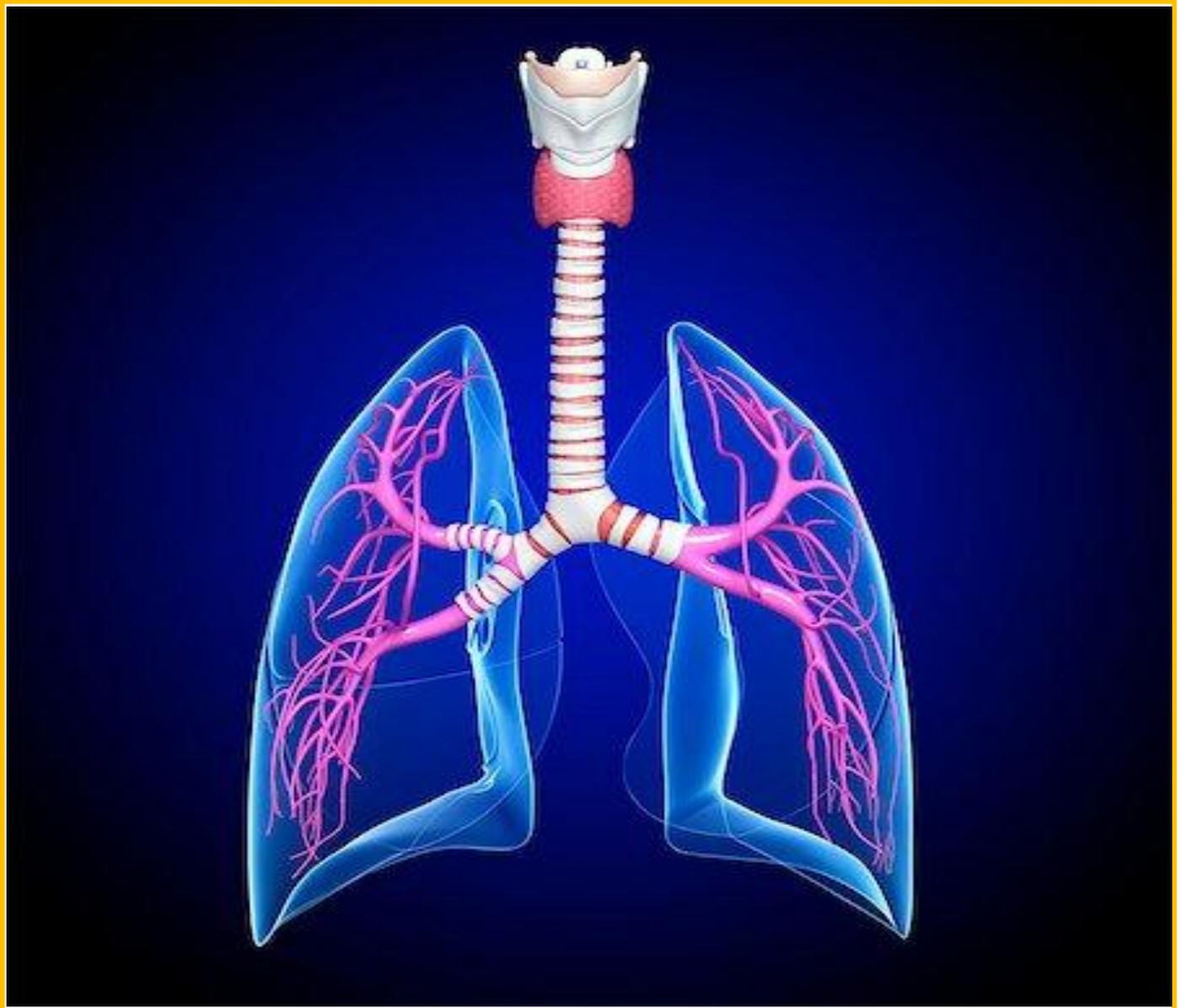




STUDY GUIDE RESPIRATORY MODULE

1st Professional MBBS (Session 2018-19)



Prepared by Dr. Munila Khattak

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LIST OF ABBREVIATIONS

Anat-L	Anatomy Lecture	Path-L	Pathology Lecture
Anat-SGD	Small Group Discussion in Anatomy	Phar-L	Pharmacology Lecture
ARDS	Acute Respiratory Distress Syndrome	PFTs	Pulmonary Function Tests
Bio-L	Biochemistry Lecture	Phy-L	Physiology Lecture
Bio-P	Biochemistry Practical	Phy-P	Physiology Practical
Bio-SGD	Small Group Discussion in Biochemistry	Phy-SGD	Small Group Discussion in Physiology
CMed	Community Medicine	Pul-L	Pulmonology Lecture
DSL	Directed Self Learning	Rad-L	Radiology Lecture
FDT	Film/Demonstration/Tutorial	SDL	Self-Directed learning
FMed	Forensic Medicine	SAQs	Short Essay Questions
Histo-P	Histology Practical	SGD	Small Group Discussion
IPS	Islamiyat/Pak Studies	Skill Lab	Skill Laboratory
MCQs	Multiple Choice Questions	Sur-L	Surgery Lecture
OSPE	Objectively Structured Practical Examination		
PRIME	Professionalism and communication skills, Research, Identity formation, Management and leadership, Ethics		

