

National Curriculum of Pakistan
2022-23

GENERAL SCIENCE

Grades 9-10



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

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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

General Science

Progression Grid Template

Grade 9-10

Domain A: Nature of Science

Standard A1: Students will be able to explain with examples that the philosophical assumptions underpin the practice of sciences

Grade 9	Grade 10
Benchmark: Students should be able to explain the nature of science and relationships between different branches of Sciences	
Student Learning Outcomes	
<p>Students will be able to [SLO:GS-09-A-01]: Explain the nature of science</p> <p>[SLO:GS-09-A-02]: Enlist the main branches of sciences and explain their applications</p>	<p>Students will be able to [SLO:GS-10-A-01]: Differentiate between the terms science, technology and engineering with suitable examples</p> <p>[SLO:GS-10-A-02]: Discuss that science is blend of logic and imagination</p>

[SLO:GS-09-A-03]:

Describe the relationship between different branches of science and name some interdisciplinary fields of science

[SLO:GS-09-A-04]:

Justify with examples that science is a collaborative field that requires interdisciplinary researchers working together to share knowledge and critique ideas

[SLO:GS-10-A-03]:

Explain with examples in science falsifiability is the idea that a theory is scientific only if it makes assertions that can be disproven

Domain B: Life Sciences

Standard B1: Students will establish an understanding of a cell as a basic unit of life.

Grade 9	Grade 10
Benchmark I:	
Students will be able to describe the structure and functions of cells and tissues in plants and animals	
Student Learning Outcomes	
Students will be able to	

[SLO:GS-09-B-01]:

Define Cell as the basic unit of life.

[SLO:GS-09-B-02]:

describe different organelles of a cell.

[SLO:GS-09-B-03]:

differentiate between plant cell and animal cell

[SLO:GS-09-B-04]:

describe different types of Tissues in plants (epidermal,xylem and phloem)and animals (epithelial,muscular and nervous)

[SLO:GS-09-B-05]:

Make 3-D models of plant and animal cell steam

Standard B2: Student will establish an understanding of Biodiversity and Classification System

Benchmark II: Students will analyse the importance of biodiversity in daily life and Classification System of living organisms

Student Learning Outcomes

Students will be able to...

[SLO:GS-09-B-06]:

define biodiversity

[SLO:GS-09-B-07]:

identify the importance of biodiversity

[SLO:GS-09-B-08]:

discuss the impact of human beings on biodiversity

[SLO:GS-09-B-09]:

describe the ways of conservation of biodiversity

[SLO:GS-09-B-10]:

discuss and describe the need of the Classification System

[SLO:GS-09-B-11]:

<p>compare the Two Kingdom System,,three kingdom system and five kingdom system of classification</p>	
<p>Standard B3: Student will establish an understanding of some vital life processes in Animals and Plants</p>	
<p>Benchmark III: Students can identify the role of Circulatory System, and Musculoskeletal System in human beings and photosynthesis in plants.</p>	
	<p>Students will be able to</p> <p>[SLO:GS-10-B-01]:</p> <p>recognize the role of different parts of circulatory System (heart,lungs,blood,blood vessels)</p> <p>[SLO:GS-10-B-02]:</p> <p>describe muscle and skeletal System in humans</p> <p>[SLO:GS-10-B-03]:</p> <p>explain the process of Photosynthesis in Plants</p> <p>[SLO:GS-10-B-04]:</p> <p>analyse the effects of limiting factors of photosynthesis</p>

[SLO:GS-10-B-05]:

demonstrate a working model of circulatory system(with the help of battery,tubes,red and blue coloured ink) STEAM

Standard B4: Students will establish an understanding of Biotechnology and Genetic Engineering

Benchmark IV: Students will be able to interpret the application of biotechnology.

Students will be able to

[SLO:GS-10-B-06]:

explain biotechnology and its significance

[SLO:GS-10-B-07]:

interpret the applications of biotechnology in everyday life
(food,medicine,agriculture)

[SLO:GS-10-B-08]:

define Genetic Engineering and discuss its applications

Standard: Students will establish an understanding of Health and Hygiene.

Benchmark V: Students will be able to discuss the importance of food components and to describe causes, symptoms, preventive measures/ treatments of some bacterial and viral diseases.

