



STUDY GUIDE
1st YEAR MBBS
Y1 B2

DEPARTMENT OF MEDICAL EDUCATION

CMH KHARIAN MEDICAL COLLEGE



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MISSION

Our mission is to educate and produce exemplary doctors who practice ethical patient centered health care, discover and advance knowledge and are responsive to the community needs.

VISION

To produce competent doctors equipped with sound knowledge based on scientific principles, imbued with ethics and moral values primed to serve the community through the profession.

Our aim is to

- Provide outstanding educational environment for medical students.
- Develop exemplary clinicians who are lifelong learners and provide the highest quality compassionate care and serve the needs of their community and the nation in the best traditions of medical profession.
- Ensure the highest ethical and professional standards in all of our deeds.

Exit Outcomes for the CKMC Graduate

At the end of five years MBBS degree program graduate of CMH Kharian Medical College should be able to:

Knowledge

- Integrate knowledge of basic and clinical sciences in disease prevention and promotion of health and well-being of community.
- Able to appraise varied information they would come across during professional work

and testify innovative ideas to benefit human society through evidence-based health care practice

- Demonstrate scientific knowledge in all professional activities
- Demonstrate research skills which bring innovation and significance to health care practices.

Skills

- Able to perform physical examinations, formulate provisional diagnosis with appropriate investigations to identify specific problems.
- Perform various common procedures to diagnose and manage non critical clinical problems.
- Demonstrate competency in life saving procedures.
- Exhibit propensity of critical thinking, problem solving and lifelong self-directed learning skills

Attitude

- Manifest ethical values and professionalism.
- Demonstrate professional attitude towards patients, their families, seniors and colleagues.
- Demonstrate dedication and professionalism when faced natural disasters in country.
- Demonstrate communication skills, inter professional skills and leadership.

knowledge	Skill	Attitude
Integrated knowledge of basic & clinical sciences	Communication skills	Ethical values
Patient centered care	Research skills	
Health promotion & disease prevention	Patient management skills	Professionalism
Community needs	Leadership skills	
	Critical thinking skills	

Introduction to the Study Guide

Dear Students,

We, at the Department of Medical Education, CMH Kharian Medical College, have developed this study guide especially for you. This study guide is an aid to

- Inform you how this part of your syllabus has been organized.
- Inform you how your learning programs have been organized in this block.
- Help you organize and manage your studies throughout the block
- Guide you on assessment methods, rules and regulations.
- Communicate information on organization and management of the block. This will help you to contact the right person in case of any difficulty.
- Define the objectives which are expected to be achieved at the end of the block.
- Identify the learning strategies such as lectures, small group discussions, clinical skills, demonstration, tutorial and case-based learning that will be implemented to achieve the block objectives.
- Provide a list of learning resources such as books, and journals for students to consult in order to maximize their learning.

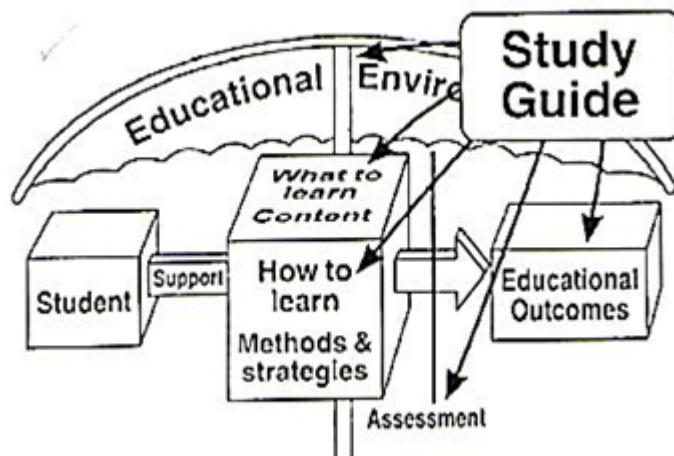


Figure 1 Objectives of study guide by Harden

Curriculum Integration



Medical college curriculum shall be organized in blocks of modules. The modules are named after body system for example a module of blood in a block. The key details are as follows:

- There shall be three blocks in first year MBBS comprising modules.
- The blocks shall be labeled as 1, 2 and 3.
- Each module in a block shall have a title. The name of the module shall represent the content taught and learned the majority of time in that module. Module shall be named after body systems.
- The duration of three blocks shall vary between 8–11 weeks according to syllabus.
- The syllabus shall be integrated horizontally around systems of the body.
- There shall be vertical integration to the extent decided by the curriculum coordination committee.
- Vertical integration shall be in case based learning sessions and in clinical lectures of basic sciences, scheduled in the structured training program.

Teaching and Learning Methods

1: Small Group Discussions (SGD)

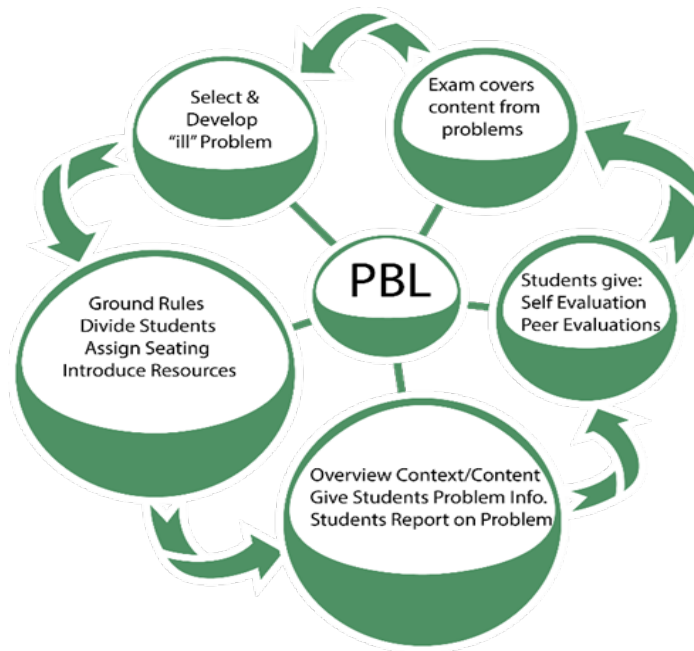


The topic will be taught in groups with the help of models and audiovisual aids. Pre-planned topics would help students to combine their wisdom in achieve learning objectives. Facilitator would be guiding to achieve learning objectives and making them on right track by clarify any misconception.

“Small group learning provides more active learning, better retention, higher satisfaction, and facilitates development of problem-solving and team-working abilities (Jahan, Siddiqui, AlKhouri, Ahuja, & AlWard, 2016).

2: Problem Based Learning (PBL)

This is group learning comprising of 8-10 students guided by a facilitator. For a specific problem given to students two sessions of 2 hours would be scheduled to achieve the learning objectives. In the first session students will discuss problem based upon their existing knowledge among the group and will produce a list of their learning objectives for further study. In the second session students share, discuss with each other to build new knowledge.



PBL is a self-directed learning and that type of educational strategy most likely produce doctors who are prepared for lifelong learning and able to meet the changing needs of their patients (Spencer & Jordan, 1999).

3: Large Group Interactive Session (LGIS)



These are meant to give overview of certain course content. They should be interactive so that students can not only gain knowledge but should completely understand it. Students may clarify the difficult concepts in these sessions. The lecturer introduces a topic and explains the underlying phenomena through questions, pictures, videos of patient's interviews, exercises, etc. Students are actively involved in the learning process.

4: Self Directed Learning (SDL)



In this modern era of medical education, students assume responsibilities of their own learning according to the principles of adult learning. They can study independently, can share and discuss with peers, can take information from the sources of information college have like library, internet and teachers. Students will be provided time within the scheduled college hours for self-study.

5: Hands on Training

- **Lab session**



Histology, biochemistry, physiology practical will build skills in identification of normal histology of human body tissues. There would be test of these skills in OSPE exam.

- **Clinical Rotations**



The students will rotate in the clinical departments to see integration of knowledge into clinical practices.

Teaching and learning activities are meant to help students to gain new knowledge. It should be kept in mind that they are not meant to fully cover the objectives of the subject. It is therefore responsibility of students to attain more information to cover all objectives given in the overall objectives.

Class attendance and participation is of most important in gaining knowledge. If any help is needed module team can be contacted without any hesitation. Attendance will be strictly checked in different teaching activities. If attendance is **less than 75%**, students would not be allowed to sit for the examination.

Attendance in the examination is must and no students would be allowed to enter the examination area after starting the examination. In case of sickness, sick leaves from government/private hospitals or the emergency of the college hospital will only be entertained.

Assessment Format

Assessment is a goal-oriented process (Angelo, 1995). We assess in order to check whether the learning objectives set at the initiation of the program are met or not and to what extent (Amin, 2007).

No student will be allowed to sit in the annual examination if attendance is below 75% in theory

and practical separately.