MODULE PLANNING COMMITTEE

Patron	Prof. Dr. Noor Ullman Dean, KMC
Chairman	Prof. Dr. Mushtaq Ahmad Marwat Chairman College Curriculum Committee, KMC
Co-Chairman	Prof. Dr. Farooq Ahmed Director Medical Education, KMC
Course Coordinator	Dr. Saleem Abbas Department of Physiology, KMC
Module Director	Assistant Prof. Dr. Munila Khattak Department of Anatomy, KMC
Member	Prof. Dr. Mudassir Ahmad Khan Chairman, Department of Biochemistry, KMC
Member	Prof. Dr. Qaiser Inayat Chairman, Department of Anatomy, KMC
Member	Prof. Dr. Shafiqur Rahman Chairman, Department of Physiology, KMC

DISTRIBUTION OF ACADEMIC ACTIVITIES
AMONG DIFFERENT SPECIALITIES

S No	Basic and Clinical Sciences	Large Group Format (LGA, LGB)		Small Group Format (Batch A, B, C, and D)			
		Lectures	DSLs	Practicals/ Skill Lab	SGDs/FDT /Dissection	DSLs	SDLs
1	General Anatomy	7			1+4=5		3+4
2	Histology	4		3	3		
3	Embryology	4					
4	Physiology	15	1	4	4		
5	Biochemistry	7	1	1	3		
6	Pharmacology	1					
7	Pathology	1					
8	Pulmonology	2					
9	Forensic Medicine	1					
10	Com. Medicine	2					
11	Radiology	1					
12	Behavioral sciences	2					
13	Medical Education	1					
14	Islamiyat /Pak St.	3					
15	Surgery	1					
	Sub Totals	52	2	8	15		7
	Grand Total	54+30=84					
		Total Contact Hours= 54+(30x2)=114hours					

Introduction to Respiratory Module

The Respiratory module is a 3 weeks module consisting of the study of Lungs and respiratory passageways. It consists of an extensive and in-depth study of the developmental, gross and functional aspects of respiratory system. The contents of the module will be taught in lectures, SGDs, Practicals and DSLs. Respiratory module consists of the following themes:

- 1) **Chest Wall Injuries** ---1 week
- 2) **Cough and Hemoptysis** -----1 week
- 3) **Breathlessness** -----1 week

General Learning Outcomes

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

- 1- Describe the anatomy and abnormalities of thoracic cage
- 2- Describe the development and gross anatomy of the diaphragm
- 3- Describe the contents of mediastinum and their relations
- 4- Describe the anatomy of pleura and its reflections
- 5- Describe the gross and microscopic structure, development, nerve supply and blood supply of trachea, bronchi and lungs
- 6- Describe the epithelia and connective tissues lining the respiratory passageways.
- 7- Describe pulmonary ventilation
- 8- Discuss the mechanisms of gaseous exchange between alveoli, and blood and blood and tissues
- 9- Elaborate the transport of gases in the blood
- 10- Describe the mechanisms of regulation of respiration
- 11- Define hypoxia ,and cyanosis
- 12- Describe the effect of aging on respiratory system
- 13- Describe glycolysis
- 14- Describe the processes of Krebs's cycle
- 15- Describe the mechanisms of biologic oxidation
- 16- Describe the mechanisms of energy production in the body
- 17- Describe the mechanisms of O₂ and CO₂ transport in the blood
- 18- Classify anti-asthmatic and anti-tuberculous drugs
- 19- Describe the types and signs of asphyxia
- 20- Enlist the causes and signs of pneumonias, bronchial asthma, tuberculosis, Acute Respiratory Distress Syndrome (ARDS), and pulmonary edema
- 21- Describe the parameters of Pulmonary Function Tests (PFTs)
- 22- Describe basic statistical terms and its significance.
- 23- Understand personality development and personal development plans.

Theme-1: Chest wall injuries

Introduction

This theme is one week long mostly emphasizing on the physiological and anatomical aspects of thoracic wall, mediastinum, lungs and diaphragm. It also includes the development of diaphragm & rib, physiological & biochemical aspects of mechanism of respiration and a brief account of developmental and surgical abnormalities related to it.

Specific Learning Objectives and topics covered

Subject /Topic	S. No	Learning objectives
Gross anatomy		
Gross anatomy of thorax	1.	Describe main features of thoracic wall
	2.	Describe the location and shape of the sternum
	3.	Describe the parts of the sternum
	4.	Describe different joints of thorax
	5.	Discuss Intercostal muscles
	6.	Discuss the contents of intercostal spaces
	7.	Describe the origin of intercostal arteries
	8.	Describe the origin, course and distribution of intercostal nerves
	9.	Discuss branches and course of internal thoracic artery
Abnormalities of thoracic wall	10.	Describe thoracic wall abnormalities and its clinical correlation
Diaphragm	11.	Describe the origin and insertion of the diaphragm
	12.	Describe the openings of the diaphragm
	13.	Describe the nerve supply of diaphragm and its clinical significance
Mediastinum	14.	Describe the contents of the superior mediastinum
	15.	Describe the contents of the Anterior & Posterior Mediastinum
	16.	Describe the relations of different contents in mediastinum

