



MODULE

CARDIO-PULMONARY MODULE

1st Year BDS

Table of Contents

Vision & Mission3

Teaching Hours Allocation.....4

Themes5

Learning Objectives6

Theme 1: Chest Pain7

Theme 2: Breathlessness and Ankle Swelling9

Theme 4: Cough and Hemoptysis..... 13

Learning Resources 15

Vision & Mission

Khyber Medical University (KMU) Vision:

Khyber Medical University will be the global leader in health sciences academics and research for efficient and compassionate health care.

Khyber Medical University (KMU) Mission:

Khyber Medical University aims to promote professional competence through learning and innovation for providing comprehensive quality health care to the nation.

Institute of Health Professions Education & Research (IHPER) Mission:

To produce leaders, innovators and researchers in health professions education who can apply global knowledge to resolve local issues.

Teaching Hours Allocation

S. No	Subject	Hours
1.	Anatomy	16hrs
2.	Physiology	25hrs
3.	Biochemistry	8hrs
4.	Pharmacology	3hrs
5.	General Pathology	3hrs
6.	Medicine	1hr
7.	Community & Preventive Dentistry	1hr
Total		57hrs

Themes

S. No	Theme	Duration in Weeks (hrs)
1.	Chest pain	15hrs
2.	Breathlessness and Ankle swelling	23hrs
3.	Blood Pressure and Palpitations	6hrs
4.	Cough and Hemoptysis	13hrs
Total		2 Weeks (57hrs)

Learning Objectives

By the end of this Module, 1st year BDS students will be able to:

1. Describe the structure and surface markings of the heart, valves, and great vessels.
2. Describe the steps of development of the heart.
3. Describe the steps of development of arterial, venous, and lymphatic system.
4. Describe the conduction system of the heart.
5. Describe the anatomy of valves of the heart.
6. Describe the microscopic structure of myocardium, and blood vessels.
7. Describe the cardiac cycle.
8. Discuss cardiac output, and venous return.
9. Discuss blood pressure and its regulation.
10. Discuss coronary circulation and diseases associated with it.
11. Describe the mechanisms and types of circulatory shock and associated compensatory mechanisms.
12. Describe the anatomy and common pericardial diseases.
13. Describe the cardiac enzymes.
14. Discuss the hyperlipidemias and the roles lipoproteins and cholesterol in the development of atherogenesis.
15. Describe the mechanisms of impulse generation, conduction, and excitation of myocardium.
16. Discuss normal ECG and common ECG abnormalities.
17. Enlist the drugs used in ischemic heart disease and hyperlipidemias.
18. Describe preventive strategies of cardiovascular diseases.

Theme 1: Chest Pain

Subject	Topic	Hours	Learning Objectives
Embryology	Fetal Circulation	1hr	1. Describe the physiological changes in circulation after birth.
Anatomy	Pericardium Surface anatomy Coronary circulation	1hr	2. Define pericardium. 3. Describe different reflections of pericardium. 4. Describe the gross structure of the heart. 5. Enlist the Coronary arteries and its branches.
Physiology	Cardiac Muscles	1hr	6. Explain the physiologic anatomy of the cardiac muscle. 7. Describe the properties of the cardiac muscle.
	Excitation and contraction of cardiac muscles	1hr	8. Describe excitation-contraction process in cardiac muscles and outline its differentiation from skeletal muscles. 9. Describe gap-junctions and the significance of functional syncytium. 10. Describe chronotropic, Inotropic and dromotropic effects. 11. Describe the significance of prolonged action potential in cardiac muscle. 12. Define automaticity and rhythmicity of conductivity. 13. Explain phases of action potential in cardiac muscle, plateau formation and its significance. 14. Define pacemaker of the heart and explain why SA node is the normal pacemaker of the heart. 15. Describe AV nodal and ventricular impulse conduction.
	Normal ECG	1 hr	16. Discuss the characteristics of normal ECG. 17. Describe different waves of ECG and its significance.
Biochemistry	Enzymes	4hrs	18. Define Enzymes. 19. Define activation energy. 20. Define Gibbs Free energy. 21. Explain the general structure of enzymes.

