

National Curriculum of Pakistan
2022-23

SCIENCE

Grades 4-8



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

Science (Grades 4-8) Progression Grid

The following progression grid incorporates specifications from the Science Curriculum of Pakistan and globally recognized curricula. Science for grades 4-8 is organized in the following domains:

- A. Life Sciences
- B. Physical Sciences
- C. Earth and Space Sciences

Thinking and Working Scientifically	
Overarching SLOs that will be addressed during the course of teaching different scientific concepts.	
By the end of Grade 5 students should be able to:	By the end of Grade 8 students should be able to:
<p>Scientific Enquiry:</p> <ul style="list-style-type: none"> ● Ask questions ● Know the five main types of scientific enquiry (observe over time, identify and classify, compare and contrast, fair test, research-by finding information). ● Use equipment to carry out scientific investigations. ● Take measurements and record them. ● Enlist and practice safety procedures while carrying out practical activities. ● Make a conclusion from results informed by reasoning. 	<p>Scientific Enquiry:</p> <ul style="list-style-type: none"> ● Identify whether a given hypothesis is testable. ● Make predictions of likely outcomes for a scientific enquiry. ● Plan a range of scientific investigations e.g. observe and classify etc. ● Know the meaning of hazard symbols, and consider them when planning practical work. ● Decide what equipment is required to carry out an investigation . ● Take precise measurements, explaining why accuracy and precision are important. ● Collect and record observations and/or measurements ● Describe trends and patterns in results. ● Make conclusions by interpreting results informed by reasoning. ● Suggest improvements while doing experiments.

<p>Engineering Design Process - STEM/ STEAM</p> <p>Models and Representations</p> <ul style="list-style-type: none"> ● Use models to show scientific ideas and what happens in science. ● Use a variety of technologies following the design process to identify and solve problems, to interpret data and present the data collected in the form of graphs and charts. 	<p>Engineering Design Process - STEM/ STEAM</p> <p>Models and Representations</p> <ul style="list-style-type: none"> ● Describe the strengths and limitations of a model. ● Use symbols and formulae to represent scientific ideas. ● Use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions to challenges/ enquiry questions. ● Apply mathematical concepts (e.g., percentages and ratios) to analyze data and present the data collected in the form of graphs, charts and tables.
<p>Science in Context:</p> <ul style="list-style-type: none"> ● Describe how science is used in their local area. ● Identify people who use science, including professionally, in their area and describe how they use science. ● Discuss how the use of science and technology can have positive and negative environmental effects locally and globally. 	<p>Science in Context:</p> <ul style="list-style-type: none"> ● Describe how science is applied across societies and industries, and in research. ● Discuss issues which involve and/or require scientific understanding. ● Describe how people develop and use scientific understanding. ● Discuss how the uses of science can have a global environmental impact.

Domain A: Life Science

Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Life processes Plant structure and function Animal structure and function Ecosystem - adaptations	Structure and function- human body system Microorganisms and diseases Ecosystem	Cellular Organization Re-production in plants Balanced diet Human digestive system	Plant systems Human respiratory and circulatory system Immunity and Diseases	Ecology Human Nervous system Variations, Heredity& Cell division Biotechnology
Organisms - Characteristics and Life Processes of Living Things				
Benchmark I By the end of Grade 5, students should be able to: Describe the life processes of animals and plants.		Benchmark I By the end of Grade 8, students should be able to: Research and describe the structure and function of specialized plant and animal cells, including cell division. Describe how the genetic information stored in DNA, received from parents, determine our physical characteristics.		

Student Learning Outcomes

[SLO: S-04-A-01] Understand that living things grow, take in nutrients, breathe, reproduce eliminate waste and die.				
[SLO: S-04-A-02] Discuss that living things need energy to grow, live and be healthy, and plants get their energy from light (photosynthesis) while animals get their energy from eating plants and other animals.				
[SLO: S-04-A-03] Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow).				

Student Learning Outcomes

[SLO: S-06-A-01]
Recognize cells as the basic unit of life that are organized into tissues, organs, systems and organisms.

[SLO: S-06-A-02]
Arrange and rank different levels of cellular organizations – cells to tissues, organs and organisms.

[SLO: S-06-A-03]
Relate the structures of some common cells (nerve, muscle, epithelium and blood cells) to their functions.

Student Learning Outcomes

[SLO: S-08-A-01]
Describe variation and adaptation in living organisms.

[SLO: S-08-A-02]
Explain and illustrate the differences between variation and adaptation.

[SLO: S-08-A-03]
Identify sources of variation from environmental and genetic factors.

[SLO: S-08-A-04]
Explain how different adaptations affects the chances of survivals of different species of organism.

Student Learning Outcomes

		<p>[SLO: S-06-A-04] Identify the structures present in an animal cell and plant cell as seen under a simple microscope and relate them to their functions (only cell membrane, cytoplasm, nucleus, cell wall, chloroplast, mitochondria and sap vacuole).</p> <p>[SLO: S-06-A-05] Describe the similarities and differences between the structures of plant and animal cells. Sketch the animal and plant cells and label key organelles in each.</p> <p>[SLO: S-06-A-06] Compare and contrast an animal cell and plant cell by preparing slides using onion peels and cheek cells.</p>		<p>[SLO: S-08-A-05] Recognize Genetics as the study of Heredity and understand and define heredity as the transfer of genetic information that specifies structure, characteristics, and functions, from parents to offspring.</p> <p>[SLO: S-08-A-06] Differentiate between the concept of genes and chromosomes and relate them to how genetic characteristics are inherited.</p>
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Student Learning Outcomes

				<p>[SLO: S-08-A-07] Describe the composition and structure of DNA.</p> <p>[SLO: S-08-A-08] Design a model of DNA to demonstrate its structure, functions, and various components.</p>
				<p>[SLO: S-08-A-09] Describe cell division and its types – mitosis and meiosis and relate them to the passage of genetic information through reproduction.</p> <p>[SLO: S-08-A-10] Explain the process of mitosis and meiosis and identify their key phases.</p>

2. Organisms - Structure and Functions (Plants) - How plants use their body structures to survive?

Benchmark II:

By the end of Grade 5, students will be expected to:

Explain how plants use their body structures to survive, identify the parts of plant transport system, and describe their functions.

Describe the parts of the flower and their functions.

Benchmark II:

By the end of Grade 8, students will be expected to:

Explain the root and shoot system of plants emphasizing the process of photosynthesis, respiration, and transpiration.

Compare and contrast the artificial and natural reproduction in plants and investigate ways in which artificial propagation of plants can lead to food production and food security.

Student Learning Outcomes

[SLO: S-04-A-04]
Classify the plants into two major groups (flowering, non-flowering), and give examples of each group.

[SLO: S-04-A-05]
Describe the functions of different parts of flowering plants: Roots, stem/ trunk, leaves and flowers.

[SLO: S-06-A-07]
Describe the different types of reproduction of plants.

[SLO: S-06-A-08]
Compare and contrast types of reproduction (sexual and asexual) in plants.

[SLO: S-06-A-09]
Distinguish between artificial and natural asexual reproduction in plants. (Budding, grafting, Bulbs, Tuber, Runners, cutting, and layering.)

[SLO: S-06-A-10]
Inquire how artificial propagation can lead to better quality yield in agriculture.

