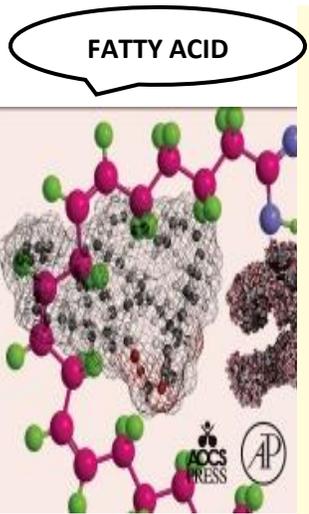
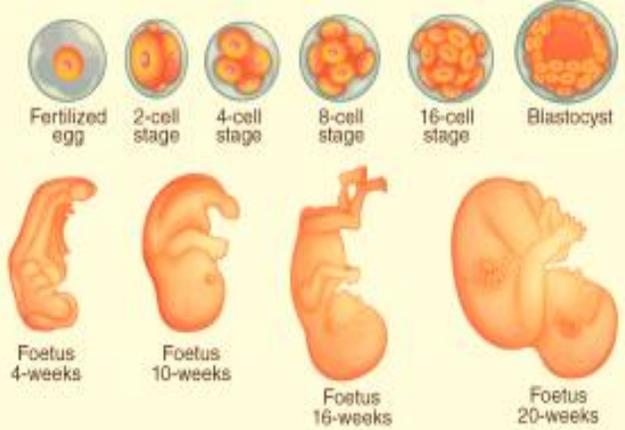


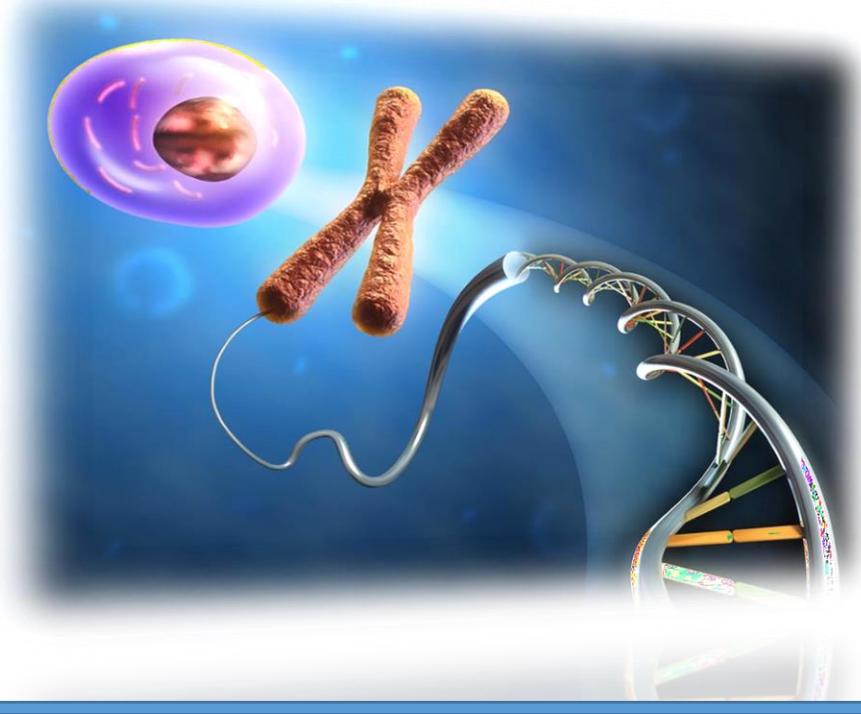
# Study Guide- First Year MBBS

- 28-Feb- 16 April 2022
- Duration 7 weeks

## EMBRYO DEVELOPMENT



# FOUNDATION MODULE



**STUDY GUIDE FOR FOUNDATION MODULE**

<b>S.No</b>	<b>CONTENTS</b>	<b>Page No</b>
1	Overview	3
2	Introduction to Study Guide	4
3	Learning Methodologies	5
4	Module 1: FOUNDATION	7
4.1	Introduction	7
4.2	Objectives and strategies	8
5	Learning Resources	20
6	Assessment Methods	21
7	LNMC Examination Rules And Regulations	24
8	Schedule	25

Module name: **Foundation**Year: **One**Duration: **7 weeks (February– April 2022)**

Timetable hours: **Lectures, Case-Based Learning (CBL), Self-Study, Practical, Skills, Demonstrations**

**MODULE INTEGRATED COMMITTEE**

<b>MODULE COORDINATOR:</b>	<ul style="list-style-type: none"> <li>• Dr. Saima Athar (<b>Anatomy</b>)</li> </ul>
<b>CO-COORDINATOR:</b>	<ul style="list-style-type: none"> <li>• Dr. Fatima Rehman (<b>Anatomy</b>)</li> </ul>

**DEPARTMENTS' & RESOURCE PERSONS' FACILITATING LEARNING**

<b>BASIC HEALTH SCIENCES</b>	<b>CLINICAL AND ANCILLARY DEPARTMENTS</b>
<b>ANATOMY</b> <ul style="list-style-type: none"> <li>• Professor Zia-ul-Islam</li> </ul>	<b>BIOETHICS</b> <ul style="list-style-type: none"> <li>• Dr. Saleha Shahzad</li> </ul>
<b>BIOCHEMISTRY</b> <ul style="list-style-type: none"> <li>• Professor Kashif Nisar</li> </ul>	<b>COMMUNICATION SKILLS</b> <ul style="list-style-type: none"> <li>• Mrs. Mehr Yahya</li> </ul>
<b>PHYSIOLOGY</b> <ul style="list-style-type: none"> <li>• Professor Syed Hafeezul Hassan</li> </ul>	<b>FAMILY MEDICINE</b> <ul style="list-style-type: none"> <li>• Dr. Rabeeya Saeed</li> </ul>
	<b>MOLECULAR PATHOLOGY</b> <ul style="list-style-type: none"> <li>• Dr. Sobia Rafiq</li> </ul>
<b>DEPARTMENT OF HEALTH PROFESSIONS EDUCATION</b>	
<ul style="list-style-type: none"> <li>• Professor Nighat Huda</li> <li>• Professor Sobia Ali</li> <li>• Dr. Afifa Tabassum</li> <li>• Dr. Sana Shah</li> </ul>	
<b>LNH&amp;MC MANAGEMENT</b>	
<ul style="list-style-type: none"> <li>• Professor KU Makki, Principal LNH&amp;MC</li> <li>• Dr. Shaheena Akbani, Director A.A &amp; R.T LNH&amp;MC</li> </ul>	
<b>STUDY GUIDE COMPILED BY: Department of Health Professions Education</b>	

## **INTRODUCTION**

### **WHAT IS A STUDY GUIDE?**

It is an aid to:

- Inform students how student learning program module has been organized
- Help students organize and manage their studies throughout the module
- Guide students on assessment methods, rules and regulations

### **THE STUDY GUIDE:**

- Communicates information on organization and management of the module. This will help the student to contact the right person in case of any difficulty.
- Defines the objectives which are expected to be achieved at the end of the module.
- Identifies the learning strategies such as lectures, small group teachings, clinical skills, demonstration, tutorial and case based learning that will be implemented to achieve the module objectives.
- Provides a list of learning resources such as books, computer assisted learning programs, web- links, journals, for students to consult in order to maximize their learning.
- Highlights information on the contribution of continuous and Term examinations on the student's overall performance.
- Includes information on the assessment methods that will be held to determine every student's achievement of objectives.
- Focuses on information pertaining to examination policy, rules and regulations.

