National Curriculum of Pakistan
2022-23

TECHNICAL EDUCATION

MEDICAL TECHNOLOGY

Elementary Anatomy & Micro Techniques

Grade 11-12

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

بسم الله الرحمن الرحيم

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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

Medical Lab Technology

Elementary Anatomy & Micro Techniques

Grade 11

Domain A: Introduction/Fundamentals to Anatomy
Standard Students acquire knowledge and skills to explore the intricate aspects of the structure and function of living organisms.

Grade 11	
Benchmark I: Student will be able to • Explain anatomical terms, identify abdominal regions and organs • List body system functions, • Explain basic cell components, and describe mitosis and meiosis processes.	
Student Learning Outcomes	
Student will be able to: **[SLO:EAMT-11-A-01]:** Define anatomical terms used to describe body directions, regions, and structures. **[SLO:EAMT-11-A-02]:** Identify the nine abdominal regions and their corresponding main organs	

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

List the primary divisions of the body systems along with their functions.

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

Describe the fundamental cellular components and their respective functions.

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

Define and differentiate between the processes of mitosis and meiosis, recognizing their distinct phases and purposes in cellular reproduction.

Practical

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

Students will be able to apply knowledge of anatomical terms to describe body directions, regions, and structures.

[SLO:EAMT-11-A-07]:

Students will be able to identify and label the nine abdominal regions on a diagram/model.

[SLO:EAMT-11-A-08]:

Students will be able to identify and label major cellular organelles such as the nucleus, mitochondria, endoplasmic reticulum, Golgi apparatus, on diagrams/ models.

[SLO:EAMT-11-A-09]:

Students will be able to describe the changes occurring in the nucleus, chromosomes, and cytoplasm during both mitosis and meiosis using diagrams/ models.

Domain B Respiratory System

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

Grade 11	
Benchmark I:Student will be able to • Describe respiratory organs, their functions, and locations • Differentiate between right and left lungs, air pathway from nose to lungs, gas exchange in alveoli, and the diaphragm's role in breathing is crucial, • Illustrate the diaphragm's anatomy and role as the primary muscle driving respiration	
Student Learning Outcomes	
Student will be able to: **[SLO:EAMT-11-B-01]:** Describe the anatomical organs of the respiratory system. **[SLO:EAMT-11-B-02]:** Identify the location, structure, and function of respiratory organs such as the trachea, bronchi, alveoli, and diaphragm. **[SLO:EAMT-11-B-03]:** Compare the anatomical difference between right and left lungs with their lobes and segments. **[SLO:EAMT-11-B-04]:**	

Describe the pathway of air from the nose through the respiratory system to the lungs.

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

Describe the process of gas exchange occurring in the alveoli, focusing on the diffusion of oxygen and carbon dioxide across the alveolar membranes.

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

Illustrate the anatomy and function of the diaphragm as the primary muscle responsible for respiration.

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

Explain the role of the diaphragm, intercostal muscles, and accessory respiratory muscles in chest expansion and contractions.

PRACTICAL

[SLO:EAMT-11-B-08]:

Identify and label organs of the respiratory system on diagrams/models.

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

Measure and record an individual's respiratory rate.

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

Demonstrate the ability to explain the mechanism of gas exchange in the alveoli on flowcharts and diagrams.

[SLO:EAMT-11-B-11]:

Apply the skill of clinical assessment to evaluate respiratory status (respiratory rate, and chest movements).

Domain C Digestive system

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

Grade 11	
Benchmark I:Student will be able to • Identify the main and accessory organs of digestive system with their functions, • Explain the activities of the digestive system; identify the histological layers of the digestive tract. • Apply the knowledge of principal digestive enzymes, and their site of action, substrate and their products, for the process of digestion.	
Student Learning Outcomes	
Student will be able to: **[SLO:EAMT-11-C-01]:** Identify the main and accessory organs of the digestive system along with their respective functions. **[SLO:EAMT-11-C-02]:** Identify and describe the histological layers (such as mucosa, sub mucosa, muscular is external, and serosa) of the digestive tract, explaining their roles in digestive **[SLO:EAMT-11-C-03]:**	

Describe the locations and basic structures of digestive organs.

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

Describe the distribution of the peritoneum, outlining its anatomy, layers, and connections within the abdominal cavity

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

Explain the various activities of the digestive system (ingestion, digestion, absorption, and elimination Processes.

PRACTICAL

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

Identify and label the main and accessory organs of the digestive system on diagrams/models

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

Apply knowledge of enzymatic action and chemical breakdown by explaining the process of digestion using models/diagrams/flow charts.