Assessment types

The assessment will be continuous. The purpose of continuous assessment is formative and summative.

Summative Assessment:

The marks of this type of assessment contribute in the final university result through internal assessment. It comprises:

- CBL/tutorial assessment
- Scheduled tests
- Sub-stages
- End of block exam
- Pre-annual exam

Scheduled tests and sub-stages will be conducted intermittently throughout the block. Their schedule will be intimated through the time tables.

The end of the block exam will be conducted after 8 weeks of instruction. It will comprise one theory paper and one practical exam for Anatomy, Physiology and Biochemistry. (Table of specifications (TOS) for exam has been provided)

Formative Assessment: Tests may be quizzes, surprise tests/written assignments/self-reflection by students during the teaching time but their marks will not be added to internal evaluation marks. The purpose of formative assessment is to provide feedback to the students, for the purpose of improvement and to teachers to identify areas where students need further guidance.

Internal Assessment

(Will be submitted to the university before professional exam)

- The weightage of internal assessment shall be 10 % in theory paper and 10 % in practical, in the annual professional examination (or 10 marks for 100 marks in theory and practical each)
- Scheduled tests, sub-stages, CBLs/tutorials, block examinations and pre-annual examinations, conducted by the college shall contribute towards internal assessment for professional examination.

Annual Professional Examination:

- The professional examinations schedule will be provided by NUMS.
- There will be two components of the final result
 - (i) Examination-80 % (ii) Internal Assessment- 20 %
- There will be one theory paper and one Practical exam for Anatomy, Physiology and Biochemistry each. For practical the class will be divided into batches. Each batch will have practical exam of one subject on the specified day, according to schedule.
- Theory & Practical assessment shall be of 100 marks each in Anatomy, Physiology and Biochemistry, making a **total of 200 marks for each subject**.
- The Annual Theory paper shall be of 80 marks. 20 marks of internal assessment of theory papers, conducted throughout the year will be added to it, to make annual theory assessment of 100 marks. Similarly, the annual practical examination will be of 80 marks. 20 marks of internal evaluation of practical exams, conducted throughout the year will be added to it, to make annual practical assessment of 100 marks.
- The pass score shall be 50 out of 100, in theory and practical separately.

Schedule of examinations:

a) Continuous assessments schedule

Schedule provided by each department in Time table.

b) Formative tests: Throughout the block

Structured Summery of Y1B2

Block Code	Y1B2
Pre requisite Block	Y1B1
Duration	8 weeks
Anatomy	General anatomy, General embryology, General histology, Gross anatomy of upper limb
Physiology	Cell and Genetics, Nerve and Muscle and blood
Biochemistry	Cell, Chemistry of Proteins, Enzymes & hemoglobin
Surgery	Cell, breast cancer, fracture of upper limb, imaging techniques, imaging of upper limb
Medicine	Anemias, Bleeding disorders and Transfusion reaction
BSP	Communication skills, professionalism, leadership and management, ethics

Block Development Committee

Chairperson curriculum committee	Principal Brig (Retd) Shoaib Nayyar Hashmi
Director Medical education	Dr Aasma Qaiser
Block Planner	Dr Aasma Qaiser
Resource Persons	Anatomy: Dr Saad Abdullah Physiology: Dr Ahmed Murtaz Biochemistry: Dr Zeeshan Medicine: Maj. Usman Surgery : Dr Waqas Ali
Study Guide Developed By	Department of Medical Education CMH Kharian Medical College Kharian



Learning Outcomes

Knowledge

- Acquire the basic science knowledge and terminology necessary to understand the normal structure and function of human body from biochemical to organ system level, as well as the concepts of diseases in the community, drug dynamics.
- Identify different anatomical planes and correlate the importance of these with clinical medicine.
- Explain the structure & development of MS.
- Explain the physiological anatomy, biochemistry affecting the functions of MS.
- Apply the knowledge of the basic sciences to understand pathophysiology of common fractures.
- Understand the constituents and functions of human blood
- Describe development of blood cell from stem cell.
- Describe the process of development of RBC, WBC and Platelets.
- Discuss the. Process of immunity.
- Describe the sequence of events involved in homeostasis
- Understand the physiology of conductive system of heart, cardiac cycle
- Explain different waves, segment and

	<p>intervals of ECG and apply it to the interpretation of ECG</p> <ul style="list-style-type: none"> • Understand the pathophysiology of edema, infarction, shock and thrombosis • Demonstrate effective communication skill strategies while history taking and examining the patients with CVS problems. • Describe the gross anatomy of mediastinum along with clear understanding of structures present in it. • Correlate between histological structure of respiratory membrane and its role in diffusion of gases. • Integrate the basic science knowledge with clinical sciences in order to describe the pathogenesis, clinical presentations of common respiratory disorders, e.g., COPD
Skill	<ul style="list-style-type: none"> • Dissect limbs to demonstrate their gross Anatomy and relationship to each other. • Identify histological features of parts of MS under microscope • Perform the steps to determine the normal RBC count and ESR • Identify the type of lymphoid tissue under microscope • Demonstrate the differences between live attenuated vaccine and toxoids • Perform, the steps to identify ABO and Rh typing
Attitude	<ul style="list-style-type: none"> • Demonstrate the effective attitude towards the colleagues • Demonstrate a professional attitude, team building spirit and good communication skills

COURSE CONTENT

FIRST YEAR MBBS

Block II CODE Y1B2

In case of online classes MIT and Assessment will be online via zoom meeting and Google classroom

ANATOMY					
S.No	Topic/ Theme	Learning outcomes	Learning Objectives/ Contents	MIT	Assessment Tool
1.	Histology of Circulatory System	Appraise the light microstructure of different components of cardiovascular System and predict functional outcomes of their altered structure.	<ul style="list-style-type: none">• Define capillaries & classify them on the basis of their morphology and describe each class by giving examples• Classify arteries and veins depending on their size and describe structure and relative thickness of each component by giving examples. Describe histological changes in intima in atherosclerosis or arteriosclerosis	LGIS	MCQs/ SEQs/ SAQs VIVA, VOCE
2.	Histology of lymphoid organs	Appraise the light microstructure of different lymphoid organs	<ul style="list-style-type: none">▪ Explain the light microscopic features of the following:▪ Lymph node▪ Thymus	LGIS	MCQs/ SEQs/ SAQs VIVA VOICE

			<ul style="list-style-type: none"> ▪ Spleen ▪ Palatine tonsil 		
3.	The Embryonic Period (Third to Eight Weeks)	Correlate the developmental events during the embryonic period with relevant congenital anomalies	<ul style="list-style-type: none"> • Define neurulation and describe process of formation of neural plate, neural tube and neural crest cells. • Enlist derivatives of: <ul style="list-style-type: none"> ▪ Surface ectoderm ▪ Neuroectoderm ▪ Neural crest ▪ Intraembryonic mesoderm (paraxial, intermediate, lateral plate) • Explain the development of Intraembryonic coelom. • Correlate the folding of the embryo in the horizontal and longitudinal planes with its consequences. Explain the processes of formation of blood vessels Define hemangioma and explain its embryological basis. 	LGIS	MCQs/ SEQs/ SAQs VIVA VOCE
4.	Fetal Period (third month to birth)	Correlate the developmental events during the fetal periods with relevant congenital anomalies	<p>Define fetal period and enlist the external body landmarks from third month to birth</p> <ul style="list-style-type: none"> • Enumerate various methods to estimate fetal age <p>Enlist factors affecting fetal growth. Define intrauterine growth retardation.</p>	LGIS	MCQs/ SEQs/ SAQs VIVA VOCE

5.	Placenta and fetal membranes	Apply the basic principles behind the formation of placenta and fetal membranes in appraising relevant clinical conditions	<ul style="list-style-type: none"> • Enlist types of chorion and give fate of each. • Define decidua. Enlist types of decidua and give fate of each. • Enumerate the fetal and maternal components of placenta. • Differentiate between stem, anchoring and terminal villi & enumerate the layers forming placental barrier • Describe placental circulation (maternal and fetal) • Enlist the features of maternal and fetal surfaces of placenta. • Describe the structure and enumerate the functions of the placenta • Enlist fetal membranes & their fate • Describe development of umbilical cord • Describe production, circulation and significance of amniotic fluid • Define poly & oligohydramnios. • Enumerate their causes & adverse effects 	LGIS	MCQs/ SEQs/ SAQs VIVA VOCE
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			<ul style="list-style-type: none"> Describe embryological basis of amniotic bands and umbilical cord defects 		
6.	Multiple pregnancies	Comprehend the process of multiple pregnancies and related congenital anomalies	<ul style="list-style-type: none"> Appraise the mechanism behind their occurrence. Explain the embryological basis of fetus papyruses, twin transfusion syndrome and conjoined twins. 	LGIS	MCQs/ SEQs/ SAQs VIVA VOCE
7.	Development of Cardiovascular system	Comprehend the development of cardiovascular system to explain the relevant congenital anomalies	<p>Explain the formation of heart tube with special reference to primary & secondary heart fields</p> <ul style="list-style-type: none"> Enlist the subdivisions of heart tube & their fate Appraise the mechanism of Cardiac looping and enlist its abnormalities. Explain different methods of septal formation. Describe division of atrioventricular canal. Explain the embryological steps involved in formation of interatrial septum. Describe the formation of left atrium and pulmonary veins Enlist sources of different parts of interventricular septum Explain the division of 	LGIS	MCQs/ SEQs/ SAQs VIVA VOCE