Embryology		
Development of ribs, vertebrae and Sternum	17.	Describe the development of ribs from costal elements of primitive vertebrae, development of vertebrae and Sternum
Development of respiratory system and developmental anomalies	18.	Describe development of trachea, bronchial tree, pleura, lungs
	19.	Discuss the formation of Lung Bud
	20.	Discuss the developmental anomalies
Development of body cavities	21.	Recognize the cephalo-caudal and transverse folding of embryonic disc
	22.	Describe the extent of intra embryonic coelom after folding and its divisions into three serous cavities
	23.	State the derivatives of visceral and parietal layers of mesoderm
	24.	State the pericardio-peritoneal canals and their final fate
	25.	Discuss the development of body cavities
Physiology		
Mechanics of Respiration	26.	Describe the mechanics of respiration
	27.	Describe the pressures that cause the movements of the air in and out of the lungs
Lung compliance	28.	Define compliance of the lung and elastic recoil
	29.	Identify two common clinical conditions in which lung compliance is higher or lower than normal.
Lung volumes and capacities	30.	Describe changes in the lung volume, alveolar pressure, pleural pressure, and trans-pulmonary pressure during normal breathing
	31.	Draw a normal pulmonary pressure-volume (compliance) curve (starting from residual volume to total lung capacity and back to residual volume), labeling the inflation and deflation limbs. Explain the cause and significance of the hysteresis in the curves.
	32.	Draw the pressure-volume (compliance) curves for the lungs, chest wall, and respiratory system on the same set of axes. Show and explain the significance of the resting positions for each of these three structures.
Pulmonary ventilation	33.	Define respiration
	34.	Compare between the internal and external

		respiration
	35.	Enlist the steps of external respiration accomplished by
	36.	the respiratory system and those carried out by the circulatory system
	37.	State the functions of Type I alveolar cells, Type II alveolar cells, and alveolar macrophages
	38.	Describe the forces that keep the alveoli open and those that promote alveolar collapse.
	39.	Define the following terms: anatomic dead space, physiologic dead space, wasted (dead space) ventilation, total minute ventilation and alveolar minute ventilation.
	40.	Compare anatomic and physiologic dead space
	41.	Describe the basic concept of measurement of dead space
	42.	Enlist the factors that changes the dead space
	43.	Define the following terms: hypoventilation, hyperventilation, hypercapnea, eupnea, hypopnea, and hyperpnea.
	44.	Define surface tension, surfactants, atelectasis
	45.	Describe the role of surfactants on the lung compliance.
	46.	Describe the composition of the pulmonary surfactants
	47.	and its role
	48.	Describe the pathophysiology of respiratory distress syndrome of the newborn
	49.	Discuss the work of breathing
Pulmonary volumes and capacities	50.	Discuss pulmonary volumes and capacities.
	51.	How are they measured?
Biochemistry		
Biological Oxidation and ETC	52.	Define biological oxidation
	53.	Define redox reactions
	54.	Describe the structure of Mitochondria
	55.	Enlist the Functions of Mitochondria
	56.	Describe Oxidoreductases

	57.	Describe sources of NADH and FADH ₂
Community Medicine		
Basic statistics in Research	58.	Discuss various basic statistics use in Research
Radiology		
Anatomical Landmarks on CXR, CT and MRI	59.	Identify various anatomical landmarks on chest X-Rays, CT and MRI
Surgery		
Pneumothorax	60.	Describe Pneumothorax
	61.	Define Hydropneumothorax

List of Practicals/FDT

Subject /Topic	Learning Objectives	Teacher	Venue
	At the end of this practical work, the 1st year students will be able to;		
Histology(Histo P1)			
Transverse section of Trachea	Identify the slide of transverse section of Trachea under the microscope	Dr Asif	Anat- 7
Physiology(Phy P-1)			
Spirometry	Identify the different parts of Spirometer.	Dr Gulshan	Phy-11
	Learn the procedure of Spirometry.	Dr Durre	
	Measure the various lung Volumes and Capacities of the subject.	Dr Ayesha Dr Aslam	
Gross Anatomy(FDT-1)			
Anatomy Film	To learn the skeletal features of thorax	Dr Harris	Ana-3
	Surface anatomy of thorax	Dr Haroon Dr Ikram	
	Internal features of thoracic wall	DrShagufta	

List of Dissection sessions

Subject /Topic	Learning objective	Teacher	Venue
	At the end of the Dissections , the 1 st year students will be able to:		
Anatomy (Dissection 1)			
Thorax, components of thoracic cavity and their relations	Describe the boundaries, components of thorax and their relations	Dr Harris Dr Haroon Dr Ikram DrShagufta	Anat-3 Anat-4 Anat-5 Ana-6
Anatomy (Dissection 2)			
Gross features of sternum Anatomy	Discuss the gross features of sternum	Dr Harris Dr Haroon Dr Ikram	Anat-3 Anat-4 Anat-5

		DrShagufta	Ana-6
Anatomy (Dissection 3)			
Gross features of thoracic vertebrae Anatomy	Discuss the gross features of thoracic vertebrae	Dr Harris Dr Haroon Dr Ikram DrShagufta	Anat-3 Anat-4 Anat-5 Ana-6
Anatomy (Dissection 4)			
Thoracic muscles, Inter costal spaces Anatomy	Describe the origin and insertion of thoracic muscles, components of Inter costal spaces	Dr Harris Dr Haroon Dr Ikram Dr Shagufta	Anat-3 Anat-4 Anat-5 Ana-6

List of DSLs

Subject/Topic	Learning objective	Teacher	Venue
	At the end of this DSL, the 1 st year students will be able to:		
Biochemistry			
DSL	Describe the complexes of electron transport chain	Dr Sobia	Ana-1
	Explain the site specific action of various inhibitors of electron transport chain		
Physiology			
DSL	Discuss pulmonary volumes and capacities.	Dr Gulshan	Ana-2
	How are they measured?		

