

National Curriculum of Pakistan
2022-23

TECHNICAL EDUCATION

MEDICAL TECHNOLOGY

Basic Medical Science I: Physiology

Grades 11-12



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

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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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

BASIC MEDICAL SCIENCES I (PHYSIOLOGY) Grade 11

Domain A: Cell

Standard Students will acquire knowledge and skills to explore the intricate aspects of the basic component of a cell.

Grade 11

Benchmark I: Student will be able to

- Explain basic cell components
- Describe mitosis and meiosis processes.
- Explain the process of ingestion and phagocytosis.

Student Learning Outcomes

Student will be able to:

[SLO: MSP-11-A-01]:

Define the main components of a human cell, including the cell membrane, nucleus, and cytoplasmic organelles.

[SLO:MSP-11-A-02]:

Explain the functions of the cell membrane in maintaining cellular integrity and regulating transport.

[SLO:MSP-11-A-03]:

Differentiate a human cell from an animal cell, highlighting structural similarities and differences.

[SLO:MSP-11-A-04]:

Define the processes of endocytosis and phagocytosis in cellular uptake.

[SLO:MSP-11-A-05]:

Discuss the mechanisms involved in ingestion and digestion by the cell during phagocytosis.

[SLO:MSP-11-A-06]:

Explain the process of cell division, including mitosis and meiosis.

Domain B Basic Tissues

Standard Students will be acquiring knowledge and skills to explore the intricate aspects of the structure and function of basic body tissues

Grade 11.

Benchmark I: Student will be able to

- Describe the basic characteristics and functions of each tissue type.
- Describe the characteristics of different tissues of the body.

Student Learning Outcomes

Student will be able to:

[SLO:MSP-11-B-01]:

Define the term tissue and discuss the significance of tissues in structure and formation of organs.

[SLO:MSP-11-B-02]:

Describe the basic characteristics and functions of each tissue type.

[SLO:MSP-11-B-03]:

Distinguish between epithelial, connective, muscle, and nervous tissues.

[SLO:MSP-11-B-04]:

Define connective tissues and their function.

[SLO:MSP-11-B-05]:

Differentiate between skeletal, smooth, and cardiac muscles.

[SLO:MSP-11-B-06]:

Define water as a fundamental and essential component of the body.

[SLO:MSP-11-B-07]:

Enlist common electrolytes, including sodium, potassium, calcium, magnesium, chloride, phosphate, and bicarbonate.

Domain C Circulatory system

Standard Students will be acquiring knowledge and skills to explore the intricate aspects of the function of the circulatory system.

Grade 11

Benchmark I: Student will be able to

- Identify major components of the circulatory system.
- Explain the cardiac cycle, diastole, and systole.
- Explain how lymphatic vessels and nodes filter lymph, remove pathogens, foreign particles, and damaged cells.
- Explain the definitions of cardiac output, stroke volume, heart rate, and the variables that influence them.

Student Learning Outcomes

Student will be able to:

[SLO:MSP-11-C-01]:

Identify components of the heart, including chambers (atria and ventricles), valves, and major blood vessels (arteries, veins, and capillaries).

[SLO:MSP-11-C-02]:

Differentiate between the functions and characteristics of arteries, veins, and capillaries.

[SLO:MSP-11-C-03]:

Define the cardiac cycle, diastole, and systole.

[SLO:MSP-11-C-04]:

Explain the sequence of events during diastole and systole in the cardiac cycle.

[SLO:MSP-11-C-05]:

Identify the different valves of the heart, including the atrioventricular (AV) valves and semilunar valves and enlist its function.

[SLO:MSP-11-C-06]:

Define the concept of cardiac work output and its significance in cardiovascular physiology

[SLO:MSP-11-C-07]:

Explain the definitions of cardiac output, stroke volume, heart rate, and the variables that influence them.

[SLO:MSP-11-C-08]:

Identify the structures in the lymphatic system and enlist their role in the body including details related to lymph nodes.

Domain D Respiratory system

Standard Students will be acquiring knowledge and skills to explore the intricate aspects of the function of the respiratory system.

Grade 11

Benchmark I: Students will be able to

- Explain the basic mechanism of respiration.
- Explain the definitions of respiratory rate and tidal volume, vital capacity, inspiratory and expiratory reserve volume.
- Explain the mechanisms of oxygen and carbon dioxide transport in the blood, including hemoglobin saturation and bicarbonate ion formation.

Student Learning Outcomes

Student will be able to:

[SLO:MSP-11-D-01]:

Explain the basic mechanism of respiration and the role of respiratory muscles.

[SLO:MSP-11-D-02]:

Label and define the role of diaphragm and intercostal muscles in the mechanics of breathing.

[SLO:MSP-11-D-03]:

Describe the basic mechanism and changes in thoracic volume and pressure during inspiration and expiration.

[SLO:MSP-11-D-04]:

Explain the definitions of respiratory rate and tidal volume and the physiological factors influencing respiratory rate and tidal volume.