			<p>Conotruncus Appraise the embryological basis of the following heart defects.</p> <ul style="list-style-type: none"> ▪ Atrial septal defects ▪ Ventricular septal defects ▪ Fallot's tetralogy ▪ Transposition of great vessels ▪ Persistent truncus arteriosus ▪ Ectopia cordis ▪ Dextrocardia <ul style="list-style-type: none"> • Define aortic arches Explain the development and fate of aortic arches • Enumerate the developmental sources of aorta • Justify the relationship of recurrent laryngeal nerves on the embryological basis • Explain the fate of vitelline & umbilical arteries • Explain the congenital anomalies of arterial system which include: <ul style="list-style-type: none"> ▪ Patent Ductus ▪ Arteriosus ▪ Coarctation of aorta ▪ Double aortic arch ▪ Right aortic arch ▪ Abnormal origin of the Right Subclavian Artery ▪ An interrupted 		
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			<p>aortic arch</p> <ul style="list-style-type: none"> • Differentiate fetal from adult circulation • Identify the structures related to general development and development of cardiovascular system on given models and diagrams 		
GROSS ANATOMY					
8.	Gross Anatomy of thoracic wall	Appraise the structure of chest wall & the diaphragm to understand anatomical basis of relevant clinical conditions	<p>Identify structures forming thoracic wall, thoracic inlet, outlet</p> <ul style="list-style-type: none"> • Identify important bony landmarks of sternum with reference to its parts, sternal angle and its importance in clinical practice • Determine the anatomical position of different ribs, • Differentiate between typical and atypical ribs based on their parts • Identify the important bony landmarks of thoracic vertebrae • Enlist various joints these vertebrae make and identify their types <p>Enlist the muscles of thoracic cage with reference to their attachments, nerve supply and actions</p> <p>Describe a typical intercostal space</p> <p>Discuss the blood</p>	SGD	MCQs/ SEQs/ SAQs VIVA VOCE

			<p>supply of the thoracic wall.</p> <p>Describe the course and distribution of a typical intercostal nerve</p> <p>Differentiate it from its atypical counterpart</p> <p>Enlist different dimensions of thorax.</p> <p>Explain the factors (bony, articular and muscular) responsible for changes in these dimensions during respiration</p> <p>Appraise the following clinical conditions on the basis of anatomical</p> <p>knowledge:</p> <ul style="list-style-type: none"> □ Rib fractures, flail chest, supernumerary ribs, thoracic outlet syndrome and herpes zoster infection of spinal ganglia <ul style="list-style-type: none"> • Define thoracostomy, enlist the anatomical structures encountered by needle on its way to pleural cavity and precautionary measures to avoid damage to important structures. 		
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			<ul style="list-style-type: none"> • Describe the parts, attachments and nerve supply of diaphragm • Enlist the major apertures in diaphragm with their levels and structures passing through each <p>Analyze the anatomical basis of clinical scenario related to diaphragmatic hernia, phrenic nerve lesions and penetrating injuries of diaphragm.</p> <p><input type="checkbox"/> Define referred pain and correlate the tip of shoulder pain with irritation of diaphragm.</p>		
9.	Gross Anatomy of thoracic cavity	Appraise the structure of thoracic viscera, and their relationship for understanding relevant clinical problems.	<ul style="list-style-type: none"> • Define mediastinum. • Enumerate the divisions of mediastinum • Enlist the structures forming different boundaries • Describe the structure and topographic relations of contents of anterior mediastinum • Describe the structure and topographic relations of contents of superior mediastinum 	SGD	MCQs/ SEQs/ SAQs VIVA VOCE

			<ul style="list-style-type: none"> • Describe the structure and topographic relations of contents of posterior mediastinum • Enlist the structures lying at the level of transverse thoracic plane • Appraise the anatomical basis of clinical conditions related to mediastinum • Identify the contents of anterior, posterior and superior mediastinum on given model/specimen • Enumerate and describe various parts of pleura, its reflections, recesses and nerve supply • Explain anatomical basis of pneumothorax, pleural effusion, pleuritis, pleurectomy and pleurodesis • Determine the sides, surfaces and borders of both lungs • Discuss the relations of various surfaces of each lung • Describe gross features of bronchi. Name the bronchus which is the more probable 		
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			<p>site of impacted foreign body and enlist its reasons.</p> <ul style="list-style-type: none"> • Define Broncho pulmonary segments. Illustrate them in each lung. Discuss their significance. • Identify the side, surfaces, borders and structures in hilum of each lung on given model/specimen • Describe the gross features of various layers of pericardium • Summarize the blood supply and innervation of pericardium. • Describe anatomical position, borders, and surfaces, external and internal features of the heart. • Describe the blood supply and innervation of heart • Explain the basis of right or left dominance of heart. • Analyze a case of coronary artery disease with anatomical reasoning • Apply knowledge of gross anatomy of heart to explain following: <ul style="list-style-type: none"> ▪ Coronary Angiography 		
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			<ul style="list-style-type: none"> ▪ Angina pectoris ▪ Myocardial infarction ▪ Cardiac referred pain • Identify border, surfaces, chambers, openings of atria and ventricles, major vessels and valves of heart on model/specimen. • Identify the radiological landmarks of bony and soft components of thoracic wall and the viscera of thoracic cavity on radiographs • Demonstrate the surface anatomy of different components of thoracic wall, thoracic apertures and thoracic viscerae on a subject while following standard procedures. 		
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GENERAL ANATOMY

10.	General anatomy of cardiovascular including lymphatic system	Appraise the general concept of anatomical organization of cardiovascular system in understanding the basic concepts of gross anatomy and histology with relevant presentations	<ul style="list-style-type: none"> • Summarize the general structural plan of blood vessels. • Describe general plan of systemic, pulmonary, portal and coronary circulatory system. • Classify blood vessels on anatomical and functional basis with the help of examples. • Differentiate between anatomic end arteries 	LGIS	MCQs/ SEQs/ SAQs/
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		encountered in clinical practice	<p>and functional end arteries by giving examples.</p> <ul style="list-style-type: none"> • Explain the importance of collateral circulation • Describe general plan of the lymphatic circulatory system of the body. 		
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PRACTICALS

S.No	Topic/ theme	Learning outcome	Learning objective	MIT	Assessment Tool
1.	Histology of Circulatory System	Identify H&E stained slides of different vessels and appreciate their characteristic histological features to distinguish them from common Pathological conditions in future.	<ul style="list-style-type: none"> • Identify various vessels under light microscope And enlist at least two identification points for each. • Illustrate various vessels emphasizing the differences amongst them with the help of eosin and hematoxylin pencils 	Practical	OSPE/ Viva voce
2.	Histology of lymphoid organs	Appraise the light microstructure of different lymphoid organs	<ul style="list-style-type: none"> • Identify slides of lymph node, thymus, spleen and palatine tonsils under light microscope and enlist at least two identification points for each. • Illustrate lymph node, thymus, spleen and palatine tonsils with the help of eosin and hematoxylin pencils. 	Practical	OSPE/ Viva voce

CBLs

CBL 1: CHEST PAIN

A-middle aged businessman. After a heavy meal at a well-known restaurant, walked briskly to join his fellows. He fell short of breath and developed chest pain radiating to inner aspect of his left arm. The pain reduced on stopping. He was taken to Casualty Department. On arrival, his pulse rate was 95/minute, blood pressure was 80/50 mmHg and he had pallor on face and cold sweat. The heart sounds were normal on auscultation. His chest X-ray (PA view) showed cardiomegaly. He informed the doctor that he was taking medication for hypertension. He was admitted to CCU and given supportive therapy. His Electrocardiogram showed ST-elevation in all leads. Troponin-I (cardiac marker) was raised in blood. His coronary angiography showed narrowing of 3 coronary arteries

Learning objectives

- Enlist the possible causes of pain in this case? Why do you think this is cardiac pain? Chest pain with radiation to the neck or arm is a 'characteristic' symptom of acute myocardial infarction (AMI) in many patients; explain why the pain can be felt in these distant regions.
- Describe the blood supply to the heart, listing the major arteries and branches.
- Enumerate the arteries of the heart most commonly occluded?
- Explain why do occlusions rapidly lead to infarct in the heart? Which artery supplies the papillary muscles?
- Enlist the areas supplied by the left anterior descending (LAD or anterior interventricular) coronary artery supply?
- Enumerate the branches of the LAD?
- Define myocardial infarction? Explain the mechanisms which cause an acute myocardial infarction (AMI) considering changes in coronary artery? What is coronary angiography and angioplasty. Describe the venous drainage of heart.
- Describe the anatomy of the pericardium, its reflections and pericardial spaces.

