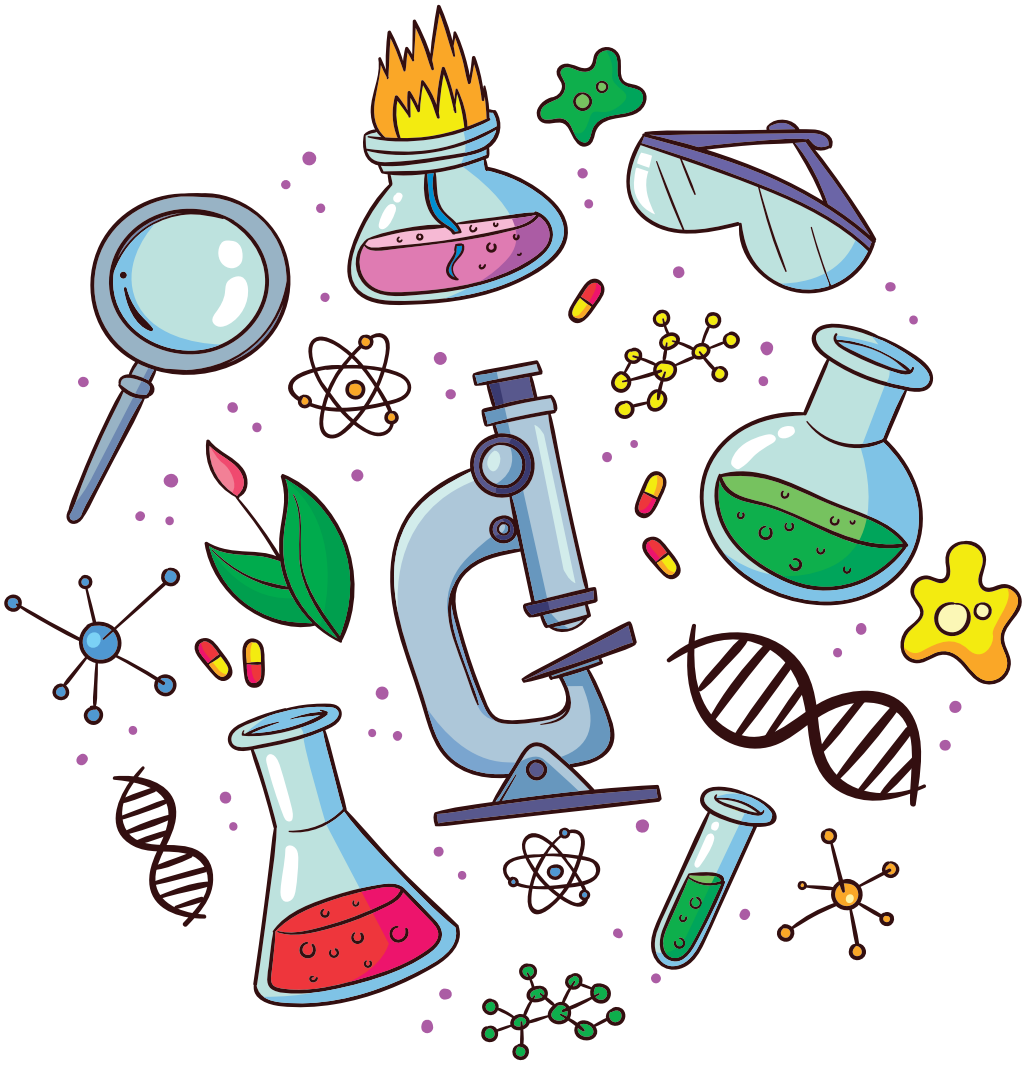
National Curriculum of Pakistan
2022-23

TECHNICAL EDUCATION

APPLIED SCIENCES-I

Physics (Theory)
Grade 11



NATIONAL CURRICULUM COUNCIL SECRETARIAT
MINISTRY OF FEDERAL EDUCATION AND
PROFESSIONAL TRAINING, ISLAMABAD
GOVERNMENT OF PAKISTAN

بسم اللہ الرحمن الرحیم

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Physics (Theory)
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It is with great pride that we, at the National Curriculum Council Secretariat, present the first core curriculum in Pakistan's 75-year history. Consistent with the right to education guaranteed by Article 25-A of our Constitution, the National Curriculum of Pakistan (2022-23) aspires to equip every child with the necessary tools required to thrive in and adapt to an ever-evolving globalized world.