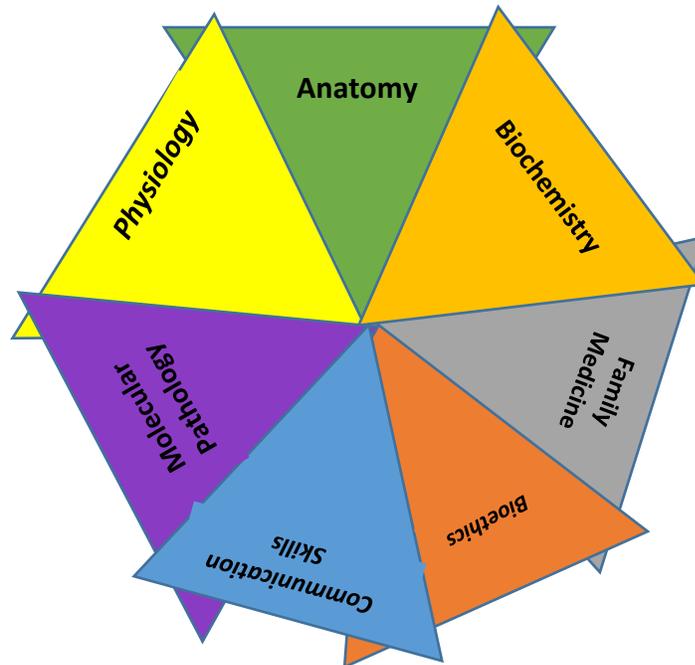
### **CURRICULUM FRAMEWORK**

Students will experience integrated curriculum.

**INTEGRATED CURRICULUM** comprises system-based modules such as foundation and blood which links basic science knowledge to clinical problems. Integrated teaching means that subjects are presented as a meaningful whole. Students will be able to have better understanding of basic sciences when they repeatedly learn in relation to clinical examples.

Case-based discussions, computer-based assignments, early exposure to clinics, wards, and skills acquisition in skills lab are characteristics of integrated teaching program.

## INTEGRATING DISCIPLINES OF FOUNDATION MODULE



### LEARNING METHODOLOGIES

The following teaching/ learning methods are used to promote better understanding:

- Interactive Lectures
- Team- Based Learning
- Small Group Discussion
- Case- Based Learning
- Practicals
- Skills session
- E-Learning
- Self-Directed Study

**INTERACTIVE LECTURES:** In large group, the lecturer introduces a topic or common clinical conditions and explains the underlying phenomena through questions, pictures, videos of patients' interviews, exercises, etc. Students are actively involved in the learning process.

**TEAM- BASED LEARNING:** Team-Based Learning is an evidence based collaborative learning teaching strategy designed around units of instruction, known as "modules," that are taught in a three-step cycle: preparation, (b) in-class readiness assurance testing, and (c) application-focused exercise.

Preparation before class: Students must complete preparatory materials before a class or the start of the module. Materials may be text, visual or other, and set at a level that is appropriate to the students and the course.

In-class Readiness Assurance Testing: Students complete an individual readiness assurance test (IRAT), consisting of 5 to 20 multiple choice questions. After submitting their individual answers, and they take the same test, the team RAT (TRAT), with their team. All members of each team share the same TRAT score, and both IRAT and TRAT scores count toward the students' grades.

Instructor Feedback: The instructor reviews material from the RAT that seems to be difficult for students.

In-class application focused exercise: The remainder of the session is taken up with exercises that help students learn how to apply and extend the knowledge that they have pre-learned and tested. Teams are given an appropriate problem or challenge, and must arrive at a consensus to choose a "best" solution out of options provided. Teams then display their answer choice, and the educator facilitates a classroom discussion between teams to explore the topic and the possible answers to the problem.

**SMALL GROUP DISCUSSION (SGD):** This format helps students to clarify concepts acquire skills or attitudes. Sessions are structured with the help of specific exercises such as patient case, interviews or discussion topics. Students exchange opinions and apply knowledge gained from lectures, tutorials and self study. The facilitator role is to ask probing questions, summarize, or rephrase to help clarify concepts.

**CASE- BASED LEARNING:** A small group discussion format where learning is focused around a series of questions based on a clinical scenario. Students' discuss and answer the questions applying relevant knowledge gained in clinical and basic health sciences during the module.

**PRACTICAL:** Basic science practicals related to anatomy, biochemistry and physiology are scheduled for student learning.

**SKILLS SESSION:** Skills relevant to respective module are observed and practiced where applicable in skills laboratory.

**SELF DIRECTED STUDY:** Students' assume responsibilities of their own learning through individual study, sharing and discussing with peers, seeking information from Learning Resource Center, teachers and resource persons within and outside the college. Students can utilize the time within the college scheduled hours of self-study.

**E-LEARNING:** E-Learning is a strategy by which learning occurs through the utilization of electronic media, typically the Internet.

## MODULE 1: FOUNDATION

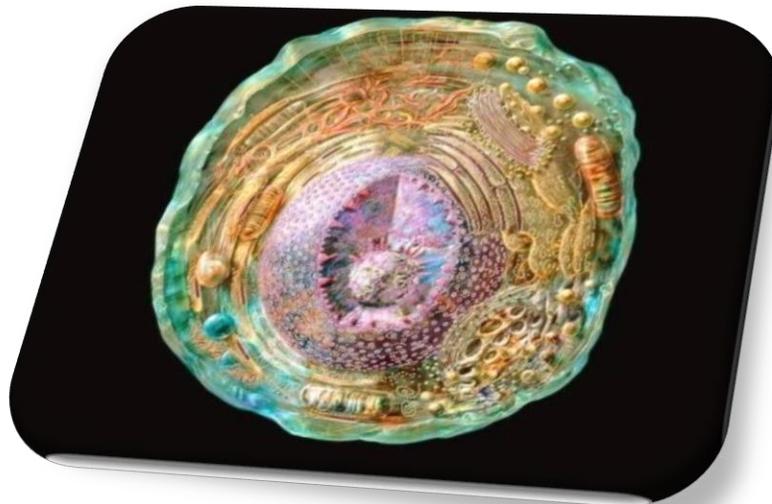
### INTRODUCTION

This module has been designed to introduce you to the basics of health sciences. The course covers the molecular level of cell biology including genetics and its role in embryology, microbiology and pathology.