TIME TABLE OF RESPIRATORY MODULE FOR 1st YEAR MBBS (Session 2018-19)

WEEK 1						
Day/Date	8:00 – 8:45 am	8:45 – 9:30 am	9:30 am – 11:00 am	11:00 – 11:45 am	11:45 – 1:00 pm	
THEME 1: CHEST WALL INJURIES						
Monday 20/05/2019	Emb-L1 Development of ribs, vertebrae and Sternum Dr Munila (LGA: Anat-1) Dr Zainab (LGB: Anat-2)	Anat-L1 Overview of Thorax (skeleton, wall, inlet, outlet, joints of thoracic cage) Dr Junaid (LGA: Anat-1) Dr Waqar (LGB: Anat-2)	PRACTICALS Batch A: Histo-P1 Dr Asif Batch B: Phy-P1 Dr Gulshan Batch C: SDL (SLRC/Library) Batch D: FDT-1 Dr Shagufta	Phy-L1 Mechanics of Breathing Dr Henna (LGA: Anat-1) Phy-DSL Dr Gulshan (LGB: Anat-2)	DISSECTION-1 Thorax, components of thoracic cavity and their relations Batch A: Dr Harris (Anat-3) Batch B: Dr Haroon (Anat-4) Batch C: Dr Ikram (Anat-5) Batch D: Dr Shagufta (Ana-6)	
Tuesday 21/05/2019	Bio-L1 Biological Oxidation and ETC Dr Sadaf Durranj (LGA: Anat-1) Bio-DSL Dr Sobia (LGB: Anat-2)	Emb-L2 Development of respiratory system and Developmental anomalies Dr Munila (LGA: Anat-1) Dr Zainab (LGB: Anat-2)	PRACTICALS Batch A: FDT-1 Dr Harris Batch B: Histo-P1 Dr Asif Batch C: Phy-P1 Dr Durre Batch D: SDL (SLRC/Library)	Phy-L2 Compliance of the Lungs Dr Sajjad (LGA: Anat-1) Phy-L1 Mechanics of Breathing Dr Henna (LGB: Anat-2)	DISSECTION-2 Gross features of sternum Batch A: Dr Harris (Anat-3) Batch B: Dr Haroon (Anat-4) Batch C: Dr Ikram (Anat-5) Batch D: Dr Shagufta (Ana-6)	
Wednesday 22/05/2019	Phy-L3 Pulmonary Volumes and Capacities Dr Ayesha (LGA: Anat-1) Phy-L2 Compliance of the Lungs Dr Sajjad (LGB: Anat-2)	Emb-L3 Development of body cavities Dr Munila (LGA: Anat-1) Dr Zainab (LGB: Anat-2)	PRACTICALS Batch A: SDL (SLRC/Library) Batch B: FDT-1 Dr Haroon Batch C: Histo-P1 Dr Asif Batch D: Phy-P1 Dr Ayesha	Anat-L2 Gross anatomy of Diaphragm Dr Shazja (LGA: Anat-1) Dr Shabnum (LGB: Anat-2)	DISSECTION-3 Gross features of thoracic vertebrae Batch A: Dr Harris (Anat-3) Batch B: Dr Haroon (Anat-4) Batch C: Dr Ikram (Anat-5) Batch D: Dr Shagufta (Ana-6)	
Thursday 23/05/2019	PRIME-1 Basic statistics in Research Dr Bushra (LGA: Ana-1) Dr Rubena (LGB: Ana-2)	Phy-L4 Alveolar Ventilation Dr Shahid (LGA: Anat-1) Phy-L3 Pulmonary Volumes and Capacities Dr Ayesha (LGB: Anat-2)	PRACTICALS Batch A: Phy-P1 Dr Aslam Batch B: SDL (SLRC/Library) Batch C: FDT-1 Dr Ikram Batch D: Histo-P-1 Dr Asif	Anat-L3 Mediastinum (Boundaries & structures present in each of its division and subdivision) Dr Junaid (LGA: Anat-1) Dr Waqar (LGB: Anat-2)	DISSECTION-4 Thoracic muscles, Inter costal spaces Batch A: Dr Harris (Anat-3) Batch B: Dr Haroon (Anat-4) Batch C: Dr Ikram (Anat-5) Batch D: Dr Shagufta (Ana-6)	
Friday 24/05/2019	8:00- 9:00 am	09:00 am	10:00 – 11:00 am	11:00am – 12:00 am	JUMMABREAK	XXXX
	Hajj Islamiat Dr Zahid (LGB: Anat-2) Pak Studies Congress ministries Dr Zafar (LGA: Anat-1)	Rad-L1 Anatomical Landmarks on CXR, CT and MRI Dr Humaira (LGA: Ana-1) Dr Mehmood (LGB: Ana-2)	Surg-L1 Pneumothorax Dr Asad (LGA: Ana-1) Dr Hizbullah (LGB: Ana-2)	MENTORING		

