# Council of Higher Secondary Education, Odisha

## BFC
## PHYSICS (Rationalised)
## Class XI-XII

Higher Secondary stage of school education is a transition from general education to discipline-based focus on curriculum. The present updated syllabus keeps in view the rigor and depth of disciplinary approach as well as the comprehension level of learners. Due care has also been taken that the syllabus is comparable to the international standards. Salient features of the syllabus include:

- Emphasis on basic conceptual understanding of the content.
- Emphasis on use of SI units, symbols, nomenclature of physical quantities and formulations as per international standards.
- Providing logical sequencing of units of the subject matter and proper placement of concepts with their linkage for better learning.
- Reducing the curriculum load by eliminating overlapping of concepts/content within the discipline and other disciplines.
- Promotion of process-skills, problem-solving abilities and applications of Physics concepts.

**Besides, the syllabus also attempts to**

- Strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject.
- Expose the learners to different processes used in Physics-related industrial and technological applications.
- Develop process-skills and experimental, observational, manipulative, decision making and investigatory skills in the learners.
- Promote problem solving abilities and creative thinking in learners.
- Develop conceptual competence in the learners and make them realize and appreciate the interface of Physics with other disciplines.

**PHYSICS**
**COURSE STRUCTURE**
**Class XI – 2023-24 (Theory)**

**Time: 3 hrs.**                                      **Max Marks: 70**

| Unit | Topics | No. of periods | Mark |
|------|--------|:---:|:---:|
| **Unit–I** | **Physical World and Measurement** | | |
| | Chapter–2: Units and Measurements | **04** | |
| **Unit-II** | **Kinematics** | | |
| | Chapter–3: Motion in a Straight Line | **18** | |
| | Chapter–4: Motion in a Plane | | **20** |
| **Unit–III** | **Laws of Motion** | | |
| | Chapter–5: Laws of Motion | **08** | |
| **Unit–IV** | **Work, Energy and Power** | | |
| | Chapter–6: Work, Energy and Power | **08** | |
| **Unit–V** | **Motion of System of Particles and RigidBody** | **10** | |
| | Chapter–7: System of Particles and Rotational Motion | | **20** |
| **Unit-VI** | **Gravitation** | | |
| | Chapter–8: Gravitation | **12** | |
| **Unit–VII** | **Properties of Bulk Matter** | | |
| | Chapter–9: Mechanical Properties of Solids | | |
| | Chapter–10: Mechanical Properties of Fluids | **18** | |
| | Chapter–11: Thermal Properties of Matter | | |
| **Unit–VIII** | **Thermodynamics** | | **20** |
| | Chapter–12: Thermodynamics | **12** | |
| **Unit–IX** | **Behaviour of Perfect Gases and Kinetic Theory of Gases** | **08** | |
| | Chapter–13: Kinetic Theory | | |
| **Unit–X** | **Oscillations and Waves** | | |
| | Chapter–14: Oscillations | **16** | **10** |
| | Chapter–15: Waves | | |
| **Total** | | **90** | **70** |

**Unit I:**    **Physical World and Measurement**          **04 Periods**
             **Chapter–2: Units and Measurements**

Need for measurement: Units of measurement; systems of units; SI units, Dimensions of physical quantities,

**Unit II:**    **Kinematics**          **18 Periods**
             **Chapter–3: Motion in a Straight Line**

Frame of reference, Motion in a straight line, uniform and non- uniform motion, and instantaneous velocity, uniformly accelerated motion, velocity~time and position~time graphs. Relation between associated physical quantities .

**Chapter–4: Motion in a Plane**

Scalar and vector quantities; position and displacement vectors, general vectors and their notations; equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors, unit vector; resolution of a vector in a plane, rectangular components, Scalar and Vector product of vectors.
Motion in a plane:- Cases of uniform velocity and uniform acceleration, projectile motion, uniform circular motion.

**Unit III:**    **Laws of Motion**          **08 Periods**
             **Chapter–5: Laws of Motion**

Intuitive concept of force, Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion.
Law of conservation of linear momentum and its applications.
Equilibrium of concurrent forces, static and kinetic friction, laws of friction, rollingfriction, lubrication.
Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on a level circular road, vehicle on a banked road).

**Unit IV:**    **Work, Energy and Power**          **07 Periods**
             **Chapter–6: Work, Energy and Power**

Work done by a constant force and a variable force; Derivation by Graphical Method; kinetic energy, work- energy theorem, power.
Notion of potential energy, collisions in one dimensions.

**Unit V:**    **Motion of System of Particles and Rigid Body**          **10 Periods**

### Chapter–7: System of Particles and Rotational Motion

Centre of mass of a two-particle system, momentum conservation and
Centre of mass motion.
Moment of a force, torque, angular momentum, law of conservation of angular
momentum and its applications.
Moment of inertia, radius of gyration, values of moments of inertia for simple
geometrical objects (no derivation).

**Unit VI:    Gravitation                                            12 Periods**
### Chapter–8: Gravitation

Kepler's laws of planetary motion, universal law of gravitation. Acceleration due
to gravity and its variation with altitude and depth. Gravitational potential
energy and gravitational potential, escape speed, orbital velocity of a satellite.

**Unit VII:    Properties of Bulk Matter                             18 Periods**
### Chapter–9: Mechanical Properties of Solids

Elasticity: Stress-strain diagram, Hooke's law, Young's modulus, bulk modulus,
shear modulus of rigidity (qualitative idea  only), Poisson's ratio.

### Chapter–10: Mechanical Properties of Fluids

Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift
and hydraulic brakes),
Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical
velocity, Bernoulli's theorem and its simple applications.
Surface energy and surface tension.

### Chapter–11: Thermal Properties of Matter                          06 Periods

Heat, Temperature, Thermal expansion: thermal expansion of solids, liquids and
gases, anomalous expansion of water; specific heat capacity; $C_P$, $C_V$,
calorimetry; change of state: idea & definition of latent heat.

**Unit VIII: Thermodynamics                                          12 Periods**
### Chapter–12: Thermodynamics

Thermal equilibrium and definition of temperature, zeroth law of
thermodynamics, heat, work and internal energy. First law of thermodynamics,
Second law of thermodynamics: gaseous state of matter, change of condition
of gaseous state: isothermal, adiabatic, reversible, irreversible, and cyclic
processes.

**Unit IX:  Behavior of Perfect Gases and Kinetic Theory of Gases          07 PeriodsChapter–13: Kinetic Theory**

Equation of state of a perfect gas, work done in compressing a gas.
Kinetic theory of gases: assumptions, concept of pressure. kinetic interpretation of temperature; rms speed of gas molecules; degrees of freedom, law of equi-partition of energy (statement only) and application to specific heat capacities of gases.

**Unit X:    Oscillations and Waves                                        16 Periods**
**Chapter–14: Oscillations**

Periodic motion: time period, frequency, displacement as a function of time, periodic functions and their applications.
Simple Harmonic Motion (SHM) ; Simple Pendulum and it's time period.
**Chapter–15: Waves**

Wave motion: Transverse and longitudinal waves, speed of travelling wave, displacement relation for a progressive wave, principle of superposition of waves.

**PRACTICALS**

**Total Periods: 60**

The fair practical records are to be submitted by the students at the time of their annual examination. At least 08 experiments are required to be performed by each student.

**EVALUATION SCHEME**

**Time: 3 hours**                                                      **Max. Marks: 30**

| Topic | Marks |
|---|---|
| One experiment from the list of experiments outlined below <br> **Theory (2 marks) , Observation/Graph/Circuit diagram/Ray diagram (10 marks) , Calculation & Conclusion (3 marks)** | 15 (02+10+03) |
| Practical record | 04 |
| Experiment based conceptual question | 05 |
| Viva on experiments | 06 |
| **Total** | **30 marks** |

**Experiments**

1. To measure the diameter of a small spherical / cylindrical body and to measure internal diameter and depth of a given beaker / calorimeter using Vernier Callipers and hence to find their volumes.
2. To measure the diameter of a given wire and thickness of a given sheet using Screw gauge.
3. To determine the volume of an irregular lamina by using a screw gauge.
4. To determine the radius of curvature of a given spherical surface by a spherometer.
5. To determine the mass of two different objects by using a beam balance.
6. To find the weight of a given body by using parallelogram law of addition of vectors.
7. Using a simple pendulum, plot $L \sim T^2$ graph and use it to find the effective length of second's pendulum.
8. To study the variation of time period of a simple pendulum of a given length by taking bobs of same size but different masses and interpret the result.
9. To study the relationship between force of limiting friction and normal reaction and to find the co- efficient of friction between a block and a horizontal surface.
10. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination $\theta$ by plotting graph between force and $\sin\theta$.
11. To determine Young's modulus of elasticity of the material of a given wire.
12. To find the force constant of a helical spring by plotting a graph between load and extension.
13. To determine the surface tension of water by capillary rise method.
14. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
15. To determine specific heat capacity of a given solid by method of mixtures.
16. To study the relation between frequency and length of a given wire under constant tension by using a sonometer.
17. To study the relation between the length of a given wire and tension for constant frequency by using a sonometer.
18. To find the speed of sound in air at room temperature by using a resonance tube at two resonance positions.