You will also experience clinical skills such as learning to communicate effectively so that you can relate to patients and their loved ones with compassion and understanding in coming years. Through working within teams, your co-operative and approachable working style will be enhanced. Through group and individual work, you will develop problem solving skills to apply your medical knowledge to practical situations. This, supplemented by lectures, and practical classes, is a significant component of the course.

This study guide has been developed to help guide you and keep you focused on the objectives for this module.

*Welcome to the field of medicine and hope that the journey ahead will be exciting and fulfilling for you all!!*



**TOPICS, COURSE OBJECTIVES AND STRATEGIES**

At the end of the module the students will be able to:

**ANATOMY**

OBJECTIVES	LEARNING STRATEGY
<b>GENERAL ANATOMY</b>	
<b>1. Levels of organization of Human Body</b>	Interactive Lecture
<ul style="list-style-type: none"> <li>Describe the organization of the body from cellular to system level</li> </ul>	
<b>2. Anatomical terminologies: positions and planes</b>	Small Group Discussion /Tutorial
<ul style="list-style-type: none"> <li>Differentiate among the various positions and planes of the body</li> </ul>	
<b>3. Terms of movement</b>	
<ul style="list-style-type: none"> <li>Define the movements occurring at various joints of body (flexion, extension, abduction, adduction, rotation)</li> <li>Identify movements occurring at specific joints (pronation, supination, inversion, eversion)</li> <li>Identify the planes at which movements occur</li> </ul>	
<b>4. Bones-I: Classification</b>	
<ul style="list-style-type: none"> <li>Classify bone on the basis of shapes and region</li> <li>Describe the gross structure of young and adult bone</li> </ul>	Interactive Lecture
<b>5. Bones-II: Ossification, Blood supply of long bones, Cartilage, Bone Markings</b>	
<ul style="list-style-type: none"> <li>Explain the ossification of bone</li> <li>Identify the centers of ossification and their significance</li> <li>Distinguish between intramembranous and endochondral ossification</li> <li>Define bone markings with examples</li> <li>List the types of cartilage</li> <li>Describe the general anatomical features of each type of cartilage with example</li> </ul>	
<b>6. General Concept of Muscles I</b>	
<ul style="list-style-type: none"> <li>List the components of muscular system.</li> <li>Classify the muscles according to their fascicular architecture with example</li> </ul>	
<b>7. General Concept of Muscles II</b>	
<ul style="list-style-type: none"> <li>Classify the muscles according to direction of fibers and their actions with example</li> <li>Explain the principles of innervation and blood supply of muscles.</li> </ul>	
<b>8. General concept of joints</b>	
<ul style="list-style-type: none"> <li>Define joint</li> <li>Classify the joints on the basis of structure (uniting material) with example</li> <li>Define a synovial joint</li> <li>List the features of synovial joint</li> <li>Classify Synovial joints on the basis of shape of articulating surfaces and degree of mobility</li> <li>Explain the principles of innervation and blood supply of synovial joints</li> </ul>	

<b>9. Nervous system- I: Somatic nervous system and typical spinal nerve</b>	
• List the basic divisions of Nervous system	
• Define the various components of Central and Peripheral nervous systems (CNS and PNS)	
• Describe the structure of Neuron	
• Classify neurons on the basis of number of processes and length of fibers	
• Define a nerve and its coverings	
• Differentiate between myelinated and unmyelinated fibers	
• List various types of Neuroglia	
• State their functions	
• Define a spinal nerve	
• Enumerate the spinal nerves in different regions	
• Identify their location and site of emergence	
• Identify various components of a typical spinal nerve	
• Describe the fate of rami	
• Describe the distribution of gray rami	
<b>10. Nervous system-II: Autonomic Nervous System (ANS)</b>	
• Describe the anatomical components of ANS	
• Differentiate between sympathetic and parasympathetic systems based on gross structure and distribution	
<b>11. Introduction to lymphatic system</b>	
• Define lymphatic system, lymphatics and lymph nodes	
• Describe the structure of lymph nodes and their general distribution	
• List various lymphoid tissues and organs	
• Identify large lymphatic channels	
• Discuss the role of lymphatics in the spread of cancer	
<b>12. Integumentary system -I</b>	
• Define the term integumentary system	
• Discuss the functions of the skin	
• Differentiate between epidermis and dermis	
• Discuss the significance of tension lines	
<b>13. Integumentary system - II</b>	
• Discuss the main determinant of skin color	
• Identify the appendages of the skin	
• Differentiate between superficial & deep fascia	
• Identify different layers of skin under the microscope	
<b>II. GENERAL EMBRYOLOGY</b>	
<b>14. Terms of Embryology</b>	
• Explain terms related to embryology	
• List steps of cell division during mitosis	
• Explain the significance of mitosis	
• Define Meiosis	
• List the steps of meiosis	
• Differentiate first and second meiotic divisions	
	Interactive Lecture/Practical
	Interactive Lecture/ Small Group Discussion