Learning Resources

Clinical Anatomy by Snells

Clinically Oriented Anatomy by Keith. L. Moore

CBL 2: PNEUMOTHORAX

A twenty-five-year-old male presents in emergency room after sustaining a single gunshot wound to the right side of his chest in fifth intercostal space. On arrival, the patient's vital signs were worse. X-ray

revealed deviation of patient's trachea to the left. On examination, there was crepitus, absence of breathing sounds and hyper resonant note on the right side of his chest. Diagnosis of tension_pneumothorax was made and resident inserted chest tube at the fifth intercostal space in the maxillary line and connected to a chest drainage device.

Learning objectives

1. Describe the cause of tension pneumothorax tracheal shift?
2. Enlist the changes in lungs during inspiration and expiration
3. Enumerate the structures, the chest tube will pass through to enter the pleural cavity?
4. Describe the appropriate immediate treatment and mention the intercostal space level?
5. Describe pleura and give its innervation.
6. Identify the thoracic part of the trachea and bronchi describe its blood supply and innervation.
7. Identify and describe the location of the lungs in the thoracic cavity.
8. Identify the relations of the pulmonary artery, pulmonary veins and the bronchi at the hilum of each lung
9. Define a bronchopulmonary segment and discuss its general organization.
10. Name the bronchopulmonary segments and give their approximate location in reference to the lobes of the lungs.
11. Identify the relations of the pulmonary artery, pulmonary veins and the bronchi at the hilum of each lung
12. Define a bronchopulmonary segment and discuss its general organization.
13. Name the bronchopulmonary segments and give their approximate location in reference to the lobes of the lungs.

Learning Resources

Clinical Anatomy by Snells

Clinically Oriented Anatomy by Keith. L. Moore

CBL 3: CHYLOTHORAX

Consultative support to a patient was asked who had become unstable during his postoperative phase of surgery. The patient was currently recovering from a modified radical neck procedure for squamous cell carcinoma of the tongue. The patient presented with tachycardia and hypotension with decreasing urinary output and poor skin turgor. He was intermittently combative and semi-conscious. On physical exam, surgeon noticed the neck was edematous and a palpable mass, roughly 8 cm in diameter was felt. After connecting the bulb suction to the wall suction apparatus approximately 600 ml of milky white fluid was immediately aspirated from the wound with a subsequent diminution in the size of the mass. He was

diagnosed a case of chylothorax. The plan for management includes contacting the thoracic surgery team and replacing the patient's lost fluid volume.

Learning objectives:

- Explain chylothorax and aspiration of milky white fluid following this kind of operation?
- Name the lymphatic channel/duct involved?
- Given the location of the surgical procedure - How would a definitive diagnosis be made?
- Describe the course of the thoracic duct? Enlist the structures drain into the thoracic duct?
- Define mediastinum and its divisions. Enlist the contents of each mediastinum.
- Define the boundaries of the posterior mediastinum and enumerate the lymph nodes found in the posterior mediastinum?
- Describe the major contents of the posterior mediastinum and their interrelationships

Learning Resources

Clinical Anatomy by Snells

Clinically Oriented Anatomy by Keith. L. Moore

CBL 4: Patent ductus arteriosus

During a routine physical exam for participation in interscholastic sports, the physician noted that Bilal, a twelve-year-old boy, had a long continuous heart murmur at the second intercostal space near the left sternal border. A systolic thrill was also noted in the same region. When questioned, the patient's mother recalled that Bilal had periods of cyanosis and breathlessness as an infant, but that his previous pediatrician said that the signs and symptoms will subside with medication and passage of time. Bilal also mentioned that he tires easily during physical activity. Chest films and Doppler ultrasound were ordered. The radiographs indicated slight left ventricular hypertrophy, and ultrasound revealed a patent ductus arteriosus. Bilal was scheduled for surgery to ligate the ductus arteriosus. The surgery resulted in successful ligation of the ductus arteriosus; however, Bilal experienced hoarseness when speaking following the procedure. Laryngoscopy revealed paralysis of the left vocal fold.

Learning objectives:

- What is the ductus arteriosus, and where is it located?
- What is the prenatal function of the ductus arteriosus, and what usually happens to it after birth?
- What is the cause of cyanosis, breathlessness and left ventricular hypertrophy in this case?
- What likely caused paralysis of the left vocal fold?
- Why would Doppler ultrasound be used to diagnose a patent ductus arteriosus? Identify and trace all the branches of the arch of the aorta in the region and the relationship of the vagus and phrenic nerves to them.

Physiology					
Cardiovascular System					
S.No	Topic/ Theme	Learning outcomes	Learning Objectives/ Contents	MIT	Assessment Tool
		At the end of the session, the student should be able to:			
1.	Physiological anatomy of heart and cardiac action potential	Appreciate the functional characteristics of cardiac muscle and action potential	<ul style="list-style-type: none">• Appreciate the physiological arrangement of right and left hearts along with the Parallel arrangement of systemic circulation.• Recognize physiological anatomy of cardiac muscles, its functional syncytium and intercalated disc• Differentiate between cardiac, skeletal and smooth muscles based on macro-, microscopic and functional differences, and action potentials.• Distinguish ionic changes in different Phases of action potential within cardiac muscle. <p>Correlate the phases with ionic changes during pacemaker action potential in</p>	LGIS /SGD / CBLs	MCQ SAQ/SEQ Structured viva

			heart		
2.	Cardiac cycle	Compare and contrast the pressure and volume changes in different components of circulatory system during cardiac cycle	<ul style="list-style-type: none"> • Illustrate pressure and volume changes during various phases of cardiac cycle • Illustrate pressure-volume diagram of left heart • Comprehend preload and afterload, its influence on stroke volume (The Frank-Starling's mechanism) <p>Discuss the autonomic regulation of heart.</p>	LGIS/SGD/CBLs	MCQ SAQ/SEQ Structured viva
3.	ECG	Interpret normal and abnormal ECG changes in health and disease	<ul style="list-style-type: none"> • Comprehend basis of • ECG, different ECG Leads and their placements • Draw and label normal ECG showing various waves, segments and intervals • Understand significance of waves, segments and intervals of ECG • Calculation of heart rate and various intervals and segments • Appreciate relationship between vector and lead, type 	LGIS/SGD/CBLs	MCQ SAQ/SEQ Structured viva

			<p>and locations of leads and principles for vector analysis in a normal heart</p> <ul style="list-style-type: none"> • Discuss current of injury and differentiate between systolic and diastolic theories of current of injury • Appreciate the role of re-entry phenomenon in pathogenesis of ventricular fibrillation • Relate the ionic changes in Cardiac tissues to ECG changes in sinus arrhythmias, pathological arrhythmias, Ischemia, infarction and heart blocks. 		
4.	Hemodynamics of circulation	Explain the hemodynamics of systemic circulation	<ul style="list-style-type: none"> • Categorize the components of circulatory systems into. Greater (Systemic), Lesser (Pulmonary) circulations and accessory circulatory system (Lymphatic). • Analyze the relationship between flow, resistance and conductance. • Conceptualize the 	LGIS /SGD/ CBLs	MCQ SAQ/SEQ Structured viva

			<p>phenomenon of vascular compliance and resistance</p> <p>Distinguish between turbulent and laminar flow based on significance, pressure gradient, resistance.</p> <p>Appreciate formation, propagation, damping</p> <ul style="list-style-type: none"> • and abnormalities of arterial pressure pulse • Discriminate jugular venous pulse from arterial pulse based on location, appearance, origin, waves and significance 		
5.	Control of Local Blood	Identify the dynamics of local and peripheral Blood flow	<ul style="list-style-type: none"> • Distinguish between acute and chronic control of local blood flow. • Conceptualize active and reactive hyperemia • Relate the blood flow control to total peripheral resistance 	LGIS /SGD/ CBLs	MCQ SAQ/SEQ Structured viva
6.	Capillary dynamics	Elucidate edema types, clinical significance and factors responsible for causing edema	<ul style="list-style-type: none"> • Identify the principles of capillary dynamics and structure of Interstitium. • Analyze the role of starling forces and other safety factors (lymphatics, negative ISF pressure) in 	LGIS /SGD/ CBLs	MCQ SAQ/SEQ Structured viva