**Practical Examination for Visually Impaired students**
**Class XI**

**Note:** Same Evaluation scheme and general guidelines for visually impaired students as given for Class XII may be followed.

**A.  Items for Identification/Familiarity of the apparatus for assessment in practical's (all experiments)**

Spherical ball, Cylindrical objects, vernier calipers, beaker, calorimeter, Screw gauge, wire, Beam balance, spring balance, weight box, gram and milligram weights, forceps,

Parallelogram law of vectors apparatus, pulleys and pans used in the same 'weights' used, Bob and string used in a simple pendulum, meter scale, split cork, suspension arrangement, stop clock/stop watch, Helical spring, suspension arrangement used, weights, arrangement used for measuring extension, Sonometer, Wedges, pan and pulley used in it, 'weights' Tuning Fork, Meter scale, Beam balance, Weight box, gram and milligram weights, forceps, Resonance Tube, Tuning Fork, Meter scale, Flask/Beaker used for adding water.

## B. List of Practicals

1. To measure diameter of a small spherical/cylindrical body using a vernier calipers.
2. To measure the internal diameter and depth of a given beaker/calorimeter using a vernier calipers and hence find its volume.
3. To measure diameter of given wire using a screw gauge.
4. To measure thickness of a given sheet using a screw gauge.
5. To determine the mass of a given object using a beam balance.
6. Using a simple pendulum plot $L\sim T^2$ graph; hence find the effective length of second's pendulum using appropriate length values.
7. To find the weight of given body using the parallelogram law of vectors.
8. To find the force constant of given helical spring by plotting a graph betweenload and extension.
9 (i) To study the relation between frequency and length of a given wireunder constant tension using a sonometer.

   (ii) To study the relation between the length of a given wire and tension, for constant frequency by using a sonometer.

10. To find the speed of sound in air, at room temperature, using a resonance tube, by observing two resonance positions.

**Note:** Above practicals may be performed in an experiential manner rather than recording the observations.

## Prescribed Books:

1. Physics Part-I, Textbook for Class XI, Published by NCERT
2. Physics Part-II, Textbook for Class XI, Published by NCERT
3. Laboratory Manual of Physics, Class XI Published by NCERT
4. The list of other related books and manuals brought out by NCERT (consider multimedia also).
5. Bureau's Higher Secondary (+2) Physics , Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar

**PHYSICS (Rationalised)**
**(THEORY)**

**Time: 3 hrs.**                                                          **Max Marks: 70**

| Unit | Topics | No. of periods | Mark |
|------|--------|----------------|------|
| Unit–I | **Electrostatics** | | |
| | Chapter–1: Electric Charges and Fields | 16 | 20 |
| | Chapter–2: Electrostatic Potential and Capacitance | | |
| Unit-II | **Current Electricity** | | |
| | Chapter–3: Current Electricity | 15 | |
| Unit-III | **Magnetic Effects of Current and Magnetism** | | |
| | Chapter–4: Moving Charges and Magnetism | 18 | |
| | Chapter–5: Magnetism and Matter | | 17 |
| Unit-IV | **Electromagnetic Induction and Alternating Currents** | | |
| | Chapter–6: Electromagnetic Induction | 12 | |
| | Chapter–7: Alternating Current | | |
| Unit–V | **Electromagnetic Waves** | | |
| | Chapter–8: Electromagnetic Waves | 04 | |
| Unit–VI | **Optics** | | 18 |
| | Chapter–9: Ray Optics and Optical Instruments | 12 | |
| | Chapter–10: Wave Optics | | |
| Unit–VII | **Electronic Devices** | | |
| | Chapter–14: Semiconductor Electronics: Materials, Devices and Simple Circuits | 16 | 15 |
| **Total** | | **90** | **70** |

**Unit I:**   **Electrostatics**                                                          **16 Periods**
**Chapter–1: Electric Charges and Fields**

Electric charges, Conservation of charge, Coulomb's law: electrostatic force between two point charges.

Electric field: electric field intensity, electric field (intensity) due to a point charge, electric field lines.

### Chapter–2: Electrostatic Potential and Capacitance

Electric potential, potential difference, due to a point charge, electric potential energy of a system of two-point charges and of electric dipole in   an electric field.
Conductors and insulators, free charges and bound charges inside a conductor. Capacitors and capacitance, combination of capacitors in series and in parallel, energy stored in a capacitor (no derivation, formulae only), colour code of capacitor.

**Unit II:     Current Electricity                                        15 Periods**
### Chapter–3: Current Electricity

Electric current, flow of electric charges in a metallic conductor,  drift velocity, Ohm's law, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity, temperature dependence  of resistance, internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's rules, Wheatstone bridge.(No Derivation) , Colour code of Resistors

**Unit III:   Magnetic Effects of Current and Magnetism                          18 Periods**
### Chapter–4: Moving Charges and Magnetism

Concept of magnetic field, Oersted's experiment. Biot - Savart law and its application to find the magnetic field near a current carrying circular loop. Ampere's law and its applications to to find the magnetic field near an infinitely long straight wire carrying current. Straight solenoid (only qualitative treatment).
Force on a moving charge in uniform magnetic and electric fields. Force on a current-carrying conductor in a uniform magnetic field, definition of ampere, Moving coil galvanometer.

### Chapter–5: Magnetism and Matter

Bar magnet: bar magnet as an equivalent solenoid (qualitative treatment only), magnetic field intensity due to a  (bar magnet) along its axis and perpendicular to its axis (qualitative treatment only), torque on a magnetic dipole (bar magnet) in a uniform magnetic field (qualitative treatment only), magnetic field lines.
Magnetic properties of materials- dia- para- and ferro - magnetic materials with examples, Magnetization of materials,effect of temperature on magnetic

properties.

**Unit IV:** **Electromagnetic Induction and Alternating Currents**          **12 Periods**

**Chapter–6: Electromagnetic Induction**

Electromagnetic induction: Faraday's laws; induced emf and current.

**Chapter–7: Alternating Current**

Alternating currents, peak and rms value of alternating current / voltage; AC generator, Transformer.

**Unit V:** **Electromagnetic waves**          **04 Periods**

 **Chapter–8: Electromagnetic Waves**

Basic idea of displacement current, Electromagnetic waves, their characteristics, transverse nature of e m waves (qualitative idea only). Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

**Unit VI:** **Optics**          **12 Periods**

**Chapter–9: Ray Optics and Optical Instruments**

**Ray Optics:** Reflection of light, spherical mirrors, mirror formula, refraction of light, total internal reflection and optical fibers, Lenses,Thin lens formula, Lens maker's Formula(No Derivation) , Magnifying power of a simple microscope.

**Unit VII:** **Electronic Devices**          **16 Periods**

**Chapter–10: Semiconductor Electronics: Materials, Devices and Simple Circuits**

Energy bands in conductors, semiconductors and insulators (qualitative ideas only) Intrinsic and extrinsic semiconductors: p- and n- type, p-n junction Semiconductor diode: I~V characteristics in forward and reverse bias, application of junction diode: diode as a rectifier; NPN & PNP Transistor, Elementary idea of oscillator (qualitative) LC Oscillation, Integrated Circuit and it's types, Classification of IC.

# PRACTICALS

**Total Periods 60**

The fair practical records are to be submitted by the students at the time of their annual examination. At least 08 experiments are required to be performed by each student.

## Evaluation Scheme

**Time: 3 hours**                                                                 **Max. Mark: 30**

| Topic | Marks |
|---|---|
| One experiment from the list of experiments<br>**Theory (2 marks) , Observation/Graph/Circuit diagram/Ray diagram (10 marks) , Calculation& Conclusion( 3 marks)** | 15<br>(02+10+03) |
| Practical record | 04 |
| Experiment based conceptual question | 05 |
| Viva on experiments | 06 |
| **Total** | **30 marks** |

### Experiments

1. To determine resistance per unit length of (two / three) given wires by plotting a graph for potentialdifference versus current.
2. To find resistance of a given wire / standard resistor by metre bridge method
3. To verify the laws of combination (series/ parallel) of resistances using a metre bridge.
4. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
5. To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of desired range and to verify the same.

**OR**

To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of desired range and to verify the same.

6. To find the frequency of AC mains by using a sonometer.
7. To find the value of $v$ for different values of $u$ in case of a concave mirror and to find its focal length.
8. To find the focal length of a convex mirror, by using a convex lens.
9. To find the focal length of a convex lens by plotting graphs between $u$ and $v$ or between $1/u$ and $1/v$.
10. To find the focal length of a concave lens, using a convex lens.
11. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
12. To determine refractive index of a glass slab by using a travelling microscope.
13. To draw the reverse characteristic curve for a Zener diode and to determine its breakdown voltage

14. To draw an I~V characteristic curve of a p-n junction diode in forward and reverse biased conditions.

**Practical Examination for Visually Impaired students**
**Class XII**
**Evaluation Scheme**

**Time 2 hours**                                                                         **Max. Marks: 30**

| Identification/Familiarity with the apparatus | 05 marks |
|---|---|
| Written test (based on given/prescribed practicals) | 10 marks |
| Practical Record | 05 marks |
| Viva | 10 marks |
| **Total** | **30 marks** |

**General Guidelines**

    I    The practical examination will be of two-hour duration.