<ul style="list-style-type: none"> <li>• State the phases of meiotic divisions</li> <li>• Justify the importance meiosis in both sexes</li> <li>• Differentiate between mitosis and meiosis</li> </ul>	
<b>15. Introduction to Reproductive Organs</b>	
<ul style="list-style-type: none"> <li>• Identify the male &amp; female reproductive organs</li> <li>• Describe Ovarian cycle</li> <li>• Relate ovarian cycle with uterine cycle</li> <li>• Describe the cyclical changes occurring in uterus, preparation of uterus for implantation, and their endocrine control</li> </ul>	
<b>16. Oogenesis &amp; Spermiogenesis</b>	
<ul style="list-style-type: none"> <li>• Define gametogenesis (oogenesis &amp; Spermatogenesis)</li> <li>• Describe the process of oogenesis</li> <li>• Differentiate between primary and secondary oocytes</li> <li>• Compare the male and female gametes</li> <li>• Define gametogenesis</li> <li>• Describe the sequence events of spermatogenesis</li> <li>• Discuss the importance of mitosis &amp; meiosis in spermatogenesis</li> <li>• List the steps in spermiogenesis</li> <li>• Differentiate between spermatogenesis &amp; spermiogenesis</li> </ul>	Interactive Lecture
<b>17. Transportation of Ovum and fertilization</b>	
<ul style="list-style-type: none"> <li>• Explain transportation of sperm and ovum</li> <li>• Define fertilization</li> <li>• Discuss phases and results of fertilization</li> <li>• Discuss the clinical aspects of fertilization</li> </ul>	
<b>18. 1st week of development after fertilization</b>	
<ul style="list-style-type: none"> <li>• Discuss the formation of zygote</li> <li>• Explain the transport of zygote from ampulla of fallopian tube to the uterine cavity</li> <li>• Discuss initial stages of development by the process of cleavage.</li> <li>• Explain the formation of blastocyst</li> </ul>	
<b>19. 2nd Week of development</b>	
<ul style="list-style-type: none"> <li>• Define implantation</li> <li>• Explain the formation of outer and inner cell masses</li> <li>• Discuss the further development of outer cell mass (trophoblast)</li> <li>• Differentiate syncytiotrophoblast and cytotrophoblast with its microscopic appearance</li> <li>• Describe the process of implantation (day by day changes)</li> <li>• State the differentiation of embryonic pole and development of bilaminar germ disc with formation Epiblast and hypoblast, their cavities (amniotic cavity and primary yolk sac)</li> <li>• Discuss the development of the chorionic sac and Primary chorionic villi</li> <li>• Enumerate the abnormal sites for implantation (ectopic pregnancy) and the different diagnostic tools</li> </ul>	Interactive Lecture/ Small Group Discussion /Tutorial

<b>20. 3rd week of Development: Gastrulation, primitive streak and notochord</b>	
<ul style="list-style-type: none"> <li>Define gastrulation (formation of three germ layers)</li> <li>Discuss the development of primitive streak &amp; related congenital anomalies (Sacrococcygeal Teratoma)</li> <li>Describe the development of notochordal process, notochord canal, prechordal plate and cloacal membrane</li> <li>Describe the location of allantois and its importance</li> <li>Discuss the formation of secondary and tertiary chorionic villi</li> <li>Describe the development of intra-embryonic coelom</li> </ul>	
<b>21. 3rd week of Development: Neurulation and somite formation</b>	
<ul style="list-style-type: none"> <li>Define neurulation</li> <li>Describe briefly the events occurring in neurulation</li> <li>Describe briefly the formation of somites</li> </ul>	
<b>22. Embryonic Period</b>	
<ul style="list-style-type: none"> <li>Define embryonic period</li> <li>Describe folding of embryo in median and horizontal planes</li> <li>List the derivatives of germ layers</li> <li>List events with the corresponding weeks, occurring during the period</li> </ul>	
<b>23. Fetal Period</b>	
<ul style="list-style-type: none"> <li>Define fetal period</li> <li>Discuss the factors affecting fetal period/growth.</li> <li>Explain the week by week development of tissues and organs</li> <li>Describe the different milestones in development of fetus</li> <li>List the causes of fetal loss</li> </ul>	Interactive Lecture
<b>24. Amnion, Chorion, umbilical cord &amp; Yolk-Sac, Disorders of amniotic fluid</b>	
<ul style="list-style-type: none"> <li>List the fetal membranes</li> <li>Describe the structure of amnion &amp; chorion</li> <li>Describe the formation, circulation and function of amniotic fluid</li> <li>Discuss the development of chorion and its complications</li> <li>Discuss the disorder related to amniotic fluid volume</li> <li>Describe the relationship of twinning (multiple pregnancies) with fetal membranes</li> <li>Describe the umbilical cord (morphology, composite structures, positioning and fate)</li> <li>Discuss the fate of umbilical vesicle (yolk sac)</li> </ul>	
<b>25. Placenta</b>	
<ul style="list-style-type: none"> <li>Describe the changes in the maternal endometrium with formation of decidua and decidual reaction</li> <li>Describe the different types of chorionic villi</li> <li>Explain the development of placenta, both the fetal and maternal part</li> <li>Describe the placental circulation and barrier</li> <li>Describe the functions of placenta</li> </ul>	Interactive Lecture /Practical/Tutorial
<b>26. Prenatal diagnosis</b>	
<ul style="list-style-type: none"> <li>Discuss prenatal diagnosis</li> <li>List the types of prenatal diagnosis</li> <li>Differentiate between amniocentesis, chorionic villus sampling, cordocentesis, ultrasonography, maternal AFP levels in terms of indication, time of performance and technique</li> <li>Describe the indications and goals of prenatal diagnosis</li> </ul>	Interactive Lecture

<b>27. Congenital Malformations</b>	Interactive Lecture/ Case- Based Learning
<ul style="list-style-type: none"> <li>Define congenital malformation</li> </ul>	
<ul style="list-style-type: none"> <li>List the types of abnormalities (Disruptions, Deformations)</li> <li>Discuss the common congenital anomalies</li> </ul>	
<b>28. Teratogenesis</b>	Interactive Lecture
<ul style="list-style-type: none"> <li>Define Teratogenesis</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the principles governing teratogenesis</li> <li>Describe the teratogenic factors and their effects on the developing tissue</li> </ul>	
<b>III. GENERAL HISTOLOGY</b>	
<b>29. Tissue Preparation and staining</b>	Interactive Lecture/ Practical
<ul style="list-style-type: none"> <li>Describe different stages of tissue preparation</li> </ul>	
<ul style="list-style-type: none"> <li>List various types of stains</li> <li>Describe Haematoxylin and Eosin (H&amp;E) staining</li> </ul>	
<ul style="list-style-type: none"> <li>Identify different parts of microscope</li> </ul>	
<b>30. Cell Membrane</b>	Interactive Lecture
<ul style="list-style-type: none"> <li>Identify the structures of cell membrane</li> <li>Describe the phospholipid bilayer and its composition</li> <li>Explain the Fluid Mosaic Model of cell membrane</li> </ul>	
<b>31. Cytoplasm</b>	
<ul style="list-style-type: none"> <li>Define cytoplasm</li> <li>Discuss components and functions of cytoplasm</li> </ul>	
<b>32. Nucleus</b>	
<ul style="list-style-type: none"> <li>Describe the structure of nuclear membrane</li> <li>Explain the component of nucleus and different types of chromatin material</li> </ul>	
<b>33. Cell organelles</b>	
<ul style="list-style-type: none"> <li>Describe various cell organelles</li> </ul>	
<b>34. Cytoskeleton</b>	
<ul style="list-style-type: none"> <li>Define Cytoskeleton</li> <li>Describe the composition and functions of cytoskeleton</li> <li>Enumerate the types, distribution and functions of cytoskeleton</li> <li>Describe the details of cytoplasmic filaments and microtubules</li> </ul>	
<b>35. Cell Cycle</b>	
<ul style="list-style-type: none"> <li>Define cell cycle</li> <li>Explain various stages of cell cycle</li> <li>Explain the events of somatic cell division (mitosis)</li> <li>Discuss the significance of S phase of cell cycle</li> <li>Relate phases of cell cycle with the basis of development of cancer</li> </ul>	
<b>36. Epithelium</b>	Interactive Lecture/ Practical
<ul style="list-style-type: none"> <li>Describe the types, locations and functions of epithelium</li> </ul>	
<ul style="list-style-type: none"> <li>Describe the structural details of organization of cells in epithelium and other basic tissues of body</li> <li>Explain their origin of germinal layer and their derivatives</li> </ul>	
<ul style="list-style-type: none"> <li>Identify various types of epithelium under microscope</li> </ul>	

