Blood & Immunology Module I

First Professional Year MBBS

5 Weeks

KMU - Central Curriculum Committee

Table of Contents

General Learning Outcomes *4*

COGNITIVE DOMAIN **4**

PSYCHOMOTOR DOMAIN **4**

ATTITUDE AND BEHAVIOUR **5**

THEMES FOR BLOOD MODULE *6*

THEME –I *7*

Pallor and Swelling *7*

ANATOMY **7**

PHYSIOLOGY **7**

BIOCHEMISTRY **8**

PATHOLOGY **10**

PHARMACOLOGY **10**

COMMUNITY MEDICINE **10**

LAB WORK **10**

ANATOMY PRACTICAL (HISTOLOGY) 10

PHYSIOLOGY PRACTICAL 11

THEME –II *1*

Fever (Infection and Immunology) *1*

ANATOMY **1**

PHYSIOLOGY **1**

Biochemistry **4**

COMMUNIUTY MEDICINE **4**

LAB WORK **4**

PHYSIOLOGY PRACTICAL 4

THEME –III *5*

Excessive Bleeding *5*

PHYSIOLOGY **5**

Pharmacology **6**

LAB WORK **6**

THEME –IV *7*

Transfusion Reaction *7*

PHYSIOLOGY 7

Forensic Medicine 8

COMMUNITY MEDICINE 8

LAB WORK (Physiology Practical) 9

General Learning Outcomes

COGNITIVE DOMAIN

By the end of this module, First year MBBS students shall be able:

1. Identify & describe the various cellular and non-cellular components of blood in relation to its Anatomy, Physiology & Biochemistry
2. Describe structure, synthesis and degradation of Hemoglobin
3. Describe the regulatory mechanisms of normal hemostasis and coagulation
4. Describe the conditions associated with dysfunction of cellular and non-cellular components of blood
5. Describe the basic characteristics of immune system.
6. Discuss the structure, functions and biochemical aspects of the Lympho-reticular system.
7. Explain the principles and clinical significance of ABO/RH blood grouping system
8. Explain the pathophysiology of various bleeding disorders
9. Identify the role of pharmacology in anemia and bleeding disorders.

PSYCHOMOTOR DOMAIN

Description of the psychomotor skills to be developed and the level of performance required:

By the end of BLOOD Module, the student should be able to:

1. Carry out practical work as instructed in an organized and safe manner
2. Make and record observations accurately.
3. Identify slide of Lymph node, thymus, tonsils and spleen under microscope
4. Identify slide of Gut associated lymphoid tissue
5. Determine percentage of formed blood elements.
6. Identify RBC and should be able to do its counting on counting chamber and to know normal values. And also classify Anemia morphologically.

7. Determine the Hemoglobin with the apparatus and have knowledge of normal and abnormal value.
8. Identify WBC morphology and its different types, should be able to count them on counting chamber and to know the normal values. Diagnostic importance of each WBC.
9. Identify Platelets and should be able to do its counting on counting chamber and to know normal values. Its diagnostic importance in relation to bleeding disorders
10. Perform bleeding time and clotting time and to know normal values and its diagnostic importance in relation to bleeding disorders.
11. Perform Blood groups typing and Rh factor.
12. Perform ESR and to know its normal value and prognostic importance.
13. Detect blood, bile pigments & bile salts in the given sample of urine

ATTITUDE AND BEHAVIOUR

By the end of BLOOD Module the student shall gain the ability and carry responsibility to:

1. Demonstrate ability to give and receive feedback, respect for self and peers.
2. Demonstrate empathy and care to patients.
3. Develop respect for the individuality and values of others - (including having respect for oneself) patients, colleagues and other health professionals
4. Organize& distribute tasks
5. Exchange opinion & knowledge
6. Develop communication skills and etiquette with sense of responsibility.
7. To equip themselves for teamwork
8. Regularly attend the classes
9. Demonstrate good laboratory practices

THEMES FOR BLOOD MODULE

SNO	Theme	Duration
1	Pallor and swelling	2 weeks
2	Fever (Infection and Immunity)	2 weeks
3	Excessive bleeding & Transfusion Reaction	1 week

THEME –I Pallor and Swelling		
SNO	**Topic**	**Learning Outcomes**
ANATOMY		
1	**Introduction to hematopoietic system**	1. Describe various components of hematopoietic system including their locations and their functions 2. Describe surface anatomy and applied anatomy of main organs of hematopoietic system 3. Define and classify lymphoid organs and lymphoid tissues
PHYSIOLOGY		
2	**Introduction to Blood**	4. Describe the composition and functions of blood 5. Define Hematocrit 6. Enlist the components of plasma 7. Explain the difference between Serum and plasma
3	**Red Blood Cells**	8. Describe the structure, function, life span and normal count of Red Blood Cells. 9. Define Haemopoiesis 10. Classify haematopoitic stem cells 11. Summarize the erythropoiesis sites during pre-natal and post-natal periods.