[SLO:MSP-11-C-05]:

Identify the chemical receptors involved in respiratory control, including peripheral chemoreceptors and central chemoreceptors

[SLO:MSP-11-C-06]:

Define artificial respiration and describe techniques such as mouth-to-mouth ventilation

[SLO:MSP-11-C-07]:

Explain the mechanisms of oxygen and carbon dioxide transport in the blood, including hemoglobin saturation and bicarbonate ion formation.

Domain E Digestive system

Standard Students will be acquiring knowledge and skills to explore the intricate aspects of the function of the digestive system.

Grade 11
Benchmark I: Student will be able to <ul style="list-style-type: none">• Describe the process of digestion and its importance in the digestive system.• Enlist the digestive organs and discuss their functions in the digestive system.• Explain the concept of digestion, covering both mechanical and chemical aspects, and its role in converting food into absorbable nutrients.
Student Learning Outcomes
Student will be able to:

[SLO:MSP-11-E-01]:

Define the process of ingestion and its importance in the digestive system.

[SLO:MSP-11-E-02]:

Explain the process of mastication (chewing) and its role in breaking down food.

[SLO:MSP-11-E-03]:

Explain the concept of digestion, covering both mechanical and chemical aspects, and its role in converting food into absorbable nutrients.

[SLO:MSP-11-E-04]:

Identify the physiological role of anatomical structures involved in mastication, swallowing and digestion such as the mouth, teeth, tongue, esophagus, stomach and intestines.

[SLO:MSP-11-E-05]:

Discuss the functions of the structures of the digestive system.

Domain F: Secretions of GIT.

Standard Students will acquire knowledge and skills to explore the intricate aspects of gastrointestinal tract (GIT) secretion.

Grade 11

Benchmark I: Student will be able to:

- Identify major secretions and glands in the gastrointestinal tract
- Explain the functions of saliva, gastric secretions, pancreatic secretions, bile, and other intestinal secretions
- Explain how different secretions contribute to the overall digestive process and nutrient absorption

Student Learning Outcomes

Student will be able to:

[SLO:MSP-11-F-01]:

Identify major secretions and glands in the gastrointestinal tract.

[SLO:MSP-11-E-02]:

Describe saliva and identify the role of salivary glands, including parotid, submandibular, and sublingual glands.

[SLO:MSP-11-E-03]:

Describe the functions of saliva in lubrication, initiation of starch digestion with amylase, and antimicrobial action.

[SLO:MSP-11-E-04]:

Explain gastric secretion and its components, including hydrochloric acid and pepsin.

[SLO:MSP-11-E-05]:

Describe how gastric secretions contribute to the digestive process in the stomach.

[SLO:MSP-11-E-06]:

Describe the composition of pancreatic juice and its role in digestion.

[SLO:MSP-11-E-07]:

Explain the production and secretion of bile by the liver and its storage in the gallbladder.

[SLO:MSP-11-E-08]:

Identify secretions of the small intestine, including intestinal enzymes and mucus.

[SLO:MSP-11-E-09]:

Describe the processes of digestion and absorption of nutrients in the small intestine, including the role of villi and microvilli.

Domain E Metabolism

Standard Students will be acquiring knowledge and skills to explore the intricate aspects of metabolism.

Grade 11

Benchmark I: Students will be able to...

- Discuss the basic concepts of protein, carbohydrate and fat metabolism
- Discuss the processes of glycolysis and gluconeogenesis and their significance

- Describe the processes of lipid metabolism
- Describe the basic properties of proteins

Student Learning Outcomes

Students will be able to:

[SLO:MSP-11-E-10]:

Define metabolism and its significance in cellular processes.

[SLO:MSP-11-E-11]:

Explain the basic concepts of protein, carbohydrate and fat metabolism.

[SLO:MSP-11-E-12]:

Explain the processes of glycolysis and gluconeogenesis and their significance in energy production.

[SLO:MSP-11-E-13]:

Explain the mechanisms of glucose transport in body tissues, including the role of insulin.

[SLO:MSP-11-E-14]:

Describe the processes used in uptake of lipid molecules, metabolism, including lipolysis, fatty acid oxidation, and triglyceride synthesis.

[SLO:MSP-11-E-15]:

Explain the transport of nutrients from the gastrointestinal tract (GIT) to various tissues.

[SLO:MSP-11-E-16]:

Explain the role of vitamins in metabolism, emphasizing their function as coenzymes.

[SLO:MSP-11-E-17]:

Describe the properties of proteins, such as amino acid structure and peptide bonds.

Domain F Nervous system

Standard: Students will be acquiring knowledge and skills to explore the intricate aspects of the function of the Nervous system.

Grade 11

Benchmark I: Student will be able to:

- Describe the general design and organization of the nervous system
- Explain the functions of the cerebrum, midbrain, pons, medulla, cerebellum and spinal cord
- Explain the cranial nerves and their functions

Student Learning Outcomes

Students will be able to:

[SLO:MSP-11-F-01]:

Define the nervous system and its role in coordinating physiological processes.

