D.M.S.Mandal's
BHAURAO KAKATKAR COLLEGE, BELGAUM

DEPARTMENT OF CHEMISTRY
PROGRAMME OUTCOMES AND COURSE OUTCOMES
ACADEMIC YEAR 2022-23

PROGRAMME OUTCOME

B.Sc.(Sem. I-IV) (Hons.) Chemistry (A.Y.2022-23)

The B.Sc. (Hons.) programme in Chemistry is designed to develop in students in depth knowledge of thecore concepts and principles that are central to the understanding of this core science discipline. Undergraduates pursuing this programme of study go through laboratory work that specifically develop their quantitative and qualitative skills, provides opportunities for critical thinking and team work, and exposes them to techniques useful for applied areas of scientific study.

1. **Knowledge: Width and depth:** Students acquire theoretical knowledge and understanding of the fundamental concepts, principles and processes in main branches of chemistry, namely, organic, inorganic, physical, spectroscopy, analytical and biochemistry. In depth understanding is the outcome of transactional effectiveness and treatment of specialized course contents. Width results from the choice of electives that students are offered.

2. **Laboratory SkillsQuantitative, analytical and instrument based:** A much valued learning outcome of this programme is the laboratory skills that students develop during the course. Quantitative techniques gained through hands on methods opens choice of joining the industrial laboratory work force early on. The programme also provides ample training in handling basic chemical laboratory instruments and their use in analytical and biochemical determinations. Undergraduates on completion of this programme can cross branches to join analytical, pharmaceutical, material testing and biochemical labs besides standard chemical laboratories.

3. **Communication:** Communication is a highly desirable attribute to possess. Opportunities to enhance students' ability to write methodical, logical and precise reports are inherent to the structure of the programme. Techniques that effectively communicate scientific chemical content to large audiences are acquired through oral and poster presentations and regular laboratory report writing.

4. **Capacity Enhancement:** Modern day scientific environment requires students to possess ability to think independently as well as be able to work productively in groups. This requires some degree of balancing. The chemistry honours programme course is designed to take care of this important aspect of student development through effective teaching learning process.

5. **Portable Skills:** Besides communication skills, the programme develops a range of portable or transferable skills in students that they can carry with them to their new work environment after completion of chemistry honours programme. These are problem solving, numeracy and mathematical skills- error analysis, units and conversions, information retrieval skills, IT skills and organizational skills. These are valued across work environments.

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COURSE OUTCOMES:

Chemistry as Discipline Specific Course (DSC) B.Sc. Semester –I& II

1. Describe the dual nature of radiation and matter; dual behaviour of matter and radiation, de Broglie's equations, Heisenberg Uncertainty principle and their related problems.

2. Electronic configurations of the atoms.

3. Define periodicity, explain the cause of periodicity in properties, and classify the elements into four categories according to their electronic configuration.

4. Define atomic radii, ionisation energy, electron affinity and electronegativity, discuss the factors affecting atomic radii, describe the relationship of atomic radii with ionisation energy and electron affinity, describe the periodicity in atomic radii, ionization energy, electron affinity and electronegativity.

5. Explain bond properties, electron displacement effects (inductive effect, electrometric effect, resonance effect and Hyper conjugation effect). Steric effect and their applications in explaining acidic strength of carboxylic acids, basicity of amines.

6. Understand basic concept of organic reaction mechanism, types of organic reactions, structure, stability and reactivity of reactive intermediates.

7. Describe important characteristics of configurationally and conformational isomers. Practice and write conformational isomers of ethane, butane and cyclohexane.

8. Understand the various concepts of geometrical isomerism and optical isomerism. Describe CIP rules to assign E,Z notations and R& S notations. Explain D and L configuration and threo and erythro nomenclature.

9. Explain racemic mixture and racemisation, resolution of racemic mixture through mechanical separation, formation of diastereomers, and biochemical methods, biological significance of chirality.