<b>37. Cell Junctions</b>	Interactive Lecture/ Practical
<ul style="list-style-type: none"> <li>Define cell junction</li> </ul>	
<ul style="list-style-type: none"> <li>Name the junctions along the lateral and basal surfaces of cells</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the structure and functions of the five main types of cell junction</li> </ul>	
<ul style="list-style-type: none"> <li>List the sites of distribution &amp; components of junctional complex</li> </ul>	
<b>38. Glands</b>	
<ul style="list-style-type: none"> <li>Define glands</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the general feature and structure of exocrine glands</li> </ul>	
<ul style="list-style-type: none"> <li>Classify exocrine glands on the basis of number of cells, their structure &amp; types of secretions</li> </ul>	
<ul style="list-style-type: none"> <li>Identify various glands</li> </ul>	
<b>39. Connective Tissues (Components)</b>	
<ul style="list-style-type: none"> <li>Define connective tissue</li> </ul>	
<ul style="list-style-type: none"> <li>Differentiate connective from epithelial tissue</li> </ul>	
<ul style="list-style-type: none"> <li>Describe the components of connective tissue</li> </ul>	
<b>40. Connective Tissues (Classification)</b>	
<ul style="list-style-type: none"> <li>Classify different types of connective tissue</li> </ul>	
<ul style="list-style-type: none"> <li>Identify different types of connective tissue under the microscope</li> </ul>	
<ul style="list-style-type: none"> <li>State the distribution of each type</li> </ul>	
<ul style="list-style-type: none"> <li>Identify connective tissue cell, fibers under microscope</li> </ul>	
<b>41. Histology of muscles</b>	
<ul style="list-style-type: none"> <li>Describe the histological features of different types of muscular tissue and their location</li> </ul>	
<ul style="list-style-type: none"> <li>Identify the various types of muscular tissues</li> </ul>	

### **BIOETHICS /COMMUNICATION SKILLS**

OBJECTIVES	LEARNING STRATEGY
<ul style="list-style-type: none"> <li>Discuss the importance of Ethics in medicine</li> </ul>	Interactive Lecture/ Small Group Discussion
<ul style="list-style-type: none"> <li>Discuss the Importance of good Communication skills</li> </ul>	

### **BIOCHEMISTRY**

OBJECTIVES	LEARNING STRATEGY
<b>WATER</b>	Interactive Lecture/Tutorial
1. Chemical nature of water	
<ul style="list-style-type: none"> <li>Describe the structure and properties of water.</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the physicochemical properties of water (e.g. surface tension, viscosity, adsorption)</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the role of water as a Solvent</li> </ul>	
<ul style="list-style-type: none"> <li>Describe the role of water in forming molecular bonds.</li> </ul>	

<b>2. Distribution of water</b>	
• Discuss the water distribution and homeostasis	
• Explain the clinical aspects of water disturbances	
<b>3. pH and Buffers</b>	
• Describe the mechanism of dissociation of water and maintenance of normal pH	
• Discuss the change in pH due to the addition of a given quantity of acid or base	
• Describe the role of buffers in maintaining pH	
• Explain the Henderson–Hassel Balch equation	
<b>CELL</b>	
<b>4. Cell membrane</b>	Interactive Lecture
• Describe the biochemical composition	
• Describe the functions of the cell membrane	
<b>5. Cell organelles</b>	
• Discuss the biochemical structure and function of each organelle	
<b>CARBOHYDRATE CHEMISTRY</b>	
<b>6. Carbohydrate Classification</b>	Interactive Lecture/ Practical
• Define carbohydrates with examples	
• Classify carbohydrates with examples	
• Describe the biochemical role of carbohydrates	
<b>7. Monosaccharaides</b>	
• Classify Monosaccharaides with examples	
• Explain chiral carbon and isomerism with examples	
• Explain the properties and functions of Monosaccharaides	
<b>8. Detection of Carbohydrates and Polysaccharides</b>	
• Outline the scheme for detection of carbohydrates in a sample	
• Identify the chemical tests and bio-techniques to detect proteins	
• Detect Carbohydrates in the given sample	
• Detect Polysaccharides in the given sample	
<b>9. Detection of Mono &amp; Disaccharides</b>	
• Identify the chemical tests and bio-techniques to detect proteins	
• Detect Monosaccharides in the given sample	
• Detect Disaccharides in the given sample	
• Correlate the laboratory investigations with relevant clinical conditions	
<b>10. Disaccharides and Oligosaccharides</b>	
• Classify Disaccharides with examples	
• Explain the properties and functions of Disaccharides	
• Classify Oligosaccharides with examples	
• Explain the properties and functions of Oligosaccharides	
<b>11. Polysaccharides</b>	
• Classify Polysaccharides with examples	
• Explain the properties and functions of Polysaccharides	
• Describe the clinical importance of Polysaccharides	