4	**Red Blood Cells Genesis** Erythropoiesis	12. Illustrate the stages of RBC development from pluripotent hematopoietic stem cells to a mature RBC. 13. Describe the erythropoiesis and factors regulating erythropoiesis 14. Describe the role of Vitamin B12 and Folic acid in RBC maturation. 15. Describe the effects of deficiency of Vita- min B12 and Folic acid on RBC maturation.
5	**Erythropoitin**	16. Describe source, control / regulation and functions of Erythropoitin 17. Explain the role of Erythropoietin in RBC production. 18. Describe the effects of high altitude and exercise on RBC production.
6	**Anemia**	19. Define and describe the different types of anemia 20. Define hemolysis 21. Describe the various red cell indices 22. Interpret the diagnosis of anemia by using red cell indices 23. Describe the effects of anemia on functions of circulatory system / human body
7	**Polycythemia**	24. Define and classify polycythemia 25. Differentiate between primary and secondary Polycythemia
BIOCHEMISTRY		
8	**Introduction of Porphyrins**	26. Define Porphyrins 27. Describe Chemistry of Porphyrins

		28. Enlist the types, metabolic causes and clinical presentation of different types of Porphyrias.
9	**Iron metabolism**	29. Describe the iron metabolism
10	**Introduction to heme synthesis and degradation**	30. Define heme and Describe its structure and functions 31. Describe the biochemical features of the hemoglobin molecules 32. Describe Heme Synthesis on cellular and molecular level 33. Describe Heme Degradation 34. Describe the Regulation of Heme Synthesis. 35. Describe the concept of Oxygen binding with hemoglobin 36. Describe the normal picture of blood chemistry.
11	**Hemoglobinopathies**	37. Define Hemoglobinopathies and enlist the variants of hemoglobin 38. Describe causes of Hemoglobinopathies 39. Describe two major categories of hemoglobinopathies 40. Describe the amino acid substitution in sickle cell disease. 41. Define and Classify thalassemias. 42. Explain the genetic defects in α and β thalassemias. 43. Enlist the clinical features of α and β thalassemias
12	**Water soluble vitamins**	44. Discuss water soluble vitamins including Vitamin B complex Vitamin C Folic Acid

PATHOLOGY		
13	• **Anemia's of diminished erythropoiesis**	45. define anemia 46. List the factors for regulation of erythropoiesis 47. Enlist the types of anemia
14	• **Hemolytic anemia's**	48. Define hemolytic anemia. 49. Enlist types of hemolytic anemia.
PHARMACOLOGY		
15	**Drug treatment of anemia's**	50. Enlist the drugs used in the treatment of iron deficiency & Megaloblastic anemia 51. Describe the pharmacological basis/ role of iron in iron deficiency anemia (hypochromic normocytic anemia) 52. Describe the pharmacological basis/ role of vit B12 and folic acid in megaloblastic anemia 53. Describe the role of Erythropoietin in the treatment of Anemia (normochromic normocytic anemia)
COMMUNITY MEDICINE		
16	**Epidemiology of blood borne diseases**	54. Describe Epidemiology of Iron Deficiency Anemia 55. Describe prevention of different types of anemia's in community

LAB WORK		
ANATOMY PRACTICAL (HISTOLOGY)		
17	**Histology**	56. Identify and describe the microscopic anatomy of lymph node, thymus, bone marrow and spleen under microscope 57. Compare the histological features of lymph node, thymus and spleen

PHYSIOLOGY PRACTICAL		
18	**Hemoglobin determination**	58. Assist in phlebotomy while practicing aseptic procedure. 59. Determine the hemoglobin (Hb) concentration in the given sample 60. Estimation of hemoglobin by Sahli's method 61. Determination of packed cell volume
19	**Blood cells**	62. Identify and describe various blood cells under microscope.
20	**RBC count**	63. Determine the red blood cell (RBC) count in the given sample and calculate RBC indices