    II.    A separate list of 8 experiments should be included here.

    III.    The written examination in practical for these students will be conducted at the timeof practical examination of all other students.

    IV.    The written test will be of 30 minutes duration.

    V.    The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.

    VI.    A writer may be allowed to such students as per CHSE examination rules.

    VII.    All questions included in the question papers should be related to the listed practicals.Every question should require about two minutes to be answered.

    VIII.    These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practical should be duly checked and signed by the internal examiner.

    IX.    The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.

    X.    Questions may be generated jointly by the external/internal examiners and used for assessment.

    XI.    The viva questions may include questions based on basic theory/principle/concept, apparatus/ materials/chemicals required procedure, precautions, sources of error etc.

**Class XII**

**A.  Items for Identification/ familiarity with the apparatus for assessment in practical (All experiments)**

Meter scale, general shape of the voltmeter/ammeter, battery/power supply, connecting

wires, standard resistances, connecting wires, voltmeter/ammeter, meter bridge, screw gauge, jockey Galvanometer, Resistance Box, standard Resistance, connecting wires, Potentiometer, jockey, Galvanometer, Lechlanche cell, Daniel cell [simple distinction between the two vis-à-vis their outer (glass and copper) containers], rheostat connecting wires, Galvanometer, resistance box, Plug-in and tapping keys, connecting wires battery/power supply, Diode, Resistor (Wire-wound or carbon ones with two wires connected to two ends), capacitors (one or two types), Inductors, Simple electric/electronic bell, battery/power supply, Plug- in and tapping keys, Convex lens, concave lens, convex mirror, concave mirror, Core/hollow wooden cylinder, insulated wire, ferromagnetic rod, Transformer core, insulated wire.

B. **List of Practicals**

1. To determine the resistance per cm of a given wire by plotting a graph between voltage and current.
2. To verify the laws of combination (series/parallel combination) of resistances by Ohm's law.
3. To find the resistance of a given wire / standard resistor using a meter bridge.
4. To determine the resistance of a galvanometer by half deflection method.
5. To identify a resistor, capacitor, inductor and diode from a mixed collection of such items.
6. To observe the difference between
   (i) a convex lens and a concave lens
   (ii) a convex mirror and a concave mirror and to estimate the likely difference between the power of two given convex /concave lenses.
7. To design an inductor coil and to know the effect of
   (i) change in the number of turns
   (ii) Introduction of ferromagnetic material as its core material on the inductance of the coil.
8. To design a (i) step up (ii) step down transformer on a given core and know the relation between its input and output voltages.

**Note:** The above practicals may be carried out in an experiential manner rather than recording observations.

**Prescribed Books:**

1. Physics, Class XI, Part -I and II, Published by NCERT.
2. Physics, Class XII, Part -I and II, Published by NCERT.
3. Laboratory Manual of Physics for class XII Published by NCERT.
4. The list of other related books and manuals brought out by NCERT (consider multimedia also).
5. Bureau's Higher Secondary (+2) Physics , Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar

# QUESTION PAPER DESIGN
## Theory (Class: XI/XII)

**Maximum Marks: 70**                                                    **Duration: 3 hrs.**

| S No. | Typology of Questions | Total Marks | Approximate Percentage |
|---|---|---|---|
| 1 | **Remembering**: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.<br>**Understanding**: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas | 27 | 38 % |
| 2 | **Applying**: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way. | 22 | 32% |
| 3 | **Analysing :** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations<br>**Evaluating:**<br>Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.<br>**Creating**:<br>Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions. | 21 | 30% |
| | Total Marks | 70 | |
| | **Practical** | 30 | |
| | **Gross Total** | 100 | 100% |

**Note:** *The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions.*

*For more details kindly refer to Sample Question Paper of class XII for the year 2023- 24 to be published by CHSE at its website.*

# Council of Higher Secondary Education, Odisha

## BFC : CHEMISTRY (Rationalised)
### Class - XI-XII
### Rationale

Higher Secondary is the most crucial stage of school education because at this juncture specialized discipline based, content -oriented courses are introduced. Students reach this stage after 10 years of general education and opt for Chemistry with a purpose of pursuing their career in basic sciences or professional courses like medicine, engineering, technology and study courses in applied areas of science and technology at tertiary level. Therefore, there is a need to provide learners with sufficient conceptual background of Chemistry, which will make them competent to meet the challenges of academic and professional courses after the senior secondary stage.

The new and updated curriculum is based on disciplinary approach with rigour and depth taking care that the syllabus is not heavy and at the same time it is comparable to the international level. The knowledge related to the subject of Chemistry has undergone tremendous changes during the past one decade. Many new areas like synthetic materials, bio -molecules, natural resources, industrial chemistry are coming in a big way and deserve to be an integral part of chemistry syllabus at senior secondary stage. At international level, new formulations and nomenclature of elements and compounds, symbols and units of physical quantities floated by scientific bodies like IUPAC and CGPM are of immense importance and need to be incorporated in the updated syllabus. The revised syllabus takes care of all these aspects. Greater emphasis has been laid on use of new nomenclature, symbols and formulations, teaching of fundamental concepts, application of concepts in chemistry to industry/ technology, logical sequencing of units, removal of obsolete content and repetition, etc.

### Objectives

The curriculum of Chemistry at Senior Secondary Stage aims to:

- Promote understanding of basic facts and concepts in chemistry while retaining the excitement of chemistry.
- make students capable of studying chemistry in academic and professional courses (such as medicine, engineering, technology) at tertiary level.
- expose the students to various emerging new areas of chemistry and apprise them with their relevance in future studies and their application in various spheres of chemical sciences and technology.
- equip students to face various challenges related to health, nutrition, environment, population, weather, industries and agriculture.
- develop problem solving skills in students.
- expose the students to different processes used in industries and their technological applications.
- apprise students with interface of chemistry with other disciplines of science such as physics, biology, geology, engineering etc.
- acquaint students with different aspects of chemistry used in daily life.
- develop an interest in students to study chemistry as a discipline.
- integrate life skills and values in the context of chemistry.

**COURSE STRUCTURE**
**CLASS–XI (THEORY) (2023-24)**

Time: 3 Hours                                                                                    Total Marks :70

| Sl.No. | UNIT | No. of Periods | Marks |
|--------|------|----------------|-------|
| 1 | Some Basic Concepts of Chemistry | 10 | 7 |
| 2 | Structure of Atom | 13 | 9 |
| 3 | Classification of Elements and Periodicity in Properties | 07 | 6 |
| 4 | Chemical Bonding and Molecular Structure | 13 | 7 |
| 5 | Chemical Thermodynamics | 15 | 9 |
| 6 | Equilibrium | 14 | 7 |
| 7 | Redox Reactions | 6 | 4 |
| 8 | Organic Chemistry: Some basic Principles and Techniques | 14 | 11 |
| 9 | Hydrocarbons | 12 | 10 |
| | **TOTAL** | 104 | **70** |

**Unit I:      Some Basic Concepts of Chemistry                                    10 Periods**
General Introduction: Importance and scope of Chemistry.
Nature of matter, concept of elements, atoms and molecules.
Atomic and molecular masses, Equivalent masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions.

**Unit II:      Structure of Atom                                                  13 Periods**
Atomic number, isotopes and isobars. Thomson's model and its limitations. Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms.

**Unit III: Classification of Elements and Periodicity in Properties                    07 Periods**
Modern periodic law and the present form of periodic table, periodic trends in properties of elements -atomic radii, ionic radii, inert gas radii, Ionization enthalpy, electron gain enthalpy, electronegativity, valency.

**Unit IV:Chemical Bonding and Molecular Structure                                13 Periods**
Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s and p orbitals and shapes of some simple molecules.

**Unit VI:Chemical Thermodynamics                                                 15 Periods**

Concepts of System and types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics -internal energy and enthalpy, heat capacity and specific heat,  measurement of U and  H, Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution. Second law of Thermodynamics (brief introduction)

## Unit VII: Equilibrium                                                                                              14 Periods

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium - Le Chatelier's principle, ionic equilibrium- ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of poly basic acids, acid strength, concept of pH, buffer solution, Henderson Equation, solubility product, common ion effect (with illustrativeexamples).

## Unit VIII: Redox Reactions                                                                                    06 Periods

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number.

## Unit IX: Organic Chemistry -Some Basic Principles and Techniques                14 Periods

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electrometric effect, resonance and hyper conjugation. Hemolytic and heterolysis fission of a covalent bond: free radicals, carbocation, carbanions, electrophiles and nucleophiles,types of organic reactions.