10. Explain the existence of different states of matter in terms of balance between intermolecular forces and thermal energy of the particles. Explain the laws governing behavior of ideal gases and real gases. Understand cooling effect of gas on adiabatic expansion.

11. Describe the conditions required for liquefaction of gases. Realise that there is continuity in gaseous and liquid state.

12. Explain properties of liquids in terms of intermolecular attractions.

13. Understand principles of titrimetric analysis.

14. Understand principles of different type's titrations. Titration curves for all types of acids – base titrations.

15. Gain knowledge about balancing redox equations, titration curves, theory of redox indicators and applications.

16. Understand titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences.

OEC-1 Chemistry

1. Understand the chemical constituents in various day today materials using by a common man.
2. Understand the chemical constituents in fertilizers, insecticides and pesticides, chemical explosives
3. Understand the chemical constituents in polymers, surface coatings etc.

OEC-2 Chemistry

After studying this paper the student would be able to

1. Acquire knowledge about different types of sugars and their chemical structures.
2. Identify different types of amino acids and determine the structure of peptides.
3. Explain the actions of enzymes in our body and interpret enzyme inhibition.
4. Predict action of drugs. Depict the biological importance of oils and fats. Importance of lipids in the metabolism Differentiate RNA and DNA and their replication. Explain production of energy in our body.

Sem IV

Course Specific Outcomes

After the completion of this course, the student would be able to

1. Understand the importance of fundamental law and validation parameters in chemical analysis
2. Know how different analytes in different matrices (water and real samples) can be determined by spectrophotometric nephelometric and turbidometric methods.
3. Understand the requirement for chemical analysis by paper, thin layer and column chromatography.
4. Apply solvent extraction method for quantitative determination of metal ions in different samples
5. Utilize the ion-exchange chromatography for domestic and industrial applications
6. Explain mechanism for a given reaction.
7. Predict the probable mechanism for a reaction. explain the importance of reaction intermediates, its role and techniques of generating such intermediates 8. Explain the importance of Stereochemistry in predicting the structure and property of organic molecules.
9. Predict the configuration of an organic molecule and able to designate it.
10. Identify the chiral molecules and predict its actual configuration.

OEC SEM III:

After studying this paper the student would be able to

1. Acquire knowledge about different types of sugars and their chemical structures.
2. Identify different types of amino acids and determine the structure of peptides. 3. Explain the actions of enzymes in our body and interpret enzyme inhibition. 4. Predict action of drugs. Depict the biological importance of oils and fats. Importance of lipids in the metabolism Differentiate RNA and DNA and their replication. Explain production of energy in our body.

Course outcomes:

After the completion of this course, the student would be able to

1. Predict the nature of the bond formed between different elements
2. Identify the possible type of arrangements of ions in ionic compounds
3. Write Born-Haber cycle for different ionic compounds
4. Relate different energy parameters like, lattice energy, entropy, enthalpy and solvation energy in the dissolution of ionic solids
5. Explain covalent nature in ionic compounds
6. Write the M.O. energy diagrams for simple molecules
7. Differentiate bonding in metals from their compounds
8. Learn important laws of thermodynamics and their applications to various thermodynamic systems
9. Understand adsorption processes and their mechanisms and the function and purpose of a catalyst.
10. Apply adsorption as a versatile method for waste water purification.
11. Understand the concept of rate of a chemical reaction, integrated rate equations, energy of activation and determination of order of a reaction based on experimental data

Open Elective:

Electrochemistry, Corrosion and Metallurgy

Expected Course Outcomes Upon completion of the course students will be able to

1. Understand the concept of conductance in electrolytic solutions, electrolysis and redox reactions involved in electrode reactions.
2. Learn the different types of electrochemical cells, their symbolical representation and application of electrochemical series.
3. Apply conductometric, potentiometric and pH titrations
4. Know the principle, construction and working of batteries
5. Understand different types of corrosion and its prevention by different methods
6. Learn the methods of extraction of metals from their ores and purification

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