The National Curriculum is in line with international benchmarks, yet sensitive to the economic, religious, and social needs of young scholars across Pakistan. As such, the National Curriculum aims to shift classroom instruction from rote learning to concept-based learning.

Concept-based learning permeates all aspects of the National Curriculum, aligning textbooks, teaching, classroom practice, and assessments to ensure compliance with contemplated student learning outcomes. Drawing on a rich tapestry of critical thinking exercises, students will acquire the confidence to embark on a journey of lifelong learning. They will further be able to acknowledge their weaknesses and develop an eagerness to build upon their strengths.

The National Curriculum was developed through a nationwide consultative process involving a wide range of stakeholders, including curriculum experts from the public, private, and non-governmental sectors. Representatives from provincial education departments, textbook boards, assessment departments, teacher training departments, *deeni madaris*, public and private publishers, private schools, and private school associations all contributed their expertise to ensure that the National Curriculum could meet the needs of all Pakistani students.

The experiences and collective wisdom of these diverse stakeholders enrich the National Curriculum, fostering the core, nation-building values of inclusion, harmony, and peace, making the National Curriculum truly representative of our nation's educational aspirations and diversity.

I take this opportunity to thank all stakeholders, including students, teachers, and parents who contributed to developing the National Curriculum of Pakistan (2022-23)

Dr. Mariam Chughtai
Director
National Curriculum Council Secretariat
Ministry of Federal Education and Professional Training

Applied Sciences - I
Progression Grid (PG)

Physics (Theory)

Domain A: Nature of Science

Standard The content of nature of sciences enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to ● Define the nature of science.physics and scientific methods ● Categorize the main divisions of science ● Describe the sequential steps of the scientific method
[SLO:API-11-A-01]: Define the nature of science as a systematic and evidence-based approach to understanding the natural world. [SLO:API-11-A-02]: Describe the scope and focus of physics as a branch of science. [SLO:API-11-A-03]: Define and categorize the main divisions of science. [SLO:API-11-A-04]: Define the scientific method and describe the sequential steps of the scientific method, including observation, hypothesis formulation, experiment design, data collection, analysis, and conclusions.

Domain B: Measurements

Standard The content of measurements enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: ● Define measurement in the context of physics ● Describe the concept of metric system as a decimal-based system of measurement
[SLO:API-11-B-01]: Define measurement in the context of physics. [SLO:API-11-B-02]: Explain the concept of scientific notation as a way to express very large or very small numbers using powers of 10.1 [SLO:API-11-B-03]: Describe the concept of metric system as a decimal-based system of measurement [SLO:API-11-B-04]: Define and identify the units of mass (gram, kilogram), length (meter, kilometer), and volume (liter, milliliter) within the metric system. [SLO:API-11-B-05]: Demonstrate the ability to convert between different metric units

Domain C: Mechanics

Standard The content of mechanics enables students to learn and apply scientific knowledge and skills related to Physics..

Grade 11
Benchmark I: The student will be able to • Define mechanics and describe the principles of kinematics • Explain Newton's first, second and third law of motion • Explain the concept of inertia
[SLO:API-11-C-01]: Define mechanics and describe the principles of kinematics, including the concepts of position, displacement, velocity, and acceleration. [SLO:API-11-C-02]: Describe the concept of force and differentiate between various types of forces [SLO:API-11-C-03]: Identify the SI unit of force (newton) and the vector nature of force. [SLO:API-11-C-04]: Explain Newton's first, second and third law of motion and derive the formula for calculating force with the help of Newton law. [SLO:API-11-C-05]: Explain the concept of inertia

Domain D: Gravity

Standard The content of gravity enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Define gravity, speed, velocity, center of gravity and acceleration. • Explain the concept of speed, velocity and acceleration with their SI Units
[SLO:API-11-D-01]: Define gravity and explain the concept of Newton’s law of universal gravitation. [SLO:API-11-D-02]: Explain the concept of speed, velocity and acceleration with their SI Units. [SLO:API-11-D-03]: Differentiate between speed, velocity and acceleration. [SLO:API-11-D-04]: Define the center of gravity and explain the fundamental role of gravity in determining the center of gravity for different objects.