			<p>prevention of edema.</p> <ul style="list-style-type: none"> • Appreciate Types of edema, its pathophysiology and safety factors preventing edema formation. • Differentiate between pitting and nonpitting edema based on its etiology, pathophysiology and clinical significance. 		
7.	Cardiac output and venous return	Analyze the factors regulating venous return and cardiac output at rest and during exercise	<ul style="list-style-type: none"> • Understand the determinants of cardiac output and factors affecting cardiac output. • Appreciate the mechanics of low and high cardiac outputs along with their effects on heart. • Comprehend the factors affecting stroke volume, heart rate and total peripheral resistance. • Explain Fick's principle for the measurement of cardiac output • List the functions of veins • Identify factors regulating venous return and Significance of venous reservoirs. • Appreciate the equality of cardiac output 	LGIS /SGD/ CBLs	MCQ SAQ/SEQ Structured viva

			and venous return.		
8.	Arterial blood pressure	Summarize regulatory mechanisms of blood pressure & cardiac output control in health and disease	<ul style="list-style-type: none"> • Comprehend the determinants of arterial pressure, factors affecting and mechanisms regulating blood pressure on short- and long-term basis. • Recognize mean arterial pressure and its significance. • Comprehend the individual and integrative role of baroreceptors, chemoreceptor, volume receptors, arterial natriuretic factors and Reninangiotensin - aldosterone system in regulation of arterial pressure. Understand the characteristics of regional circulations (skeletal muscles, pulmonary, coronary & cerebral) and factors regulating thereof 	LGIS /SGD/ CBLs	MCQ SAQ/SEQ Structured viva
9.	Heart sounds	Differentiate among normal and abnormal heart sounds	Analyze heart sounds regarding their origin, abnormalities (murmurs) and their clinical importance	LGIS /SGD/ CBLs	MCQ SAQ/SEQ Structured viva
10.	Cardiac failure	Analyze cardiovascular and pulmonary changes (including oxygen consumption) during	<ul style="list-style-type: none"> • Identify types and severity of exercise in different sports. • Conceptualize general adaptive changes in muscles in response to 	LGIS /SGD/ CBLs	MCQ SAQ/SEQ Structured viva

		different grades of exercise.	<p>increased and decreased physical activity.</p> <ul style="list-style-type: none"> • Appraise fuels available in body during rest and exercise. • Analyze cardiovascular and pulmonary changes (including oxygen consumption) during different grades of exercise. 		
11.	Circulatory shock	Compare various types of shock and their pathophysiology	<ul style="list-style-type: none"> • Discriminate various types of shock, its types and stages of development • Differentiate between compensated and uncompensated shock. • Recognize the short term and long-term compensatory mechanisms in circulatory shock. • Diagnose and treat various types of shock based on clinical scenarios and lab investigations 	LGIS /SGD/ CBLs	MCQ SAQ/SEQ Structured viva

PRACTICALS

S.No	Topic/ Theme	Learning outcomes	Learning Objectives/ Contents	MIT	Assessment Tool
1	Blood Physiology	Perform the differential leucocyte count	<ul style="list-style-type: none"> • Describe the relevance of preparing and staining a blood smear and 	Practical	OSPE

			performing DLC <ul style="list-style-type: none"> • Prepare satisfactory blood films, fix and stain them, • Name the components of Leishman stain • Identify different blood cells in the film and indicate the identifying feature of each type of leucocyte • Carry out the differential count and express your results in their percentages and absolute numbers 		
2		Perform and estimate bleeding time.	<ul style="list-style-type: none"> • Indicate the clinical importance of bleeding time • Determine bleeding time by the routine laboratory methods • Give the normal values of bleeding Time. Name the conditions in which bleeding time is prolonged	Practical	OSPE
3		Perform and estimate clotting time.	<ul style="list-style-type: none"> • Indicate the clinical importance of clotting time • Determine clotting time by the routine laboratory methods • Give the normal values of clotting time • Name the conditions in which clotting time is prolonged 	Practical	OSPE
4	Cardiovascular	Record &	<ul style="list-style-type: none"> • Explain the 	Practical	OSPE

	Physiology	Interpret normal electrocardiogram (ECG) by placing all the chest and limb leads on an SP	<p>significance of ECG</p> <ul style="list-style-type: none"> Name different leads used in electrocardiography and their placement Operate the ECG machine Identify different waves, intervals and segments in a normal ECG Give the physiological basis of different waves, intervals and segments in a normal ECG Calculate the heart rate from ECG 		
5		Examine the Radial Pulse and comment on rate, rhythm and character	<ul style="list-style-type: none"> Define arterial pulse and name its different parts Name the different arterial pulses that can be palpated Give the significance of recording of arterial pulse Demonstrate the procedure of palpating the arterial pulse Enlist the factor that affect the normal pulse rate 	Practical	OSPE
6		Examine the Heart Sound on Pulmonary, Aortic, Mitral and Tricuspid areas	<ul style="list-style-type: none"> Auscultate heart sounds Differentiate between first and second heart sound Comprehend the physiological basis of different heart sounds 	Practical	OSPE

			<ul style="list-style-type: none"> • Know different parts and use of stethoscope <ul style="list-style-type: none"> • Learn exact location on chest where to auscultate for mitral, tricuspid, pulmonary and aortic valves 		
7		Determine the jugular venous Pulse (JVP) on an SP	<ul style="list-style-type: none"> • Define the JVP • Give the clinical importance of JVP • Identify and name different parts of JVP • Explain the different methods of measuring JVP 	Practical	OSPE
8		Record the effects of posture and Exercise on Blood Pressure	<ul style="list-style-type: none"> • Define arterial blood pressure • Define systolic, diastolic, pulse and mean arterial pressure • Measure blood pressure by palpatory and auscultatory method • Describe korotokoff's sound and their cause • Enlist the physiological variation in blood pressure • Enlist the precautions that must be taken before and during recording of blood pressure 	Practical	OSPE

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CBLs Physiology

CBL 1 : Angina Pectoris

A 66-year-old man sought medical care at an emergency center of a hospital due to severe chest pain lasting for over 24 hours. He is a smoker and known case of essential hypertension and is on antihypertensive treatment but showing poor compliance. Without any prior symptom, he started with severe compressing chest pain which persisted over 24 hours. On arrival he was given sublingual nitroglycerin and the pain was relieved. He was diagnosed with angina pectoris. He was advised to have coronary angiography and possible revascularization. On invasive coronary angiography, it showed $\geq 50\%$ diameter stenosis in the left main coronary artery.

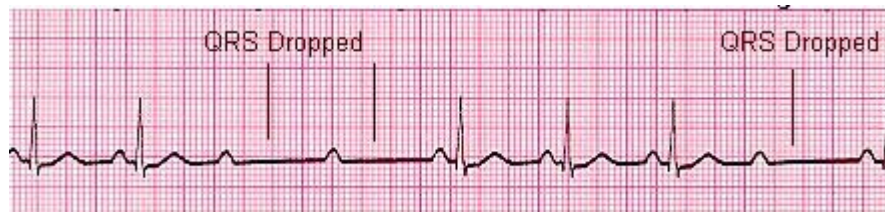
Learning Objectives:

By the end of session, student should be able to:

1. Explain the given case scenario.
2. Explain the acute control of local blood flow.
3. Summarize the concept of collateral circulation.
4. Discuss the concept of active and reactive hyperemia.
5. Understand the regulation of coronary circulation.
6. Gain insight into concept of coronary steal syndrome and systolic stretch.
7. Define angina pectoris and comment on relieve of chest pain on taking rest.
8. Explain the causes of death after acute coronary occlusion.

CBL 2 : Heart Block

A 75 years old man comes into emergency department and faints. Five minutes later, he is alert. An electrocardiogram was recorded immediately. It showed 75 P waves of normal morphology per minute whereas QRS complexes were recorded at the rate of 35 per minute. Close observation of ECG revealed that QRS complexes were wide with high voltage and there was no relation between P waves and the QRS complexes.



Second degree AV block

Learning Objective:

By the end of session, student should be able to:

1. Explain the given case scenario.
2. Comment on sinus arrhythmias.
3. Explain the circus movement and re-entrant signals in heart muscle
4. Explain the pathophysiology of heart blocks, their various types and presentation.
5. Explain the mechanisms of tachyarrhythmia's and comment on paroxysmal tachyarrhythmias.
6. Summarize the nervous regulation of heart
7. Explain the factors affecting heart rate.

