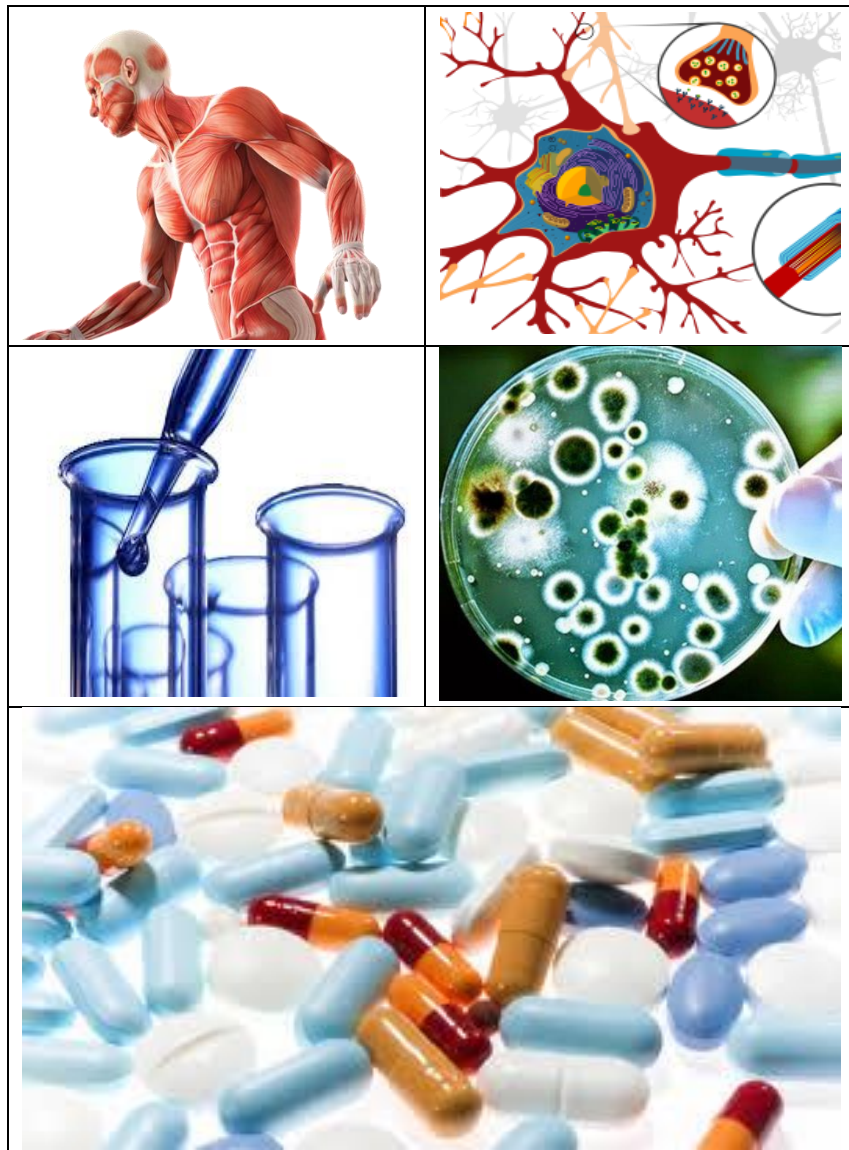


# Blood and Immunology Module

## First Professional Year MBBS

4 Weeks



## **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 Lymphoreticular 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
10. Describe the basics of communication skills
11. Describe different types of stress, and its behavioral aspects

### **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. Describe the 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

<b>SNO</b>	<b>Theme</b>	<b>Duration</b>
1	Pallor and fatigue	1 weeks
2	Fever (Infection and Immunity)	2 weeks
3	Excessive bleeding & Transfusion Reaction	1 week

# **BLOOD MODULE**

## **THEME –I**

### **Pallor and fatigue**

<b>SNO</b>	<b>Topic</b>	<b>Learning Outcomes</b>
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<b>ANATOMY</b>		
1	<b>Introduction to hematopoietic system</b>	1. Define and classify lymphoid organs and lymphoid tissues
<b>PHYSIOLOGY</b>		
2	<b>Introduction to Blood</b>	2. Describe the composition and functions of blood 3. Define Hematocrit 4. Enlist the components of plasma 5. Explain the difference between Serum and plasma
3	<b>Red Blood Cells</b>	6. Describe the structure, function, life span and normal count of Red Blood Cells. 7. Define Haemopoiesis 8. Classify haematopoietic stem cells 9. Summarize the erythropoiesis sites during pre-natal and post-natal periods.
4	<b>Red Blood Cells Genesis</b> Erythropoiesis	10. Illustrate the stages of RBC development from pluripotent hematopoietic stem cells to a mature RBC. 11. Describe the erythropoiesis and factors regulating erythropoiesis 12. Describe the role of Vitamin B12 and Folic acid in RBC maturation. 13. Describe the effects of deficiency of Vitamin B12 and Folic acid on RBC maturation.