Histo-P1: Trachea (Anat-7),
FDT-1: (Anat-3),

Phy-P1: Spirometry (Physio-11),

Theme-2: Cough and Hemoptysis:

Introduction

This theme is one week long consisting of developmental, gross and microscopic study of lungs and bronchial tree. Physiological and Pathological features along with preventive measures and treatment will also be the part of the module. This module includes lectures on asthma, pneumonia and tuberculosis by the department of pathology and anti-asthmatic and anti-tuberculous drugs by the department of pharmacology. This module consists of lectures, Practicals, SGDs, DSLs and SDLs.

Specific Learning Objectives and topics covered

Subject /Topic	S. No	Learning objectives
Gross anatomy		
Thoracic sympathetic trunk, Phrenic nerve, Thoracic duct	62.	Describe the gross anatomy of thoracic sympathetic trunk, Phrenic nerve, Thoracic duct.
	63.	Describe their relations
	64.	Discuss clinical correlates
Gross anatomy of Lungs	65.	Describe the major components of the (upper and lower) respiratory system and describe their functions
	66.	Describe trachea and bronchi with relations plus subdivisions
	67.	Describe the neurovascular supply of trachea and bronchi
	68.	Describe the surface anatomy of trachea and bronchi
	69.	Describe the lungs with their lobes and fissures, relations with surroundings and surfaces and compare between right and left lungs.
	70.	Describe Broncho-pulmonary segments and their clinical importance
	71.	Describe innervations, blood supply and lymphatic drainage of the lungs.
Anterior Thoracic wall, Mediastinum	72.	To learn the anatomy of Anterior thoracic wall, boundaries, division and contents of Mediastinum
Embryology		

Development of Diaphragm	73.	Describe development of diaphragm
	74.	Describe diaphragmatic hernias and clinical significance
Histology		
Respiratory Epithelium & olfactory mucosa	75.	Classify the types of epithelia lining the various parts of respiratory system
	76.	Differentiate between the histological differences among various parts of respiratory system
Histology of trachea & Bronchial tree	77.	Describe the structure of trachea and its layer
	78.	Discuss the microscopic picture of respiratory bronchiole, alveolar ducts, alveolar sacs and alveoli.
	79.	Describe the different types of cells found in alveoli
	80.	Discuss surfactant, alveolar septum, alveolar pores and alveolar macrophages
Physiology		
Functions of the Respiratory Passageways	81.	Describe the respiratory and non-respiratory functions of the respiratory passageways
	82.	Identify the mechanism by which particles are cleared from the airways.
Pulmonary Circulation	83.	Explain the physiologic anatomy of the pulmonary circulatory system
	84.	Describe the pressures in the pulmonary circulatory system
	85.	Describe blood volume of the lungs
	86.	Describe blood flow through the lungs and its distribution
	87.	Compare the systemic and pulmonary circulations with respect to pressures, resistance to blood flow, and response to hypoxia.
	88.	Describe the regional differences in pulmonary blood flow in an erect position.
	89.	Describe the consequence of hypoxic pulmonary vasoconstriction on the distribution of pulmonary blood flow.
Pulmonary Capillary Dynamics	90.	Describe the pulmonary capillary dynamics

(Pulmonary Edema)	91.	Describe the pulmonary capillary dynamics
	92.	Describe the development of pulmonary edema
Principles of Gas Exchange /Physics of Gas Diffusion	93.	List the normal airway, alveolar, arterial, and mixed venous PO ₂ and PCO ₂ values.
	94.	List the normal arterial and mixed venous values for O ₂ saturation, [HCO ₃ ⁻]
Biochemistry		
Oxidative Phosphorylation	95.	Describe Glycerol 3-phosphate Shuttle
	96.	Describe Malate Shuttle
	97.	Enumerate different parts enzymes and co-enzymes that carryout biological oxidation
	98.	Enlist components of each enzyme involved in Biological Oxidation
	99.	Describe transfer of electron through each complexes
	100.	Describe the free radicals involved in BO
	101.	Explain Chemiosmotic theory.
	102.	Describe structure of ATP
	103.	Describe the mechanism of ATP production by ATP Synthase
	104.	Describe transfer of protons from Inter mitochondrial membrane to Mitochondrial matrix through ATP Syntatase
	105.	Explain coupling
	106.	Describe uncoupling along with examples
	107.	Enumerate the Electron transport chain inhibitors
Steps of respiration/ O ² -Hb dissociation curve	108.	Define respiration and Explain steps of respiration.
	109.	Define partial pressure and explain its role in the transport of gases according to Dalton's law.
	110.	Explain various modes of oxygen transport and clinical importance of oxygen.
	111.	Describe the formation of oxyhemoglobin.
	112.	Explain Respiratory exchange ratio.
	113.	Explain oxygen-dissociation curves with various factors affecting oxygen delivery.
Pulmonology		