CBL 3 : Hypertension/ Acute MI/ Ventricular Fibrillation

A 58 years old business man with obesity, having BMI of 31, with sedentary lifestyle and a known case of essential hypertension is on irregular treatment. He had previous history of Angina pectoris characterized by on/off chest pain, which was relieved by taking rest and placing some tablet under tongue. He was brought to emergency department with a history of severe, crushing precordial chest pain, radiating to left arm for last one hour, associated with history of profuse sweating and two episodes of vomiting. On examination he had blood pressure of 145/80mmHg, pulse rate 62 beats/min regular, respiratory rate 28 breaths/min. ECG showed significant ST segment elevation. Serum cardiac enzymes CPK and Trop-T were markedly raised. On the basis of history, clinical examination and investigations, he was diagnosed as a case of acute myocardial infarction. He was shifted to coronary care unit and managed with thrombolytic therapy, high saturation oxygen inhalation, and opioid analgesics. Few hours later he again developed chest pain and became unconscious. Repeat ECG was done and bizarre electrocardiogram was noted without any regular cardiac rhythm and diagnosis of ventricular fibrillation was made.

Learning Objectives:

By the end of session, student should be able to:

1. Explain the given case scenario.
2. Define blood pressure and explain its determinants.
3. Define mean arterial pressure and pulse pressure with their significance and calculations.
4. Summarize the nervous regulation of blood pressure
5. Summarize the renin-angiotensin aldosterone for regulation of blood pressure.
6. Comment on essential hypertension.

CBL-4 Ischemic Heart Disease

A 55 years old male was brought to cardiac emergency department with history of severe left sided chest pain. His ECG showed ST segment elevation and significant Q waves in leads I, aVL and V6. QRS complex was positive in lead aVF and predominantly negative in lead I. There was also right axis

deviation. His ECG was suggestive of acute myocardial infarction of the left ventricle. The patient was admitted in coronary care unit for stabilization and further management.

Learning Objectives:

By the end of session, student should be able to:

1. Explain the given case scenario.
2. Explain the generation and propagation of cardiac impulse.
3. Enlist the properties of myocardium and comment on Frank Starling's law.
4. Identify the differences between ventricular and pacemaker action potential.
5. Discuss the concept of pre-load and after-load.
6. Identify the waves and intervals in a normal ECG and changes in acute myocardial infarction.
7. Name the ECG leads and comment on vector analysis.
8. Comment on physiological basis of ST segment shift (current of injury).

CBL-5 Swollen Lower Limbs

A 60 years old lady presented in medical OPD with complaints of bilateral swelling lower limbs for the last about three months. She also gives history of epistaxis. Physical examination revealed pitting oedema over the legs. Laboratory investigations showed prolonged clotting time and decreased plasma proteins. Ultrasound abdomen revealed cirrhosis of the liver.

Learning Objectives:

By the end of session, student should be able to:

1. Explain the given case scenario.
2. Explain the functions of veins
3. Enumerate the causes of pitting edema and non-pitting edema.
4. Explain about forces acting upon capillary membrane.
5. Summarize the Starling's equilibrium
6. Comment on the edema safety factors.
7. Explain lymphatic system

Biochemistry					
S.No	Topic/ Theme	Learning outcomes	Learning Objectives/ Contents	MIT LGIS/ SGD/ CBL/ Practical / Tutorial	Assessment Tool MCQs/SEQs/ OSCE/ Structured Viva
		At the end of the session, the student should be able to:			
1.	Enzymes	To understand the structure, functions, classification, biochemical significance, and clinical importance of enzymes	Define different terms e.g. enzymes, Coenzymes, co-factors, holozymes, prosthetic group, ribozymes, zymogens, isozymes etc.	LGIS/ CBL/SDL	MCQs/ SEQs
			Classify enzymes and describe mechanism of enzyme actions.	LGIS/C BL/SDL	MCQs/ SEQs
			Explain different properties of enzymes and factors Affecting enzymes activity.	LGIS/C BL/SDL	MCQs/ SEQs
			Illustrate enzyme kinetics in relation to Michaelis-Menten Equation and Line weaver- Burke plot.	LGIS/C BL/SDL	MCQs/ SEQs
			Describe enzyme Regulations, activation, inhibition and biomedical importance of synthetic inhibitors.	LGIS/C BL/SDL	MCQs/ SEQs
			Understand the role of enzymes in clinical diagnosis and therapeutics.	LGIS/C BL/SDL/ Practical	MCQs/ SEQs/OSCE
2	Chemistry of Lipids	Understand the structure, functions and biochemical/	□ Define lipids and enumerate their biomedical functions	LGIS/ Practical	MCQs/SEQs /OSCE

		clinical significance of Lipids, and relate the significance of different lipids in medicine	□ Describe lipids classification with examples and biochemical significance	LGIS/ CBL/ SDL/ Practical	MCQs/SE Qs / OSCE
			Draw and label the structure of a fatty acid. Also discuss their chemistry, classification and biochemical functions	LGIS/C BL/ SDL	MCQs/SE Qs / OSCE
			Define essential fatty acids. Give examples with deficiency disorders	LGIS/C BL/ SDL/ Practical	MCQs/SE Qs / OSCE
			Give nutritional significance of lipids	LGIS/C BL/ SDL/ Practical	MCQs/SE Qs / OSCE
			Describe eicosanoids, their classification and functions in health and disease	LGIS /CBL/ SDL/ Practical	MCQs/SE Qs
			Describe steroids, sterols like cholesterol, their chemistry, functions and clinical significance	LGIS /CBL/ SDL/ Practical	MCQs/SE Qs
			Understand the rancidity, its types and lipid per oxidation and its clinical implications.	LGIS /CBL/ SDL/ Practical	MCQs/SE Qs
3	Metabolism of Lipids	Apply the knowledge of lipid metabolism for understanding relevant metabolic disorder	Describe in detail the biosynthesis of fatty acids	LGIS/C BL/SDL	MCQs/ SEQs
			Draw the mechanism of oxidation of fatty acids along with activation and transport of fatty acids in the mitochondria	LGIS/C BL/SDL	MCQs/ SEQs
			Explain the beta oxidation of fatty acid and regulation of this beta oxidation	LGIS/C BL/SDL	MCQs/ SEQs

			Explain alpha oxidation, omega oxidation and peroxisomal oxidation of fatty acids	LGIS/C BL/SDL	MCQs/ SEQs
			Describe oxidation of fatty acids with odd number of carbon atoms	LGIS/C BL/SDL	MCQs/ SEQs
			Give a brief account of oxidation of unsaturated fatty acids	LGIS/C BL/SDL	MCQs/ SEQs
			Explain lipid peroxidation and its significance	LGIS/C BL/SDL	MCQs/ SEQs
			Elaborate the phospholipids' synthesis and degradation along with related metabolic disorders	LGIS/C BL/SDL	MCQs/ SEQs
			Explain triacylglycerol synthesis with its regulation	LGIS/C BL/SDL/ Practical	MCQs/ SEQs
			Describe mobilization and transport of fatty acids, triacylglycerol and sterols	LGIS/C BL/SDL	MCQs/ SEQs
			Explain mechanism of synthesis of ketone bodies and give their utilization and significance in body	LGIS/C BL/SDL/ Practical	MCQs/ SEQs/ OSCE
			Define ketosis and explain its mechanism	LGIS/C BL/SDL	MCQs/ SEQs
			Explain mechanism of cholesterol synthesis along with its regulation	LGIS/C BL/SDL	MCQs/ SEQs/OSCE
			Enumerate functions and fate of the intermediates of cholesterol degradation	LGIS/C BL/SDL	MCQs/ SEQs
			Define and explain hypercholesterolemia in relation with the pathophysiology of	LGIS/C BL/SDL/ Practical	MCQs/ SEQs

			atherosclerosis		
			Define plasma lipoproteins also discuss VLDL, LDL, HDL, and Chylomicrons with respect to their transport, functions, and importance in health and diseases	LGIS/C BL/SDL/ Practical	MCQs/ SEQs
			Differentiate between bile acids and bile salts	LGIS/C BL/SDL	MCQs/ SEQs/OSCE
			Describe the role of Troponins in diagnosis of MI	LGIS/C BL/SDL	MCQs/ SEQs/OSCE
4.	Minerals and Trace Elements	understand the structure, function and biochemical / clinical significance of minerals and trace elements	Classify minerals (macro minerals and micro minerals).	LGIS /CBL/SDL	MCQs/SE Qs
			Describe absorption/resorption and body regulation of minerals, nutritional sources, RDAs, Toxicity and deficiency states of minerals.	LGIS /CBL/SDL	MCQs/SE Qs
			Enlist the trace elements and briefly explain their biochemical significance.	LGIS /CBL/SDL	MCQs/SE Qs

CBLs/SDLs

CBL 1: Enzymes (Diagnosis of biliary obstruction)

A 40 years old female presented with jaundice and pain in epigastrium for three days. She also complained of nausea, vomiting, itching on skin, anorexia, pale color stools and dark color urine. On examination her skin and sclera were yellow. There was no history of fever or weight loss over last few months. Ultrasonography abdomen showed gall stones and no mass in the bile duct was seen. Other lab investigations are as under