<b>LIPID CHEMISTRY</b>		
<b>12. Lipid Classification</b>		
<ul style="list-style-type: none"> <li>Define Lipids with examples</li> <li>Classify Lipids with examples</li> <li>Describe the biochemical functions of lipids</li> </ul>	Interactive Lecture/Tutorial/ Practical	
<b>13. Lipids: Detection of Lipids</b>		
<ul style="list-style-type: none"> <li>Outline the method for detection of Lipids in a sample</li> <li>Identify the chemical tests and bio-techniques to detect Lipids</li> <li>Detect Lipids in the given sample</li> <li>Correlate the laboratory investigations with relevant clinical conditions</li> </ul>		
<b>14. Fatty acids</b>		
<ul style="list-style-type: none"> <li>Explain the chemical structure of fatty acids.</li> <li>Classify fatty acids with examples</li> <li>Describe the properties and functions of fatty acids</li> </ul>		
<b>15. Simple &amp; Compound Lipids</b>		
<ul style="list-style-type: none"> <li>Classify simple and compound lipids with examples.</li> <li>Explain the chemical structure of simple and compound lipids</li> <li>Describe the properties and biological functions of simple and compound lipids</li> <li>Discuss the clinical importance of Lipid storage diseases</li> <li>Discuss the clinical significance of plasma lipoproteins</li> </ul>	Interactive Lecture	
<b>16. Steroids &amp; Sterols</b>		
<ul style="list-style-type: none"> <li>Explain the structure and biochemical importance of steroids and sterols.</li> <li>List the sources and functions of Cholesterol</li> <li>Discuss the clinical importance of Cholesterol</li> </ul>		
<b>17. Eicosanoids</b>		
<ul style="list-style-type: none"> <li>Define Eicosanoids with examples</li> <li>Classify Eicosanoids with examples</li> <li>Explain the functions of Eicosanoids</li> <li>Explain the synthesis of Eicosanoids.</li> <li>Discuss the clinical significance of Eicosanoids</li> </ul>		
<b>PROTEIN CHEMISTRY</b>		
<b>18. Amino acids</b>		
<ul style="list-style-type: none"> <li>Describe the structure and classification of amino acids with example</li> <li>Describe the properties of amino acids</li> <li>Describe the functions of amino acids</li> </ul>	Interactive Lecture/Practical	
<b>19. Peptides and Polypeptides</b>		
<ul style="list-style-type: none"> <li>Describe the structure and classification of Peptides and Polypeptides with examples</li> <li>Describe the characteristics of the Peptide bond</li> <li>Describe the functions and biomedical importance of Peptides and Polypeptides</li> </ul>		
<b>20. Chemistry of Proteins</b>		
<ul style="list-style-type: none"> <li>Define proteins with examples</li> <li>Classify proteins with examples</li> <li>List the sources and properties of proteins</li> <li>Describe the functions and biomedical importance of individual proteins</li> </ul>		

<b>21. Protein Structure</b>		
<ul style="list-style-type: none"> <li>Explain the structure of proteins</li> </ul>		
<b>22. Detection of Proteins</b>		
<ul style="list-style-type: none"> <li>Outline the scheme for detection of Proteins in a sample</li> <li>Identify the chemical tests and bio-techniques to detect proteins</li> <li>Detect Proteins in the given sample (General tests)</li> <li>Correlate the laboratory investigations with relevant clinical conditions</li> </ul>		
<b>23. Detection of individual amino acids</b>		
<ul style="list-style-type: none"> <li>Identify the chemical tests and bio-techniques to detect the different amino acids</li> <li>Detect individual amino acids in the given sample</li> <li>Correlate the laboratory investigations with relevant clinical conditions</li> </ul>		
<b>24. Detection of individual Proteins</b>		
<ul style="list-style-type: none"> <li>Identify the chemical tests and bio-techniques to detect the different amino acids</li> <li>Detect individual Proteins in the given sample</li> <li>Correlate the laboratory investigations with relevant clinical conditions</li> </ul>		
<b>NUCLEIC ACID CHEMISTRY</b>		Interactive Lecture
<b>25. Nucleotides</b>		
<ul style="list-style-type: none"> <li>Describe the structure and classification of nitrogenous bases with examples</li> <li>Compare the structures of nucleotides and nucleosides</li> <li>Discuss the biomedical functions of nucleotides</li> <li>Explain the biomedical significance of nucleotide derivatives and synthetic analogues.</li> </ul>		
<b>26. Chemistry of Nucleic acids</b>		
<ul style="list-style-type: none"> <li>Classify DNA and RNA with examples</li> <li>Explain the properties of nucleic acids</li> <li>Describe the structure and functions of DNA and RNA</li> </ul>		
<b>ENZYLE CHEMISTRY</b>	Interactive Lecture/Practical	
<b>27. Classification of Enzymes</b>		
<ul style="list-style-type: none"> <li>Define enzymes with examples</li> <li>Classify enzymes with examples</li> <li>Describe the structure and properties of Enzymes</li> <li>Explain Co-enzymes, Co factors, zymogens, prosthetic group and Isoenzymes</li> </ul>		
<b>28. Enzyme Kinetics</b>		
<ul style="list-style-type: none"> <li>Explain the energy of activation</li> <li>Explain the two hypothesis enzyme substrate binding.</li> <li>Explain mechanism of action of enzymes</li> <li>Explain the Michaelis Menten Model of enzyme kinetics</li> </ul>		
<b>29. Factors affecting enzyme activity</b>		
<ul style="list-style-type: none"> <li>Discuss factors inhibiting and promoting enzyme activity</li> <li>Define enzyme inhibitors with examples</li> <li>Classify enzyme inhibitors with examples</li> </ul>		

<b>30. Clinical Enzymology</b>	
• Explain the diagnostic importance of enzymes and isoenzymes	
• Outline different ways of measuring plasma enzymes	
• List enzymes and isoenzymes commonly assayed for diagnostic purposes	
• Discuss the clinical importance of isoenzymes of LDH, CPK, Troponin, Alkaline phosphatase and Aldolase	
<b>31. Enzymes: Detection of Factors affecting Enzyme activity</b>	
• Outline the scheme for detection of factors affecting enzyme activity	Interactive Lecture
• Identify the chemical tests and bio-techniques to detect the factors affecting enzyme activity	
• Detect the effect of factors affecting the activity of salivary amylase	
<b>32. VITAMINS</b>	
• Define vitamins with examples	
• Classify vitamins with examples	
• Discuss the overall role of vitamins and their importance in normal body functions	Practical
• Describe the chemical structure and functions of individual vitamins	
• List the sources, daily requirement, digestion absorption of individual vitamins	
• Describe the clinical significance of deficiency and toxicity of vitamins	
<b>33. Lab protocols &amp; Solutions</b>	
• Explain the Biochemistry Laboratory protocols & Lab hazards	
• Identify the signs and symbols related to Laboratory hazards	
• Prepare different types of Solutions (Normal, Molar, Molal, Percent)	
• Identify the clinical uses and hazards of different types of solutions	
• Correlate the laboratory investigations with relevant clinical conditions	

### ***FAMILY MEDICINE***

OBJECTIVES	LEARNING STRATEGY
• Discuss the role and scope of family medicine in health care system	Interactive Lecture

### ***MOLECULAR PATHOLOGY***

OBJECTIVES	LEARNING STRATEGY
• Describe the basic principal of genetics	Interactive Lecture