Domain E: Work, Power and Energy.

Standard The content of work. Power and energy enables students to learn and apply scientific knowledge and skills related to Physics

Grade 11
Benchmark I: The student will be able to

• Define the term work and how to calculate it from the formula • Describe the term power, its formula and Si units.
[SLO:API-11-E-01]: Define the term work and how to calculate it from the formula. [SLO:API-11-E-02]: Explain energy and differentiate between different forms of energy. [SLO:API-11-E-03]: Describe the relationship between work and energy. [SLO:API-11-E-04]: Describe the term power, its formula and SI units.

Domain F: Simple Machines

Standard The content of Simple machine enables students to learn and apply scientific knowledge and skills related to Physics

Grade 11
Benchmark I: • Define simple machines as basic mechanical devices and their basic functions. • Explain the principles of machines • Describe levers and the components of a lever.
[SLO:API-11-F-01]: Define simple machines as basic mechanical devices and their basic functions. [SLO:API-11-F-02]: Categorize the six types of simple machines including lever, pulley, wheel and axle, inclined plane, wedge, and screw [SLO:API-11-F-03]: Explain the principles of machines. [SLO:API-11-F-04]: Define friction and the different types of friction, including static friction (at rest), kinetic friction (in motion), and rolling friction [SLO:API-11-F-05]: Explore various methods to reduce friction in machines, [SLO:API-11-F-06]: Describe levers and the components of a lever.

Domain G: Density, Specific Gravity, Archimedes' Principle:

Standard The content of density enables students to learn and apply scientific knowledge and skills related to Physics

Grade 11
Benchmark I: The student will be able to • Define Archimedes' Principle and explain its importance • Explain the concept of density its importance and SI units • Explain the concept of specific gravity and its importance in various fields
[SLO:API-11-G-01]:

Explain the concept of density its importance and SI units. [SLO:API-11-G-02]: Demonstrate the ability to calculate density using appropriate formulas, considering mass and volume measurements. [SLO:API-11-G-03]: Explain the concept of specific gravity and its importance in various fields. [SLO:API-11-G-04]: Define Archimedes' Principle and explain its importance

Domain H: Pressure

Standard: The content of Pressure enables students to learn and apply scientific knowledge and skills related to Physics

Grade 11
Benchmark I: The student will be able to • Define pressure and its SI Units. • Describe the concept of pressure in hydrostatic fluids and their application.
[SLO:API-11-H-01]: Define pressure and its SI Units. [SLO:API-11-H-02]: Demonstrate the ability to calculate pressure using appropriate formulas [SLO:API-11-H-03]: Describe the concept of pressure in hydrostatic fluids, pressure in flowing liquids and their practical application in various fields

Domain I: Gas Laws

Standard: The content of Gas Law enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Explain Boyle's Law, Charles law, and express Boyle's Law and Charles laws mathematically • Define atmospheric pressure and explain how changes in atmospheric pressure can impact the human body.
[SLO:API-11-I-01]: Explain Boyle's Law, Charles law, and express Boyle's Law and Charles laws mathematically [SLO:API-11-I-02]: Describe practical applications of Boyle's Law and Charles law in various fields. [SLO:API-11-I-03]: Explain how gas laws, including Boyle's and Charles's laws, apply to the respiratory process and the behavior of gases in the lungs. [SLO:API-11-I-04]: Define atmospheric pressure and explain how changes in atmospheric pressure can impact the human body.