LAB INVESTIGATIONS:

Test Name	Result	Normal Values
Serum bilirubin Total	40µmol/L	2-17 µmol/L
Conjugated	22 µmol/L	0-4 µmol/L
Unconjugated	18 µmol/L	0-13 µmol/L
Serum ALT	46 U/L	Upto 40 U/L
AST	49 U/L	Upto 40 U/L
ALP	620 U/L	132-365 U/L
GGT	130 U/L	Upto 30 U/L

Enzymes are mostly intracellular species or they are secreted into specific cavities e.g, digestive enzymes. Normal cellular turnover causes some release into the plasma and that constitute the basis for normal levels of plasma enzymes. If a certain enzyme is increased more than normal in plasma, it means cellular rupture in the tissue in which this particular enzyme or its specific isoform was abundant. Isoforms or isozymes of one enzyme mean a single change in primary structure of protein which does not affect the activity or stability of enzyme much but give different bands on electrophoresis. Increase in plasma ALT means hepatocellular damage

LEARNING OBJECTIVES:

At the end of the block the students should be able to describe the:

1. Classification of enzymes
2. Factors affecting enzyme activity
3. Mechanism of enzyme action

CBL 02: Enzyme

A 65 years old chronic alcoholic reported to surgical OPD CMH Rwp with complains of **weight loss, anorexia & abdominal pain radiating to the back**. Physical examination showed a palpably enlarged gall bladder. Lab investigation showed:

Lab Investigation:

Computed tomography showed a **mass in the head of pancreas**. The patient was diagnosed as a case of **obstructive jaundice due to the pancreatic adenocarcinoma**.

	Patient Value
Serum conjugated bilirubin level	Increased
Urine bilirubin	Present
Urine urobilinogen	Absent
Fecal urobilinogen	Absent
Serum ALP	Highly Increased
Serum ALT	Marginally Increased
Serum AST	Marginally Increased

Many diseases that cause tissue damage result in an increased release of **intracellular enzymes into the plasma**. The level of specific enzyme activity in the plasma frequently correlates with the **extent of tissue damage**. Alkaline phosphatase (ALP) is elevated in certain bone **and liver diseases**. ALP is useful for the diagnosis of **rickets, hyperparathyroidism, carcinoma of bone, and obstructive jaundice**.

LEARNING OBJECTIVES:

At the end of the block the students should be able to describe the:

1. Mechanism of action of enzymes
2. Factors affecting enzyme activity
3. Role of enzymes in clinical diagnosis

CBL 03:Lipid Metabolism (cholesterol – Ischemic Heart Disease IHD)

A 46 year old businessman, known hypertensive, was brought in cardiology emergency in a semi-unconscious state after a bout of severe chest pain 40 mins ago. He was immediately put on oxygen and given injection pethidine. His ECG and trop I was done in emergency and findings of both were consistent with myocardial infarction (showing more than two hours passed since MI). He was given nitrates and injection streptokinase immediately. He had mild chest pain few days back and underwent complete investigation for cardiac disease. At that time his ECG and echocardiography were unremarkable, his BP was 160/90mmHg and his lipid profile including other tests is given in table below. On the basis of these investigations, he was advised low fat (strict prohibition of saturated fat), **low salt and low calorie diet**, regular **exercise** after clearance by cardiologist, low dose **aspirin** and **statins**.

RELATED LAB INVESTIGATIONS:

Test Name	Result	Normal Values (mmol/L)
Triglycerides (TG)	2.4mmol/L	Desirable <1.60 Border line 1.60 - 2.20 High Risk 2.30 - 5.60
Total cholesterol (TC)	6.4mmol/L	Desirable < 5.20 Moderate Risk 5.20 - 6.20 High Risk > 6.20
LDL-c	4.30mmol/L	Optimal < 2.50 Desirable 2.60 - 3.30 Moderate risk 3.40 - 4.10 High risk > 4.10
HDL-c	0.93mmol/L	Desirable > 1.04
Plasma Glucose fasting	5.9mmol/L	Normal 3.3 – 5.6mmol/L Impaired GT 5.6-7.0 mmol/L Diabetes mellitus >7.0
CK-MB	24 U/L	Upto 25 U/L

Intake of energy dense foods, lack of physical activity, sedentary life style, smoking and aberrant eating and work hours are all risk factors for CAD. Type of fat consumed is also very important in determining the risk. It is established that circulating cholesterol (LDL-c) is a bad indicator of coronary health. Dietary cholesterol is poorly absorbed from the intestine thus it does not significantly affect plasma LDL levels. Cholesterol is synthesized in almost all nucleated cells of human body and its endogenous production is inhibited by statin drugs which are widely used in clinics. Limitation on dietary cholesterol has been lifted recently and it is now allowed for healthy individuals. On the other hand taking saturated fat in diet significantly increases plasma cholesterol (LDL-c) levels and make one prone to atherosclerosis and cardiac event. Plasma glucose surge after intake of refined sugars has also been found to be associated with cardiac morbidity.

LEARNING OBJECTIVES:

At the end of the block the students should be able to describe the:

1. Metabolism of lipoproteins
2. Hyperlipidemias especially hypercholesterolemia type II
3. Cholesterol synthesis and statin drugs

REFERENCE BOOKS:

1. Lippincott's illustrated reviews and Harper's text book of Biochemistry

2. Davidson's Practice of Medicine
3. Internet sources

CBL 04: Lipid Metabolism (FA oxidation – MCAD Deficiency)

A 10 month old infant was admitted in pediatric ward for pneumonia. He was being given appropriate antibiotics but suddenly went into syncope after an episode of vomiting. He was found to have severe hypoglycemia while his BP was normal. Ketonemia and ketonuria were absent. On examination there was hepatomegaly (examination was done after patient was stable). He was normal at birth and no newborn screening was done for inborn errors of metabolism. The measurement of MCAD enzyme activity in leukocytes confirmed the diagnosis of MCAD deficiency. Mother was advised to never let the baby empty stomach and ensure feeding at regular small intervals especially of carbohydrate rich meals. In infants 2 g/kg of uncooked cornstarch at bedtime ensures sufficient glucose overnight.

RELATED LAB INVESTIGATIONS:

Test Name	Result	Normal Values
Plasma Glucose random	2.0 mmol/L	3.3-11.1 mmol/L
Plasma ketones	0.04 mmol/L	0.05-3.0 mmol/L
Urinary ketone bodies	Present	Absent (may be present during fasting)
Plasma acylcarnitines tandem mass spectrometry	Increased	-

In mitochondria, there are four fatty acyl CoA dehydrogenase species, each with a specificity for either short-, medium-, long-, or very-long-chain fatty acids. MCAD deficiency, an autosomal recessive disorder, is one of the most common inborn errors of metabolism, and the most common inborn error of fatty acid oxidation, being found in 1:14,000 births worldwide, with a higher incidence in Northern Europeans. It results in decreased ability to oxidize fatty acids with six to ten carbons (these accumulate and can be measured in urine), and severe hypoglycemia (because the tissues must increase their reliance on glucose). Treatment includes avoidance of fasting. MCAD deficiency has been identified as the cause of some cases originally reported as sudden infant death syndrome (SIDS) or Reye syndrome.

LEARNING OBJECTIVES:

At the end of the block the students should be able to describe the:

1. Fatty Acid synthesis
2. Beta oxidation
3. Ketogenesis, ketonemia and ketonuria

REFERENCE BOOKS:

1. Lippincott's illustrated reviews and

2. Harper's text book of Biochemistry

CBL 05:Minerals (Copper Storage Disease, WD disease)

An 8-years boy was brought to PAEDS OPD in the hospital. He was presenting mild **cognitive deterioration and clumsiness** and common **parkinsonian** features. Parents informed that the child had delayed slurred speech. It was also informed by the parents that on opening arms child present **wing-beating tremors**. On details family history parents informed that three years girls died two years earlier because of same symptoms. Physician observed **Kayser–Fleischer rings (KF rings)** using slit lamp and **skin turgor& Spasticity** was poor. Persistent elevated levels of serum alanine aminotransferase (ALT), and aspartate aminotransferase (AST) levels were observed. The attending pediatrician suspected Wilson Disease. Liver nodular growths were observed in abdominal USG. To confirm diagnosis Liver FNAC was performed which showed very high level of copper accumulation. High level of copper was also observed in 24-hour urine exam. Furthermore, reduced Serum ceruloplasmin levels was observed. In order to confirm the Wilson disease whole blood samples was sent to molecular laboratory for genetic analysis in ATP7B gene.