Acute Respiratory Distress Syndrome	114.	Discuss acute lung injury and its correlation Acute Respiratory Distress Syndrome
	115.	Describe the causes of Acute Respiratory Distress Syndrome
	116.	Discuss the morphology of Acute Respiratory Distress Syndrome
Pathology		
Pathophysiology of Pneumonia, Tuberculosis, Asthma, Pulmonary edema	117.	Define pneumonia and enlist the causative pathogens of pneumonia
	118.	Define primary and secondary Tuberculosis and state its etiology
	119.	Describe the etiology, pathogenesis and clinical features of asthma
	120.	Define pulmonary edema and classify it according to underlying causes
Pharmacology		
Anti-asthmatic drugs	121.	Enlist Anti-asthmatic drugs
Anti-tuberculous drugs	122.	Classify Anti-tuberculous drugs

List of Practicals/FDT

Subject /Topic	Learning Objectives	Teacher	Venue
	At the end of this practical work, the 1st year students will be able to;		
Histology(Histo P2)			
Histological features of Lungs	Identify the slide of Lung under the microscope and study the identification points.	Dr Asif	Anat- 7
Physiology(Phy P-2)			
Vitalography(Recording)	Identify the various parts of Vitalograph.	Dr Gulshan Dr Durre	Phy-11 Phy-12
	Learn the procedure of Vitalography	Dr Ayesha Dr Aslam	
Physiology(Phy P-3)			
Vitalography(Interpretat	Learn how to interpret the results obtained	Dr Gulshan	Phy-11

ion)	at the end of Vitalography	Dr Durre Dr Ayesha Dr Aslam	Phy-12
Gross Anatomy(FDT-2)			
Anatomy Film	To learn the anatomy of Anterior thoracic wall	Dr Harris Dr Haroon Dr Ikram DrShagufta	Ana-3
	To learn the anatomy of Mediastinum		

List of Small Group Discussion (SGD) sessions

Subject /Topic	Learning objective	Scenario	Teacher	Venue
	At the end of this SGD, the 1 st year students will be able to:			
Gross Anatomy(AnaSGD-1)				
Ribs	Describe the typical and atypical ribs .	A 30 years old man present in emergency department following a car accident with laboured breathing. On examination breath sounds are absent on left side.	Dr Harris Dr Haroon Dr Ikram Dr Shagufta	Anat-3 Anat-4 Anat-5 Ana-6
Physiology(Phy SGD-1)				
Functions of respiratory system	Discuss the non-respiratory Functions of Respiratory System What is mechanism of cough reflex? What is difference between cough and sneezing	As two and half year old boy inhaled peanut, he started coughing vigourously and became	Dr Shahid	Phy-11

	reflex	cyanosed.		
Biochemistry(Bio SGD-1)				
Detection of various constituents in normal urine	Explain the conditions in which various organic and inorganic constituents are increased or decreased than the normal	A 55 year old diabetic lady presented to a physician with complaints of nausea, body swelling, fatigue and confusion. Her lab results showed decreased urinary urea and creatinine levels suggestive of acute renal failure. She was treated with hemodialysis.	Dr Shabir Dr Fariza Dr Iqbal Dr Faria	Biochem 9

Theme3-: Breathlessness:

Introduction

In this part of module the anatomical features of pleura and pleural cavity will be discussed. The physiological aspects of the module will include pulmonary ventilation, pulmonary circulation, gaseous exchange, and transport along with related respiratory abnormalities. The process of oxidative phosphorylation will be described in biochemistry. Forensic medicine department will explain asphyxia and the department of community medicine will give an account of prevention of respiratory disorders.

Specific Learning Objectives and topics covered

Subject /Topic	S. No	Learning objectives
Gross anatomy		
Gross features of pleura	123.	Describe the gross features of pleura
	124.	Describe the pleural cavity and the pleural reflections
	125.	Describe the surface anatomy related to pleural reflections
Histology		
Histology of lungs		Classify the types of epithelia lining the various parts of respiratory system
		Differentiate between the histological differences among various parts of respiratory system
Physiology		
Diffusion of gases through the respiratory membrane	126.	Describe the physiologic anatomy of the respiratory membrane and its significance
	127.	Describe the factors that affect the rate of gaseous diffusion through the respiratory membrane
	128.	Describe the diffusing capacity of respiratory membrane for O ₂ and CO ₂ at rest and exercise.
	129.	Describe the effect of ventilation/perfusion (V/Q) ratio on alveolar gas concentrations.
	130.	Describe the factors that affect the rate of gaseous diffusion through the respiratory membrane