Student Learning Outcomes

<p>[SLO: S-04-A-06] Investigate the way in which water is transported within plants.</p> <p>[SLO: S-04-A-07] Identify the parts of the plant transport system and describe their functions (stem, -leaf, -root). Note: - <i>Recall of the relative positions of water and food carrying tubes is not required.</i> - <i>The use of specific terms ('xylem' and 'phloem') is not required.</i></p>			<p>[SLO: S-07-A-01] Explain the root and shoot system in plants. Label different parts of leaf, stem and root (external and internal structure).</p>	
			<p>[SLO: S-07-A-02] Predict the role of xylem and phloem in transport of water and food in plants by observing the cross section of the stem.</p>	
<p>[SLO: S-04-A-08] Identify the parts of a flower and describe their functions (limited to petals, sepals, anthers, filaments, stamens, stigma, style, carpel, and ovary).</p>			<p>[SLO: S-07-A-03] Define the process of photosynthesis and derive word equations for it.</p>	

Student Learning Outcomes

<p>[SLO: S-04-A-09] Explore the role of flowers in the life cycle of flowering plants, including pollination, fruit and seed formation and seed dispersal.</p> <p>[SLO: S-04-A-10] Describe seed germination and know that seeds require water and an appropriate temperature to germinate.</p> <p>[SLO: S-04-A-11] Identify stages in the life cycles of common flowering plants.</p>			<p>[SLO: S-07-A-04] Know that plants require minerals to maintain healthy growth and life processes (limited to magnesium to make chlorophyll and nitrates to make protein).</p> <p>[SLO: S-07-A-05] <ul style="list-style-type: none"> ● Explain that the structure of leaves is adapted to the process of photosynthesis. </p>	
<p>[SLO: S-04-A-12] Relate that why plants are vital to sustaining life on Earth.</p>				
<p>[SLO: S-04-A-13] Identify various professions associated with this unit of science. E.g., botanists, farmers, gardeners, florists, etc.</p>			<p>[SLO: S-07-A-06] Describe the process of respiration and write word equations for it. Compare and contrast the processes of photosynthesis and respiration.</p>	

Student Learning Outcomes			
			<p>[SLO: S-07-A-07]</p> <p>Investigate the phenomena of transpiration and its importance in a plant (wind, temperature, light, humidity affecting rate of transpiration in plants).</p>
			<p>[SLO: S-07-A-08]</p> <p>Explore and apply natural raise of water based on the principle of transpiration.</p>

3. Organisms - Structure and Functions (Animals)	
<p>Benchmark III:</p> <p>By the end of Grade 5, students will be able to:</p> <p>Explain how organ systems work together to help human bodies get what they need and carry out life processes.</p> <p>Describe that animals receive different types of information through their senses, and respond by processing it in their brains.</p>	<p>Benchmark III:</p> <p>By the end of Grade 8, students will be able to:</p> <p>Compare and contrast the transport system of animals and plants.</p> <p>Explore and explain the structure and function of major human organ systems, and relate them to the basic biological processes required to sustain life.</p> <p>Explain how the brain controls and coordinates with other organ system(s).</p>

Student Learning Outcomes

<p>[SLO: S-04-A-14] Distinguish between major groups of animals with backbones (vertebrates: Fish, amphibians, reptiles, birds and mammals) and without backbones (invertebrates: Insects, snails, earthworm, jellyfish and corals) on the basis of their characteristics.</p> <p>[SLO: S-04-A-15] Identify that some animals (spider, crab, beetles) have an exoskeleton.</p>	<p>[SLO: S-05-A-01] identify that the human body has a number of systems, each with its own function.</p> <p>[SLO: S-05-A-02] Recognize the integration of the different systems (Respiratory, and Circulatory) in carrying out life processes.</p> <p><i>Note: Detailed knowledge of the respiratory system (e.g., alveoli) and circulatory system (e.g., heart chambers and valves) is not required.</i></p>		<p>[SLO: S-07-A-09] Differentiate between the processes of respiration and breathing.</p> <p>[SLO: S-07-A-10] Differentiate between aerobic and anaerobic respiration.</p> <p>[SLO: S-07-A-11] Trace the path of air in and out of the body and how the oxygen it contains is used during the process of respiration.</p> <p>[SLO: S-07-A-12] Sketch and label the human circulatory system.</p>	<p>[SLO: S-08-A-11] Identify the organs, functions and processes of the Human Nervous System.</p> <p>[SLO: S-08-A-12] Sketch and label a diagram of the Human Nervous System.</p> <p>[SLO: S-08-A-13] Explain how the brain works as the control station of the human body.</p> <p>[SLO: S-08-A-14] Identify the three major parts of the brain – cerebrum, cerebellum, the fore brain, mid brain and hind brain, & describe their various functions.</p> <p>[SLO: S-08-A-15] Describe the structure of the cerebrum, its division into two hemispheres (left and right) and the role of each hemisphere in the control of the body.</p>
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Student Learning Outcomes

[SLO: S-08-A-16]
Map the various steps in the transmission of messages through the body and to the brain via a reflex arch.

[SLO: S-08-A-17]
Describe the type and function of neurons in transmitting messages through the body.

[SLO: S-08-A-18]
Create a plan of activities and exercises they can do to maintain a healthy brain.

[SLO: S-08-A-19]
Match various body functions with the relevant part of the brain that controls or regulates them (For instance, associating breathing with the brain stem).

Student Learning Outcomes

[SLO: S-04-A-16]
Describe some of the important functions of the skeleton.

[SLO: S-05-A-03]
Use a model to describe how we receive different types of information through our senses, process the information in our brain and respond to the information in different ways.

[SLO: S-07-A-13]
Hypothesize how exercises of varying intensity (from rest to high-intensity interval training) would impact their pulse rate, test their hypothesis, calculate their pulse rate and record their findings.

[SLO: S-07-A-14]
Describe the role and function of major organs in the human respiratory system including trachea, lungs and alveoli (air sacs).

[SLO: S-07-A-15]
Explain that living organisms have a complex transport system for transfer of various solids, liquids, and gases across the body.

Student Learning Outcomes

<p>[SLO: S-04-A-17] Describe the Human Digestive System including the simple functions of the organs involved (mouth, esophagus, stomach, small and large intestine).</p>	<p>[SLO: S-05-A-04] Describe the Human Respiratory System in terms of oxygen from the air moving into the blood in the lungs and know that many vertebrates have a similar respiratory system.</p>	<p>[SLO: S-06-A-11] State the importance of digestion in the human body and describe physical and chemical digestion.</p> <p>[SLO: S-06-A-12] Sequence the main regions of Alimentary Canal, its associated organs and describe the functions of different parts of the Alimentary Canal.</p> <p>[SLO: S-06-A-13] Briefly describe the role of enzymes in digestion.</p>	<p>[SLO: S-07-A-16] Describe the structure and function of the human heart.</p> <p>[SLO: S-07-A-17] Explain how blood circulates in the human body through a network of vessels (arteries, veins and capillaries), and transports gases, nutrients, wastes and heat.</p> <p>[SLO: S-07-A-18] Compare and contrast arteries, veins and capillaries.</p> <p>[SLO: S-07-A-19] Describe the composition of blood and the functions of red cells, white cells, platelets and plasma.</p>	
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Student Learning Outcomes

[SLO: S-04-A-18]
Recognize that humans have different types of teeth (molar, premolar, incisors, canine) and know their functions in digestion of food.

[SLO: S-04-A-19]
Investigate the causes and prevention of tooth decay and gum diseases.