			<p>22. Define co-factors.</p> <p>23. Explain the function of co-factors.</p> <p>24. Enlist different types of co-factors.</p> <p>25. Define different parts and forms of enzymes.</p> <p>26. Describe the factors involved in structure of enzymes.</p> <p>27. Describe the mechanism of Enzyme activity.</p> <p>28. Define catalysis.</p> <p>29. Explain different mechanism of catalysis.</p> <p>30. Explain the Principals for Nomenclature of enzymes.</p> <p>31. Classify Enzymes on the basis of functions.</p> <p>32. Enlist the factors affecting the activity of enzymes.</p> <p>33. Describe roles of factors affecting enzyme activity.</p> <p>34. Define enzyme kinetics.</p> <p>35. Explain different areas of enzyme kinetics.</p> <p>36. Describe the role of Km in Enzyme kinetics.</p> <p>37. Define Isoenzymes (Isozymes).</p> <p>38. Explain Factors affecting the properties of isozymes.</p> <p>39. Explain the role of enzymes as a diagnostic tool.</p>
	Cardiac enzymes	1hr	<p>40. Enlist the enzymes that increase in myocardial infarction.</p> <p>41. Describe lipid profile and its clinical significance.</p> <p>42. Lipid peroxidation.</p> <p>43. Describe the role of Na, K, Ca, and Mg in cardiac muscle contractility and their biochemical abnormalities.</p> <p>44. Describe the cardiac manifestations of vitamin B1 deficiency.</p>
Pharmacology	Drugs in Cardio-vascular diseases.	1hr	<p>45. Enlist and classify the group of drugs used in the treatment of coronary artery diseases (angina and MI).</p> <p>46. Enlist the groups of lipid-lowering drugs.</p>
Lab Work			
Anatomy	Anatomy of heart	2hrs	<p>47. Identify the Heart and major blood vessels.</p> <p>48. Identify chambers of the heart.</p> <p>49. Identify internal structures of various chambers of the heart.</p>

Theme 2: Breathlessness and Ankle Swelling

Anatomy	General features of thorax	1hr	50. Describe main features of thoracic wall. 51. Describe the location and shape of the sternum. 52. Describe the parts of the sternum. 53. Describe the gross features of the thoracic vertebra. Describe the general features of the ribs.
	Diaphragm and Mediastinum	1hr	54. Describe the origin and insertion of the diaphragm. 55. Describe the openings of the diaphragm. 56. Enlist the contents of the superior mediastinum. Enlist the contents of the Anterior & Posterior Mediastinum.
	Pleura	1hr	57. Describe the gross features of pleura.
Physiology	Cardiac cycle and heart sounds	2hrs	58. Discuss the cardiac cycle and its regulation. 59. Describe the concept of systole and diastole. 60. Describe the role of atria and ventricles as pumps. 61. Discuss pressure volume diagram during cardiac cycle. 62. Describe the functions of heart valves. 63. Correlate the cardiac cycle events with ECG. 64. Differentiate between first and second heart sounds. 65. Describe the mechanism of production of Normal and Abnormal heart sounds
	Cardiac output	1hr	66. Describe end-diastolic volume, ejection fraction, systolic volume, and stroke volume. 67. Explain Frank-Starling law of heart pumping. 68. Describe methods of measurement of cardiac output. 69. Discuss regulation and control of heart pumping. 70. Explain the role of potassium and calcium and temperature on heart function. 71. Describe Normal Cardiac output and venous return during rest and during activity.

Blood flow	2hrs	72. Discuss vascular distensibility and vascular compliance. 73. Describe the regulation of blood flow and “Starling forces” 74. Discuss arterial pressure pulsations. 75. Discuss auto-control of local blood flow. 76. Explain the local metabolic vasodilator hypothesis. 77. Describe the physiological vasodilators and vasoconstrictors. Explain their mechanism of action. 78. Describe the role of oxygen in long term regulation of blood flow.
Lymphatic System	1hr	79. Describe the function of lymphatic system in the maintenance of interstitial fluid volume. 80. Explain fluid filtration across the capillaries and pressure regulating it. 81. Describe the effects of interstitial fluid pressure on lymph flow 82. Describe how capillary hydrostatic dynamics can lead to tissue edema
Mechanics of Respiration	1hr	83. Discuss mechanics of respiration. 84. Discuss the muscles involved in lung expansion and contraction. 85. Discuss the pressures that cause movement of air in and out of lungs. 86. Explain the pressure volume changes graph during normal breathing.
Lung compliance and surfactant	1hr	87. Define compliance of the lung. 88. Discuss compliance curve. 89. Describe elastic forces caused by surface tension. 90. Explain the role of surfactant in the collapse of alveoli. 91. Discuss the role of surfactant in respiratory distress syndrome of newborn.
Lung volumes and capacities	1hr	92. Describe types of pulmonary volumes and its significance. 93. Discuss types of pulmonary capacities. 94. Explain the graph of lung volume and capacities.
Pulmonary ventilation	1hr	95. Define alveolar ventilation. 96. Discuss dead space and its effects on alveolar ventilation. 97. Compare anatomic and physiologic dead space. 98. Describe the basic concepts of measurement of dead space. 99. Define alveolar ventilation and minute ventilation.