	131.	Describe the diffusing capacity of respiratory membrane for O ₂ and CO ₂ at rest and exercise.
	132.	Describe the effect of ventilation/perfusion (V/Q) ratio on alveolar gas concentrations.
	133.	Identify the average V/Q ratio in a normal lung.
	134.	Explain the concept of physiologic shunt and physiologic dead space
	135.	Describe the abnormalities of ventilation perfusion ratio in normal lung and chronic obstructive lung disease.
	136.	Enlist common causes of hypoxemia
Transport of oxygen in the blood	137.	Define oxygen partial pressure (tension), oxygen content, and percent hemoglobin saturation as they pertain to blood.
	138.	Describe Oxyhemoglobin dissociation curve (hemoglobin oxygen equilibrium curve) showing the relationships between oxygen partial pressure, hemoglobin saturation, and blood oxygen content.
	139.	Describe the relative amounts of O ₂ carried bound to hemoglobin with that carried in the dissolved form.
	140.	State Henry's Law (the relationship between PO ₂ and dissolved plasma O ₂ content)
	141.	Describe how the shape of the oxyhemoglobin dissociation curve influences the uptake and delivery of oxygen.
	142.	Define P ₅₀ .
	143.	Describe how the oxyhemoglobin dissociation curve is affected by changes in blood temperature, pH, PCO ₂ , and 2,3-DPG.
	144.	Describe how anemia and carbon monoxide

		poisoning affect the shape of the oxyhemoglobin dissociation curve, PaO ₂ , and SaO ₂ .
Transport of CO ₂ in the blood	145.	List the forms in which carbon dioxide is carried in the blood.
	146.	Describe the percentage of total CO ₂ transported as each form.
	147.	Describe the chloride shift and its importance in the transport of CO ₂ by the blood.
	148.	Describe the enzyme that is essential to normal carbon dioxide transport by the blood and its location.
	149.	Describe the carbon dioxide dissociation curves for oxy- and deoxyhemoglobin.
	150.	Describe the interplay between CO ₂ and O ₂ binding on hemoglobin that causes the Haldane effect.
Regulation of Respiration	151.	Describe the regions in the central nervous system that play important roles in the generation and control of cyclic breathing.
	152.	Give three examples of reflexes involving pulmonary receptors that influence breathing frequency and tidal volume. Describe the receptors and neural pathways involved.
	153.	List the anatomical locations of chemoreceptors sensitive to changes in arterial PO ₂ , PCO ₂ , and pH that participate in the control of ventilation. Identify the relative importance of each in sensing alterations in blood gases.
	154.	Describe how changes in arterial PO ₂ and PCO ₂ alter alveolar ventilation, including the synergistic effects when PO ₂ and PCO ₂ both change.

Regulation of Respiration During Exercise	155.	Describe the significance of the feedforward control of ventilation (central command) during exercise, and the effects of exercise on arterial and mixed venous PCO ₂ , PO ₂ , and pH.
	156.	Describe voluntary control of respiration
	157.	Describe the effect of irritant receptors, J-receptors, brain edema and anesthesia on breathing.
Biochemistry		
CO ₂ dissociation curve	158.	Describe Bohr effect and its importance.
	159.	Describe the modes of carbon dioxide transport
	160.	Explain various modes of oxygen transport
	161.	Describe in detail all the events occurring at lung site and tissue site including Haldene effect.
	162.	Explain the chloride shift and its importance.
	163.	Explain the factors affecting the transport of carbon dioxide transport.
	164.	Describe the role of Nitrogen in plasma.
O ₂ Toxicity	165.	Explain how free radicals are produced and why oxygen is more prone to produce superoxide radical?
	166.	Discus various toxic effects of free radicals.
	167.	Classify antioxidants. How they are produced and discus its role in combating free radicals.
	168.	Describe the respiratory control of acid base balance.
	169.	Role of dipalmitoylphosphotidyl inositol in infant respiratory syndrome.
Pulmonology		
Introduction to Respiratory symptomatology	170.	Enumerate the various symptoms of respiratory disorders

	171.	Interpret the Pulmonary Function Tests
Forensic Medicine		
Asphyxia	172.	Define Asphyxia
	173.	Describe different types of Asphyxia
	174.	Identify classical signs of asphyxia
Community Medicine		
Prevention of Respiratory disorders	175.	Discuss preventive strategies of different problems related to respiratory system
	176.	Discuss the relationship of smoking with lung Diseases
	177.	Describe preventive strategies for smoking

List of Practicals /FDT

Subject /Topic	Learning objective	Teacher	Venue
	At the end of this practical work, the 1 st year students will be able to:		
Anatomy(Histo P-3)			
Review of Trachea and lungs	Identify the slide of Trachea and Lungs under the microscope along with two identification points.	Dr Asif	Anat- 7
Physiology(Phy P-4)			
Stethography	Identify the various parts of Stethograph & Kymograph. Learn the procedure of Stethography. Record the qualitative changes that occur in respiratory rate, rythm & amptitude, in response to physical stimuli like laughing, coughing, reading etc.	Dr Gulshan Dr Durre Dr Ayesha Dr Aslam	Phy-11
Biochemistry(Bio P-1)			

Detection of various constituents in normal urine	Analyze normal urine for inorganic constituents (chloride ion, calcium, phosphate, inorganic sulphate, magnesium, ammonia) and organic constituents (urea, uric acid, creatinine, organic sulphate, indicant	Dr Shabir Dr Fariza Dr Iqbal Dr Faria	Biochem-9
Anatomy(FDT-3)			
Anatomy Film	To learn the Anatomy of lungs, skeletal features of vertebrae	Dr Harris Dr Haroon Dr Ikram DrShagufta	Ana-3