[SLO: S-05-A-05]
Identify by name the main parts of the Human Circulatory System, and describe briefly the functions of the heart, blood vessels and blood.

[SLO: S-08-A-20]
Describe the structure of the cerebrum, its division into two hemispheres (left and right) and the role of each hemisphere in the control of the body.

Student Learning Outcomes

<p>[SLO: S-04-A-20] Identify that many vertebrates have a digestive system similar to humans.</p>	<p>[SLO: S-05-A-06] Identify that many animals have a circulatory system similar to humans.</p>	<p>[SLO: S-06-A-14] Conclude that blood transports the products of digestion to other parts of the body and the undigested products get egested/defecated.</p>		<p>[SLO: S-08-A-21] Explain and represent how messages flow through the body from and to the brain, and how the brain collaborates with the sensory organs to regulate this process.</p> <p>[SLO: S-08-A-22] Map the various steps in the transmission of messages through the body and to the brain.</p> <p>[SLO: S-08-A-23] Describe the role and function of neurons in transmitting messages through the body.</p> <p>[SLO: S-08-A-24] Predict what would happen if a nerve connection broke.</p>
				<p>[SLO: S-08-A-25] Match various body functions with the relevant part of the brain that controls or regulates them (for instance, associating breathing with the brain stem).</p>

4. Human health and disease

Benchmark IV:

By the end of Grade 5, students will be expected to:

Describe some of the causes of infectious diseases and suggest measures that can control the spread of the diseases.

Recognize the advantages and disadvantages of microorganisms.

Benchmark IV:

By the end of Grade 8, students will be expected to:

Describe the causes and prevention of infectious diseases and how the natural immune system responds.

Understand the constituents of balanced diet and analyze the consequences dietary deficiencies which lead to different disorders.

Student Learning Outcomes

<p>[SLO: S-04-A-21] Recognize the items of the first aid box.</p>	<p>[SLO: S-05-A-07] Use a first aid box to dress a wound.</p>	<p>[SLO: S-06-A-15] Identify the constituents of a balanced diet for humans as including protein, carbohydrates, fats and oils, water, minerals (limited to calcium and iron) and vitamins (limited to A, C and D), and describe the functions of these nutrients.</p> <p>[SLO: S-06-A-16] Identify the essential nutrients, their chemical composition, and food sources.</p> <p>[SLO: S-06-A-17] Identify and describe essential nutrients' deficiency disorders.</p> <p>[SLO: S-06-A-18] Recognize that a healthy diet contains a balance of foodstuffs.</p> <p>[SLO: S-06-A-19] Correlate diet and fitness.</p>		
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Student Learning Outcomes

[SLO: S-05-A-08]
Define and describe main groups of microorganisms (bacteria, virus and fungi) and give examples of each.

[SLO: S-05-A-09]
Recognize some common diseases of each group (bacteria, virus and fungi) caused by microorganisms.

[SLO: S-05-A-10]
Recognize that microorganisms get transmitted into humans and spread infectious diseases.

[SLO: S-05-A-11]
Differentiate between contagious and non-contagious diseases.

[SLO: S-05-A-12]
Relate the transmission of common communicable diseases to human contact

[SLO: S-05-A-13]
Explain some methods of preventing the transmission of contagious diseases COVID-19 & Polio.

[SLO: S-07-A-20]
Explain the various lines of defenses that the body has against pathogens.

[SLO: S-07-A-21]
Describe the three types of immunity in humans – innate, adaptive, and passive.

[SLO: S-07-A-22]
Identify the various types of pathogens that cause infectious diseases.

[SLO: S-07-A-23]
Describe the parts of the immunity system and how they function to produce an immune response.

[SLO: S-07-A-24]
Illustrate how adaptive immunity develops over time.

[SLO: S-07-A-25]
Visualize the ways to add additional layers of defense (such as wearing masks, using sanitizers, etc.).

Student Learning Outcomes

			<p>[SLO: S-07-A-26] Propose some common strategies for strengthening their immune system.</p>	
		<p>[SLO: S-06-A-20] Briefly describe some major digestive disorders.</p>	<p>[SLO: S-07-A-27] Explain how infectious diseases such as hepatitis, covid-19, typhoid, and dengue are caused /contracted, how they are tested and diagnosed, and how they can be prevented.</p> <p>[SLO: S-07-A-28] Suggest ways in which communities of people can safeguard against the spread of infectious diseases.</p>	
	<p>[SLO: S-05-A-14] Recognize the advantages of microorganisms.</p> <p>[SLO: S-05-A-15] Investigate the role of microorganisms in producing or breaking down/decomposing materials.</p>			

5. Ecosystems - Conditions for life on Earth/ Biodiversity and Interdependence

Benchmark V:

By the end of Grade 5, students will be expected to:

Explore the interaction of living things in an ecosystem.
Use diagrams to explain how energy flows in an ecosystem.
Identify the causes and effects of environmental pollution and suggest measures to reduce it.

Benchmark V:

By the end of Grade 8, students will be expected to:

Explain the interdependence of non-living and living components in an ecosystem.
Describe the energy flow and nutrient cycles in an ecosystem.
Communicate solutions that will reduce the impact of humans on land, water, air and/or other living things in the local environment.

Student Learning Outcomes

[SLO: S-04-A-22]
Recognize that ecosystems (e.g., forests, ponds, rivers, grasslands and deserts) consist of habitats that provide living things with what they need.

[SLO: S-05-A-16]
Describe food chains as being made of producers and consumers, and classify consumers as herbivores, omnivores, carnivores, predators, and/or prey.

[SLO: S-08-A-26]
Describe the role of living things in cycling oxygen and carbon through an ecosystem, citing the processes of respiration, photosynthesis, and combustion.

[SLO: S-08-A-27]
Relate how oxygen and carbon cycles are complementary processes that bring balance and symmetry to life on Earth.

[SLO: S-08-A-28]
Describe global warming and explain how threats to the carbon-oxygen balance such as overpopulation, reliance on fossil fuels, and deforestation are contributing to global warming and climate change.

[SLO: S-08-A-29]
Describe how energy flows from producers to consumers, and how only part of the energy flows from one level of the pyramid to the next.

Student Learning Outcomes

[SLO: S-04-A-23]
Recognize and explain that living things respond to environmental conditio

[SLO: S-05-A-17]
Describe a food web and its relation to a food chain.

[SLO: S-08-A-30]
Draw a food web diagram to illustrate the food relationships between organisms.

[SLO: S-08-A-31]
Describe and illustrate through examples key ecological relationships between organisms, including competition, predation and symbiosis.

[SLO: S-08-A-32]
Predict how changes in an ecosystem (e.g., changes in the water supply, the introduction of a new population, hunting, migration) can affect available resources, and thus the balance among populations.