S.No	Tests	Patients	Refence
1	ALT	134U/L	Upto 42 U/L
2.	Urine Cu	65mmol/L	>1mmol/l
3.	Serum Cu	75mmol	11-24mmol/L
4.	Serum ceruloplasmin	8 mg/L	15-20mg/L
5.	USG abdomin	Nodular liver	Negative

Learning Objectives:

At the end of the block the students should be able to describe the:

1. Copper metabolism in Human and its absorption
2. Functions of Copper
3. Dietary sources of Copper
4. Copper containing Enzymes

CBL 06: Iron Deficiency Anemia:

A multiparous female presented in medical OPD with the complaints of generalized weakness, occasional dizziness, easy fatigability and shortness of breath. She belonged to a low socio-economic status. Her past medical history reveals postpartum hemorrhage. On examination she was pale, her pulse was 90 beats/min, blood pressure was 100/70mmHg.

LAB INVESTIGATIONS:

Test Name	Result	Normal Values
Hb	8.5g/dl	12-14g/dl
MCV	70fl	80-100fl

MCH	20pg	27- 31pg
MCHC	28g/dl	32- 36g/dl
S.Fe	34 ^μ g/dl	50- 170 ^μ g/dl
TIBC	400 ^μ g 'dl	250- 370 ^μ g/dl
S. Ferritin	10 ^μ g/L	15- 150 ^μ g/L
Peripheral Smear	Blood Hypochromia Microcytosis	

LEARNING OBJECTIVES:

At the end of the block the students should be able to describe the:

1. Classify minerals
2. Sources, Absorption and Transport of Iron
3. Disorders of iron metabolism

REFERENCE BOOKS:

1. Lippincott's textbook of Biochemistry
2. Harper's text book of Biochemistry

PRACTICALS

S.No	Topic/ Theme	Learning outcomes	Learning Objectives/ Contents	MIT Practical	Assessment Tool Theory/ OSCE/ Viva Voice
		By the end of session, the learner should be able to:			
1	Chemical Examination of Urine for detection of Lipids	Interpret the results of given experiments	Rothera's Nitroprusside Test	Rothera's Nitroprusside Test	OSPE/ OSCE/ Practical Performance
2	Chemical Examination of Urine for detection of Amino acids and Proteins		Scheme for the Analysis of \urine based on performed Tests for Analysis of Amino Acids, Proteins and Lipids	Demonstration/ Practical	OSPE/ OSCE/ Practical Performance

3	Rancidity		Rancidity of fats	Demonstration/ Practical	OSPE/ OSCE/ Practical Performance
4	Cholesterol		Microscopic Examination of Cholesterol Crystals	Demonstration/ Practical	OSPE/ OSCE/ Practical Performance
5	Estimation of Cholesterol		Salkowski's Test	Demonstration/ Practical	OSPE/ OSCE/ Practical Performance
6	Estimation of Cholesterol		Liebermann Burchard Test	Demonstration/ Practical	OSPE/ OSCE/ Practical Performance

Medicine

S.No	Topic/ Theme	Learning outcomes	Learning Objectives/ Contents	MIT	Assessment Tool
		At the end of the session, the student should be able to:			
1.	Hypertension	Relate clinical knowledge of hypertension with the physiological and biochemical basis	<ul style="list-style-type: none">• Define and classify hypertension according to its severity.• Describe common causes of hypertension• Enumerate possible target organ damage caused by hypertension	LGIS	MCQ
2.	Heart Failure	Relate clinical knowledge of heart failure with the physiological and biochemical basis	<ul style="list-style-type: none">• Define heart failure.• Differentiate clinical features of right and left heart failure'• Describe pathophysiology of heart failure• Suggest outline of treatment based on the pathophysiology	LGIS	MCQ
3.	Shock	Relate clinical knowledge of shock with the physiological and biochemical basis	<ul style="list-style-type: none">• Define and classify shock.• Describe its clinical features.• Outline the treatment strategy in different types of shock	LGIS	MCQ

Reference Book: Davidson's Principles and Practice of Medicine 23 Edition.

Surgery

S.No	Topic/ Theme	Learning outcomes	Learning Objectives/ Contents	MIT	Assessment Tool
		At the end of the session, the student should be able to:			
1.	CVS	<p>Interpreted different contrast studies in relation to various diseases of cardiovascular system</p> <p>Develop an understanding regarding surgical aspects of various diseases CVS</p>	<ul style="list-style-type: none">• Interpret findings on Arteriogram to understand various diseases of arteries• Interpret findings on venogram to understand various diseases of veins• Interpret findings on lymphangiogram to understand various diseases of lymph nodes and lymph vessels• Develop an understanding of surgical aspects of various diseases of heart and great vessels	LGIS	MCQs/ SEQs/ SAQs/
2.	Radiology	Relate radiological and clinical findings of thorax with various traumatic and nondramatic diseases	<ul style="list-style-type: none">• Interpret findings on Chest X-Rays in relation to various diseases of thorax-1• Interpret findings on Chest X-Rays in relation to various diseases of thorax-2• Apply knowledge of anatomy to understand the effect of trauma to various organs of throx-1• Apply knowledge of anatomy to understand the effect of trauma to organs of throx-2	LGIS/ SGD	MCQ

			<ul style="list-style-type: none"> • Appraise the knowledge of autonomy to understand signs caused by various mediastinum nesses • Appraise the knowledge of autonomy to understand signs and symptoms of thoracic outlet syndrome 		
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Behavioral Sciences& Professionalism

S.No	Topic/ Theme	Learning outcomes	Learning Objectives/ Contents	MIT	Assessment Tool
		At the end of the session, the student should be able to:			
1.	Health belief model	Determine social interplay of health, illness, and treatment	Explain Health belief model explanatory models of health and illness	LGIS	MCQs
2	Favorable and unfavorable attitudes in clinical practice	Demonstrate understanding of human Attitudes in clinical practice.	Differentiate favorable and unfavorable attitudes in clinical Practice.	LGIS	Reflective writing
3.	Role of culture in health	Assess the impact of culture on global national and local health care system	Analyze impact of religion, psychology, culture and society medical approaches	LGIS	MCQs/ SEQs
4.	Wellness & disease in society	Demonstrate understanding of core concepts used	Describe the concepts of wellness, disease and illness in society, disparities in	LGIS	MCQs/ SEQs

		in medical sociology	class, gender, race seeing through lens of medical sociology		
5.	Healings and healers in a society	Recognize the value of anthropology in understanding medicine and healing	Discuss role of healing and healers in society	LGIS	MCQs/ SEQs
6.	Basics of History taking	Demonstrate skills to assimilate and handle patient information in different clinical scenarios	Discuss ethical and scientific skills of taking Information from patient and assimilate it to others at clinical setups	SGD	Directly observed Behaviors / Reflective writing
7.	Breaking Bad News		Demonstrate skills like breaking bad news,	SGD/ Roleplay	Directly observed Behaviors / Reflective writing
8.	Handling death		Demonstrate skills handling death and terminally ill patients	SGD	
9.	Conflict Resolution		Demonstrate skills of resolve conflict	SGD	



Learning Resources

Anatomy

- a) Clinical Anatomy for Medical Students by Richard Snell (9th edition).
- b) Basic Histology Text and Atlas by Luiz Carlos and Junqueira (14th edition)
- c) Basic Histology by Laiq Hussain Siddiqui (5th Revised edition)
- d) Medical Embryology by Langman (14th edition).
- e) Essential Clinical Anatomy by Keith Moore (7th edition).
- f) The Developing Human by Keith Moore (10th edition).
- g) General Anatomy by Laiq Hussain Siddiqui.

Physiology

- a) Guyton and Hall Textbook of Medical Physiology, 13th Edition by John E. Hall.
- b) Human Physiology: From Cells to Systems, 9th Edition by Lauralee Sherwood.
- c) Ganong's Review of Medical Physiology, 25th Edition (LANGE Basic Science) by Kim E. Barrett, Susan M. Barman, Scott Boitano, Heddwen Brooks.

- d) Practical physiology by CL Ghai
- e) Electronic modes

Bio chemistry

- a) Lippincott's illustrated reviews, 7th edition
- b) Harper's illustrated Biochemistry, 30th edition
- c) M.N Chatterjea Textbook of Biochemistry , 8th edition
- d) M.D Vasudevan, Sreekumari, M.D.S;Kannan, M.D. Vaidyanathan D.M Textbook of Biochemistry for medical students, 2016
- e) Practical Biochemistry Manual (Prof Maj Gen AK Naveed, Dr Shakir Khan)
- f) Electronic modes

Feedback on the study guide

We value your feedback and will use it for improvement of this Study guide.

Kindly provide feedback for this study guide. At the email: dme@ckmc.edu.pk

References:

HARDEN, J.M. LAIDLAW, E.A. HESKETH, R. M. (1999). AMEE Medical Education Guide No 16: Study guides-their use and preparation.
Medical Teacher, 21(3),248–265. <https://doi.org/10.1080/01421599979491>