Domain J: Heat

Standard The content of heat enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Define heat and describe the units used to measure heat, • Explain the concept of calorimeter as a technique for measuring heat
[SLO:API-11-J-01]: Define heat and describe the units used to measure heat, such as calories, joules, and British thermal units (BTUs). [SLO:API-11-J-02]: Explain the mechanisms of heat transfer, including conduction, convection, and radiation, in the context of the nature of heat. [SLO:API-11-J-03]: Explain the concept of calorimeter as a technique for measuring heat

Domain K: Light

Standard: The content of Light enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Define light, refraction and reflection of light • Describe lens terminology, including focal point, focal length, and principal axis. • Explain different types of lenses (convex lenses, concave lenses) and understand how they refract light.
[SLO:API-11-K-01]: Define light as electromagnetic radiation. [SLO:API-11-K-02]: Explore the speed of light in a vacuum and understand its significance in the study of light. [SLO:API-11-K-03]: Explain how light travels through different mediums and the concepts of transparency, translucency, and opacity. [SLO:API-11-K-04]: Describe refraction and reflection of light and its importance. [SLO:API-11-K-05]: Describe lens terminology, including focal point, focal length, and principal axis. [SLO:API-11-K-06]: Explain different types of lenses (convex lenses, concave lenses) and understand how they refract light. [SLO:API-11-K-07]: Describe lens power and its measurement in diopters. [SLO:API-11-K-08]: Describe the practical applications of lense.

Domain L: Sound
Standard: The content of sound enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Describe characteristics and properties of sound waves • Explain the concept of sound absorption • Describe the relationship between amplitude and loudness
[SLO:API-11-L-01]: Explain the mechanisms involved in sound production, including the vibration of objects and the generation of sound waves. [SLO:API-11-L-02]: Describe characteristics of sound (pitch, frequency, amplitude, and wavelength). [SLO:API-11-L-03]: Comprehend the process of sound transmission through various mediums, including air, solids, and liquids. [SLO:API-11-L-04]: Explain the properties of sound waves (interference, diffraction, and the Doppler effect). [SLO:API-11-L-05]: Describe the relationship between amplitude and loudness, understanding how changes in amplitude influence the perceived intensity of sound. [SLO:API-11-L-06]: Explain the concept of sound absorption, identifying materials and surfaces that absorb or reflect sound waves. [SLO:API-11-L-07]: Define echoes as distinct reflections of sound.

Domain M: Electricity
Standard: The content of electricity enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Define atomic structure and their role in electrical conductivity. • Differentiate between conductors and insulators • Describe the characteristics of a series circuit and parallel circuit: • Apply Ohm's Law (V = I * R), understanding the relationships between voltage, current, and resistance in an electrical circuit
[SLO:API-11-M-01]: Define atomic structure, recognizing the arrangement of electrons, protons, and neutrons within an atom and their role in electrical conductivity. [SLO:API-11-M-02]: Describe the concept of free electrons in conductive materials, exploring their mobility and contribution to electrical current. [SLO:API-11-M-03]:

Differentiate between conductors and insulators, identifying materials that allow or inhibit the flow of electric current
[SLO:API-11-M-04]:
Define electric current as the flow of electric charge, understanding the direction of flow and its measurement in amperes (A).
[SLO:API-11-M-05]:
Define potential difference (voltage) as the electrical force that drives the flow of current in a circuit.
[SLO:API-11-M-06]:
Describe resistance as the opposition to the flow of electric current, exploring its factors and measurement in ohms (Ω).
[SLO:API-11-M-07]:
Describe the laws governing resistance, recognizing how resistance is influenced by the material, length, and cross-sectional area of a conductor.
[SLO:API-11-M-08]:
Apply Ohm's Law (V = I * R), understanding the relationships between voltage, current, and resistance in an electrical circuit
[SLO:API-11-M-09]:
Describe the characteristics of a series circuit and parallel circuit:
[SLO:API-11-M-10]:
Explain how to calculate electrical power (P), its relationship with voltage and current (P = V * I).
[SLO:API-11-M-11]:
Explain the concept of electrical energy in circuits.

