JINNAH SINDH MEDICAL UNIVERSITY

STUDY GUIDE	
PROGRAM	**MBBS**
MODULE TITLE	**Cardiovascular system -1**
ACADEMIC YEAR	**1st year MBBS-2025**
INTRODUCTION	This module is the first step towards producing doctors who have the basic information for decision making. This module provides the basis for Cardiovascular 2 and then rotations of Medicine in semesters 9 & 10. These latter modules are mainly clinical in nature and help students develop necessary skills in diagnosing and developing management plans for common Cardiovascular related conditions. This module will focus on the normal structure and function of the cardiovascular system and will help students apply this information to solve clinically relevant problems suitable for this level of students.
RATIONALE	CVS related morbidity and mortality in Pakistan are among the highest in the region. An in-depth understanding of managing CVS conditions is an essential part of expertise by our graduates. The country needs to offer safe health care delivery and produce safe general practitioners, especially those who can identify and provide initial management for CVS conditions. Hence it becomes imperative for institutions to provide detailed and clinically relevant information and skills to its students.
OUTCOMES	At the end of this module the students will be able to apply basic sciences knowledge to understand the basis of common CVS disease problems,
DEPARTMENTS INVOLVED	1. Anatomy, 2. Biochemistry, 3. Physiology

MODULE OBJECTIVES	By the end of the module, students will be able to:
LECTURES **ANATOMY**	**1. Overview of Cardiovascular system** • Explain the organization of cardiovascular system • Enumerate the components of cardiovascular system • Enumerate the vessels related to the heart **2. Middle Mediastinum: Pericardium** • Describe the boundaries of middle mediastinum • Discuss the contents of the middle mediastinum • Explain the different coverings of heart (pericardium) • Discuss the location of pericardial sinuses • Discuss the clinical conditions associated with the pericardium **3. External features of the Heart** • Describe the location, coverings, borders & surfaces of the heart • Discuss the external features of heart • Briefly discuss the chambers and valves of the heart • Discuss the different circulatory circuits and their working **4. Heart: Internal features- I & II (Demonstration)** • Describe the anatomical position of the heart • Describe the chambers and valves of the heart • Discuss the internal features of chambers and valves of right & left sides of heart. **5. Histology of Heart** • Discuss the basic structure of blood circulatory system • Enumerate the layers of the walls of heart • Describe the histological characteristics of cardiac muscle • Discuss the structure and significance of intercalated discs **6. Coronary blood vessels, blood supply of heart** • Describe coronary circulation and its importance

	• Name the different branches of coronary arteries and their area of supply • Describe variations of coronary arteries and right and left dominance • Discuss variations of coronary artery disease • Discuss clinical manifestations of blockage of coronary arteries • Discuss Myocardial Infarction and Angina Pectoris in relation to vessel occlusion **7. Conducting system of heart and nerve supply** • Describe the conducting system of heart • Explain the different components of conducting system • Discuss blood supply of conducting system of heart • Discuss the innervation of heart and clinical relevance of cardiac Pain **8. Surface markings of heart, valves and great vessels** • Describe the position of the heart • Identify the surface anatomy of heart on a mannequin or normal subject • Identify the surface marking of the borders, great vessels and valves of heart • Identify the surface markings of the areas of auscultation. **9. Development of Heart** • Discuss the development of heart tube • Describe the development of atria and interatrial septum, AV valves and aortic and pulmonary valves, ventricles and interventricular septum • Describe the partitioning of outflow tract and contribution of neural crest cells to this process **10. Congenital Anomalies of the Heart (Excluding vessels)**

	• Describe congenital heart defects • Discuss clinical features of heart defects **11. Development of arterial system & anomalies** • Discuss the relation of pharyngeal arches and aortic arches • Explain the fate and formation of aortic arches • Describe the formation of brachiocephalic trunk, common carotid and left sub clavian arteries • Describe the anomalies of arterial syste **12. Development of veins and their anomalies** • Describe the major veins of heart, coronary sinus, anterior cardiac veins, venae cordis minima • Explain the development and fate of umbilical, vitelline and cardinal veins • Describe the anomalies of venous system **13. Fetal Circulation** • Describe the components of fetal circulation • Describe the location of foramen ovale • Describe the ductus arteriosus • Explain the path of fetal circulation • Explain the changes in circulation after birth • Discuss the problems with persistence of fetal components of circulation after birth (Patent ductus arteriosus and patent foramen ovale)
BIOCHEMISTRY	**1. Fatty Acid & Triacylglycerol Metabolism** • Overview of Digestion and Absorption of lipids • Discuss the biochemical significance of Fatty Acids • Discuss the synthesis of fatty acids • Discuss the regulation of fatty acid synthesis • Describe energy requirement during fatty acid synthesis

	• Describe the synthesis of Triacylglycerol **2. Beta oxidation** • Discuss the beta oxidation of fatty acids • Discuss the regulation of beta oxidation • Describe energy generation during beta oxidation • Name the steps of unsaturated fatty acid oxidation • Compare fatty acid synthesis with fatty acid oxidation **3. Cholesterol Metabolism** • Overview of cholesterol structure and functions • Describe the mechanism of cholesterol synthesis and its degradation • Discuss the regulation of cholesterol metabolism • Explain the formation of Bile salts and vitamin D • Describe the clinical significance of cholesterol • Discuss the biochemical role of cholesterol in CVS diseases • Discuss the clinical significance of hyperlipidemia **4. Transport of Lipids** • Classify the lipoproteins • Discuss the metabolism of lipoproteins • Discuss the transport of lipoproteins • Discuss the clinical significance of lipoproteins **5. Ketone Bodies Metabolism** • Classify the Ketone bodies • Describe the biochemical role of Ketone bodies • Describe Ketone bodies synthesis and utilization. • Discuss the mechanism of ketoacidosis • Discuss the clinical significance of ketone bodies **6. Oxidants & Antioxidants** • Classify oxidants and antioxidants