5	<b>Erythropoitin</b>	<p>14. Describe source, control / regulation and functions of Erythropoitin</p> <p>15. Explain the role of Erythropoietin in RBC production.</p> <p>16. Describe the effects of high altitude and exercise on RBC production.</p>
6	<b>Anemia</b>	<p>17. Define and describe the different types of anemia</p> <p>18. Define hemolysis</p> <p>19. Describe the various red cell indices</p> <p>20. Interpret the diagnosis of anemia by using red cell indices</p> <p>21. Describe the effects of anemia on functions of circulatory system / human body</p>
7	<b>Polycythemia</b>	<p>22. Define and classify polycythemia</p> <p>23. Differentiate between primary and secondary Polycythemia</p>
<b>BIOCHEMISTRY</b>		
8	<b>Introduction of Porphyrins</b>	<p>24. Define Porphyrins</p> <p>25. Describe Chemistry of Porphyrins</p> <p>26. Enlist the types, metabolic causes and clinical presentation of different types of Porphyrias.</p>
	B- Complex vitamins	
9	<b>Iron metabolism</b>	27. Describe the iron metabolism



10	<b>Introduction to heme synthesis and degradation</b>	<p>28. Define heme and Describe its structure and functions</p> <p>29. Describe the biochemical features of the hemoglobin molecules</p> <p>30. Describe Heme Synthesis on cellular and molecular level</p> <p>31. Describe Heme Degradation</p> <p>32. Describe the Regulation of Heme Synthesis.</p> <p>33. Describe the concept of Oxygen binding with hemoglobin</p>
11	<b>Hemoglobinopathies</b>	<p>34. Define Hemoglobinopathies and enlist the variants of hemoglobin</p> <p>35. Describe causes of Hemoglobinopathies</p> <p>36. Describe two major categories of hemoglobinopathies</p> <p>37. Describe the amino acid substitution in sickle cell disease.</p> <p>38. Define and Classify thalassemias.</p> <p>39. Explain the genetic defects in <math>\alpha</math> and <math>\beta</math> thalassemias.</p> <p>40. Enlist the clinical features of <math>\alpha</math> and <math>\beta</math> thalassemias</p>
12	<b>Proteins</b>	<p>41. Define proteins,</p> <p>42. Describe the Biomedical importance of Proteins</p> <p>43. Classify proteins based on Physiochemical properties, Functions, Nutrition</p> <p>44. Explain Structure of proteins</p> <p>45. Describe the significance of Proteins</p>

13	<b>Amino Acids</b>	<p>46. Define Amino acids,</p> <p>47. Describe their structure, properties &amp; functions</p> <p>48. Classify Amino Acid</p> <p>49. Describe nutritional significance of amino acids</p> <p>50. Describe Dissociation, titration and importance of amino acid in pH maintenance</p>
14	<b>Proteins</b>	<p>51. Explain Separation of proteins e.g. salting out, ELISA, Electrophoresis, Chromatography, Centrifugation</p>
15	<b>Proteins</b>	<p>52. Explain Separation of proteins e.g. Chromatography, Centrifugation</p>
16	<b>Plasma Proteins</b>	<p>53. Classify and describe the physical, chemical and electro-phoretic properties of plasma proteins.</p> <p>54. Illustrate the production of plasma proteins and the factors affecting plasma protein synthesis.</p> <p>55. Describe clinical significance of Plasma proteins</p> <p>56. Explain Globulin proteins and Albumin with their functions</p> <p>57. Explain gamma Globulin proteins and Albumin with their functions</p>
<b>PATHOLOGY</b>		
17	<ul style="list-style-type: none"> <li>• <b>Anemia's of diminished erythropoiesis</b></li> </ul>	<p>58. define anemia</p> <p>59. List the factors for regulation of erythropoiesis</p> <p>60. Enlist the types of anemia</p>
18	<ul style="list-style-type: none"> <li>• <b>Hemolytic anemia's</b></li> </ul>	<p>61. Define hemolytic anemia.</p>

		62. Enlist types of hemolytic anemia.
<b>PHARMACOLOGY</b>		
19	<b>Drug treatment of anemia's</b>	<p>63. Enlist the drugs used in the treatment of iron deficiency &amp; Megaloblastic anemia</p> <p>64. Describe the pharmacological basis/ role of iron in iron deficiency anemia</p> <p>65. Describe the pharmacological basis/ role of vit B12 and folic acid in megaloblastic anemia</p> <p>66. Describe the role of Erythropoietin in the treatment of Anemia</p>
<b>COMMUNITY MEDICINE</b>		
20	<b>Epidemiology of blood borne diseases</b>	<p>67. Describe Epidemiology of Iron Deficiency Anemia</p> <p>68. Describe prevention of different types of anemia's in community</p>