**PHYSIOLOGY**

OBJECTIVES	LEARNING STRATEGY
<b>1. Extracellular fluid &amp; internal environment</b>	Interactive Lecture/Tutorial/ Practical
<ul style="list-style-type: none"> <li>• Describe functional organization of human body and fluid compartments</li> <li>• Identify the effects of osmotic variations in Extracellular fluid (ECF) on cell</li> </ul>	
<b>2. Homeostasis and control system of body</b>	Interactive Lecture/Tutorial
<ul style="list-style-type: none"> <li>• Recognize the role of physiochemical aspects in the maintenance of homeostasis</li> </ul>	
<b>3. Functional importance of Cell membrane</b>	
<ul style="list-style-type: none"> <li>• Explain composition and basic structure of cell membrane its functional importance and adaptation</li> </ul>	
<b>4. Cell organelles 1</b>	
<ul style="list-style-type: none"> <li>• Describe the structure and functions of Ribosomes, Endoplasmic reticulum, Golgi apparatus</li> </ul>	
<b>5. Cell organelles 2</b>	
<ul style="list-style-type: none"> <li>• Describe the structure and functions of Lysosomes, Mitochondria, peroxisomes, cytoskeleton</li> </ul>	
<b>6. Transport across cell membrane (Passive)</b>	
<ul style="list-style-type: none"> <li>• Describe types and process of passive transport across the membrane and their effects</li> <li>• Describe diffusion and its physical basis</li> </ul>	
<b>7. Transport across cell membrane (Active)</b>	
<ul style="list-style-type: none"> <li>• Describe the types and effects of membrane transport mechanism</li> </ul>	
<b>8. Cell Adaptation</b>	
<ul style="list-style-type: none"> <li>• Explain the process of endocytosis, exocytosis and transcytosis</li> </ul>	
<b>9. Cell signaling mechanism</b>	
<ul style="list-style-type: none"> <li>• Discuss the chemistry of signals, receptors and importance of lipid and proteins in membranes</li> </ul>	
<b>10. Locomotion and Apoptosis</b>	
<ul style="list-style-type: none"> <li>• Define Apoptosis</li> </ul>	
<ul style="list-style-type: none"> <li>• Describe the process of apoptosis and cell locomotion</li> </ul>	
<b>11. Introduction to Autonomic Nervous System</b>	
<ul style="list-style-type: none"> <li>• Define Autonomic Nervous System</li> </ul>	
<ul style="list-style-type: none"> <li>• Describe the function of divisions of ANS and the neurotransmitters involved</li> </ul>	

**STUDY SKILLS**

OBJECTIVES	LEARNING STRATEGY
<b>1. Learning Styles</b>	Interactive Lecture/ Small Group Discussion
<ul style="list-style-type: none"> <li>• Identify their own learning styles</li> </ul>	
<ul style="list-style-type: none"> <li>• Apply effective learning strategies to improve their learning</li> </ul>	
<b>2. Test Taking Skills</b>	
<ul style="list-style-type: none"> <li>• Demonstrate appropriate test preparation skill</li> </ul>	
<ul style="list-style-type: none"> <li>• Analyze test taking strategies of academic high achievers</li> </ul>	
<ul style="list-style-type: none"> <li>• Develop repertoire of effective study habits</li> </ul>	
<ul style="list-style-type: none"> <li>• Distinguish between effective and ineffective study habits</li> </ul>	
<ul style="list-style-type: none"> <li>• Apply strategies to improve reading skills.</li> </ul>	
<ul style="list-style-type: none"> <li>• Improve note taking skills during lectures and visual aids.</li> </ul>	
<b>3. Time Management Skills</b>	
<ul style="list-style-type: none"> <li>• Identify various strategies for reducing time wasters</li> </ul>	
<ul style="list-style-type: none"> <li>• Recognize the variety of procrastination</li> </ul>	
<ul style="list-style-type: none"> <li>• Apply relevant technique to overcome procrastination</li> </ul>	
<ul style="list-style-type: none"> <li>• Create more planning time for achieving priority goals timely</li> </ul>	
<b>4. Stress Management</b>	
<ul style="list-style-type: none"> <li>• Map the course and effect of stress on one self</li> </ul>	
<ul style="list-style-type: none"> <li>• Assess their own stress levels</li> </ul>	
<ul style="list-style-type: none"> <li>• Recognize stress management technique</li> </ul>	
<b>5. Reflective Practise</b>	
<ul style="list-style-type: none"> <li>• Appreciate the benefits of reflection &amp; its place in academic study</li> </ul>	
<ul style="list-style-type: none"> <li>• Use reflection to improve their learning</li> </ul>	
<b>6. Healthy Lifestyle Changes</b>	
<ul style="list-style-type: none"> <li>• Identify healthy study habits to maintain and improve cognitive, social, physical and emotional health.</li> </ul>	

**LEARNING RESOURCES**

<b>SUBJECT</b>	<b>RESOURCES</b>
<b>ANATOMY</b>	<p><b>A. <u>GROSS ANATOMY</u></b></p> <ol style="list-style-type: none"> <li>1. K.L. Moore, Clinically Oriented Anatomy</li> <li>2. Neuro Anatomy by Richard Snell</li> </ol> <p><b>B. <u>HISTOLOGY</u></b></p> <ol style="list-style-type: none"> <li>1. B. Young J. W. Health Wheather's Functional Histology</li> </ol> <p><b>C. <u>EMBRYOLOGY</u></b></p> <ol style="list-style-type: none"> <li>1. Keith L. Moore. The Developing Human</li> <li>2. Langman's Medical Embryology</li> </ol>
<b>BIOCHEMISTRY</b>	<p><b>A. <u>TEXTBOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Harper's Illustrated Biochemistry</li> <li>2. Lehninger Principle of Biochemistry</li> <li>3. Biochemistry by Devlin</li> </ol>
<b>PHYSIOLOGY</b>	<p><b>A. <u>TEXTBOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Textbook Of Medical Physiology by Guyton And Hall</li> <li>2. Ganong ' S Review of Medical Physiology</li> <li>3. Human Physiology by Lauralee Sherwood</li> <li>4. Berne &amp; Levy Physiology</li> <li>5. Best &amp; Taylor Physiological Basis of Medical Practice</li> </ol> <p><b>B. <u>REFERENCE BOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Guyton &amp; Hall Physiological Review</li> <li>2. Essentials Of Medical Physiology by Jaypee</li> <li>3. Textbook Of Medical Physiology by InduKhurana</li> <li>4. Short Textbook Of Physiology by Mrthur</li> <li>5. NMS Physiology</li> </ol>



**ASSESSMENT METHODS:**

- **Best Choice Questions(BCQs)** also known as MCQs (Multiple Choice Questions)

**BCQs:**

- A BCQ has a statement or clinical scenario of four options (likely answers).
- **Correct answer carries one mark, and incorrect 'zero mark'. There is NO negative marking.**
- Students mark their responses on specified computer-based sheet designed for LNHMC.

○ **Sample BCQs:**

A 25 year old patient presented with the complain of productive cough, breathlessness and wheezing.