List of Small Group Discussion SGDS

Subject /Topic	Learning objective	Scenario	Teacher	Venue
	At the end of this SGD, the 1 st year students will be able to:			
Physiology(Phy-SGD2)				
Useful Methods For Studying Respiratory Abnormalities.	What is FEV1?	An asthmatic patient comes to the hospital complaining of great difficulty in breathing. The doctor advises vitalography. Results show that his FEV1is 40%.	Dr Umema	Phy-12
	What is its value in healthy persons?			
	What is the difference in the results of Obstructive and Restrictive airway diseases on Vitalography?			
Physiology(Phy-SGD3)				

Adjustment of Respiration to High Altitudes	What is Acute and Chronic Mountain Sickness?	A group of friends plan to go for hiking. They decided to climb the highest mountain. They ascended gradually taking rest every now and then. As they reached 12,000 feet above the ground, they became drowsy and developed headache and nausea.	Dr Fazlina	Physio-11
	What is Acclimatization?			
	Which changes occur in Acclimatization?			
Biochemistry(SGD2)				
Redox Reactions with Oxidoreductases and Shuttles	Describe Redox Reactions and shuttle mechanisms involved in electron transport chain.	An automobile repair worker was brought to the emergency department with complaints of severe headache, nausea, vomiting, breathlessness and dizziness. He was diagnosed as a case of carbon monoxide poisoning. He was treated with oxygen inhalation, fully recovered and sent	Dr Ubaid	Biochem-9

		home.		
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List of DSLs

Subject/Topic	Learning objective	Teacher	Venue
	At the end of this DSL, the 1 st year students will be able to:		
Biochemistry			
DSL	Describe the complexes of electron transport chain	Dr Sadaf	Ana-1
	Explain the site specific action of various inhibitors of electron transport chain		
Physiology			
DSL	Discuss pulmonary volumes and capacities.	Dr Gulshan	Ana-2
	How are they measured?		

Books and other reading resources

Gross Anatomy	Netter`s “Atlas of Human Anatomy-6 th Edition Gray`s Anatomy-4 th Edition Cunningam`s “Textbook of Anatomy’-12 th Edition Snell`s Clinical Anatomy by regions-9 th Edition Snell`s Clinical Neuroanatomy-7 th Edition Last`s Anatomy-10 th Edition
Embryology	Langman`s Medical Embryology-14 th Edition The Developing Human “by Keith L Moore”-10 th Edition
Histology	Textbook of Histology “by Leslie Gartner-3 rd Edition Basic Histology-Text and Atlas- “by Luiz Carlos-11 th Edition
Physiology	Guyton`s “Textbook of Medical Physiology”-13 th edition Ganong`s “Review Of Medical Physiology”-25 th Edition “Human Physiology-From cell to system” by <i>Lauralee Sherwood</i> -8 th Edition
Biochemistry	Harper`s Biochemistry-31 st Edition Principles of Medical Biochemistry-3 rd Edition Lippincot`s Biochemistry-6 th Edition
Pharmacology	Katzung`s Basic and Clinical Pharmacology-12 th Edition
Pathology	Robbin`s Basic Pathology-9 th Edition
Community Medicine	Essential Community Medicine-
Medicine	Davidson`s Principles and Practice of Medicine-22 nd Edition
Clinical Examination	Talley and O'Connor's Clinical Examination-6 th Edition

Exercises

BIOCHEMISTRY

MCQ

1. At the lung level where there is high partial pressure of oxygen, the oxygen dissociation curve shifts towards the left, called the Haldane Effect. Which of the following factors lead to Haldane effect?
 - a) Increased partial pressure of carbon dioxide
 - b) Increased level of 2, 3 BPG
 - c) Increased temperature
 - d) Increased PH
 - e) None of these

Key: d

PHYSIOLOGY

MCQ

- 1) A young healthy man is sitting in upright position. At the apex of his lungs:
 - a) Perfusion and ventilation are both normal
 - b) Both perfusion and ventilation are high
 - c) Both perfusion and ventilation are low
 - d) Perfusion is more than ventilation
 - e) Ventilation is more than perfusion

Key : e

ANATOMY

MCQ

Which of the following cell of respiratory epithelium secretes Catecholamine?

- a. Brush cell
- b. Kulchitsky cell
- c. Goblet cell
- d. Columnar cell
- e. Basal cell

Key: b

BIOCHEMISTRY**SEQ**

A 55 year old male patient, known hypertensive and diabetic presented to the emergency department with central chest pain. On ECG the patient was found to have myocardial infarction, BP140/90 mmHg, RBS 400 mg/dL. His lipid profile showed dyslipidemia: TC 260 mg/dL, TG 20 mg/dL, LDL 170 mg/dL, HDL 17 mg/dL.

Oxidative stress leads to modified LDL which plays an important role in atherogenesis leading to coronary heart disease.

- a. Define Free radicals. Enumerate free radical scavengers
- b. Briefly describe mechanism of ATP production through oxidative phosphorylation.

PHYSIOLOGY**SEQ**

- a) What is Respiratory Dead Space?
- b) What is the difference between Anatomical and Physiological Dead Space?

ANATOMY**SEQ**

- a) Discuss the anatomy of intercostals space.
- b) Enumerate the contents of posterior mediastinum.