## Unit X: Hydrocarbons                                                                                           11 Periods
**Classification of Hydrocarbons**
**Aliphatic Hydrocarbons:**
**Alkanes**- Nomenclature, isomerism, physical properties, chemical reactions including free radical mechanism of halogenation, combustion.
**Alkenes**- Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation.
**Alkynes**- Nomenclature, structure of triple bond (ethyne), physical properties, methods ofpreparation, chemical reactions: acidic character of alkynes, addition reaction of - hydrogen, halogens, hydrogen halides and water.
**Aromatic Hydrocarbons**:
Introduction, IUPAC nomenclature, benzene: resonance, aromaticity, chemical properties: mechanism of electrophilic substitution. Nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation.
.

**Prescribed Books:**
1. +2 Chemistry Vol- I : Published by Odisha State Bureau of Text Book Preparation and production, Bhubaneswar.
2. Chemistry Part – I, Class-XI, Published by NCERT.
3. Chemistry Part – II, Class-XI, Published by NCERT.

**Experiments:**
1. Basic Laboratory Techniques: (Non-evaluative)
a)Bunsen burner (different parts and their functions)
b)         Chemical balance - weighing with chemical balance by equal oscillation method.

c) Cutting and bending glass tube, drawing jet and boring a cork.

2. Crystallization:
Preparation of CuSO4, 5H2O crystal from CuCO3.

3. Qualitative Analysis:
a) **Identification of Acid Radicals**:
Radicals: $CO_3^{2-}$, $SO_3^{2-}$, $S^{2-}$, $NO_2^-$, $Cl^-$, $Br^-$, $I^-$, $NO_3^-$, $SO_4^{2-}$, & $PO_4^{3-}$

**b)       Identification of Basic Radicals :**
Radicals : $Ag^+$, $Pb^{2+}$, $Hg_2^{2+}$, $Cu^{2+}$, $Hg^{2+}$, $Bi^{3+}$, $As^{3+}$, $Sb^{3+}$, $Sn^{2+}$, $Al^{3+}$, $Fe^{3+}$, $Cr^{3+}$, $Co^{2+}$, $Ni^{2+}$,
$Zn^{2+}$, $Mn^{2+}$, $Ba^{2+}$, $Sr^{2+}$, $Ca^{2+}$, $NH_4^+$, $Mg^{2+}$, $K^+$ and $Na^+$ (Dry Tests only).

4. Volumetric Analysis:
Single titration of acids and bases (three experiments to be done ; one on direct determination of normality of one of the solutions from that of the other and the other two, involving numerical calculations)

5. Gravimetric Analysis
a) Equivalent mass of Mg by hydrogen displacement method.
b)       Solubility of $K_2SO_4$ at room temperature.

**Books Recommended:**
+2 Practical Chemistry, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar

## QUESTION PATTERN AND DISTRIBUTION OF MARKS
### Class- XI (PRACTICAL)

**Full Mark : 30          Time : 3 Hrs.**

1. Salt analysis (Acid radical) - **10 marks**
Dry Test - **04 marks**
Wet Test - **06 marks**
2. Crystallization / Single titration / Equivalent mass / Solubility - **10 marks**
3. Viva-Voce - - **06 marks**
4. Record - - **04 marks**

**\*\*\*\*\*\*\*\***

### Practical Examination for Visually Impaired Students
### Class XI

A. **List of apparatus for identification for assessment in practical (All experiments)**
Beaker, tripod stand, wire gauze, glass rod, funnel, filter paper, Bunsen burner, test tube, test tube stand, dropper, test tube holder, ignition tube, china dish, tongs, standard flask, pipette, burette, conical flask, clamp stand, dropper, wash bottle

- Odour detection in qualitative analysis
- Procedure/Setup of the apparatus

**B. Quantitative estimation**
1. Preparation of standard solution of oxalic acid.
2. Determination of molarity of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.

**C. Qualitative Analysis**
1. Determination of one anion and one cation in a given salt
2. Cations - $NH_4^+$

        Anions – $(CO_3)^{2-}$, $S^{2-}$, $(SO_3)^{2-}$, $Cl^-$, $CH_3COO^-$

(Note: insoluble salts excluded)

*Note: The above practicals may be carried out in an experiential manner rather than recording observations.*

**Prescribed Books:**
1. Chemistry Part – I, Class-XI, Published by NCERT
2. Chemistry Part – II, Class-XI, Published by NCERT

## QUESTION PATTERN AND DISTRIBUTION OF MARKS

| | |
|---|---|
| Identification/Familiarity with the apparatus | 5 marks |
| Written test (based on given/prescribed practicals) | 10 marks |
| Practical Record | 5 marks |
| Viva | 10 marks |
| Total | 30 marks |

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# BFC (CHEMISTRY)

## CLASS XII (THEORY)

**Time: 3 Hours**                                                                                                    **70 Marks**

### Unit wise distribution of Periods and marks

| Sl.No. | Title | No. of Periods | Marks |
|--------|-------|----------------|-------|
| 1 | Solutions | 10 | 7 |
| 2 | Electrochemistry | 12 | 9 |
| 3 | Chemical Kinetics | 10 | 7 |
| 4 | d -and f -Block Elements | 11 | 7 |
| 5 | Coordination Compounds | 11 | 7 |
| 6 | Haloalkanes and Haloarenes | 10 | 6 |
| 7 | Alcohols, Phenols and Ethers | 10 | 6 |
| 8 | Aldehydes, Ketones and Carboxylic Acids | 10 | 8 |
| 9 | Amines | 10 | 6 |
| 10 | Biomolecules | 10 | 7 |
| | **Total** | 104 | **70** |

**Unit I: Solutions**                                                                                              **10 Periods**

Types of solutions, expression of concentration of solutions of solids in liquids, Raoul's law, colligative properties - relative lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties.

**Unit II: Electrochemistry**                                                                                    **12 Periods**

Redox reactions, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and EMF of a cell, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and law of electrolysis (elementary idea).

**Unit III: Chemical Kinetics**                                                                                  **10 Periods**

Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst; order and molecularity of a reaction, rate law and specific rate constant, integrated rate equations and half-life (only for zero and first order reactions).

**Unit IV: d and f Block Elements**                                                                            **11 Periods**

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, color, catalytic property, magnetic properties, interstitial compounds, alloy formation. General Electronic configuration, oxidation states
F Block elements ,

**Unit V: Coordination Compounds**                                                                             **11 Periods**

Coordination compounds - Introduction, ligands, coordination number, color, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory and VBT; structure and stereoisomerism.

**Unit VI: Halo alkanes and Halo alkenes**                              **10 Periods**

**Halo alkanes:** Nomenclature, nature of C–X bond, physical and chemical properties, optical rotation mechanism of substitution reactions.

**Halo alkenes:** Nature of C–X bond, substitution reactions


**Unit VII: Alcohols, Phenols and Ethers**                              **10 Periods**

**Alcohols:** Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), mechanism of dehydration.

**Phenols:** Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophillic substitution reactions, uses of phenols.

**Ethers:** Nomenclature, methods of preparation, physical and chemical properties, uses.


**Unit VIII: Aldehydes, Ketones and Carboxylic Acids**                  **10 Periods**

**Aldehydes and Ketones:** Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes, uses.

**Carboxylic Acids:** Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.


**Unit IX: Amines**                                                      **10 Periods**

**Amines:** Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses.

**Diazonium salts:** Preparation, chemical reactions and importance in synthetic organic chemistry.


**Unit X: Biomolecules**                                                 **10 Periods**

**Carbohydrates -** Classification (aldoses and ketoses), monosaccharides (glucose and fructose), D-L configuration oligosaccharides (sucrose, lactose, maltose),Importance of carbohydrates.

**Proteins -**Elementary idea of - amino acids, peptide bond, polypeptides, proteins, denaturation of proteins; enzymes. Hormones - Elementary idea excluding structure.

**Vitamins -** Classification and functions.


**Prescribed Books:**

1. +2 Chemistry  Vol- II : Published by Odisha State Bureau of Text Book Preparation and production, Bhubaneswar
2. Chemistry Part – I, Class-XII, Published by NCERT
3. Chemistry Part – II, Class-XII, Published by NCERT


**CHEMISTRY (PRACTICAL)**
**XII (Science)**
**(*Detailed Syllabus*)**


1. **Crystallization:**
a) Preparation of Mohr's Salt [$FeSO_4$, $(NH_4)_2SO_4$, $6H_2O$] crystal.
b) Preparation of potash alum [$K_2SO_4$, $Al_2(SO4)_3$, $24H_2O$] crystal.


2. **Quantitative Analysis :**

a) **Double titration :** Two experiments to be done - i) one acid two alkalis double titration and
ii) Two acids one alkali double titration.

b) **Bench Acid Titration:** Strong acid of approximately 2·0 N be supplied.

c) **Redox Titration:** Titration between potassium permanganate and oxalic acid.