Domain N: Magnets and Magnetism
Standard: The content of Magnets enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Define a magnet and magnetic field. • Explain the principles of electromagnetism • Describe how electric current produces a magnetic field • Explain the mechanism of motor effect and generator effect of current
[SLO:API-11-N-01]: Define a magnet and the fundamental properties of magnets. [SLO:API-11-N-02]: Describe the concept of a magnetic field, understanding how magnets influence the space around them and affect nearby objects. [SLO:API-11-N-03]: Explore the patterns formed by magnetic lines of force, visualizing the direction and strength of the magnetic field. [SLO:API-11-N-04]: Explain the principles of electromagnetism, including the creation of a magnetic field through the application of an electric current. [SLO:API-11-N-05]:

Grade 11
Describe how electric current produces a magnetic field, exploring the relationship between current flow and magnetic strength. [SLO:API-11-N-06]: Explain how an electric current flowing through a conductor produces a magnetic field around it, as described by Ampere's law and demonstrated by the right-hand rule. [SLO:API-11-N-07]: Explain the mechanism of motor effect and generator effect of current. [SLO:API-11-N-08]: Describe the phenomenon of magnetic and electric induction, as described by Faraday's law. [SLO:API-11-N-09]: Describe transformer and types of transformers. [SLO:API-11-N-10]: Explain the construction and working operation of transformer.

Domain O: Charge

Standard: The content of charge enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Explain Coulomb's Law and how it relates to the force between two charged objects. • Describe the basic structure and characteristics of capacitor. • Differentiate between capacitors connected in series and parallel.
[SLO:API-11-O-01]: Explain the fundamental concept of electric charge and state its symbol and SI unit. [SLO:API-11-O-02]: Explain the principle of conservation of electric charge [SLO:API-11-O-03]: Explain Coulomb's Law and how it relates to the force between two charged objects. [SLO:API-11-O-04]: Describe the basic structure and characteristics of capacitor. [SLO:API-11-O-05]: Describe the various types of capacitors [SLO:API-11-O-06]: Describe the construction of capacitors and how charge is stored. [SLO:API-11-O-07]: Differentiate between capacitors connected in series and parallel, and comprehend the impact of these configurations on the overall capacitance of the system [SLO:API-11-O-08]: Define Capacitance, state its symbol and unit of measurement. [SLO:API-11-O-09]: Explain the factors affecting capacitance of capacitor.

Domain P: Alternating Current.
Standard: The content of alternating current enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Define alternating current and its purpose. • Explain RMS value, how to measure rms value of alternating current. • Explain the concept of peak value sine wave
[SLO:API-11-P-01]: Define alternating current and its purpose. [SLO:API-11-P-02]: Differentiate between direct and alternating current. [SLO:API-11-P-03]: Explain RMS value, how to measure rms value of alternating current. [SLO:API-11-P-04]: Explain the concept of peak value sine wave. [SLO:API-11-P-05]: Differentiate between the peak value and other parameters of the sine wave [SLO:API-11-P-06]: Explain how the peak value measures the strength or intensity of a sine wave

Domain Q: Electromagnetic Radiation
Standard: The content of electromagnetic radiation enables students to learn and apply scientific knowledge and skills related to Physics.

Grade 11
Benchmark I: The student will be able to • Define frequency, wavelength, period and amplitude • Describe electromagnetic spectrum and its main components. • Explain inverse square law and how it express mathematically
[SLO:API-11-Q-01]: Describe electromagnetic spectrum and its main components. [SLO:API-11-Q-02]: Explain ionization and excitation and the factors influencing ionization and excitation energy. [SLO:API-11-Q-03]: Explain inverse square law and how it express mathematically. [SLO:API-11-Q-04]: Define frequency, wavelength, period and amplitude. [SLO:API-11-Q-05]: Describe the relationship between frequency and wavelength. [SLO:API-11-Q-06]: Perform basic calculations involving frequency, wavelength, and wave speed using the formula $c=f\times\lambda$.