THEME -II

Fever (Infection and Immunology)

SNO.	Topic	Learning Outcomes
	ANATOMY	
23	**Gross anatomy of hematopoietic system**	64. Locate, identify and describe the main gross external features of spleen, lymph node, thymus and tonsils 65. Describe neurovascular supply of the mentioned structures 66. Outline the surface anatomy of main lymph nodes, spleen, thymus and tonsils 67. Enlist the causes of splenic injuries
24	**Histology of lymphoid tissues**	68. Describe the overview of lymphatic tissue including MALT 69. Identify and describe the histological features and functions of Lymph node 70. Identify and describe the histological features and functions of Thymus 71. Identify the locations of tonsils and describe the histological features and functions of Tonsils 72. Describe the histological features and functions of spleen.
25	**Embryology/ Developmental Anatomy of lymphoid tissue**	73. Describe the development of lymphoid organs including lymph nodes, tonsils, thymus and spleen
	PHYSIOLOGY	

26	**White Blood Cells**	74. Classify white blood cells 75. Describe the structure, function, life span and normal count of White Blood Cells 76. Describe the stages of differentiation of white blood cells (leukopoiesis) 77. Describe the characteristics of WBCs (phagocytosis / chemotaxis, diapedesis)
27	**Reticulo-endothelial (**Monocyte-Macrophage**) system**	78. Describe the components of reticulo-endothelial system (monocyte-macrophage system) 79. Describe the role of monocyte macrophage system in immunity 80. Explain the role of neutrophils, macrophages, basophils, eosinophils and monocytes in providing immunity against infections (immune system)
28	**Inflammation**	81. Define inflammation 82. Describe characteristics of inflammation (hallmark of inflammation) 83. Describe the causes, sequence of events and cardinal signs of inflammation
29	**Abnormal leukocyte counts/ Leukemia**	84. Define Leukopenia and Leukocytosis and Leukemia
30	**Introduction to immunity**	85. Define and classify immunity 86. Define antigen 87. Define pathogen 88. Enlist the tissues that contribute to immunity and explain their function 89. Describe the functions of immune system 90. Describe the structure and function of lymphatic system
31	**Immune system**	91. Enlist the three lines of defenses and outline their properties

		92. Describe the characteristics, origin and functions of cells of immune system 93. Describe the types of immunity 94. Enlist the innate defenses 95. List the substances and cells that participate in adaptive immunity 96. Compare the **characteristics** innate and acquired immunity 97. Compare the active and passive immunity mechanism
32	**Immune response**	98. Differentiate between primary and secondary immune response 99. Describe the roles of cytokines, chemokines, and colony-stimulating factors in the immune response
33	**Humoral and cell mediated immunity**	100. Describe the role of T and B lymphocytes in immunity 101. Describe the role of B lymphocytes in humoral immunity 102. Describe cell mediated and humoral immunity 103. Explain how helper T cells regulate the immune system 104. Explain the function of cytotoxic T cells 105. Describe the role of helper T cells 106. Differentiate between humoral and cell mediated immunity
34	**Complement system**	107. Describe the complement system 108. Explain how the complement system elicits the inflammatory response, lyses foreign cells, and increases phagocytosis 109. Describe the two pathways that activate the complement system 110. compare Classic and alternate pathways pathways of complement activation

35	**Immunity: extremes of ages**	111. Compare the active and passive immunity 112. Explain the transfer of passive immunity from mother to fetus and from mother to infant during breast-feeding 113. Describe changes in immune response that occurs with aging
36	**Allergy & Hypersensitivity**	114. Define allergy and allergen 115. Describe the pathophysiology of allergy and hypersensitivity 116. Define and classify the hypersensitivity reaction 117. Compare the immediate and delayed hypersensitivity reactions 118. List the diseases associated with hypersensitivity reactions
Biochemistry		
37	**Immunoglobulin's / Antibodies**	119. Define Immunoglobulin's 120. DESCRIBE Types of Immunoglobulin's 121. Describe Structure of Immunoglobulin's 122. Describe the mechanism of action of antibodies 123. Explain biochemical role of each immunoglobulin in immunity
COMMUNIUTY MEDICINE		
38	**Vaccinology**	146. Define vaccine and immunization 147. Explain the expanded program of immunization (EPI) in Pakistan
LAB WORK		
PHYSIOLOGY PRACTICAL		
39	**TLC determination**	148. Determine the total leukocyte count (TLC) in the given sample