Gas exchange	2hrs	<p>100. Enlist differences between composition of alveolar and atmospheric air.</p> <p>101. Discuss partial pressures of oxygen and carbon dioxide in alveoli and atmosphere.</p> <p>102. Describe physiological anatomy of respiratory membrane.</p> <p>103. Discuss the factors affecting gas diffusion through respiratory membrane.</p> <p>104. Describe the diffusing capacity of respiratory membrane.</p> <p>105. Describe the effects of ventilation/perfusion ratio of alveolar gas concentration.</p> <p>106. Discuss physiological shunt and dead space.</p> <p>107. Discuss abnormalities of ventilation perfusion ratio.</p>
Transport of O ₂ and CO ₂ in the blood	2hrs	<p>108. Discuss the transport of oxygen from lungs to tissue cells.</p> <p>109. Discuss the diffusion of carbon dioxide from tissue cells to alveoli.</p> <p>110. Describe the role of Hb in oxygen transport.</p> <p>111. Explain Oxy/Hb dissociation curve.</p> <p>112. Enlist the factors that shift Oxy/Hb dissociation curve to right and left.</p> <p>113. Describe the transport of oxygen in dissolved state and oxygen poisoning.</p> <p>114. Discuss the mechanism of transport of carbon dioxide in blood.</p> <p>115. State Bohr effect and Haldane effect.</p>
Regulation of Respiration	1hr	<p>116. Enlist respiratory centers in CNS.</p> <p>117. Describe the role of dorsal and ventral respiratory group of neurons.</p> <p>118. Discuss the chemical control of respiration.</p> <p>119. Explain the role of oxygen in respiratory control.</p> <p>120. Enlist the factors that affect respiration.</p>
Common Respiratory Abnormalities	1hr	<p>121. Describe periodic breathing and basic mechanism of Cheyne-Stokes breathing.</p> <p>122. Define sleep apnea.</p> <p>123. Describe hypoxia</p> <p>124. Describe cyanosis.</p>

			125. Describe hypercapnia and dyspnea.
Biochemistry	Complex lipids	2hrs	126. Define complex lipids. 127. Classify complex lipids. 128. Define and classify phospholipids. 129. Describe functions of glycolipids 130. Describe Lipoproteins, their functions, and bio-medical significance.
Lab Work			
Physiology	use of stethoscope for chest auscultation	2hrs	131. Demonstrate the use of stethoscope for chest auscultation. 132. Palpate and find apex beat, and auscultatory areas in the chest of the subject and describe its significance.
	Spirometry	2hrs	133. Draw a normal spirogram, labeling the four lung volumes and four capacities. 134. List the volumes that comprise each of the four capacities. 135. Identify which volume and capacities cannot be measured by spirometry. 136. Define the factors that determine total lung capacity, functional residual capacity, and residual volume.
Theme 3: Blood Pressure and Palpitations			
Physiology	Blood Pressure	1hr	137. Define blood pressure and discuss high and low blood pressures. 138. Describe Autonomic regulation of blood pressure. 139. Discuss the mechanism of baro receptors in arterial blood pressure control. 140. Discuss the chemo receptors and CNS ischemic response.
General Pathology	Circulatory Shock	1hr	141. Define shock and explain causes and types of circulatory shock. 142. Explain the stages of circulatory shock.
Biochemistry	Derived lipids	1hr	143. Define and classify Fatty Acids. 144. Describe the functions of fatty acids. 145. Describe the structure, bio-chemical functions, and fate of cholesterol. 146. Discuss the types of lipo-proteins.

Medicine	Hypertension	1hr	147. Define hypertension. 148. Enlist the causes and types of hypertension. 149. Identify the major risk factors contributing to diseases of the CVS. 150. Discuss the preventive strategies for hypertension.
Pharmacology	Anti-hypertensive drugs Drugs used to treat Arrhythmias	1hr	151. Classify antihypertensive drugs. 152. Describe the mechanism of action of drugs used to manage hypertension. 153. Enlist Antiarrhythmic drugs on the basis of their Effect on Action Potential
Anatomy	Conduction system of the heart	1hr	154. Describe the different components of conduction system of the heart 155. Describe sympathetic and parasympathetic innervation of the heart
Theme 4: Cough and Hemoptysis			
Anatomy	Introduction	1hr	156. Describe the major components of the (upper and lower) respiratory system.
	Trachea and bronchi	1hr	157. Describe the general and anatomical features of trachea and bronchi.
	Lungs	1hr	158. Describe the anatomical features of lungs.
Histology	Histological features of trachea	1hr	159. Describe the histological features of trachea and its layers.
Physiology	Functions of respiratory passageways	1hr	160. Describe the respiratory and non-respiratory functions of the respiratory passageways. 161. Discuss autonomic control of bronchial musculature. 162. Explain the role of mucous lining and cilia in bronchial tree. 163. Discuss cough and sneeze reflex.
Pathology	Pneumonias Pulmonary Tuberculosis Pulmonary Edema Bronchial Asthma	2hrs	164. Define pneumonia and enlist the causative pathogens of pneumonia. 165. Define primary and secondary Tuberculosis and state its etiology. 166. Define pulmonary edema and classify it according to underlying causes. 167. enlist the etiological factors and clinical features of asthma.