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

Demonstrate practical skills related to digestive system health, (such as proper food hygiene, chewing techniques,), explaining how these practices impact digestion and overall health.

Domain D Circulatory system

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

Grade 11	
Benchmark I:Student will be able to • Identify major components of the circulatory system, • Explain the relationship between different types of blood vessels, describe the anatomical position and structure of the heart, learn the conductive system of heart • Illustrate the pathway of blood circulation by detailing the sequential flow of blood through the heart, lungs, and systemic circulation	

Student Learning Outcomes

Student will be able to:

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

Identify the major components of the circulatory system, including the heart, blood vessels (arteries, veins, and capillaries), and blood.

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

Explain the relationship and functions of arteries, veins, and capillaries in the circulatory system, detailing their distinct roles in transporting blood throughout the body.

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

Describe the anatomical position and structural features of the heart, including its chambers (atria and ventricles), valves, major blood vessels connected to the heart, and its overall location in the thoracic cavity.

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

Illustrate the pathway of blood circulation by detailing the sequential flow of blood through the heart, lungs, and systemic circulation

[SLO:EAMT-11-D-05]:

Describe the conduction system of the heart, explaining their roles in coordinating the heart's rhythmic contractions.

PRACTICAL

[SLO:EAMT-11-D-06]:

Identify and structures of the heart on diagrams or models, including the atria, ventricles, valves (tricuspid, bicuspid/mitral, pulmonary, and aortic), and major blood vessels (superior vena cava, inferior vena cava, pulmonary veins, and aorta).

[SLO:EAMT-11-D-07]:

Identify and label structures of the conductive system of heart on diagrams/ models.

[SLO:EAMT-11-D-08]:

Explain how the structure of the heart relates to its function in pumping blood, maintaining blood pressure, and facilitating the circulation of oxygenated and deoxygenated blood.

[SLO:EAMT-11-D-09]:

Demonstrate the pathway of blood circulation by detailing the sequential flow of blood through the heart, lungs, and systemic circulation through flowcharts/diagrams/models.

[SLO:EAMT-11-D-10]:

Apply the skill of measuring pulse.

Domain E Nervous system

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

Grade 11
Benchmark I:Student will be able • describe the main components of nervous system, • Describe the structure of meninges, Learn the major brain regions and their functions, Describe the function and flow CSF in the brain, Explain the functions of autonomic nervous system.
Student Learning Outcomes
Student will be able to: **[SLO:EAMT-11-E-01]:** Learn the main components of the nervous system, including the central nervous system (CNS) and peripheral nervous system (PNS). **[SLO:EAMT-11-E-02]:**

Describe the structure of the meninges, highlighting the layers and their protective functions in surrounding the brain and spinal cord.

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

Describe the function of cerebrospinal fluid (CSF) in the brain, explaining its circulation and flow within the brain's ventricles and around the CNS.

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

Learn the major brain regions and their respective functions**.**

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

Describe the basic anatomy and functions of the autonomic nervous system.

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

Learn the synapse and role of Neurotransmitter.

PRACTICAL

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

Identify and differentiate between the main components of the nervous system through diagrams/ models.

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

Demonstrate the protective function of the meninges through diagrams/, and explaining their significance in maintaining CNS health.

Domain F Musculoskeletal system
Standard Students will be acquiring knowledge and skills to explore the intricate aspects of the structure and function of living organisms.

Grade 11
Benchmark I: Students will be able to • Identify and define the components of the musculoskeletal system and its roles in bodily movement and support • Describe the bones in the upper and lower limbs, as well as the skull and sternum.
Student Learning Outcomes
Student will be able to: **[SLO:EAMT-11-F-01]:** Identify and define the components of the musculoskeletal system (bones, muscles, joints, tendons, and ligaments), and their roles in bodily movement and support. **[SLO:EAMT-11-F-02]:** Describe the bones in the upper and lower limbs, as well as the skull and sternum, detailing the location, shape, and functions of each bone in relation to bodily movement and protection. **[SLO:EAMT-11-F-03]:** Describe the different types of muscles - skeletal, smooth, and cardiac and their characteristics, locations, and functions within the body. **[SLO:EAMT-11-F-04]:** explain the movements of ball and socket, hinge, pivot, and condyloid joints,

Practical

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

Explain practically the function of main body muscles.

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

Explain the movements of ball and socket, hinge, pivot, and condyloid joints in anatomical model/diagrams.

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

Demonstrate the ability to identify and locate bones in the upper and lower limbs, skull, and sternum on anatomical models/ image

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DOMAIN G Endocrine system

Standard Students will acquire knowledge and skills to explore the intricate aspects of the endocrine system.