3. **Qualitative Inorganic Analysis :**

   **Wet tests for basic radicals:** Wet tests for the following basic radicals be done.

   Group-I basic radicals: $Ag^+$, $Pb^{2+}$, $Hg_2^{2+}$

   Group-II basic radicals : $Hg^{2+}$, $Cu^{2+}$, $Bi^{3+}$, $As^{3+}$, $Sb^{3+}$, $Sn^{2+}$ & $Sn^{4+}$,

   Group-III A basic radicals: $Fe^{3+}$, $Al^{3+}$ & $Cr^{3+}$.

   Group-III B basic radicals: $Co^{2+}$, $Ni^{2+,}$ $Zn^{2+}$ & $Mn^{2+}$

   Group-IV basic radicals: $Ba^{2+}$, $Ca^{2+}$ & $Sr^{2+}$

   Group-V basic radicals: $NH_4^+$, $Mg^{2+}$, $K^+$, $Na^+$.

   **Identification of unknown basic radicals.**

   [For identification of unknown basic radicals both dry and wet tests are to be performed]

4. **Qualitative Organic Analysis :**

   Tests for unsaturation, distinction between aromatic and aliphatic compounds by copper foil test, tests forcarboxylic, phenolic, aldehydes, ketonic and alcoholic groups.

   **Book Recommended**

   + 2 Practical Chemistry: Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar

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**QUESTION PATTERN AND MARK DISTRIBUTION**
**CHEMISTRY (PRACTICAL)**
**XII (Science)**

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**Full Mark: 30**                                                                 **Time: 3 Hrs.**

1. **Salt Analysis (Identification of basic radical only) 12 mark**

a) Dry Test = **05 marks**

b) Wet Test = **07 marks**

2. **Crystallization / Double Titration /Bench Acid Titration Redox Titration / Organic compound =10 marks**

3. **Viva-voce=05 marks**

4. **Record =03 marks**

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**Practical Examination for Visually Impaired Students of Classes XII**

</center>

**Full Mark: 30**                                                                 **Time: 3 Hrs.**

   **A. Quantitative Analysis**

   (1) (a) Preparation of the standard solution of Oxalic acid of a given volume

   (b) Determination of molarity of KMnO4 solution by titrating it against a standard solution of Oxalic acid.

   **B. Qualitative Analysis:**

   (1) Determination of one cation and one anion in a given salt.

Cation – $NH_4^+$

Anions – $CO_3^{2-}$, $S^{2-}$, $SO_3^{2-}$, $Cl^-$, $CH3COO^-$

(Note: Insoluble salts excluded)

**Note:** The above practicals may be carried out in an experiential manner rather than recording observations.

**Prescribed Books:**

1. Chemistry Part -I, Class-XII, Published by NCERT
2. Chemistry Part -II, Class-XII, Published by NCERT

## QUESTION PATTERN AND MARK DISTRIBUTION
## CHEMISTRY (PRACTICAL)
### XII (Science)

| | |
|---|---|
| Identification/Familiarity with the apparatus | 5 marks |
| Written test (based on given/prescribed practicals) | 10 marks |
| Practical Record | 5 marks |
| Viva | 10 marks |
| Total | 30 marks |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

# Council of Higher Secondary Education, Odisha

## BFC (Rationalised)

### Syllabus: MATHEMATICS

The Syllabus in the subject of Mathematics has undergone changes from time to time in accordance with growth of the subject and emerging needs of the society. Senior Secondary stage is a launching stage from where the students go either for higher academic education in Mathematics or for professional courses like Engineering, Physical and Biological science, Commerce or Computer Applications. The present revised syllabus has been designed in accordance with National Curriculum Framework 2005 and as per guidelines given in Focus Group on Teaching of Mathematics 2005 which is to meet the emerging needs of all categories of students. Motivating the topics from real life situations and other subject areas, greater emphasis has been laid on application of various concepts.

**Objectives**

The broad objectives of teaching Mathematics at senior school stage intend to help the students:

- to acquire knowledge and critical understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles, symbols and mastery of underlying processes and skills.
- to feel the flow of reasons while proving a result or solving a problem.
- to apply the knowledge and skills acquired to solve problems and wherever possible, bymore than one method.
- to develop positive attitude to think, analyze and articulate logically.
- to develop interest in the subject by participating in related competitions.
- to acquaint students with different aspects of Mathematics used in daily life.
- to develop an interest in students to study Mathematics as a discipline.
- to develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of gender biases.
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.

# COURSE STRUCTURE
## CLASS Class- XI

One Paper            Total Period–180

Three Hours            Max Marks: 80

| No. | Units | No. of Periods | Marks |
|-----|-------|----------------|-------|
| I. | Sets and Functions | 35 | 23 |
| II. | Algebra | 25 | 25 |
| III. | Coordinate Geometry | 40 | 12 |
| IV. | Calculus | 40 | 08 |
| V. | Statistics and Probability | 40 | 12 |
| | Total | 180 | 80 |
| | Internal Assessment | | 20 |

*No chapter/unit-wise weightage. Care to be taken to cover all the chapters.

**Unit-I: Sets and Functions**

**1.    Sets                               (10) Periods**

Sets and their representations, Empty set, Finite and Infinite sets, Equal sets, Subsets, Subsets of a set of real numbers especially intervals (with notations). Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement.

**2.    Relations & Functions                     (10) Periods**

Ordered pairs. Cartesian product of sets. Number of elements in the Cartesian product of two finite sets. Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special type of relation. Pictorial representation of a function, domain, co-domain and range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum, exponential, logarithmic and greatest integer functions, with their graphs. Sum, difference, product and quotients of functions.

**3.    Trigonometric Functions                   (15) Periods**

Positive and negative angles. Measuring angles in radians and in degrees and conversion from

one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin^2 x + \cos^2 x = 1$, for all $x$. Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing *sin (x±y)* and *cos (x±y)* in terms of $\sin x$, $\sin y$, $\cos x$ & $\cos y$ and their simple applications. Deducing identities like the following:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \, \tan y} \, , \cot(x \pm y) = \frac{\cot x \, \cot y \mp 1}{\cot y \pm \cot x}$$

$$\sin x + \sin y = 2 \sin \frac{x + y}{2} \cos \frac{x - y}{2} \, , \cos x + \cos y = 2 \cos \frac{x + y}{2} \cos \frac{x - y}{2}$$

$$\sin x - \sin y = 2 \cos \frac{x + y}{2} \sin \frac{x - y}{2} \, , \cos x - \cos y = -2 \sin \frac{x + y}{2} \sin \frac{x - y}{2},$$

Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$ and $\tan 3x$.

**Unit-II: Algebra**

1.  **Complex Numbers and Quadratic Equations**                    **(06) Periods**

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve some of the quadratic equations. Algebraic properties of complex numbers. Argand plane

2.  **Linear Inequalities**                                        **(06) Periods**

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line.

3.  **Permutations and Combinations**                              **(07) Periods**

Fundamental principle of counting. Factorial *n.* (n!) Permutations and combinations, derivation of Formulae for $^nP_r$ and $^nC_r$ and their connections, simple applications.

4.  **Binomial Theorem**                                           **(06) Periods**

Historical perspective, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, simple applications.

**Unit-III: Coordinate Geometry**

1.  **Straight Lines**                                             **(15) Periods**

Brief recall of two dimensional geometry from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axis, point -slope form, slope-intercept form, two-point form, intercept form, Distance of a point from a line.

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**2.      Conic Sections                                                              (15) Periods**

Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

**3.      Introduction to Three-dimensional Geometry                         (10) Periods**

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points.

**Unit-IV: Calculus**

**1.      Limits and Derivatives                                                    (40) Periods**

Derivative introduced as rate of change both as that of distance function and geometrically. Intuitive idea of limit. Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions. Definition of derivative relate it to scope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

**Unit-V Statistics and Probability**

**1.      Statistics                                                                   (20) Periods**

Measures of Dispersion: Range, Mean deviation, variance and standard deviation of ungrouped/grouped data.

**2.      Probability                                                                 (20) Periods**

Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with other theories of earlier classes. Probability of an event, probability of 'not', 'and' and 'or' events.

**BFC (Rationalised)**

**MATHEMATICS**

**QUESTION PAPER DESIGN**

**CLASS – XI**

**Time: 3 Hours**                                                                                        **Max. Marks: 80**

| S. No. | Typology of Questions | Total Marks | % Weightage |
|---|---|---|---|
| 1 | **Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.<br><br>**Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas | 44 | 55 |
| 2 | **Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way. | 20 | 25 |
| 3 | **Analysing :**<br>Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations<br><br>**Evaluating:**<br>Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.<br><br>**Creating:**<br>Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions | 16 | 20 |
| | **Total** | 80 | 100 |

1. *No chapter wise weightage. Care to be taken to cover all the chapters*
2. *Suitable internal variations may be made for generating various templates keeping the overall weightage to different form of questions and typology of questions same.*

**Choice(s):**

There will be no overall choice in the question paper.