Progression Grid (PG)
Physics (Practical)

Domain A: Physics practical

Standard The physics practical content will empower students to acquire and apply scientific principles and skills and comprehend the practical applications of physics in diverse fields.

Grade 11
Benchmark: Demonstrate proficiency in experimental techniques to measure and analyze the focal length of convex lenses, showcasing an understanding of optical principles and their practical applications
The student will be able to [SLO:API-11-A-01]: Measure and determine an unknown force using appropriate apparatus through experimental methods. [SLO:API-11-A-02]: Recognize and mark specific points on the irregular-shaped object. [SLO:API-11-A-03]: Demonstrate the law of reflection through experiments. [SLO:API-11-A-04]: Demonstrate the working of prism through experiments. [SLO:API-11-A-05]: Measure the focal point of lens. [SLO:API-11-A-06]: Measure and determine the critical angle of glass through experimentation with a glass prism. [SLO:API-11-A-07]: Calculate the speed of sound at room temperature through experimental measurements and analysis. [SLO:API-11-A-08]: Determine the focal length of a convex lens through experimental measurements and analysis. [SLO:API-11-A-09]: Calculate the speed of light at room temperature. [SLO:API-11-A-10]: Determine the refractive index of a liquid by employing a concave mirror in order to investigate optical properties

Progression Grid (PG)
Chemistry (Practical)

Domain A: Chemistry practical

Standard The chemistry practical content will empower students to acquire and apply scientific principles and skills and comprehend the practical applications of chemistry in diverse fields.

Grade 11
Benchmark: Demonstrate the ability to find solution concentration indirectly through chemical reactions, showcasing analytical and titration skills.

The student will be able to [SLO:API-11-A-01]: Demonstrate the preparation of a wash bottle, showcasing the practical skills involved in fitting up the apparatus. [SLO:API-11-A-02]: Demonstrate crystallization technique to purify a given sample of impure naphthalene [SLO:API-11-A-03]: Apply sublimation as a purification technique to pacify a given sample of naphthalene, illustrating the sublimation process." [SLO:API-11-A-04]: Determine the precise melting and boiling points of an organic compound. [SLO:API-11-A-05]: Prepare a standard solution of acid or base, demonstrating competency in solution preparation techniques." [SLO:API-11-A-06]: Prepare a standard solution of oxalic acid and utilize it to standardize a solution of NaOH, highlighting proficiency in titration and standardization procedures." [SLO:API-11-A-07]: Prepare an approximate N/10 solution of H2SO4 and determine its exact normality by titrating against standard N/10 NaOH, demonstrating analytical and titration skills." [SLO:API-11-A-08]: Demonstrate direct methods to standardize a given solution, exhibiting the ability to determine the concentration of a solution directly." [SLO:API-11-A-09]: Demonstrate indirect methods to standardize a given solution, demonstrating the ability to indirectly determine the concentration of a solution through chemical reactions."

Progression Grid (PG)
Chemistry (Theory)

Domain A: Introduction to Chemistry

Standard : The Content of Introduction to Chemistry empowers students to acquire and apply fundamental scientific knowledge and skills related to chemistry.

Grade 11
Benchmark I: Student will be able to ● Define Chemistry and its importance ● Describe major branches of chemistry ● Describe the scientific method
[SLO:API-11-A-01]: Define chemistry and the scope of chemistry. [SLO:API-11-A-02]: Describe the major branches of chemistry and their uses. [SLO:API-11-A-03]: Describe the scientific method in the context of chemistry, involving observation, hypothesis formation, experimentation, data analysis, and conclusion.

Domain B: Composition of Substance

Standard The course Composition of Substances enables students to learn and apply scientific knowledge and skills related to chemistry."