## BLOOD MODULE

## **THEME –II**

# **Fever (Infection and Immunology)**

SNO.	Topic	Learning Outcomes
<b>ANATOMY</b>		
27	<b>Histology of lymphoid tissues</b>	<p>79. Identify and describe the histological features and functions of Lymph node</p> <p>80. Identify and describe the histological features and functions of Thymus</p> <p>81. Identify the locations of tonsils and describe the histological features and functions of Tonsils</p> <p>82. Describe the histological features and functions of spleen.</p>
<b>PHYSIOLOGY</b>		
29	<b>White Blood Cells</b>	<p>83. Classify white blood cells</p> <p>84. Describe the structure, function, life span and normal count of White Blood Cells</p> <p>85. Describe the stages of differentiation of white blood cells (leukopoiesis)</p> <p>86. Describe the characteristics of WBCs (phagocytosis / chemotaxis, diapedesis)</p>
30	<b>Reticulo-endothelial (Monocyte-Macrophage) system</b>	<p>87. Describe the components of reticulo-endothelial system (monocyte-macrophage system)</p> <p>88. Describe the role of monocyte macrophage system in immunity</p> <p>89. Explain the role of neutrophils, macrophages, basophils, eosinophils and monocytes in providing immunity against infections (immune system)</p>
31	<b>Inflammation</b>	

		<p>90. Define inflammation</p> <p>91. Describe characteristics of inflammation (hallmark of inflammation)</p> <p>92. Describe the causes, sequence of events and cardinal signs of inflammation</p>
32	<b>Abnormal leukocyte counts/ Leukemia</b>	<p>93. Define Leukopenia and Leukocytosis and Leukemia</p>
33	<b>Introduction to immunity</b>	<p>94. Define and classify immunity</p> <p>95. Define antigen</p> <p>96. Define pathogen</p> <p>97. Enlist the tissues that contribute to immunity and explain their function</p> <p>98. Describe the functions of immune system</p> <p>99. Describe the structure and function of lymphatic system</p>
34	<b>Immune system</b>	<p>100. Enlist the three lines of defenses and outline their properties</p> <p>101. Describe the characteristics, origin and functions of cells of immune system</p> <p>102. Describe the types of immunity</p> <p>103. Enlist the innate defenses</p> <p>104. List the substances and cells that participate in adaptive immunity</p>

		<p>105. Compare the <b>characteristics</b> innate and acquired immunity</p> <p>106. Compare the active and passive immunity mechanism</p>
35	<b>Immune response</b>	<p>107. Differentiate between primary and secondary immune response</p> <p>108. Describe the roles of cytokines, chemokines, and colony-stimulating factors in the immune response</p>
36	<b>Humoral and cell mediated immunity</b>	<p>109. Describe the role of T and B lymphocytes in immunity</p> <p>110. Describe the role of B lymphocytes in humoral immunity</p> <p>111. Describe cell mediated and humoral immunity</p> <p>112. Explain how helper T cells regulate the immune system</p> <p>113. Explain the function of cytotoxic T cells</p> <p>114. Describe the role of helper T cells</p> <p>115. Differentiate between humoral and cell mediated immunity</p>
37	<b>Complement system</b>	<p>116. Describe the complement system</p> <p>117. Explain how the complement system elicits the inflammatory response, lyses foreign cells, and increases phagocytosis</p> <p>118. Describe the two pathways that activate the complement system</p> <p>119. compare Classic and alternate pathways pathways of complement activation</p>

38	<b>Immunity: extremes of ages</b>	<p>120. Compare the active and passive immunity</p> <p>121. Explain the transfer of passive immunity from mother to fetus and from mother to infant during breast-feeding</p> <p>122. Describe changes in immune response that occurs with aging</p>
39	<b>Allergy &amp; Hypersensitivity</b>	<p>123. Define allergy and allergen</p> <p>124. Describe the pathophysiology of allergy and hypersensitivity</p> <p>125. Define and classify the hypersensitivity reaction</p> <p>126. Compare the immediate and delayed hypersensitivity reactions</p> <p>127. List the diseases associated with hypersensitivity reactions</p>
<b>Biochemistry</b>		
40	<b>Immunoglobulin's / Antibodies</b>	<p>128. Define Immunoglobulin's</p> <p>129. DESCRIBE Types of Immunoglobulin's</p> <p>130. Describe Structure of Immunoglobulin's</p> <p>131. Describe the mechanism of action of antibodies</p> <p>132. Explain biochemical role of each immunoglobulin in immunity</p>
<b>COMMUNIUTY MEDICINE</b>		
41	<b>Vaccinology</b>	<p>146. Define vaccine and immunization</p> <p>147. Explain the expanded program of immunization (EPI) in Pakistan</p>
<b>LAB WORK</b>		