Student Learning Outcomes

<p>[SLO: S-04-A-24] Describe how plants and animals adapt to environments that are hot, cold, wet and/or dry and describe common physical adaptations of plants (e.g., a thick stem, a waxy coating helps it survive with less water) and animals e.g., colours of animals help in camouflage.</p> <p>[SLO: S-04-A-25] Associate behaviors of animals with the environments in which they live,, and describe how these behaviors help them to survive (e.g., migration and hibernation).</p>	<p>[SLO: S-05-A-18] Explain how human activities add toxic substances to an ecosystem.</p>		<p>[SLO: S-08-A-33] Hypothesize what would happen in the ecosystem if the population of one of the participants in different ecological relationships is affected.</p> <p>[SLO: S-08-A-34] Explain ways in which human behavior (e.g., replanting forests, reducing air and water pollution, protecting endangered species) can have positive effects on the local environment.</p>
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Student Learning Outcomes

<p>[SLO: S-04-A-26] Explore how human actions such as urbanization and population growth can affect a habitat.</p> <p>[SLO: S-04-A-27] Explain that when a habitat changes, organisms living in it are affected as well.</p>	<p>[SLO: S-05-A-19] Identify that some substances in our environment can be toxic and these substances can move through the food webs/ chains and can be harmful for living things.</p> <p>[SLO: S-05-A-20] Explore the main causes of water, air and land pollution in the local and wider community.</p>			
	<p>SLO: S-05-A-21] Explain the effects of water, air and land pollution. (Unclean/Toxic water, smoke, smog, excess CO/other gases, open garbage dumps, industrial waste, etc.) on the environment and life.</p> <p>[SLO: S-05-A-22] Discuss the effects of burning fossil fuels and releasing greenhouse gases in air.</p> <p>[SLO: S-05-A-23] Differentiate between biodegradable and non-biodegradable materials and their impact on the environment.</p>			

6. Biotechnology

Benchmark VI:

By the end of Grade 8, students will be expected to:

Describe the structure of DNA, its modification and application, in biotechnology in various fields.

Student Learning Outcomes

- [SLO: S-08-A-35]
Define biotechnology as the use of living cells and organisms in products and processes that can improve the quality of life.
- [SLO: S-08-A-36]
Illustrate how biotechnology is a discipline/field that has the potential to transform how we live.
- [SLO: S-08-A-37]
Discuss the applications of biotechnology in the Pakistani context and their effects on the people and the environment of Pakistan over time.
Illustrative examples:
bread-making, making of yogurt and cheese, vaccines for immunization, insulin production, dyes, etc.

Student Learning Outcomes

				<p>[SLO: S-08-A-38] Relate the use of biotechnology in food sciences in producing foods with higher nutritional value and improved taste and quality (how fermentation has been improved by genetically modified organisms or the introduction of certain genes to raise iron content in rice, can be taken as examples).</p>
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Domain B: Physical Science

Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
<p>Matter and its characteristics</p> <p>Forms of Energy and Energy transfer</p> <p>Force and Simple machines</p> <p>Technology in Everyday Life</p>	<p>Physical and Chemical changes of Matter</p> <p>Light and Sound</p> <p>Electricity and Magnetism</p> <p>Technology in Everyday Life</p>	<p>Matters as Particles</p> <p>Elements and compounds</p> <p>Mixtures</p> <p>Energy</p> <p>Electricity</p> <p>Magnetism</p> <p>Technology in Everyday Life</p>	<p>Structure of an Atom</p> <p>Physical and Chemical Changes</p> <p>Chemical Bonds</p> <p>Solutions</p> <p>Force and Motion</p> <p>Waves and energy</p> <p>Heat and Temperature</p> <p>Technology in Everyday Life</p>	<p>Periodic Table</p> <p>Chemical Reactions</p> <p>Acids, Bases and Salts</p> <p>Force and Pressure</p> <p>Reflection & Refraction of Light</p> <p>Electricity & Magnetism</p> <p>Technology in Everyday Life</p>

Benchmark VII:

By the end of Grade 5, students will be able to:

Investigate matter and explore its chemical and physical properties through daily life examples.

Recognise the importance of science and technology to solve everyday problems.

Integrate scientific concepts/ STEAM in daily life to improve the quality of their own life and lives of others.

Understand how scientific concepts/ STEAM affect their life and society..

Compare the properties of different states of matter and identify the conditions that cause matter to change states.

Benchmark VII:

By the end of Grade 8, students will be able to:

Recognise the importance of science and technology to solve everyday problems.

Integrate scientific concepts/ STEAM in daily life to improve the quality of their own life and lives of others.

Understand how scientific concepts/ STEAM affect their life and society.

Analyze the complexity of matter and energy, particle model of matter, different states of matter and its conversion from one state to another.

Investigate mixtures and apply the separating techniques.

Compare the systematic organization of elements in the periodic table, constructing formula and forming chemical bonds.

Distinguish between physical and chemical reactions, types of chemical reactions and acids, alkalis and salts.

Student Learning Outcomes

<p>[SLO: S-04-B-01] Design models of sphere, cube, prism, cylinder and cone with clay or playdough/ environment friendly materials.</p>	<p>[SLO: S-05-B-01] Design a model of a footbridge using the given specifications (e.g can sustain a given weight).</p> <p>[SLO: S-05-B-02] Design a model of a bookshelf using the given specifications (e.g can sustain a given weight, space, materials).</p>			
	<p>[SLO: S-05-B-03] Prepare LED light strings working with 2 volt battery.</p>			
<p>[SLO: S-04-B-02] Identify and describe three states of matter (i.e., a solid has a definite shape and volume, a liquid has a definite volume but not a definite shape, and a gas has neither a definite shape nor a definite volume).</p>		<p>[SLO: S-06-B-01] Describe the structure of matter in terms of particles (i.e., atoms and molecules).</p>	<p>[SLO: S-07-B-01] Describe and draw the structure of an atom in terms of electrons, protons and neutrons.</p>	
			<p>[SLO: S-07-B-02] Describe how an atom is electrically neutral</p>	

Student Learning Outcomes				
			[SLO: S-07-B-03] Differentiate between atomic number and mass number.	
			[SLO: S-07-B-04] Determine the atomic number and mass number of elements on the basis of the number of protons, electrons and neutrons.	
			[SLO: S-07-B-05] Show the arrangement of electrons in K, L and M shells of elements draw the atomic structure of the first eighteen elements of the Periodic Table.	
			[SLO: S-07-B-06] Draw atomic structures of elements in the Periodic Table.	
		[SLO: S-06-B-02] Describe molecules as a combination of atoms (e.g., H ₂ O, O ₂ & CO ₂).	[SLO: S-07-B-07] Explain that the Periodic Table is a way to organize elements in a systematic order.	[SLO: S-08-B-01] Recognise Periodic Table as a way of classifying the elements in groups and periods.

Student Learning Outcomes				
		[SLO: S-06-B-03] Recognize the names and symbols for some common elements (first 10 elements of the Periodic Table) and recognise their physical properties.	[SLO: S-07-B-08] Recognize periods and groups in the Periodic Table.	[SLO: S-08-B-02] Identify the names and location of the first 18 elements only.
			[SLO: S-07-B-09] Define valency and explain the formation of ions.	
		[SLO: S-06-B-04] Differentiate that some elements are made of atoms and some elements exist as molecules and have different properties to a single atom of the element.		
		[SLO: S-06-B-05] Explain that compounds are formed by different types of elements joining together chemically forming a new substance.	[SLO: S-07-B-10] Write chemical formulae on the basis of valency of the constituent elements. such as H ₂ O NaCl, NH ₃ , CO ₂ , CO, etc.	
		[SLO: S-06-B-06] Illustrate the formation of a compound with the help of a word equation.		
		[SLO: S-06-B-07] Distinguish between elements and compounds.		