Pharmacology	Anti-Asthmatic drugs Anti-Tuberculous drugs	1hr	168. Classify Anti-asthmatic drugs. 169. Classify Anti-tuberculous drugs.
Community & Preventive Dentistry	Prevention of Respiratory disorders	1hr	170. Discuss preventive strategies of different problems related to respiratory system. 171. Discuss the relationship of smoking with lung diseases. 172. Describe preventive strategies for smoking.
Lab Work			
Histology	Microscopic features of trachea, bronchi, and lung alveoli.	2hrs	173. Identify the various microscopic features of trachea.
		2hrs	174. Identify the various microscopic features bronchi, and lung alveoli.

Learning Resources

S#	Subjects	Resources
1.	Anatomy	<p>A. GROSS ANATOMY</p> <ol style="list-style-type: none"> 1. BD Churasia 2. Last's Anatomy <p>B. EMBRYOLOGY</p> <ol style="list-style-type: none"> 1. Langman's Medical Embryology <p>C. HISTOLOGY</p> <ol style="list-style-type: none"> 1. Medical Histology By Laiq Hussain <p style="text-align: center;">Reference Books</p> <ol style="list-style-type: none"> 1. Netter Atlas of Human Anatomy 2. Gray's Anatomy
2	Biochemistry	<p style="text-align: center;">Text Books</p> <ol style="list-style-type: none"> 1. Lippincott illustrated reviews 8th 2. Harper's illustrated Biochemistry 30th 3. U. Satyanarayan and U. Chakarpani 4th <p style="text-align: center;">Reference Books</p> <ol style="list-style-type: none"> 1. Lippincott illustrated reviews 2. MLA. Harvey, Richard A., PhD. Lippincott's illustrated reviews: Biochemistry 3. U. Satyanarayana Biochemistry 4. U. satyanarayan and U. Chakarpani 4th edition 5. Harper's illustrated Biochemistry 6. Rodwell VW, Bender DA ,Botham KM., Kennelly PJ, Weil P. Eds. Victor W. Rodwell et al. 7. Fundamentals of Biochemistry 8. Donald V., Judith G. Voet, Charlotte W. John wiley and sons, New york 9. Netter's essential Biochemisty 10. Lippincott illustrated reviews 11. MLA. Harvey, Richard A., PhD. Lippincott's illustrated reviews: Biochemistry

3	Physiology	<p style="text-align: center;">Textbooks</p> <ol style="list-style-type: none"> 1. Guyton and Hall Textbook of Medical Physiology, 13th Edition by John E. Hall. 2. Human Physiology: From Cells to Systems, 8th Edition by Lauralee Sherwood 3. Ganong's Review of Medical Physiology, 24th Edition (LANGE Basic Science) by Kim E. Barrett, Susan M. Barman, Scott Boitano, Heddwen Brooks. <p style="text-align: center;">REFERENCE BOOKS</p> <ol style="list-style-type: none"> 1. Manual of Experimental Physiology 4 th Edition Prof. Dr. Zafar Ali Choudry 2. Practical Physiology 1st Edition Prof. Dr. Shafiq Ahmed Iqbal 3. Basis of Clinical Physiology Volume 1 Prof. Dr. Muhammad Akram 4. Basis of Clinical Physiology Volume 2 Prof. Dr. Muhammad Akram 5. System wise SEQs and MCQs with key Reference: Physiology by Guyton 1 st Edition Prof. Dr. Samina Malik
4	Oral Biology	<p style="text-align: center;">Textbook</p> <ol style="list-style-type: none"> 1. Ten Cate's Oral Histology 2. Orban's Oral Histology and Embryology 3. Concise Dental Anatomy and Morphology by James L. Fuller <p style="text-align: center;">Reference Books</p> <ol style="list-style-type: none"> 1. Oral Anatomy, Histology and Embryology by B.K.B Berkovitz