.
4. View any two movies out of the following
  1. Smile Pinky (2008)
  2. Born into Brothels (2014)
  3. Salaam Bombay (1988)
  4. Slumdog Millionaire (2009)
  5. Gippie (2013)

Discuss their content, picturization, characters in the context of issues and concerns of childhood/adolescence
5. Collect five stories that children are told by elders from nearby community.

### **Suggested Readings**

- Cole, M and Cole, S (1989). *The Development of Children*, Scientific American Books, New York
- Huslok, E.B. (2003). *Child Growth and Development*, Tata Mc Graw Hill
- Kakkar, S (1978). *The Inner World: A Psychoanalytic Study of Childhood and Society in India*. Oxford University Press, New Delhi
- Mishra, A (2007), Everyday Life in a Slum in Delhi. In D.K. Behera (Ed.0. *Childhood in South Asia*. New Delhi: Pearson Education India
- Nambissan, G.B. (2009). *Exclusion and Discrimination in Schools: Experiences of Dalit Children*. Indian Institute of Dalit Students and UNICEF
- Parry, J. (2005). Changing Childhoods in Industrial Chattisgarh. In R. Chopra and P. Jeffery (Eds), *Educational regimes in Contemporary India*. Sage
- Piaget, J. (1997). Development and Learning. In M. Gauvain and M. Cole (Eds), *Readings on the development of children*. New York: WH Freeman and Company
- Saraswathi, T.S. (1999). Adult-Child Continuity in India: Is Adolescence a myth or an emerging reality? In T.S. Saraswathi (Ed), *Culture, Socialisation and Human Development: Theory, research and applications in India*. New Delhi. Sage
- Sharma, N (2011). *Understanding Adolescence*, MBT India
- Singh, A (Ed), (2015). *Human Development: A Life Span Approach*. Orient Black Swan, Delhi