Student Learning Outcomes				
		[SLO: S-06-B-08] Explore the common elements and compounds in our daily life (Carbon, Nitrogen, Hydrogen, Aluminum, Water, Common salt, Sugar).		
[SLO: S-04-B-03] Compare and sort the materials on physical properties (mass, volume, density, states of matter, conduction of heat and electricity).	[SLO: S-05-B-04] Observe the changes in materials that do not result in new materials (dissolving, crushing).			
[SLO: S-04-B-04] Properties of metals (appearance, texture, color, density, conduction of heat and electricity using daily life examples).		[SLO: S-06-B-09] Categorize elements into metals and non-metals of first 10 elements based on their physical properties.		[SLO: S-08-B-03] Identify properties of metals and non-metals. [SLO: S-08-B-04] Relate the properties to the uses of metals.
		[SLO: S-06-B-10] Explain the Particle Theory of Matter.		
	[SLO: S-05-B-05] Matter can be changed from one state to another by heating or cooling.	[SLO: S-06-B-11] Use particle model of matter to investigate the movement and arrangement of particles in three states.		

Student Learning Outcomes

		<p>[SLO: S-06-B-12] Explain why gases and liquids take the shape of their containers but solids do not, in terms of the Particle Theory of Matter.</p>		
		<p>[SLO: S-06-B-13] Discuss, using the particle theory of matter, why liquids and gases can flow easily but solids cannot.</p>		
		<p>[SLO: S-06-B-14] Interpret the evidence for the existence of the particles in matter by observing daily life examples (adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water).</p> <p>[SLO: S-06-B-15] Apply the particle theory of matter to explain diffusion.</p>		

Student Learning Outcomes				
			[SLO: S-07-B-11] Recognize that a chemical bond results from the attraction between atoms in a compound and that the atoms' electrons are involved in this bonding.	[SLO: S-08-B-05] Identify chemical reactions and give examples.
				[SLO: S-08-B-06] Define the Law of Conservation of Mass and demonstrate the law with an experiment.
				[SLO: S-08-B-07] Write and balance chemical equations.
				[SLO: S-08-B-08] Distinguish between different types of reactions (combination, displacement, double displacement, combustion).

Student Learning Outcomes				
				<p>[SLO: S-08-B-09] Distinguish between endothermic and exothermic reactions.</p> <p>[SLO: S-08-B-10] Recognize the importance of exothermic and endothermic reactions in daily life.</p>
				<p>[SLO: S-08-B-11] Design a car that is powered solely by a chemical reaction and can travel.(STEAM)</p>
				<p>[SLO: S-08-B-12] Discuss formation of ionic bonds as a result of electrostatic forces between atoms (e. g., NaCl).</p>
				<p>[SLO: S-08-B-13] Discuss types and formation of covalent bond as a result of mutual sharing of electrons between atoms (e. g., H₂, O₂, N₂).</p>
				<p>[SLO: S-08-B-14] Name certain ionic and covalent compounds.</p>

Student Learning Outcomes				
				[SLO: S-08-B-15] Draw cross and dot structures showing formation of ionic compounds and covalent compounds.
	[SLO: S-05-B-06] Identify observable changes in materials that make new materials with different properties (e.g., decaying, such as food spoiling, burning, rusting).		[SLO: S-07-B-12] Differentiate between physical and chemical changes while considering daily life examples.	
			[SLO: S-07-B-13] Recognize that oxygen is needed in combustion, rusting and tarnishing.	
			[SLO: S-07-B-14] Explore methods of preventing rusting.	
			[SLO: S-07-B-15] Relate uses of materials to their chemical properties (e.g., tendency to rust, flammability).	
			[SLO: S-07-B-16] Evaluate Impact of combustion reaction on environment.	

Student Learning Outcomes

<p>[SLO: S-04-B-05] Investigate the conditions that cause matter to change states (heating or cooling), and explain the processes associated with it (i.e., melting, freezing, and boiling).</p>		<p>[SLO: S-06-B-16] Explain the changes in states: Melting, freezing, evaporation, condensation, and sublimation, using the particle model of matter.</p>	<p>[SLO: S-07-B-17] Relate uses of materials to their physical properties (e.g., melting point, boiling point, solubility, thermal conductivity).</p>	
	<p>[SLO: S-05-B-07] Compare physical and chemical changes.</p>		<p>[SLO: S-07-B-18] Distinguish between physical and chemical properties of matter.</p>	
		<p>[SLO: S-06-B-17] Demonstrate that mixtures are formed when two or more substances mix with each other without the formation of a new substance.</p>	<p>[SLO: S-07-B-19] Demonstrate the process of solution formation (using water as universal solvent).</p>	
		<p>[SLO: S-06-B-18] Identify different types of mixtures.</p>	<p>[SLO: S-07-B-20] Distinguish among solute, solvent and solution; saturated and unsaturated solution.</p>	
		<p>[SLO: S-06-B-19] Describe the difference between elements, compounds, and mixtures.</p>		

Student Learning Outcomes				
		[SLO: S-06-B-20] Differentiate between pure substances and mixtures on the basis of their formation and composition.		
		[SLO: S-06-B-21] Describe alloys as mixtures of metals and some other elements.		
		[SLO: S-06-B-22] Identify and explain examples of common mixtures from daily life.		
		[SLO: S-06-B-23] Justify why air is considered as a mixture of gases.		
		[SLO: S-06-B-24] Demonstrate ways of separating different mixtures.		
		[SLO: S-06-B-25] Demonstrate the process of solution formation (using water as universal solvent).	[SLO: S-07-B-21] Define solubility.	
			[SLO: S-07-B-22] Recognize that the amount of solute which dissolves in a given solvent has an upper limit.	

Student Learning Outcomes				
			[SLO: S-07-B-23] Identify the factors which affect the solubility of a solute in a solvent and recognize the importance of these factors in homes and industries.	
			[SLO: S-07-B-24] Explain what is meant by a concentrated and dilute solution.	
			[SLO: S-07-B-25] Identify ways of accelerating the process of dissolving materials in a given amount of water and provide reasoning (i.e., increasing the temperature, stirring, and breaking the solid into smaller pieces increases the process of dissolving).	
			[SLO: S-07-B-26] Explore the effectiveness of various cleaning solutions in cleaning tarnished and oxidized coins. (STEAM)	
			[SLO: S-07-B-27] Make a rock candy with sugar using crystal seeding technique. (STEAM).	

Student Learning Outcomes				
				[SLO: S-08-B-16] Classify acids, alkalis, and salts and give examples of each.
				[SLO: S-08-B-17] Identify the physical properties of acids, alkalis, and salts.
				[SLO: S-08-B-18] Define pH and its ranges with reference to indicators.
				[SLO: S-08-B-19] Interpret the pH scale and identify acids, alkalis, and salts.
				[SLO: S-08-B-20] Describe neutralization reaction with real life examples.
				[SLO: S-08-B-21] Observe and write the uses of acids, bases, and salts in daily life.

Benchmark VIII:
By the end of Grade 5, students will be expected to:

Demonstrate the effects of heat on the states of matter.

Describe the forms of energy, simple energy transformation and the uses of energy.

Investigate and describe the flow of electric current in an electric circuit and relationship between electricity and magnetism.

Demonstrate the characteristics of light and sound with the physical phenomena.

Benchmark VIII:

By the end of Grade 8, students will be expected to:

Use evidence to construct an explanation on how energy is transferred, transformed, and conserved.

Compare types and properties of waves and explain how they interact with matter.

Investigate that light can be reflected, refracted, and/or absorbed.

Describe the relationships between: electricity and magnetism, static and current electricity, and series and parallel electrical circuits.

Student Learning Outcomes

[SLO: S-04-B-06]
 Recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause motion or create change.