[SLO:MSP-11-F-02]:

Identify the main components of the nervous system, including the central nervous system (CNS) and the peripheral nervous system (PNS).

[SLO:MSP-11-F-03]:

Describe the major parts of the CNS, such as the brain and spinal cord, and components of the PNS, including nerves and ganglia.

[SLO:MSP-11-F-04]:

Explain the specific functions of the cerebrum, including motor control, sensory perception, and higher cognitive processes

[SLO:MSP-11-F-05]:

Describe the functions of the cerebellum in coordination, balance, and fine motor control.

[SLO:MSP-11-F-06]:

Explain the 12 pairs of cranial nerves and their respective functions.

[SLO:MSP-11-F-07]:

Define the autonomic nervous system (ANS), sympathetic and parasympathetic system and its role in physiological processes.

[SLO:MSP-11-F-08]:

Explain the functions of the spinal cord in transmitting signals between the brain and peripheral nerves, as well as its role in reflex actions.

DOMAIN G Endocrine system

Standard: Students will be acquiring knowledge and skills to explore the intricate aspects of the function of the endocrine system.

Grade 11

Benchmark I: Students will be able to:

- Explain the basic concept of endocrine glands and hormones
- Describe the locations and primary functions of the pituitary, thyroid, pancreas, and adrenal glands, learn the roles of specific hormones

Student Learning Outcomes

Students will be able to:

[SLO:MSP-11-G-01]:

Describe the basic concept of endocrine glands and differentiate between endocrine and exocrine glands.

[SLO:MSP-11-G-02]:

Describe the concept of hormones and their role as chemical messengers in the body.

[SLO:MSP-11-G-03]:

Identify major endocrine glands, including the pituitary gland, thyroid gland, adrenal glands, and parathyroid glands.

[SLO:MSP-11-G-04]:

Describe the functions of each pituitary hormone, their roles in growth regulation, lactation, thyroid function, adrenal cortex regulation, and gonadal function

[SLO:MSP-11-G-05]:

Describe the functions of thyroid hormones in regulating metabolism, growth, and energy balance.

[SLO:MSP-11-G-06]:

Describe the functions of adrenocortical hormones in stress response, metabolism, and electrolyte balance.

[SLO:MSP-11-G-07]:

Describe the functions of PTH in calcium homeostasis, bone metabolism, and kidney function.

DOMAIN H Reproductive system

Standard: Students will be acquiring knowledge and skills to explore the intricate aspects of function of the reproductive system.

Grade 11

Benchmark I: Students will be able to:

- List and label the major components of the male and female reproductive system
- Describe the function of male and female reproductive system

- Explain the role of hormones of male and female reproductive system

Student Learning Outcomes

Students will be able to:

[SLO:MSP-11-H-01]:

Describe and identify male reproductive organs, including the testes, epididymis, vas deferens, and accessory glands.

[SLO:MSP-11-H-02]:

Describe the functions of each male reproductive organ, emphasizing sperm production, storage, and transport.

[SLO:MSP-11-H-03]:

Explain how hormones, such as testosterone, regulate male reproductive function.

[SLO:MSP-11-H-04]:

Define and identify female reproductive organs, including the ovaries, fallopian tubes, uterus, and vagina.

[SLO:MSP-11-H-05]:

Describe the functions of each female reproductive organ, including egg production, fertilization, and pregnancy support.

[SLO:MSP-11-H-06]:

Explain how female hormones, including estrogen and progesterone, regulate the menstrual cycle and reproductive processes.

DOMAIN I Special senses

Standard: Students will be acquiring knowledge and skills to explore the intricate aspects of function of special senses.

Grade 11

Benchmark I: Students will be able to:

- Identify major sensory organs, including the eyes, ears, tongue, nose, and skin.
- Describe the basic function of ear, eye, salivary glands and skin.

Student Learning Outcomes

Students will be able to:

[SLO:MSP-11-H-07]:

Identify major sensory organs, including the eyes, ears, tongue, nose, and skin.

[SLO:MSP-11-H-08]:

Describe the functions of the eye, emphasizing its role in capturing and processing visual information.

[SLO:MSP-11-H-09]:

Explain the mechanism of hearing, including the role of the external ear, tympanic membrane, and middle ear and their the role in the vestibular system

[SLO:MSP-11-H-10]:

Explain how sound is conducted from the external environment to the cochlea.

[SLO:MSP-11-H-11]:

Describe the functions of the tongue in taste perception and speech.

[SLO:MSP-11-H-12]:

Identify major salivary glands and describe their functions in saliva production and digestion.

[SLO:MSP-11-H-13]:

Describe the functions of the nose in olfaction (sense of smell) and air filtration.

[SLO:MSP-11-H-14]:

Identify and describe appendages of the skin, such as hair, nails, and sweat glands.

[SLO:MSP-11-H-15]:

Describe the functions of the skin, including protection, sensation, temperature regulation, and vitamin D synthesis.



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