However, 33% internal choices will be given in all the sections

| INTERNAL ASSESSMENT | 20 MARKS |
|---|---|
| Periodic Tests ( Best 2 out of 3 tests conducted) | 10 Marks |
| Mathematics Activities | 10 Marks |

Note: Please refer the guidelines given under XII Mathematics Syllabus:

## CLASS-XII

## Mathematics

**One Paper**                                                                                   **Max Marks: 80**

| No. | Units | No. of Periods | Marks |
|---|---|---|---|
| I. | Relations and Functions | 20 | 08 |
| II. | Algebra | 50 | 10 |
| III. | Calculus | 55 | 30 |
| IV. | Vectors and Three - Dimensional Geometry | 25 | 14 |
| V. | Linear Programming | 20 | 10 |
| VI. | Probability | 10 | 08 |
| | **Total** | 180 | 80 |
| | **Internal Assessment** | | 20 |

### Unit-I: Relations and Functions

**1.      Relations and Functions                                                               15 Periods**

Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and ontofunctions.

**2.      Inverse Trigonometric Functions                                                 05 Periods**
Definition, range, domain, principal value branch.
**3.      Unit-II: Algebra**
**1.      Matrices                                                                                       25 Periods**

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non- commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries). Solving system of linear equation by using inverse of matrix.

**2.      Determinants                                                                                25 Periods**
Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors and applications of

determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using Crameris Rule .

### Unit-III: Calculus

1.    **Continuity and Differentiability**                                      **20 Periods**

Continuity and differentiability, chain rule, derivative of inverse trigonometric functions, ▢▢▢▢ $\sin^{-1}$ , $\cos^{-1}$ ▢ and $\tan^{-1}$ ▢, derivative of implicit functions. Concept of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

2. **Applications of Derivatives**                                             **10 Periods**

Applications of derivatives: rate of change of quantities, increasing/decreasing functions, maxima andminima Simple problem based onfirst derivative test and second derivative test given as a provable tool.

3.    **Integrals**                                                            **20 Periods**

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems basedon them.

$$\int \left(\frac{dx}{x^2 \pm a^2}\right), \int \left(\frac{dx}{x^2 \pm a^2}\right), \int \left(\frac{dx}{a^2 - x^2}\right), \int \left(\frac{dx}{ax^2 + bx + c}\right),$$

$$\int \left(\frac{dx}{ax^2 + bx + c}\right), \int \frac{px + q}{ax^2 + bx + c} dx$$

$$\int \frac{px + q}{ax^2 + bx + c} dx, \int \sqrt{a^2 \pm x^2} \, dx,$$

$$\int \sqrt{x^2 - a^2} \, dx,$$

$$\int \sqrt{ax^2 + bx + c} \, dx, \int (px + q) + \sqrt{ax^2 + bx + c} \, dx$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and their evaluation of definite integrals.

4.    **Applications of the Integrals**                                        **05 Periods**

Applications in finding the area under simple curves, especially lines, circles/ parabolas/ellipses (in standard form only)

### Unit-IV: Vectors and Three-Dimensional Geometry

**1.      Vectors                                                                                    15 Periods**

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

**2.      Three - dimensional Geometry                                           10  Periods** Direction cosines and direction ratios of a line joining two points. Cartesian equation of a line, Angle between two lines.

### Unit-V: Linear Programming

**1.      Linear Programming                                                             20 Periods**

Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

### Unit-VI: Probability

**1.      Probability                                                                              10 Periods**

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem.

# MATHEMATICS

## QUESTION PAPER DESIGN CLASS - XII

**Time: 3 hours**  **Max. Marks: 80**

| S. No. | Typology of Questions | Total Marks | % Weightage |
|--------|----------------------|-------------|-------------|
| 1 | **Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas | 44 | 55 |
| 2 | **Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way. | 20 | 25 |
| 3 | **Analysing :** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations  **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.  **Creating:** Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions | 16 | 20 |
| | **Total** | 80 | 100 |

*1.     No chapter wise weightage. Care to be taken to cover all the chapters*

*2.     Suitable internal variations may be made for generating various templates keeping the overall weightage to different form of questions and typology of questions same.*

**Choice(s):**

There will be no overall choice in the question paper.
However, 33% internal choices will be given in all the sections

| INTERNAL ASSESSMENT | 20 MARKS |
|---------------------|----------|
| Periodic Tests ( Best 2 out of 3 tests conducted) | 10 Marks |
| Mathematics Activities | 10 Marks |

**Note**: For activities NCERT Lab Manual may be referred.

**Conduct of Periodic Tests:**

Periodic Test is a Pen and Paper assessment which is to be conducted by the respective subject teacher. The format of periodic test must have questions items with a balance mix, such as, very short answer (VSA), short answer (SA) and long answer (LA) to effectively assess the knowledge, understanding, application, skills, analysis, evaluation and synthesis. Depending on the nature of subject, the subject teacher will have the liberty of incorporatingany other types of questions too. The modalities of the PT are as follows:

a) **Mode:** The periodic test is to be taken in the form of pen-paper test.

b) **Schedule:** In the entire Academic Year, three Periodic Tests in each subject may beconducted as follows:

| Test | Pre Mid-term (PT-I) | Mid-Term (PT-II) | Post Mid-Term (PT-III) |
|---|---|---|---|
| Tentative Month | July-August | November | December-January |

*This is only a suggestive schedule and schools may conduct periodic tests as per their convenience.*

c) **Average of Marks**: Once schools complete the conduct of all the three periodic tests, they will convert the weightage of each of the three tests into ten marks each for identifyingbest two tests. The best two will be taken into consideration and the average of the two shall be taken as the final marks for PT.

d) The school will ensure simple documentation to keep a record of performance.

e) **Sharing of Feedback/Performance**: The students' achievement in each test must be shared with the students and their parents to give them an overview of the level of learningthat has taken place during different periods. Feedback will help parents formulate interventions (conducive ambience, support materials, motivation and morale-boosting) to further enhance learning. A teacher, while sharing the feedback with student or parent, should be empathetic, non-judgmental and motivating. It is recommended that the teacher share best examples/performances of IA with the class to motivate all learners.

**Assessment of Activity Work:**

Throughout the year any 10 activities shall be performed by the student from the activities for the respective class (XI or XII) record of the same may be kept by the student. An year end test on the activity may be conducted

The weightage are as under:

- The activities performed by the student throughout the year and record keeping
  : 5 marks
- Assessment of the activity performed during the year end test:  3 marks
- Viva-voce: 2 marks

**Prescribed Books:**

1) Mathematics Textbook for Class XI, NCERT Publications

2) Mathematics Part I - Textbook for Class XII, NCERT Publication

3) Mathematics Part II - Textbook for Class XII, NCERT Publication

4) Mathematics Exemplar Problem for Class XI, Published by NCERT

5) Mathematics Exemplar Problem for Class XII, Published by NCERT

6) Mathematics Lab Manual class XI, published by NCERT

7) Mathematics Lab Manual class XII, published by NCERT

8) Bureau's Higher Secondary (+2) Elements of Mathematics , Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar

# Council of Higher Secondary Education Odisha

**BFC (Rationalised)**
**Subject: BIOLOGY**
**Classes XI & XII (2023-24)**

The present curriculum provides the students with updated concepts along with an extended exposure to contemporary areas of the subject. The curriculum also aims at emphasizing the underlying principles that are common to animals, plants and microorganisms as well as highlighting the relationship of Biology with other areas of knowledge. The format allows a simple, clear, sequential flow of concepts. It relates the study of biology to real life through the developments in use of technology. It links the discoveries and innovations in biology to everyday life such as environment, industry, health and agriculture. The updated curriculum also focuses on understanding and application of scientific principles, while ensuring that ample opportunities and scope for learning and appreciating basic concepts continue to be available within itsframework. The prescribed syllabus is expected to:

- promote understanding of basic principles of Biology

- encourage learning of emerging knowledge and its relevance to individual and society

- promote rational/scientific attitude towards issues related to population, environment and development

- enhance awareness about environmental issues, problems and their appropriate solutions

- create awareness amongst the learners about diversity in the living organisms and developing respect for other living beings

- appreciate that the most complex biological phenomena are built on essentially simple processes

It is expected that the students would get an exposure to various branches of Biology in the curriculum in a more contextual and systematic manner as they study its various units.

**BIOLOGY (THEORY)**
**COURSE STRUCTURE (2023 -24)**
**CLASS XI**

**Botany: Full Mark-35**          **Time: 1.5 Hours**
**Zoology: Full Mark-35**          **Time: 1.5 Hours**
**Unit wise distribution of mark**

| Unit | Title | Botany | Zoology |
|------|-------|--------|---------|
| I | Diversity of Living Organisms | 8 | 7 |
| II | Structural Organization in Plants and Animals | 6 | 4 |
| III | Cell: Structure and Function | 9 | 6 |
| IV | Plant Physiology | 12 | 0 |
| V | Human Physiology | 0 | 18 |
| | Total | 35 | 35 |

## Unit-I: Diversity of Living Organisms

**Chapter-1: The Living World          (Botany)**

Biodiversity; Need for classification; three domains of life; concept of species binomial nomenclature

**Chapter-2: Biological Classification (Botany)**

Five kingdom classification; Salient features and classification of Monera, Protista and Fungi into major groups; Lichens, Viruses and Viroids.