Students will be able to

[SLO:GS-10-B-09]:

define nutrition and nutrients

[SLO:GS-10-B-10]:

discuss the role and importance of different food components (carbohydrates, proteins, lipids, vitamins, water and fibres)

[SLO:GS-10-B-11]:

define and explain balanced diet and its importance.

[SLO:GS-10-B-12]:

discuss the hygiene and its importance

[SLO:GS-10-B-13]:

Students will be able to describe different types of microorganisms (fungi, bacteria, virus)

[SLO:GS-10-B-14]:

Students will be able to recognize the advantages and disadvantages of microorganisms.

[SLO:GS-10-B-15]:

list some common bacterial and viral diseases e.g pink eye, influenza. diarrhea, typhoid, measles, covid

[SLO:GS-10-B-16]:

explain the symptoms, causes and preventive measures and treatment of pink eye, influenza. diarrhea, typhoid, measles, covid

[SLO:GS-10-B-17]:

differentiate between vaccines and antibiotics.

Domain C: Physical Science

Standard C1: Explain the basic concepts of chemistry and its applications in daily life

Grade 9	Grade 10
Benchmark I: Students will be able to demonstrate an understanding of atomic models, atomic structure and related theories and experiments	
Student Learning Outcomes	
Students will be able to [SLO:GS-09-C-01]: describe the structure of an atom including the location and electric charges of proton, electron and neutron; [SLO:GS-09-C-02]: draw the atomic structure of the first twenty elements of the periodic table [SLO:GS-09-C-03]: determine the number of protons, neutrons and electrons in different isotopes of H, C, O, Cl and U;	

<p>[SLO:GS-09-C-04]: describe Rutherford's experiment leading to the discovery of atomic nucleus</p> <p>[SLO:GS-09-C-05]: describe the defects of Rutherford's atomic model</p> <p>[SLO:GS-09-C-06]: list the main postulates of Bohr's atomic model</p>	
<p>Benchmark II: Students will be able to explain Chemical Bonding, its types, reasons why atoms form bonds, and duplet and octet rule</p>	
<p>Student Learning Outcomes</p>	
<p>Students will be able to</p> <p>[SLO:GS-09-C-07]: define Shells and subshells</p> <p>[SLO 2] determine the number of electrons in valence shell with the help of periodic table</p>	

[SLO:GS-09-C-08]:

describe duplet and octet rule

[SLO:GS-09-C-09]:

identify elements of the periodic table and their ions using their atomic number and applying duplet and octet rule

[SLO:GS-09-C-10]:

justify why atoms form chemical bonds

[SLO:GS-09-C-11]:

describe the formation of an ionic bond

[SLO:GS-09-C-12]:

describe the characteristics of ionic compounds;

[SLO:GS-09-C-13]:

describe the formation of a covalent bond

[SLO:GS-09-C-14]:

<p>describe the characteristics of covalent compounds</p> <p>[SLO:GS-09-C-15]:</p> <p>identify polar and nonpolar covalent compounds in heteroatomic and homoatomic molecules.</p> <p>[SLO:GS-09-C-16]:</p> <p>differentiate between ionic and covalent compounds with examples</p>	
<p>Benchmark III: Students will be able to demonstrate an understanding of Common States of Matter, Properties of Gases, Liquids, and Solids, Gas Laws</p>	
<p style="text-align: center;">Student Learning Outcomes</p>	
<p>Students will be able to</p> <p>[SLO:GS-09-C-17]:</p> <p>identify the three common states of matter. with the example of water etc.</p> <p>[SLO:GS-09-C-18]:</p>	

Students will be able to compare the intermolecular forces between three states of matter.

[SLO:GS-09-C-19]:

Students will be able to describe the following properties of gases by using daily life examples:

- (i) diffusion
- (ii) effusion
- (iii) condensation
- (iv) density
- (v) compressibility

[SLO:GS-09-C-20]:

Students will be able to analyse the following properties of liquids

- (i) evaporation
- (ii) vapour pressure
- (iii) boiling point
- (iv) freezing point
- (v) density

[SLO:GS-09-C-21]:

Students will be able to rationalise the following properties of solids:

- (i) melting point
- (ii) sublimation
- (iii) compressibility
- (iv) density

[SLO:GS-09-C-22]:

differentiate between amorphous solids and crystalline solids

[SLO:GS-09-C-23]:

differentiate allotropic forms of carbon.