	• List the sources of oxidants and antioxidants • Discuss the biochemical role of oxidants and antioxidants • Discuss their biochemical role in CVS diseases **7. Role of Minerals in Blood Pressure Regulation** • Minerals in B.P regulation • Overview of hypertension and its risk factors. • Describe the mechanism of action of sodium and potassium in blood pressure regulation • Explain dietary approaches to reduce hypertension. • List others life style interventions for the management of hypertension
PHYSIOLOGY	**1. Properties of cardiac muscles.** • Define properties of cardiac muscles. • Explain the phenomenon of generation of action potential in cardiac muscles and process of excitation contraction coupling. • Define Syncytium **2. Excitatory and conductive system of heart.** • Describe conducting system of heart and role of pacemaker in maintaining cardiac rhythm. • Explain the regulation of heart rhythmicity and conduction by autonomic nervous system **3. Cardiac cycle /heart sounds.** • Describe events of cardiac cycle and associated events (pressure changes, heart sound generation, and effect on volume of heart chambers and vessels (aorta, pulmonary artery). **4. ECG 1: Lead System** • Describe 12 lead ECG record • Define Einthoven's triangle & Einthoven's law **5. ECG 2: Normal ECG Pattern**

	• Describe the meaning of various normal ECG waves. **6. ECG 3: Vector Analysis** • Analyze ECG/ vectors and their interpretation. • Define Right & left Axis deviation **7. Cardiac Arrhythmias** • Abnormal sinus rhythm • Heart block • Paroxysmal Tachycardia • Ventricular / Atrial fibrillation • Cardiac arrest **8. Overview of circulation (blood flow, pressure, resistance).** • Define vascular distensibility and compliance. • Define blood flow pressure and resistance in different blood vessels. • Explain veins and their functions. **9. Cardiac output, venous return and its regulation.** • Define cardiac output and factors regulating cardiac output. **10. Nervous regulation of circulation and arterial pressure (Rapid control)** • Define arterial blood pressure • Define baroreceptor reflexes, chemoreceptor reflexes, bain bridge reflex, CNS ischemic response **11. Intermediate and long term control of blood pressure** • state mechanism of regulation of blood pressure (intermediate and long term) **12. Local control of blood flow** • Explain the process of Acute and long term blood flow regulation. • Discuss auto regulation of blood flow.

	• Describe Humoral regulation of circulation **13. Microcirculation** • Describe Starling Equilibrium for capillary exchange **14. Lymphatic system and edema** • List the functions of lymphatic system • Describe the causes of edema **15. Circulatory shock.** • Explain physiological causes of shock, its stages and types **16. CVS adaption during exercise.** • Describe cardiovascular adaptation to exercise **17. Ischemic Heart Disease** • Describe the causes of ischemic heart diseases (Myocardial Infarction, Angina)
PRACTICALS **ANATOMY**	**1. Histology of the heart** • Describe the characteristic histological features of cardiac muscle and layers of heart walls under the light microscope **2. Histology of vessels** • Describe the characteristic histological features of blood vessels under the light microscope.
BIOCHEMISTRY	**1. Triacylglycerol (TAGs)** • Identify the chemical tests and bio-techniques to detect Triacylglycerol • Outline the method for detection of Triacylglycerol in a sample • Describe the estimation of TAGs in the given sample by Spectrophotometry • Interpret clinical conditions correlated with their laboratory investigations **2. Total Cholesterol, HDL & LDL Estimation**

	• Name the chemical tests and bio-techniques to detect Total cholesterol, HDL & LDL • Outline the method for detection of Total cholesterol, HDL & LDL in a sample • Perform the estimation of total cholesterol, HDL & LDL in serum by Spectrophotometry • Interpret laboratory investigations report of relevant clinical conditions **3. Cardiac Biomarkers** • Outline the bio-techniques for detection of Cardiac biomarkers in a sample • Discuss the importance of cardiac biomarkers in the diagnosis of CVS disease • Interpret laboratory investigations reports of relevant clinical conditions
PHYSIOLOGY	**1. Power Lab. The Refractory Period of Cardiac Muscle.** • Record refractory period of cardiac muscles through power lab. **2. Major Components of ECG. Correlation of ECG and Heart Sounds.** • Setup ECG machine and arrangement of leads. **3. Normal and abnormal heart sounds** • Differentiate between normal and abnormal heart sounds. **4. Examination of Arterial Pulse**. • Examine the radial pulse (rate, rhythm, volume) • Mention different types of pulse. **5. Recording of blood pressure** • Record blood pressure by placatory and auscultatory methods.
TUTORIALS	**1. Anatomic Radiology**

ANATOMIC RADIOLOGY	• Identify parts of the heart and major vessels on normal chest X-ray
BIOCHEMISTRY	**1. Lipid Profile** • Discuss the importance of lipid profile in CVS diseases • Interpret clinical conditions correlated with their laboratory investigations. **2. Cardiac Biomarkers** • Discuss the importance of cardiac biomarkers in CVS diseases • Interpret clinical conditions correlated with their laboratory investigations.
SKILLS LAB	**Examination of Precordium** • Perform complete precordial examination on a mannequin/ normal human subject • Calculate heart rate by palpating the radial pulse on normal human subjects
INTERNAL ASSESSMENT	• Internal assessment will contribute 20% of the marks to the final score. The pattern of assessment will vary among the institutions.
ANNUAL EXAMINATION	• MCQs and OSPE (observed + un observed).
MODULE EVALUATION	• Module evaluation will be obtained through a feedback form which will be posted on the JSMU website