[SLO: S-06-B-26]
 Recognize energy as a physical quantity.

[SLO: S-06-B-27]
 Relate potential energy and kinetic energy.

Student Learning Outcomes

		[SLO: S-06-B-28] Demonstrate an energy transfer such as a bouncing ball by energy transfer diagram, e.g., gravitational potential energy → kinetic → elastic potential energy + thermal + sound → kinetic → gravitational potential energy, etc.		
		[SLO: S-06-B-29] State the Law of Conservation of Energy and explain how the law applies to different situations.		
		[SLO: S-06-B-30] Compare the Renewable Energy Sources (wind, water, Sun and plants) and Non-Renewable Sources of energy (coal, natural gas, crude oil).		
		[SLO: S-06-B-31] Identify the advantages of using renewable energy resources.		

Student Learning Outcomes

[SLO: S-06-B-32]
Assemble and demonstrate
a solar panel to operate a
small fan. (STEAM)

[SLO: S-06-B-33]
Design and make a solar
water heater. (STEAM)

Student Learning Outcomes

[SLO: S-04-B-07]
Describe the properties of light (travels in a straight line, travels very fast and in all directions).

[SLO: S-08-B-22]
Identify basic properties of light (i.e., speed, transmission through different media, absorption, reflection and dispersion).

[SLO: S-08-B-23]
Describe and show how an image is formed by the plane mirror.

[SLO: S-08-B-24]
State the Laws of Reflection.

[SLO: S-08-B-25]
Describe different optical instruments which use curved mirrors.

[SLO: S-08-B-26]
Relate the apparent color of objects to reflected or absorbed light.

[SLO: S-08-B-27]
Explain that light is refracted at the boundary between air and any transparent material.

Student Learning Outcomes

<p>[SLO: S-04-B-08] Relate familiar physical phenomena (shadow, reflection, rainbow) to the behavior of light.</p>			<p>[SLO: S-08-B-28] Distinguish between reflection and refraction of light with daily life examples.</p> <p>[SLO: S-08-B-29] Illustrate the characteristics of image formed by plane mirror.</p>
			<p>[SLO: S-08-B-30] Investigate that light is made up of many colours. Relate the apparent color of objects to reflected or absorbed light.</p> <p>[SLO: S-08-B-31] Identify spherical mirror.</p> <p>[SLO: S-08-B-32] Describe the characteristics of image(s) formed by concave mirrors and convex mirrors.</p> <p>[SLO: S-08-B-33] Describe use of different optical instruments with plane in which spherical mirrors are used.</p>

Student Learning Outcomes

	[SLO: S-05-B-08] Identify natural, artificial light sources.			
	[SLO: S-05-B-09] Sort out luminous and non-luminous objects.			
	[SLO: S-05-B-10] Identify transparent, translucent and opaque objects.			
[SLO: S-04-B-09] Demonstrate the production of sound.	[SLO: S-05-B-11] Demonstrate that sound can travel through different states of matter with different speed.			
[SLO: S-04-B-10] Relate familiar physical phenomena (vibrating objects) to the behavior of sound.	[SLO: S-05-B-12] Describe the structure and discuss the mechanism of the conduction of sound waves.			
[SLO: S-04-B-11] Identify the different sounds on the basis of softness and loudness.	[SLO: S-05-B-13] Describe the intensity of sound.			

Student Learning Outcomes

	<p>[SLO: S-05-B-14] List the harmful effects of noise on human health.</p> <p>[SLO: S-05-B-15] State the role of humans in reducing noise pollution.</p>			
<p>[SLO: S-04-B-12] Understand temperature as the degree of hotness or coldness of an object or place.</p>				
<p>[SLO: S-04-B-13] Demonstrate that the warmer objects have higher temperature than cooler objects.</p>			<p>[SLO: S-07-B-28] Describe the expansion of the three states of matter on heating, and contraction on cooling, in terms of particles.</p> <p>[SLO: S-07-B-29] Predict the effects of heat gain and heat loss.</p>	
<p>[SLO: S-04-B-14] Demonstrate changes occur when hotter objects are brought closer to the cooler objects.</p>			<p>[SLO: S-07-B-30] Compare all three scales of temperature (including inter-conversion of temperature scales).</p>	
<p>[SLO: S-04-B-15] Describe the ways to measure the temperature and its units.</p>			<p>[SLO: S-07-B-31] Define the terms heat and temperature on the basis of Kinetic Molecular Theory.</p>	

Student Learning Outcomes

<p>[SLO: S-04-B-16] Use various instruments (room thermometers, anemometer, clinical thermometer, etc.) and measure and record temperature using different scales.</p>			<p>[SLO: S-07-B-32] Explain why metals are good thermal conductors and fluids are poor conductors of heat using the particle model.</p>	
			<p>[SLO: S-07-B-33] Construct the concept of heat conduction, convection and radiation by applying particle theory including daily life examples.</p>	
			<p>[SLO: S-07-B-34] Identify the effects of thermal expansion and contraction with their applications in daily life.</p>	
			<p>[SLO: S-07-B-35] State and explain the practical methods of thermal insulation used for constructing buildings.</p>	
<p>[SLO: S-04-B-17] Recognize that electrical energy in a circuit can be transformed into other forms of energy (light, heat, sound).</p>		<p>[SLO: S-06-B-34] Explain the phenomena of static electricity in everyday life.</p>		

Student Learning Outcomes

<p>[SLO: S-04-B-18] Demonstrate that simple electrical systems (e.g., a flashlight) require a complete (unbroken) electrical pathway.</p>	<p>[SLO: S-05-B-16] Describe flow of electric current in an electric circuit.</p>	<p>[SLO: S-06-B-35] Recognize electric current as a flow of charges.</p> <p>[SLO: S-06-B-36] Describe a simple circuit as a path for flow of charges.</p> <p>[SLO: S-06-B-37] Differentiate between open and closed circuits.</p>		
	<p>[SLO: S-05-B-17] Draw circuit diagram with symbols.</p>	<p>[SLO: S-06-B-38] Draw and interpret simple circuit diagrams (using symbols).</p>		
		<p>[SLO: S-06-B-39] Describe the characteristics of series and parallel circuits.</p> <p>[SLO: S-06-B-40] Draw and construct a series and parallel circuits.</p>		
		<p>[SLO: S-06-B-41] Identify the use of series and parallel electric circuits in daily life.</p>		

Student Learning Outcomes

		<p>[SLO: S-06-B-42] Investigate the factors that affect the brightness of bulbs or speed of motors</p> <ul style="list-style-type: none"> • Number of batteries • Number of Bulbs • Type of wire • Length of wire • Thickness of wire 		
		<p>[SLO: S-06-B-43] Assemble and operate a trip wire security alarm system using simple items. (STEAM)</p>		
				<p>[SLO: S-08-B-34] Define resistance and its SI unit.</p>
				<p>[SLO: S-08-B-35] Define voltage & current state their SI units</p>
				<p>[SLO: S-08-B-36] Formulate that resistance is the ratio of voltage to current.</p>
				<p>[SLO: S-08-B-37] Define electric power and state its unit.</p>
				<p>[SLO: S-08-B-38] Recognize the electric power of various electrical appliances.</p>