**Chapter-3: Plant Kingdom   (Botany)**

Classification of plants into major groups; Salient features Gymnospermae ( Angiosperms)

**Chapter-4: Animal Kingdom   (Zoology)**

Salient features and classification of animals, non-chordates up to phyla level and chordates up to class level (salient features and at a few examples of each category).
(No live animals or specimen should be displayed.)

### Unit-II       Structural Organization in Plants and Animals

**Chapter-5: Morphology and Anatomy of Flowering Plants(Botany)**

Morphology of different parts of flowering plants: root, stem, leaf, inflorescence, flower, fruit and seed. Description of family Solanaceae.

**Chapter-6: Anatomy of Flowering Plants        (Botany)**

Anatomy . Anatomy of stems and roots-diot & stems

**Chapter-7: Structural Organisation in Animals           (Zoology)**

Anatomy and functions of different systems (digestive, circulatory,respiratory, and reproductive) of frog.

### Unit-III
### Cell: Structure and Function

**Chapter-8: Cell-The Unit of Life  (Botany)**

Cell theory and cell as the basic unit of life, structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell membrane, cell wall; cell organelles - structure and function; endoplasmic reticulum, golgi bodies, vacuoles,mitochondria, ribosomes, plastids,nucleus.

### Chapter-9: Biomolecules (Botany)

Chemical constituents of living cells: biomolecules, structure and function of proteins, carbohydrates, lipids, and nucleic acids; Enzyme - types, properties, Functions.

### Chapter-10: Cell Cycle and Cell Division (Zoology)

Cell cycle (Basic Concept) , mitosis, meiosis and their significance

#### Unit-IV

### Plant Physiology Chapter-11: Photosynthesis in Higher Plants (Botany)

Chloroplast as the site of photosynthesis pigments involved in photosynthesis (elementary idea); photochemical and biosynthetic phases of photosynthesis; non-cyclic photophosphorylation C3 and C4 pathways  factors affecting photosynthesis.

### Chapter-12: Respiration in Plants (Botany)

Cellular respiration - glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); Elementary idea on ETS

### Chapter-13: Plant - Growth and Development (Botany)

Seed germination; Vegetative and Reproductive growth phases conditions of growth; plant growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA.

#### Unit-V

#### Human Physiology

### Chapter-14: Breathing and Exchange of Gases (Zoology)

Respiratory system in humans; mechanism of breathing- exchange of gases, transport of gases disorders related to respiration - asthma, emphysema, occupational respiratory disorders.

### Chapter-15: Body Fluids and Circulation (Zoology)

Composition of blood, blood groups, coagulation of blood; composition of lymph and its function; Cardiac Cycle; disorders of circulatory system - hypertension, coronary artery disease, heart failure.  Structure and mechanism of working of Human Heart.

**Chapter-16: Excretory Products and their Elimination (Zoology)**

Modes of excretion (Basic Concept) - ammonotelism, ureotelism, uricotelism; human excretory system – structure , Urine Formation and function; diabetes insipidus; disorders - uremia, renal failure, renal calculi, nephritis; dialysis .

**Chapter-17: Locomotion and Movement (Zoology)**

Types of movement - skeletal muscle, Structure and mechanism of muscle contraction contraction; skeletal system and its functions; joints; disorders of muscular and skeletal systems - myasthenia gravis, tetany, muscular dystrophy, arthritis, osteoporosis, gout.

**Chapter-18: Neural Control and Coordination (Zoology)**

Neuron and nerves; Nervous system in humans - central nervous system; peripheral nervous system and visceral nervous system.

**Chapter-19: Chemical Coordination and Integration (Zoology)**

Endocrine glands and hormones; human endocrine system - hypothalamus, pituitary, pineal, thyroid, adrenal, pancreas, gonads; dwarfism, acromegaly, cretinism, goiter, exophthalmic goitre, diabetes, Addison's disease.

**Note:** Diseases related to all the human physiological systems to be taught in brief.

**Mark Distribution in Examination Botany / Zoology (Class XI)Theory Papers: 35 Marks**

1. **MCQ 1 x 5 = 5 Marks**
2. **Fill in the blank/ one word answer 1x 5= 5 Marks**
3. **Short notes 2 x 5 =10 Marks**
4. **Differentiate between 2 ½ x 2 = 5 Marks**
5. **Long Questions 5 x 2 =10 Marks**

                    **35 Marks**

**PRACTICAL**

### BIOLOGY-XI   (Botany)  Detailed syllabus

Study of:
1. Different parts of the Dissecting and Compound microscopes.
2. A typical Angiospermic plant.

**Major experiment**

3. Study and describe at least one common flowering plant from each of the following families (Malvacae, Solanaceae, and Liliacease) including dissection and display of floral whorls, anther and ovary to show number of chambers.
4. Preparation and study of T.S. of dicot and monocot roots, and stem and leaf (Primary).

**Minor experiment:**

5. Study of cells (Onion scale leaf, *Rhoeo* leaves)
6. Test for presence of starch, proteins and fats.
7. Study of starch grains and raphides.
8. Qualitative test for catalase activity by leaf disc method/potato disc method.
9. Modification of root, stem and leaf.
10. Study of flower and its parts.

**Spotting:**

a. Study of the specimens and identification with reasons - bacteria, *Oscillatoria*, *Spirogyra*, *Rhizopus*, Mushroom, Yeast, Liverwort, Moss, Fern, Cycas, one monocotyledonous plant, one dicotyledonous plant and one lichen.
b. Study of tissues and diversity in shapes and sizes in plants (simple tissue, complex tissue) through temporary/permanent slides.

### BIOLOGY-XI   (Botany) for Visually Impaired Students

**Note:** The 'Evaluation schemes' and 'General Guidelines' for visually impaired students as given for Class XII may be followed.

A. **Items for Identification/Familiarity with the apparatus /equipment /animal and plant material / chemicals. for assessment in practicals (All experiments)**
B. **Equipment** - compound microscope, test tube, petridish, chromatography paper, chromatography chamber, beaker, scalpel
**Chemical** – alcohol

**Specimen/Fresh Material** – mushroom, succulents such as *Aloe vera*/ kalanchoe, raisins, potatoes, seeds of monocot and dicot- maize and gram or any other plant, plants of Solanaceae - Brinjal, Petunia,any other

C. **List of Practicals**

1. Study locally available common flowering plants of the family – Solanaceae and identify type of stem (Herbaceous or Woody), type of leaves (Compound or Simple).
2. Study the parts of a compound microscope- eye piece and objective lens, mirror, stage, coarse and fine adjustment knobs.
3. Differentiate between monocot and dicot plants on the basis of venation patterns.
4. Identify the given specimen of a fungus – mushroom, gymnosperm-pine cone
5. Identify and relate the experimental set up with the aim of experiment: For Potato Osmometer/endosmosis in raisins.

**Note:** The above practicals may be carried out in an experiential manner rather than only recording observations.

## BIOLOGY - XI (Zoology) Detailed Practical Syllabus

**A. Experiments/ Observations:**

1. To test the presence of carbohydrate, protein and fat in suitable animal materials (qualitative only).

**B. Spotiing/ Identification:**

a. Study of specimens and identification with reasons- Amoeba, Hydra, Sycon, Earthworm, Cockroach, Snail and Starfish
b. Study of squamous epithelium, muscle fibres and mammalian blood film (temporary/ permanent slides).
c. Study and comment on the morphological adaptations of two animals (Tree frog, Bat) found in terrestrial conditions and two animals (Flying fish,) found in aquatic conditions.

## BIOLOGY-XI (Zoology) for Visually Impaired Students

**Note:** The 'Evaluation schemes' and 'General Guidelines' for visually impaired students as given for Class XII may be followed.

A. Items for Identification/Familiarity with the apparatus /equipment /animal and plant material / chemicals. for assessment in practicals (All experiments)
B. **Equipment** - compound microscope, test tube, petri dish, chromatography paper, chromatography chamber, beaker, scalpel
   **Chemical** – alcohol

   **Models** – Model of Human skeleton to show – Ball and socket joints of girdles and limbs, Rib cage, Honey comb, Mollusc shell, Pigeon and Star fish, cockroach

**C. List of Practicals**

    a. Study the following parts of human skeleton (Model): Ball and socket joints of thigh and shoulder

    b. Rib cage

    c. Study honeybee/butterfly, snail/sheik snail through shell, Starfish, Pigeon (through models).