Benchmark IV: Students will be able to describe the Periodicity of Elements, Groups, and Blocks of Periodic table, Group Trends and Electronic Configuration

Student Learning Outcomes

Students will be able to

[SLO:GS-10-C-01]:

define periodic table

[SLO:GS-10-C-02]:

differentiate between groups and periods

[SLO:GS-10-C-03]:

describe s,p,d,f blocks of periodic table

[SLO:GS-10-C-04]:

deduce the groups and periods of first twenty elements on the basis of electronic configuration

[SLO:GS-10-C-05]:

define the following properties and analyse their trends with reference to change in groups and periods:

(i) atomic radii

(ii) ionisation energy

(iii) electron affinity

(iv) electronegativity

(v) shielding effect

(vi) metallic character

[SLO:GS-10-C-06]:

discuss physical and chemical properties of elements of following main groups of periodic table :

(i) Group I & II

(ii) Group IV

(iii) Group VII

(iii) Group VIII

Benchmark V: Students will be able to identify and describe Acids, Bases and Salts, Different Concepts about Acids, Bases, Physical, Chemical Properties and Uses of Acids, Bases and Salts

Student Learning Outcomes

Students will be able to

[SLO:GS-10-C-07]:

State Arrhenius concept of acids and bases with examples

[SLO:GS-10-C-08]:

describe Bronsted-Lowry concept of acids and bases with examples

[SLO:GS-10-C-09]:

deduce Lewis concept of acids and bases with examples

[SLO:GS-10-C-10]:

identify the substances based on Arrhenius concept, Bronsted-Lowry concept and Lewis concept

[SLO:GS-10-C-11]:

compare the terms strong acid/base vs concentrated acid/base and /base vs dilute acid/base

[SLO:GS-10-C-12]:

discuss the physical and chemical properties of acids and bases

[SLO:GS-10-C-13]:

identify the uses of acids ,bases and salts in home and industries through a steam activity;

Benchmark VI: Students will be able to explain the concept of Environmental Chemistry, Layers of Spheres, causes and effects of Air Pollution and Water Pollution

Student Learning Outcomes

Students will be able to

[SLO:GS-10-C-14]:

recognise the importance of environmental chemistry

[SLO:GS-10-C-15]:

differentiate between troposphere, stratosphere, mesosphere and thermosphere.

[SLO:GS-10-C-16]:

identify the sources and effects of air pollutants

[SLO:GS-10-C-17]:

discuss the problems caused by the air pollution

[SLO:GS-10-C-18]:

explain the ozone formation in stratosphere;

[SLO:GS-10-C-19]:

analyse the threat of global warming, its causes and its effects through steam activity.

	<p>[SLO:GS-10-C-20]:</p> <p>demonstrate the understanding about the causes and effects of water pollution through a steam activity.</p>
	<p>[SLO:GS-10-C-21]:</p> <p>Recognize and integrate the international, cross-cultural, and transdisciplinary nature of environmental problems in analyses and solutions</p>

Standards C2:

This domain will help students will be able to understand basic concepts of physics and its applications in daily life

Grade 9	Grade 10
<p>Benchmark I: Students can demonstrate and identify of Physical and non physical quantities, common length measuring instrument, gravitational forces dissipative effects of friction, sound waves and current and its effects</p>	
<p>Student Learning Outcomes</p>	
<p>Students will be able to</p> <p>[SLO:GS-09-C-24]:</p>	<p>Students will be able to</p>

differentiate between physical quantities and non physical quantities and also describe measurement of physical quantities in table form

[SLO:GS-09-C-25]:

Explain with example that physics is based on physical quantities

[SLO:GS-09-C-26]:

Justify and illustrate how to measure length using common instrument like measuring tapes and metre rod etc

[SLO:GS-09-C-27]:

Justify and illustrate how to measure time interval using stop watch both digital and analogue

[SLO:GS-09-C-28]:

Round off and justify calculational estimates

[SLO:GS-09-C-29]:

Explain the force of gravitation and compare gravitational field strength g of earth with other planets

[SLO:GS-09-C-30]:

[SLO:GS-10-C-22]:

Describe what is meant by wave

[SLO:GS-10-C-23]:

Describe the production of sound

[SLO:GS-10-C-24]:

Describe that in general sound travels faster in solids than in liquids and faster in liquids than in gases

[SLO:GS-10-C-25]:

Analyse the effects of noise pollution on environment

[SLO:GS-10-C-26]:

Justify the effect of acoustic protection

[SLO:GS-10-C-27]:

Define current

[SLO:GS-10-C-28]:

Explain electrical conduction

Justify that gravitational force is non contact force

[SLO:GS-09-C-31]:

Using formula calculate the weight of an object

[SLO:GS-09-C-32]:

State that there are four fundamental force and describe them in terms of relative strength

[SLO:GS-09-C-33]:

Analyse the dissipative effect of friction

[this include identifying where desipation may occur and giving examples such as rubbing hands together produces heat asteroids that enter the earth atmosphere disintegrate due to high temperature generated from air resistance]

[SLO:GS-09-C-34]:

Justify methods to reduce friction

[SLO:GS-09-C-35]:

[in metals in terms of movement of free electrons]

[SLO:GS-10-C-29]:

Explain why outer casing of an electrical appliance must be non conducting or insulator

[SLO:GS-10-C-30]:

State common electrical hazards that may be caused from malpractice and lack of maintenance

[SLO:GS-10-C-31]:

Describe magnetism, magnetic field around a bar magnet

[SLO:GS-10-C-32]:

State that it is theorised that Earth's magnetic field is generated by rotation of Earth and its molten iron core

Define efficiency and describe why machine cannot be 100% efficient

[SLO:GS-09-C-36]:

Differentiate between heat and temperature

[SLO:GS-09-C-37]:

Describe thermal expansion and its consequences in daily life

[SLO:GS-09-C-38]:

State the melting and boiling temperature for water

[SLO:GS-09-C-39]:

Differentiate between conduction , convection and radiation

[SLO:GS-09-C-40]:

Describe structure of atom

[SLO:GS-09-C-41]:

Differentiate between heat conductors and insulators	
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Domain D: Earth & Space Sciences

Standard:

Students will discuss the environmental impact of energy resources on climate change and develop innovative strategies to integrate green education principles for sustainability.

Grade 9	Grade 10
Benchmark I: Students will be able to explain the Energy Resources and their impact on climate and the need of greening education	
Student Learning Outcomes	
Student will be able to [SLO:GS-09-C-42]: differentiate between renewable and non-renewable energy resources. [SLO:GS-09-C-43]:	Students will be able to [SLO:GS-10-C-33]: Explain the fundamentals of major concepts in earth science, including: a. surface and groundwater, b. volcanic and earthquake hazards, c. glaciers, d. ice ages and climate changes, e. mineral and f. hydrocarbon resources

<p>Justify : Renewable energy resources are more beneficial than nonrenewable energy resources.</p> <p>[SLO:GS-09-C-44]:</p> <p>Describe the phenomena of the greenhouse effect and its impact on climate.</p> <p>[SLO:GS-09-C-45]:</p> <p>Discuss the Hazardous effects of smog on the environment and Humans health.</p>	<p>[SLO:GS-10-C-34]:</p> <p>Identify key problems of floods and drought.</p> <p>[SLO3] Explain earth processes in context of plate tectonics, earth’s systems and the rock cycle</p> <p>[SLO:GS-10-C-35]:</p> <p>Define the term drainage basin, and give examples of how drainage basins influence surface water movement.</p> <p>[SLO:GS-10-C-36]:</p> <p>Explain how human activities influence water quality and movement.</p>
<p>[SLO:GS-09-C-46]:</p> <p>recognize the significance of greening education and how it helps in sustainable development</p> <p>[SLO:GS-09-C-47]:</p>	<p>[SLO:GS-10-C-37]:</p> <p>Explain how different factors affect the climate of an area on Earth</p> <p>[SLO:GS-10-C-38]:</p> <p>discuss the way on how to prevent climate change</p>

Identify the greening skills and describe how these skills help to prepare for their future

[SLO:GS-09-C-48]:

Compare green skills with 21st century skills as a pathway to the future

[SLO:GS-09-C-49]:

Explain changes in Atmospheric Pressure with altitude

[prior knowledge of Pressure should be included with this SLO]

[SLO:GS-09-C-50]:

Create solar oven and identify the scientific concept involved in it [STEAM]

[SLO:GS-10-C-39]:

analyse weather changes in relevance to atmospheric pressure

[SLO:GS-10-C-40]:

perform an activity to grow a plant in greenhouse and a plant in open environment and study the effects on their growth [STEAM]



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