40	**DLC determination**	149. Determine the differential leukocyte count (DLC) in the given sample

THEME -III

Excessive Bleeding

PHYSIOLOGY

SNO	Topic	Learning Outcome
41	**Introduction to hemostasis**	150. Describe the structure, function, life span and normal count of Platelets. 151. Define hemostasis 152. Describe the role of platelets in hemostasis 153. Outline the sequence of processes involved in hemostasis.
42	**Blood Coagulation**	154. Enlist the clotting factors 155. Explain the role of calcium in coagulation 156. Explain how clotting is prevented in the normal vascular system 157. Outline the sequence of processes during blood coagulation 158. Describe with the help of a flow diagram (or draw) intrinsic pathway of coagulation cascade 159. Describe with the help of a flow diagram (or draw) extrinsic pathway of coagulation cascade 160. Explain how the mechanism of clot dissolution.

43	**Bleeding disorders**	161. describe the role of Vit K in clotting 162. Describe the following bleeding disorders - Vitamin K deficiency - Thrombocytopenia - Hemophilia 163. Define Von Willebrand disease
44	**Thrombotic disorders**	164. Describe the effects of low platelet count on Hemostasis 165. Define thrombus/thrombi 166. Define emboli/embolus 167. Enlist the causes of thromboembolic conditions 168. Describe Femoral venous thrombosis and pulmonary embolism
Pharmacology		
45	**Coagulation modifying drug**	169. Identify the site of action of following drugs in coagulation cascade • Aspirin, • Heparin, • Tranexamic acid • Vit K
LAB WORK		
46	**Clotting time determination**	170. Determine the clotting time
47	**Bleeding time determination**	171. Determine the bleeding time
48	**Prothrombin time determination**	172. Determine the Prothrombin time (PT) in the given sample

THEME -IV Transfusion Reaction		
SN0	**Topic**	**Learning Outcome**
PHYSIOLOGY		
49	**Blood Grouping**	173. Describe different types of blood groups 174. Describe the genotype-phenotype relationships in blood groups. 175. Interpret the plausible blood groups (A-B-O) in children of parents with known blood groups. 176. Describe the role of agglutinogens and agglutinins in blood grouping 177. Describe the antigens and antibodies of the O-A-B blood types/ Interpret the types of agglutinins present in individuals with a specific blood group 178. Describe the process of agglutination
50	**transfusion reactions**	179. Describe the antigens and antibodies of the Rh system

		180. Describe the principles of blood typing 181. Explain universal donor and universal recipient blood groups 182. Enlist the manifestations of transfusion reaction
51	**Erythroblastosis fetalis**	183. Define Rhesus incompatibility 184. Describe erythroblastosis fetalis 185. Describe the transfusion reactions resulting from mismatched O-A-B and Rh blood types
52	**Major histocompatibility complex**	186. Define autoimmunity 187. Explain how immune reaction to self-antigens is avoided 188. Define and classify Major Histocompatibility complex (MHC) Characterize the significance and function of major histocompatibility complex molecules
Forensic Medicine		
53	**Medico-legal importance of blood groups**	189. Describe the Medico-legal importance of blood groups in forensic work that is (a)Personal Identity b)inheritance claims (c) DNA profiling (d) Disputed paternity and maternity
COMMUNITY MEDICINE		
54	**epidemiology of blood borne diseases**	190. Identify important blood borne pathogens and how they are spread 191. Discuss the epidemiology of blood borne disease transmission and the potential for HIV, HBV and HCV transmission. 192. Identify routes of transmission of blood borne pathogens

		193. Discuss the best practices to perform safe blood transfusion. 194. Identify potential exposure risks 195. List important safeguards against blood borne pathogen disease
LAB WORK (Physiology Practical)		
55	**Blood grouping**	196. Determine the O-A-B and Rh blood group in the given sample
56	**Blood smear preparation**	197. Prepare blood smear by thumb prick method.
70	**Blood Bank**	198. Observe the process of blood donation, blood product separation, screening and storage and observe the process of blood transfusion.