Student Learning Outcomes				
				[SLO: S-08-B-39] Recognize the terms earth wire, fuse, circuit breaker.
				[SLO: S-08-B-40] Analyze the danger of overloading and short circuit and identify the importance of earth wire, fuses and circuit breakers.
			<p>[SLO: S-07-B-36] Define a wave.</p> <p>[SLO: S-07-B-37] Compare the types of waves (mechanical and electromagnetic) with daily life examples.</p> <p>[SLO: S-07-B-38] Distinguish between Longitudinal and Transverse waves.</p> <p>[SLO: S-07-B-39] Identify; 1. water wave and Sound wave as mechanical wave; 2. light wave as electromagnetic wave.</p>	

Student Learning Outcomes

			<p>[SLO: S-07-B-40] Define the terms: Wavelength, frequency, and time period of wave.</p> <p>[SLO: S-07-B-41] Define and relate: 1. Pitch and frequency. 2. Amplitude and frequency.</p> <p>[SLO: S-07-B-42] Explain the factors affecting pitch and loudness of sound.</p>	<p>[SLO: S-08-B-41] List precautionary measures to ensure the safe use of electricity.</p>
			<p>[SLO: S-07-B-43] Compare and interpret waveforms in terms of pitch and loudness.</p> <p>[SLO: S-07-B-44] Construct the inverse relation between time period and frequency</p> <p>[SLO: S-07-B-45] Relate common phenomenon (e.g., echo, hearing thunder after seeing lightning) to the properties of sound.</p>	

Benchmark IX:
By the end of Grade 5, students will be expected to:
 Investigate different types of forces and their effects.
 Demonstrate the understanding that simple machines help make motion and work easier.
 Apply scientific skills to solve problems and suggest solutions.

Benchmark IX:
By the end of Grade 8, students will be expected to:
 Investigate and describe types of forces, including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.
 Measure and record data from experiments to produce speed-time graphs and interpret them to accurately describe motion.
 Evaluate through investigation the relationship between pressure, force and area.

Student Learning Outcomes

			[SLO: S-07-B-46] Describe the effect of force on changing the speed and direction of motion with time.	
			[SLO: S-07-B-47] Define and state the SI unit of force.	
			[SLO: S-07-B-48] Formulate the relationship between speed, distance and time.	
			[SLO: S-07-B-49] State SI (System International) unit of speed.	
			[SLO: S-07-B-50] Calculate average speed.	
			[SLO: S-07-B-51] Interpret a distance-time graph.	

Student Learning Outcomes

<p>[SLO: S-04-B-19] Describe different types of force (friction, resistance, muscular forces, applied, gravitational, magnetic, electric).</p> <p>[SLO: S-04-B-20] Investigate that friction can either be detrimental or useful under different circumstances (ways to reduce friction).</p>				
<p>[SLO: S-04-B-21] List uses of different types of force in our daily life.</p>				
<p>[SLO: S-04-B-22] Explore how force can move or stop objects, change direction, shape, & speed.</p>			<p>[SLO: S-07-B-52] Give examples of contact forces and non-contact forces.</p>	
<p>[SLO: S-04-B-23] Describe that an object may have multiple forces acting on it, even when at rest.</p> <p>[SLO: S-04-B-24] Compare the effects of force of different strengths in the same or opposite directions acting on an object.</p>				

Student Learning Outcomes

<p>[SLO: S-04-B-25] Recognize that simple machines, (e.g., levers, pulleys, gears, ramps) help make motion easier (e.g., make lifting things easier, reduce the amount of force required, change the distance, change the direction of the force).</p> <p>[SLO: S-04-B-26] Design hammer, wheels, rollers and gears using clay or playdough/ cardboard/ environment friendly material.</p>				
			<p>[SLO: S-07-B-53] Demonstrate that forces always work in action and reaction pairs (equal in magnitude, opposite in direction).</p>	<p>[SLO: S-08-B-42] Recognize that several forces may act on an object and that they may or may not balance each other.</p>
				<p>[SLO: S-08-B-43] Examine the effect of an unbalanced force on an object.</p>
				<p>[SLO: S-08-B-44] Differentiate between floating and sinking objects in terms of density.</p>

Student Learning Outcomes				
				[SLO: S-08-B-45] Define 'pressure' with examples and its unit
				[SLO: S-08-B-46] Relate pressure with force and area.
				[SLO: S-08-B-47] Investigate effects related to pressure (e.g., water pressure increasing with depth, a balloon expanding when inflated, etc.)
				[SLO: S-08-B-48] Examine the effect of force in the presence of air pressure.
				[SLO: S-08-B-49] Make a hydraulic elevator. (STEAM) [SLO: S-08-B-48] Build a two stage rocket model. (STEAM)

Student Learning Outcomes

	<p>[SLO: S-05-B-18] Demonstrate magnets have two poles (opposites attract and like poles repel).</p>	<p>[SLO: S-06-B-44] Recognize that electric current has a magnetic field around it using a magnetic compass.</p> <p>[SLO: S-06-B-45] Recognize that a freely-moving magnet comes to rest pointing in a North-South direction.</p>		<p>[SLO: S-08-B-50] Investigate the factors that affect the strength of an electromagnet.</p>
	<p>[SLO: S-05-B-19] Recognize the difference between a magnet and a magnetic material.</p>	<p>[SLO: S-06-B-46] Describe how to magnetize a magnetic material. Describe how to demagnetize a magnet.</p>		<p>[SLO: S-08-B-51] Describe the properties that are unique to electromagnets (i.e., the strength varies with current, number of coils, and type of metal in the core; the magnetic attraction can be turned on and off; and the poles can switch).</p>
	<p>[SLO: S-05-B-20] Relate properties of magnets (i.e., two opposite poles, attraction/repulsion, and strength of the magnetic force varies with distance) to uses in everyday life (e.g., a directional compass).</p>	<p>[SLO: S-06-B-47] Construct an electromagnet and identify its application in daily life</p>		<p>[SLO: S-08-B-52] Describe briefly the working principles of electromagnetic devices such as speaker, doorbell.</p>

Student Learning Outcomes				
		[SLO: S-06-B-48] Compare different types of magnets (permanent, temporary and electromagnets).		
	[SLO: S-05-B-21] Construct a magnetic compass. (STEM/STEAM)	[SLO: S-06-B-49] Recognize that there is a space around a magnet where effect of magnetic force can be observed.		
		[SLO: S-06-B-50] Draw magnetic field of a bar magnet using iron filings.		
		[SLO: S-06-B-51] Recognize Earth's magnetic field which attracts a freely pivoted magnet to line up with it.		
Technology in Everyday Life	Technology in Everyday Life	Technology in Everyday Life	Technology in Everyday Life	Technology in everyday life