  **Note:** The above practical may be carried out in an experiential manner rather than only recording observations.

**Prescribed Books:**

1. Biology Class-XI, Published by NCERT

2. Bureau's Higher Secondary Biology, Vol-I : Published by Text Book Bureau, Odisha

3. Other related books and manuals brought out by NCERT (including multimedia).

   **Question Pattern for Practical**

   1. Major Experiment 6 ½ Marks
      (Theory & Procedure   = 2 ½ Marks,   Experiment & Result    = 4 Marks)
   2. Spotting         1 ½ x 3 = 4.5 Marks
   3. Record        = 2 Marks
   4. Viva          = 2 Marks
                15 Marks

# BIOLOGY (THEORY)
## COURSE STRUCTURE (2023 -24)
### CLASS XII

**Botany:  Full Mark-35**                    **Time: 1.5 Hours**

**Zoology:  Full Mark-35**                   **Time: 1.5**
**Hours Unit wise distribution of mark**

| Unit | Title | Botany | Zoology |
|:---:|:---|:---:|:---:|
| VI | Reproduction | 5 | 11 |
| VII | Genetics and Evolution | 11 | 9 |
| VIII | Biology and Human Welfare | 6 | 6 |
| IX | Biotechnology and its Applications | 6 | 6 |
| X | Ecology and Environment | 7 | 3 |
| | Total | 35 | 35 |

### Unit-VI Reproduction

**Chapter-1: Sexual Reproduction in Flowering Plants (Botany)**

Flower structure; development of male and female gametophytes; pollination – types, and agencies double fertilization; post fertilization events –lead up to , development of seed and formation of fruit; Significance of seed dispersal and fruit formation.

**Chapter-2: Human Reproduction (Zoology)**

Male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis

-spermatogenesis and oogenesis; menstrual cycle; fertilisation,

**Chapter-3: Reproductive Health (Zoology)**

Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs); birth control.

### Unit-VII  Genetics and Evolution

**Chapter-4a: Principles of Inheritance and Variation (Botany)**

**Heredity and variation:** Mendelian inheritance; deviations from Mendelism – incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups; elementary idea of polygenic inheritance; chromosomes and genes;

**Chapter-4b: (Zoology)**

Sex determination - in humans and honey bee; sex linked inheritance - haemophilia,

Mendelian disorders in humans - thalassemia; chromosomal disorders in humans; Down's syndrome,.

### Chapter-5: Molecular Basis of Inheritance (Botany)

DNA as genetic material; Structure of DNA and RNA; DNA replication; Central Dogma; transcription, genetic code, translation.

### Chapter-6: Evolution (Zoology)

Origin of life; biological evolution and evidences for biological evolution (comparative anatomy, embryology); Darwin's contribution; mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection.

## Unit-VIII: Biology and Human Welfare

### Chapter-7: Human Health and Diseases (Zoology)

Pathogens; parasites causing human diseases (malaria, dengue, filariasis, typhoid, pneumonia, common cold) and their control; Basicconcepts of immunology - vaccines; cancer, HIV and  AIDS; Adolescence - drug and alcoholabuse. (Basic concepts)

### Chapter-8 : Microbes in Human Welfare (Botany)

Microbes in food processing, industrial production, sewage treatment, energy generationand microbes as bio-control agents and bio-fertilizers. Antibiotics; production and judicioususe.

## Unit-IX: Biotechnology and its Applications

### Chapter-9: Biotechnology - Principles and Processes  (Zoology)

Genetic Engineering (Recombinant DNA Technology).

### Chapter-10: Biotechnology and its Applications (Botany)

Application of biotechnology in health and agriculture: Human insulin and gene therapy; genetically modified organisms - Bt crops; transgenic animals;biosafety issues.(Basic Concepts)

## Unit-X Ecology and Environment Chapter-

### 11: Organisms and  Populations (Botany)

Population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution.

### Chapter-12: Ecosystem (Botany)

Ecosystems: Structure and Functions energy flow; pyramids of number, biomass, energy .

**Chapter-13: Biodiversity and its Conservation (Zoology)**

Biodiversity-Concept, patterns, importance; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, , (biosphere reserves, national parks, wildlife, sanctuaries and Ramsar sites.) Concept/Definations Examples  (with special emphasis on Odisha/ wildlife of Odisha ) Significance of Biodiversity.

**Mark Distribution in Examination Botany / Zoology (Class XII) Theory Papers: 35 Marks**

1. **MCQ 1 x 5 = 5 Marks**
2. **Fill in the blank/ one word answer 1x 5= 5 Marks**
3. **Short notes 2 x 5 =10 Marks**
4. **Differentiate between 2 ½ x 2 = 5 Marks**
5. **Long Questions 5 x 2 =10 Marks**

                        **35 Marks**

# PRACTICALS

## BIOLOGY - XII (Botany) Detailed syllabus

**Major Experiments:**

1. Study of the effect of temperature and chemicals (ethanol, acetone, formaldehyde) on leaching of pigments in beet root..
2. Study of transpiration by Ganong's or Farmer's potometer..
3. Effect of different wave length of light on photosynthesis by Wilmott's bubbler..
4. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity of soil. Correlate with the kinds of plants found in them.
5. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms.
6. Study of plant population density by quadrate method.
7. Study of plant population frequency by quadrate method.

**Minor Experiments:**

8. Study of pollen germination on a slide.
9. Study of distribution of stomata on upper and lower surface of a dicot and a monocot leaf.
10. Study of osmosis by potato osmometer.
11. Analysis of samples for verification of Mendelian ratio using Pea seeds or colour beads.
12. Study of plasmolysis.

**Spotting:**

13. Conditions necessary for seed germination.
14. Types of germination.
15. Phototropism
16. Morphological adaptation of hydrophyte and Xerophyte.

**Question Pattern for Practical (Botany)**

1. Major Experiment 6 ½ Marks

   (Theory & Procedure    = 2 ½ Marks,   Experiment & Result      = 4 Marks)
2. Spotting              1 ½ x 3 = 4.5 Marks
3. Record            = 2 Marks
4. Viva             = 2 Marks

                15 Marks

**BIOLOGY -XII (Botany) for Visually impaired students**

A. **Items for Identification/ familiarity with the apparatus for assessment in practicals (Allexperiments)** Petriplates, soil from different sites - sandy, clayey, loamy, small potted plants, aluminium foil, test tubes, large flowers, Maize inflorescence, Cactus/*Opuntia*(model).

B. List of Practicals

1. Study of flowers adapted to pollination by different agencies (wind, insects).
2. Study of Mendelian inheritance pattern using beads/seeds of different sizes/texture.
3. Study of emasculation, tagging and bagging by trying out an exercise on controlled pollination.
4. Comment upon the morphological adaptations of plants found in xerophytic conditions.

**Note:** The above practicals may be carried out in an experiential manner rather than recording observations.

**BIOLOGY -XII (Zoology) Detailed Practical syllabus**

**A. EXPERIMENTS/ OBSERVATIONS:**

1. To test the presence of sugar in urine/ given sample solution

2. To test the presence of urea in urine/ given sample solution

3. To determine the pH of three water samples collected from water bodies (using pH paper).
SPOTTINGS/ IDENTIFICATION:

**B.SPOTTINGS/IDENTIFICATION:**

a. Study of specimens and identification with reasons- Shark, Rohu, Frog, Garden lizard, Cobra, Krait, Pigeon and Rat.

b. TS/ VS through, ovary, testis, stomach .

c. Appendicular skeleton of rabbit (excluding skull).

d. Identification of common disease causing organisms- Plasmodium, Taenia, (permanent slides/ specimens). Commenton the symptoms of the diseases they cause.

**Book Recommended :**

Bureau's Higher Secondary (+2) Zoology, Practical, Published by Odisha State Bureau of Text Book Preparation and Production, Bhubaneswar.

**Question Pattern for Practical**

1. Major Experiment 6 ½ Marks

(Theory & Procedure    = 2 ½ Marks,   Experiment & Result       = 4 Marks)

2. Spotting            1 ½ x 3 = 4.5 Marks

3. Record            = 2 Marks

4. Viva            = 2 Marks

Total=  15 marks

**BIOLOGY - XII (Zoology) visually impaired students**

**A. Items for Identification/ familiarity with the apparatus for assessment in practicals (Allexperiments)** Beaker, flask, starch solution, iodine, ice cubes, Bunsen burner/spirit lamp/water bath, model of developmental stages highlighting morula and blastula of frog, beads/seeds of different shapes/size/texture *Ascaris*.

**B.   List of Practicals**

1.   Identification of T.S of morula or blastula of frog (Model).

2. Preparation of pedigree charts of genetic traits such as rolling of tongue, colour blindness.

3. Identify common disease-causing organisms like *Ascaris* (model) and learn some common symptoms of the disease that they cause.

**Note:** The above practicals may be carried out in an experiential manner rather than recording observations.

**Prescribed Books:**

1. Biology, Class-XII, Published by NCERT

2. Bureau's Higher Secondary Biology, Vol-II : Published by Text Book Bureau, Odisha

3. Other related books and manuals brought out by NCERT

4. Biology Supplementary Material (Revised). Available on CBSE website.