Grade 11
Benchmark I: *Student will be able to* • Describe the basic structure of Atom • Explain the main element on periodic table • Describe Chemical formula ,empirical formula and molecular formula
[SLO:API-11-B-01]: Describe Atom and the basic structure of an atom, including the roles of protons, neutrons, and electrons. [SLO:API-11-B-02]: Explore the properties and functions of subatomic particles, including protons, neutrons, and electrons. [SLO:API-11-B-03]: Explain the concept of elements as the fundamental substances that make up matter, characterized by unique chemical properties and represented by symbols on the periodic table. [SLO:API-11-B-04]: Locate and identify elements on periodic table on the basis of atomic numbers, names and symbols [SLO:API-11-B-05]: Define metals and nonmetals? Compare the difference between metals and nonmetals. [SLO:API-11-B-06]: Describe the main elements on the periodic table. [SLO:API-11-B-07]: Describe the basic c the concepts of atomic number and mass number [SLO:API-11-B-08]: Explain the term compound and mixture. [SLO:API-11-B-09]: Describe Chemical formula ,empirical formula and molecular formula,

Domain C: Chemical Reaction and Equation

Standard The content of chemical reaction and equation enables students to learn and apply scientific knowledge and skills related to chemistry.

Grade 11
Benchmark I: Student will be able to • Explain chemical reaction • Describe types of chemical reactions.
[SLO:API-11-C-01]: Explain the basic concept of chemical reaction and the importance of chemical reaction. [SLO:API-11-C-02]: Identify the various types of chemical reaction. [SLO:API-11-C-03]:

Define a chemical equation and balance chemical equations, ensuring that the number of atoms of each element is the same on both sides of the equation.

Domain D: Water

Standard : The study of water facilitates students in acquiring and applying scientific knowledge and skills pertaining to chemistry

Grade 11
Benchmark I: Student will be able to ● Define and differentiate the physical properties and chemical properties of water ● Differentiate between hard and soft water. ● Illustrate the components and processes of the water cycle
[SLO:API-11-D-01]: Define and differentiate the physical properties and chemical properties of water. [SLO:API-11-D-02]: Identify substances that are deliquescent and explain the process by which they absorb moisture from the air [SLO:API-11-D-03]: Describe the characteristics of hygroscopic substances and how they absorb and retain moisture from the surrounding environment. [SLO:API-11-D-04]: Recognize common impurities in water, such as minerals, organic matter, and pollutants, and understand their sources. [SLO:API-11-D-05]: Differentiate between hard and soft water. [SLO:API-11-D-06]: Illustrate the components and processes of the water cycle, including evaporation, condensation, and precipitation.

Domain E: Solution

Standard : The content of solution enables students to learn and apply scientific knowledge and skills related to chemistry.

Grade 11
Benchmark I: Student will be able to ● Describe solution and identify its component ● Explain the basic concept of molality and molarity. ● Describe the concept of dilution and concentration
[SLO:API-11-E-01]: Describe solution and identify its component (solute and solvent) [SLO:API-11-E-02]: Identify different types of solutions, including saturated, unsaturated, and supersaturated solutions. [SLO:API-11-E-03]:

Identify different ways to express the concentration of a solution, including mass percent, molarity, molality, and volume percent
[SLO:API-11-E-04]:
Explain the basic concept of molality and molarity.
[SLO:API-11-E-05]:
Demonstrate the calculation of molality and molarity using its formula.
[SLO:API-11-E-06]:
Explain Solubility and factors affecting solubility, including temperature, pressure, and the nature of the solute and solvent.
[SLO:API-11-E-07]:
Describe the concept of dilution and explain how to prepare a less concentrated solution by adding more solvent.

Domain F: Acids, Base and Salts
Standard *I*: The study of Acid, Base and Salts facilitates students in acquiring and applying scientific knowledge and skills pertaining to chemistry.

Grade 11
Benchmark I: *Student will be able to* ● Explain the term acid ,base ,salt and alkali ● Define PH scale as logarithm scale ● Describe the concept of Henderson Hassel Balch equation
[SLO:API-11-F-01]: Explain the term acid ,base ,salt and alkali [SLO:API-11-F-02]: Describe the Arrhenius definition, Bronsted-Lowry definition Lewis definition of acids and bases. [SLO:API-11-F-03]: Define PH scale as logarithm scale used to express the acidity alkalinity of solution [SLO:API-11-F-04]: Explain the relationship between PH and the concentration of hydrogen ions in a solution [SLO:API-11-F-05]: Describe the concept of Henderson Hassel Balch equation and use the equation to calculate the PH of solution

Domain G: Electrolytes and electrolysis.
Standard: The study of facilitates students in acquiring and applying scientific knowledge and skills pertaining to chemistry.