Student Learning Outcomes

<p>[SLO: S-04-B-27] Use scientific instruments/ apparatus in everyday life (e.g. thermometer, blood pressure apparatus, digital balance, stop watch, calculator, available digital devices).</p> <p>[SLO: S-04-B-28] Use a plumb line to install a flagpole vertically.</p>	<p>[SLO: S-05-B-22] Use scientific instruments /apparatus in everyday life (Use spirit level/water level to level different objects i.e. table, picture, frame etc.).</p> <p>[SLO: S-05-B-23] Practice safety measures for earthquake and fire drill.</p>	<p>[SLO: S-06-B-52] Grow seasonal plants and vegetables in earthen pots and demonstrate the effect of use of fertilizers on the growth of plants.</p> <p>[SLO: S-06-B-53] Prepare yogurt and cheese from milk to demonstrate the beneficial microorganisms.</p> <p>[SLO: S-06-B-54] Design a solar oven to convert solar energy into heat energy.</p> <p>[SLO: S-06-B-55] Assemble a circuit to demonstrate the working of an electric bell.</p>	<p>[SLO: S-07-B-54] Design a model to demonstrate drip & sprinkler irrigation system for conservation of water.</p> <p>[SLO: S-07-B-55] Use different techniques of preserving foods like orange juice, apple jam and pickles.</p> <p>[SLO: S-07-B-56] Make a simple Stethoscope.</p> <p>[SLO: S-07-B-57] Make a sanitizer using suitable substances.</p>	<p>[SLO: S-08-B-53] Make bioplastic from milk and vinegar as an application of biotechnology.</p> <p>[SLO: S-08-B-54] Make toothpaste, soap and detergent as an application of acids and bases in daily life.</p> <p>[SLO: S-08-B-55] Assemble a concave mirror type solar cooker to convert solar energy into heat energy</p> <p>[SLO: S-08-B-56] Assemble and operate a simple wind turbine to produce electricity.</p> <p>[SLO: S-08-B-57] Demonstrate the working of UPS and use it to operate a fan or energy saver bulb.</p>
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Domain C: Earth and Space Science

Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Earth and its Resources Earth in the Solar System	Structure of the Earth Soil Space and Satellites	Solar System	Earth & Space	Our Universe
Benchmark X: By grade V, students will be expected to: Describe the structure of the Earth and recognize that Earth’s surface is made up of land, water, and is surrounded by air. Identify the Earth’s resources that we use in our everyday life and how to conserve them. Describes the composition and characteristics of soil types, providing examples of their uses.		Benchmark X: By grade VIII, students will be expected to:		
Student Learning Outcomes				
[SLO: S-04-C-01] Define natural resources	[SLO: S-05-C-01] Describe the structure of the Earth (i.e., crust, mantle, and core) and the physical characteristics of these distinct parts.			

Student Learning Outcomes

	[SLO: S-05-C-02] Describe common features of volcanoes and know they are found at breaks in the Earth's crust.			
[SLO: S-04-C-02] Recognize that the Earth's surface is made up of land and water and is surrounded by a layer of air called the atmosphere which is a mixture of different gases (nitrogen, carbon dioxide, and oxygen, etc.).	[SLO: S-05-C-03] Understand that the Earth's crust moves and when parts move suddenly this is called an earthquake.			
[SLO: S-04-C-03] Describe the sources of water on earth.				
[SLO: S-04-C-04] Apply knowledge of changes of state of water to common weather events (e.g., cloud formation, dew formation, the evaporation of puddles, snow, and rain) and understand the Water Cycle.				
[SLO: S-04-C-05] Recognize that most water on Earth is not pure and has dissolved substances in it.	[SLO: S-05-C-04] Identify similarities and differences among the different types of soil and classify them based on their clay, sand, and organic content.			

Student Learning Outcomes				
	[SLO: S-05-C-05] Investigate the composition and characteristics of different soils.			
	[SLO: S-05-C-06] Comprehend that soil composition can change, which can support, or hinder, plant growth.			
	[SLO: S-05-C-07] Identify various causes of soil pollution.			
	[SLO: S-05-C-08] Identify professions related to Earth Science i.e., paleontologists, seismologists, geologists.			

<p>Benchmark XI: By the end of Grade 5, students will be expected to: Demonstrate the understanding of movement of the Earth, Sun, Moon, Solar System and its relationship. Demonstrate how the relationship of the Earth, Sun, and Moon, causes eclipses and moon phases. Explore and investigate the importance of space exploration and the uses of various satellites. Describes how the Earth spins around its axis in 24 hours resulting in day and night.</p>	<p>Benchmark X: By the end of Grade 8, students will be expected to: Describe the physical features of celestial bodies. Explain how gravity is the force that keeps objects in the Solar System in regular and predictable motion and describe the resulting phenomena. Describe the formation of black hole in the life of a star Recognize space exploration as an active area of scientific and technological research and development.</p>
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Student Learning Outcomes

<p>[SLO: S-04-C-06] Describe the Solar System with the Sun at the center and the planets revolving around the Sun.</p>			<p>[SLO: S-07-C-01] Recognize that the force of gravity keeps planets and moons in their orbits.</p> <p>[SLO: S-07-C-02] Differentiate between mass and weight, using examples of weightlessness experienced by astronauts on the surface of the Moon.</p>
	<p>[SLO: S-05-C-09] Know that a satellite is an object in space that orbits a larger object and a moon is a natural satellite that orbits a planet.</p>		
		<p>[SLO: S-06-C-01] Differentiate between the characteristics of different planets.</p>	

Student Learning Outcomes

[SLO: S-04-C-07] Understand that planetary systems can contain stars, planets, asteroids, and comets.		[SLO: S-06-C-02] Describe the characteristics of asteroids, meteorites and comets.		[SLO: S-08-C-01] Explore and understand the terms star, galaxy, Milky Way and the black holes
				[SLO: S-08-C-02] Compare the types of galaxies.
				[SLO: S-08-C-03] Relate the life of a star with the formation of black hole, neutron star. Pulsar White Dwarf, Red Giant.
				[SLO: S-08-C-04] Discuss the birth and eventual death of our sun.
			[SLO: S-07-C-03] Recognize that tides are caused by the gravitational pull of the Moon	
				[SLO: S-08-C-05] Show how information is collected from space by using telescopes (e.g., Hubble Space Telescope) and space probes (e.g., Galileo).

Student Learning Outcomes

[SLO: S-04-C-08] Recognize that the Earth has a Moon that revolves around it, and from the Earth the Moon looks different at different times of the month (Phases of the Moon).	[SLO: S-05-C-10] Describe the natural satellites of the planets of the Solar System.	[SLO: S-06-C-03] Describe the uses of various satellites in space i.e., geostationary, weather, communication and Global Positioning System (GPS).		
[SLO: S-04-C-09] Investigate and describe how day and night are related to Earth's daily rotation about its axis, and provide evidence of this rotation from the changing appearance of shadows during the day.			[SLO: S-07-C-04] Describe the effects of the Earth's annual revolution around the Sun, given the tilt of its axis (e.g., different seasons, different constellations visible at different times of the year).	
[SLO: S-04-C-10] Illustrate and explain how Solar and Lunar Eclipses occur				
	[SLO: S-05-C-11] Define artificial satellites and explain their importance in exploring the Earth and Space.	[SLO: S-06-C-04] Investigate how artificial satellites have improved our knowledge about space and are used for space research		
	[SLO: S-05-C-12] Recognize the role of NASA (National Aeronautics and Space Administration); explore the contribution of SUPARCO in space exploration.			

Student Learning Outcomes

			[SLO: S-07-C-05] Describe how seasons in Earth's Northern and Southern Hemispheres are related to Earth's annual movement around the Sun.	
		[SLO: S-06-C-05] Differentiate between planets and dwarf planets.		
	[SLO: S-05-C-13] Predict and comprehend how astronauts explore space, how do astronauts survive and research in space.			
		[SLO: S-06-C-06] Inquire into the sighting of Halley's Comet; describe what they would feel if they saw it.		
	[SLO: S-05-C-14] Identify using secondary sources the key milestones in space technology in the past 10 years.			[SLO: S-08-C-06] Describe advancements in space technology and analyze the benefits generated by the technology of space exploration.
	[SLO: S-05-C-15] Identify professions related to the Earth Science i.e., Astronauts, Physicists, Space Scientists, etc.			



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