He has been diagnosed with chronic obstructive pulmonary disease.

The most common risk factor for the disease is:

- a) Air pollution
- b) Coal mining
- c) Infection
- d) Tobacco smoke**

**OSPE: Objective Structured Practical Examination (See the proposed plan of OSPE)**

- It may comprise between 12- 25 stations.
- The content may assess application of knowledge, or practical skills.
- Student will complete task in define time at one given station.
- All the students are assessed on the same content by the same examiner in the same allocated time.
- A structured examination will have observed, unobserved, interactive and rest stations.

• **Observed and interactive stations:**

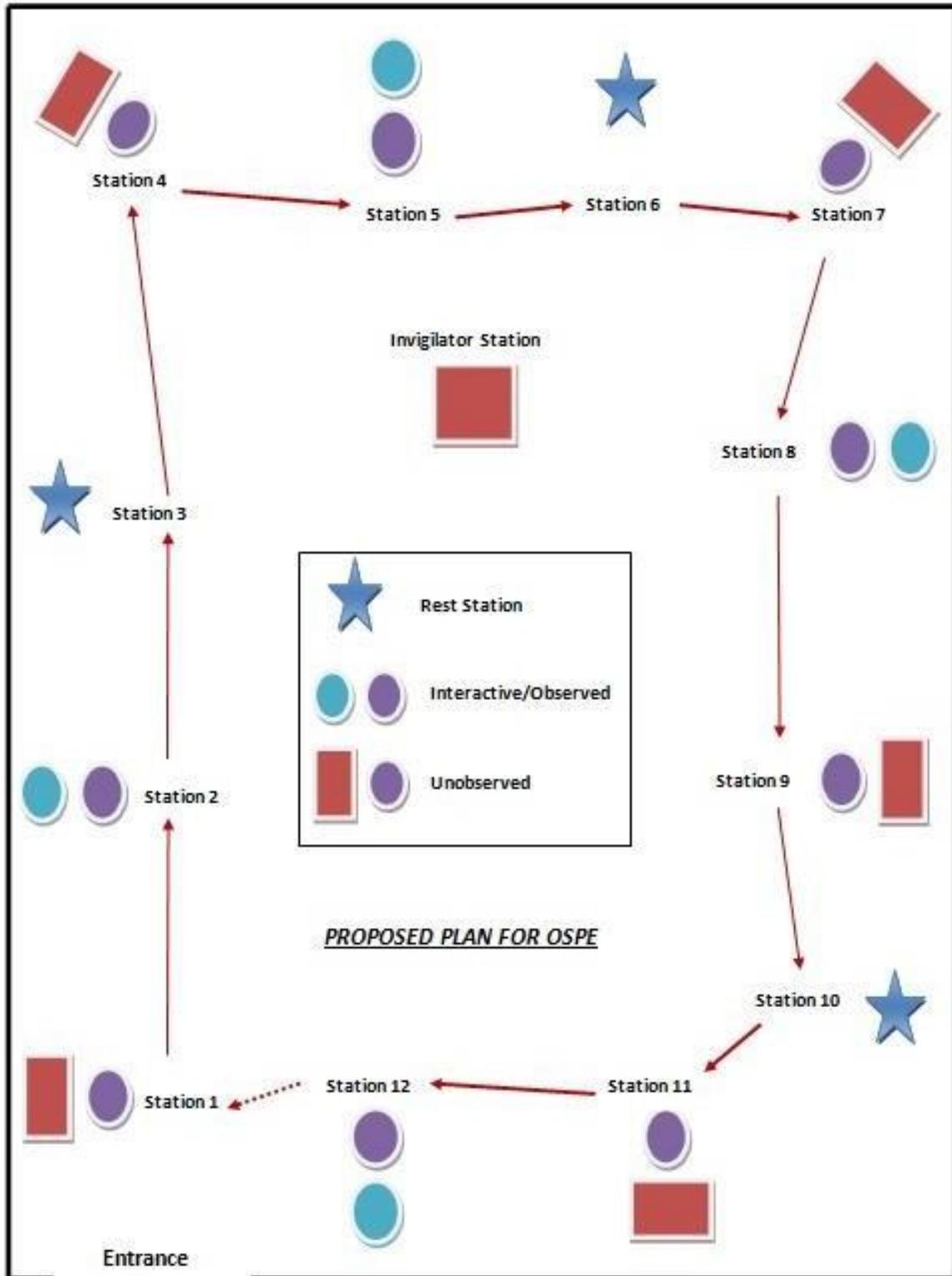
They will be assessed by internal or external examiners through the task or viva.

• **Unobserved station:**

It will be static station in which students will have to answer the questions related to the given pictures, models or specimens on the provided response sheet.

• **Rest station:**

It is a station where no task is given, and during this time student can organize his/her thoughts.



**Internal Evaluation**

- Students will be assessed comprehensively through multiple methods.
- 20% marks of internal evaluation will be added to JSMU final exam. That 20% may include class tests, assignment, practicals and the internal exam which will all have specific marks allocation.

**Formative Assessment**

Individual department may hold quiz or short answer questions to help students assess their own learning. The marks obtained are not included in the internal evaluation

**For JSMU Examination Policy, please consult JSMU website!**

**More than 75% attendance is needed  
to sit for the internal and final  
examinations**



**LNH&MC EXAMINATION RULES & REGULATIONS**

- Student must report to examination hall/venue, 30 minutes before the exam.
- **Exam will begin sharp at the given time.**
- No student will be allowed to enter the examination hall after 15 minutes of scheduled examination time.
- Students must sit according to their roll numbers mentioned on the seats.
- **Cell phones are strictly not allowed in examination hall.**
- If any student is found with cell phone in any mode (silent, switched off or on) he/she will be not be allowed to continue their exam.
- No students will be allowed to sit in exam without University Admit Card, LNMC College ID Card and Lab Coat
- Student must bring the following stationary items for the exam: Pen, Pencil, Eraser, and Sharpener.
- Indiscipline in the exam hall/venue is not acceptable. Students must not possess any written material or communicate with their fellow students.

**SCHEDULE:**

WEEKS	1 <sup>ST</sup> YEAR	MONTH
WEEK 1	FOUNDATION MODULE	28 <sup>th</sup> February 2022
WEEK 2		16 <sup>th</sup> April 2022
WEEK 3		
WEEK 4		
WEEK 5		
WEEK 6		
WEEK 7		
WEEK 1	BLOOD MODULE	18 <sup>th</sup> April 2022
WEEK 2		21 <sup>st</sup> May 2022*
WEEK 3		
WEEK 4		
<b>Mid Term Exam 26<sup>th</sup> May to 28<sup>th</sup> May 2022*</b>		

\*Final dates will be announced later