**PHYSIOLOGY PRACTICAL**

42	<b>TLC determination</b>	148. Determine the total leukocyte count (TLC) in the given sample
43	<b>DLC determination</b>	149. Determine the differential leukocyte count (DLC) in the given sample

**PHYSIOLOGY**

**Blood MODULE**

**THEME –III**

**Excessive Bleeding**

SNO	Topic	Learning Outcome
44	<b>Introduction to hemostasis</b>	<p>150. Describe the structure, function, life span and normal count of Platelets.</p> <p>151. Define hemostasis</p> <p>152. Describe the role of platelets in hemostasis</p> <p>153. Outline the sequence of processes involved in hemostasis.</p>
45	<b>Blood Coagulation</b>	<p>154. Enlist the clotting factors</p> <p>155. Explain the role of calcium in coagulation</p> <p>156. Explain how clotting is prevented in the normal vascular system</p> <p>157. Outline the sequence of processes during blood coagulation</p> <p>158. Describe with the help of a flow diagram (or draw) intrinsic pathway of coagulation cascade</p> <p>159. Describe with the help of a flow diagram (or draw) extrinsic pathway of coagulation cascade</p> <p>160. Explain how the mechanism of clot dissolution.</p>
46	<b>Bleeding disorders</b>	<p>161. describe the role of Vit K in clotting</p> <p>162. Describe the following bleeding disorders</p> <ul style="list-style-type: none"> <li>- Vitamin K deficiency</li> <li>- Thrombocytopenia</li> <li>- Hemophilia</li> </ul> <p>163. Define Von Willebrand disease</p>

47	<b>Thrombotic disorders</b>	<p>164. Describe the effects of low platelet count on Hemostasis</p> <p>165. Define thrombus/thrombi</p> <p>166. Define emboli/embolus</p> <p>167. Enlist the causes of thromboembolic conditions</p> <p>168. Describe Femoral venous thrombosis and pulmonary embolism</p>
<b>Pharmacology</b>		
48	<b>Coagulation modifying drug</b>	<p>169. Identify the site of action of following drugs in coagulation cascade</p> <ul style="list-style-type: none"> <li>• Aspirin,</li> <li>• Heparin,</li> <li>• Tranexamic acid</li> <li>• Vit. K</li> </ul>
<b>LAB WORK</b>		
49	<b>Clotting time determination</b>	170. Determine the clotting time
50	<b>Bleeding time determination</b>	171. Determine the bleeding time
51	<b>Prothrombin time determination</b>	172. Determine the Prothrombin time (PT) in the given sample

**BLOOD MODULE**

**THEME –IV**

**Transfusion Reaction**

SNO	Topic	Learning Outcome
<b>PHYSIOLOGY</b>		
52	<b>Blood Grouping</b>	<p>173. Describe different types of blood groups</p> <p>174. Describe the genotype-phenotype relationships in blood groups.</p> <p>175. Interpret the plausible blood groups (A-B-O) in children of parents with known blood groups.</p> <p>176. Describe the role of agglutinogens and agglutinins in blood grouping</p> <p>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</p> <p>178. Describe the process of agglutination</p>
54	<b>transfusion reactions</b>	<p>179. Describe the antigens and antibodies of the Rh system</p> <p>180. Describe the principles of blood typing</p> <p>181. Explain universal donor and universal recipient blood groups</p> <p>182. Enlist the manifestations of transfusion reaction</p>
55	<b>Erythroblastosis fetalis</b>	<p>183. Define Rhesus incompatibility</p> <p>184. Describe erythroblastosis fetalis</p> <p>185. Describe the transfusion reactions resulting from mismatched O-A-B and Rh blood types</p>
56	<b>Major histocompatibility complex</b>	<p>186. Define autoimmunity</p> <p>187. Explain how immune reaction to self-antigens is avoided</p> <p>188. Define and classify Major Histocompatibility complex (MHC)</p> <p>Characterize the significance and function of major histocompatibility complex molecules</p>

<b>Forensic Medicine</b>		
56	<b>Medico-legal importance of blood groups</b>	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
<b>COMMUNITY MEDICINE</b>		
57	<b>epidemiology of blood borne diseases</b>	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
<b>LAB WORK (Physiology Practical)</b>		
58	<b>Blood grouping</b>	196. Determine the O-A-B and Rh blood group in the given sample
59	<b>Blood smear preparation</b>	197. Prepare blood smear by thumb prick method.
60	<b>Blood Bank</b>	198. Observe the process of blood donation, blood product separation, screening and storage and observe the process of blood transfusion.