Grade 11
Benchmark I: *Student will be able to* ● Define the terms "electrolytes" and "electrolysis ● Explain the process of electrolysis
[SLO:API-11-G-01]: Define the terms "electrolytes" and "electrolysis" in the context of chemical reactions involving ions and electrical current.

[SLO:API-11-G-02]:
Identify substances as electrolytes or non-electrolytes based on their ability to conduct electricity.
[SLO:API-11-G-03]:
Explain the process of electrolysis, including the movement of ions and the chemical changes occurring at electrodes.
[SLO:API-11-G-04]:
Demonstrate the practical application of electrolysis in industries and daily life.

Domain H: Amines and Amides:
Standard: The study of Amines and amides facilitates students in acquiring and applying scientific knowledge and skills pertaining to chemistry.

Grade 11
Benchmark I: *Student will be able to* ● Define the term amines and amides ● Describe the properties of amines and amides ● Classify amines and amides based on their chemical structures and functional groups.
[SLO:API-11-H-01]: Define the term amines and amides. [SLO:API-11-H-02]: Classify amines and amides based on their chemical structures and functional groups. [SLO:API-11-H-03]: Describe the properties of amines and amides, emphasizing their reactivity and use in various chemical reactions. [SLO:API-11-H-04]: Distinguish between primary, secondary, and tertiary amines, understanding their differing chemical behaviors. [SLO:API-11-H-05]: Apply knowledge of amines and amides in the synthesis of organic compounds.

Domain I: protein
Standard: The study of protein facilitates students in acquiring and applying scientific knowledge and skills pertaining to chemistry.

Grade 11
Benchmark I: *Student will be able to* ● Explain the structure and properties of amino acids ● Describe protein and the composition of proteins
[SLO:API-11-I-01]: Describe protein and the composition of proteins, recognizing the role of amino acids as building blocks. [SLO:API-11-I-02]: Explain the structure and properties of amino acids to the overall structure and function of proteins. [SLO:API-11-I-03]:

Explain the properties of amino acids, considering their acidic, basic, and neutral characteristics. [SLO:API-11-I-04]: Classify proteins based on their structure (primary, secondary, and tertiary, quaternary) and function.

Domain J: Carbohydrates

Standard : The content of carbohydrate facilitates students in acquiring and applying scientific knowledge and skills pertaining to chemistry.

Grade 11
Benchmark I: *Student will be able to* ● Define the term carbohydrate. ● Identify various types of carbohydrates ● Explain the term "isomerism "in carbohydrate.
[SLO:API-11-J-01]: Describe the term carbohydrate, its empirical formula and biomedical importance. [SLO:API-11-J-02]: Differentiate between simple and complex carbohydrates, understanding their structural differences. [SLO:API-11-J-03]: Identify various types of carbohydrates, including monosaccharides, disaccharides, and polysaccharides. [SLO:API-11-J-04]: Explain the role of carbohydrates in energy storage and cellular processes. [SLO:API-11-J-05]: Explain the term "isomerism "in carbohydrate.

Domain K: lipids

Standard: The content of lipid facilitates students in acquiring and applying scientific knowledge and skills pertaining to chemistry.

Grade 11
Benchmark I: Student will be able to ● Define the term lipid ● Explain the structural diversity and functions of lipids in biological systems
[SLO:API-11-K-01]: Define lipids and the chemical composition of lipid. [SLO:API-11-K-02]: Classify lipid on the basis of composition and functions. [SLO:API-11-K-03]: Explain the structural diversity and functions of lipids in biological systems. [SLO:API-11-K-04]: Explain the role of lipids in cell membranes and their significance in maintaining cellular integrity [SLO:API-11-K-05]: Explain the physiological implications of lipid metabolism and its impact on health.

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