Grade 11
Benchmark I:Student will be able to • Explain the basic concept of endocrine glands and hormones. • Explain what hormones are and their function as chemical messengers, • Describe the locations and primary functions of the pituitary, thyroid, pancreas, and adrenal glands, learn the roles of specific hormones

Student Learning Outcomes

Student will be able to:

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

Define the basic concept of endocrine glands and hormones, and differentiate between endocrine and exocrine glands.

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

Explain what hormones are and their function as chemical messengers**.**

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

Describe the locations and primary functions of the pituitary, thyroid, pancreas, and adrenal glands.

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

Learn the roles of specific hormones (growth hormone, thyroid hormones, insulin, glucagon, adrenaline, and cortisol) and their effects on the body's physiology.

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

Demonstrate the anatomical locations and primary functions of the pituitary, thyroid, pancreas, and adrenal gland through diagrams/ models of the human body.

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

Apply their knowledge of endocrine systems and hormones to and demonstrate how imbalances or dysfunctions in endocrine systems can manifest in various health conditions

DOMAIN H Reproductive system

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

Grade 11
Benchmark I:Student will be able to • List and label the major components of the male reproductive system. • Identify and outline the main components of the female reproductive system • Describe the process of fertilization
Student Learning Outcomes
Students will be able to: **[SLO:EAMT-11-H-01]:** List and label the major components of the male reproductive system. **[SLO:EAMT-11-H-02]:** Describe the functions of each component of male reproductive system. **[SLO:EAMT-11-H-03]:** Identify and outline the main components of the female reproductive system, including the uterus, ovaries, fallopian tubes, cervix, and vagina. **[SLO:EAMT-11-H-04]:** Describe functions of each component of the female reproductive system.

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

Describe the process of fertilization.

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

Explain the different phases of female reproductive cycle

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

Explain the role of hormones in male and female reproductive system

Practical

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

Demonstrate the roles of each component within the male reproductive system, explaining how each structure contributes to the process of sperm production, storage, and delivery on models/diagrams.

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

Identify and outline the components of the female reproductive system on diagrams/model

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

Demonstrate the process of fertilization through diagrams and flowcharts.

DOMAIN I Introduction to Micro techniques

Standard Students will be acquiring knowledge and skills to explore the intricate aspects of introduction to micro techniques.

Grade 11

Benchmark I: Student will be able to

- Identify and describe various fixation methods used in preserving the structure and integrity of biological specimens.
- Evaluate the importance of sectioning in examining the internal structure of specimens

Student Learning Outcomes

Student will be able to:

[SLO:EAMT-11-I-01]:

Describes various fixation methods used in preserving the structure and integrity of biological specimens.

[SLO:EAMT-11-I-02]:

Evaluate the importance of sectioning in examining the internal structure of specimens

[SLO:EAMT-11-I-03]:

Identify different types of tissues under a microscope

Practical

[SLO:EAMT-11-I-04]:

Apply skills of using microscope (proper handling, adjustment, and focusing,) to observe tissue samples at various magnifications.

[SLO:EAMT-11-I-05]:

Demonstrate the ability to compare various fixation methods utilized in preserving the structure and integrity of biological specimens.

[SLO:EAMT-11-I-06]:

Demonstrate steps involved in various sectioning techniques

DOMAIN J Identification of tissues and Staining

Standard Students will be acquiring knowledge and skills to explore the intricate aspects of identification of tissues and staining.

Grade 11
Benchmark I:Student will be able to • Define histopathology and its role in medicine • Describe routine histological techniques, • List the steps involved in tissue processing, sectioning, staining, and mounting, Describe the significance of staining in visualizing cellular and tissue structures
Student Learning Outcomes

Student will be able to:

[SLO:EAMT-11-J-01]:

Define histopathology and its role in medicine.

[SLO:EAMT-11-J-02]:

Describe routine histological techniques.

[SLO:EAMT-11-J-03]:

List the steps involved in tissue processing, sectioning, staining, and mounting.

[SLO:EAMT-11-J-04]:

Describe the significance of staining in visualizing cellular and tissue structures.

[SLO:EAMT-11-J-05]:

Explain the purpose of Staining.

Practical

[SLO:EAMT-11-J-06]:

Apply knowledge of histopathology and explain its pivotal role in diagnosing diseases.

[SLO:EAMT-11-J-07]:

Demonstrate tissue processing techniques (fixation, dehydration, and embedding procedures), ensuring the preservation and preparation of specimens for microscopic examination.

[SLO:EAMT-11-J-08]:

Develop the ability to observe and identify unstained and stained cellular and tissue structures under a microscope.

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