

Comprehensive Hematology Exam

Prepared for Dr. Roaa - 3rd Year (Basic Stage)

Anatomy

1. Which of the following ligaments contains the splenic artery and vein as well as the tail of the pancreas?

- A. Gastrosplenic ligament
- B. Splenorenal ligament
- C. Phrenicocolic ligament
- D. Falciform ligament

2. Where does the thoracic duct typically empty its lymphatic fluid into the venous system?

- A. Right atrium
- B. Superior vena cava
- C. Junction of the left internal jugular and left subclavian veins
- D. Right venous angle

3. Which anatomical structure forms the largest anterior impression on the visceral surface of the spleen?

- A. Left kidney
- B. Stomach
- C. Left colic flexure
- D. Diaphragm

4. From which embryonic structure does the thymus gland originate?

- A. First pharyngeal pouch
- B. Second pharyngeal pouch
- C. Third pharyngeal pouch
- D. Fourth pharyngeal pouch

5. Which of the following lymph nodes receives the primary lymphatic drainage from the central part of the lower lip?

- A. Submandibular nodes
- B. Submental nodes
- C. Parotid nodes
- D. Deep cervical nodes

6. Behind which structure does the splenic vein join the superior mesenteric vein to form the portal vein?

- A. Head of the pancreas
- B. Neck of the pancreas
- C. First part of the duodenum
- D. Pylorus of the stomach

7. What is the primary arterial supply to the thymus gland?

- A. Internal thoracic artery
- B. Brachiocephalic trunk
- C. Superior mesenteric artery
- D. Vertebral artery

8. At what vertebral level does the thoracic duct usually pass through the aortic hiatus of the diaphragm?

- A. T8
- B. T10
- C. T12
- D. L2

9. Normally, the spleen is protected by which ribs on the left side?

- A. Ribs 5, 6, and 7
- B. Ribs 9, 10, and 11
- C. Ribs 11 and 12
- D. Ribs 7, 8, and 9

Histology

10. Which of the following is considered a primary lymphoid organ?

- A. Spleen
- B. Lymph node
- C. Palatine tonsil
- D. Bone marrow

11. Which cell type is responsible for producing platelets in the red bone marrow?

- A. Reticulocyte
- B. Megakaryocyte
- C. Macrophage
- D. Plasma cell

12. In the spleen, where are T-lymphocytes predominantly concentrated?

- A. Lymphoid follicles
- B. Periarterial lymphoid sheaths (PALS)
- C. Cords of Billroth
- D. Venous sinuses

13. What is the unique histological feature found exclusively in the medulla of the thymus?

- A. Germinal centers
- B. Hassall's corpuscles
- C. High endothelial venules (HEVs)
- D. Stave cells

14. Which type of collagen primarily makes up the reticular fibers that form the stroma of lymph nodes and the spleen?

- A. Type I collagen
- B. Type II collagen
- C. Type III collagen
- D. Type IV collagen

15. During erythropoiesis, what is the last developmental stage that possesses a nucleus?

- A. Proerythroblast
- B. Polychromatophilic erythroblast
- C. Orthochromatophilic erythroblast (Normoblast)
- D. Reticulocyte

16. In a lymph node, which region is considered the 'thymus-dependent' zone, rich in T-lymphocytes?

- A. Superficial cortex
- B. Paracortex
- C. Medullary cords
- D. Subcapsular sinus

17. Which of the following white blood cells is characterized by a bilobed nucleus and large specific granules that stain red with eosin?

- A. Neutrophil
- B. Eosinophil
- C. Basophil
- D. Monocyte

18. What specialized endothelial cells line the venous sinuses of the red pulp in the spleen, acting like 'staves of a barrel'?

- A. Kupffer cells
- B. Stave cells
- C. Reticular cells
- D. Epithelioreticular cells

19. Which leukocyte is normally the most abundant in a healthy adult's peripheral blood smear?

- A. Lymphocyte
- B. Monocyte
- C. Neutrophil
- D. Eosinophil

20. What is the primary function of the blood-thymus barrier?

- A. To prevent mature T-cells from leaving the thymus.
- B. To prevent antigens from reaching developing T-cells in the thymic cortex.
- C. To trap circulating bacteria for phagocytosis.
- D. To filter lymphatic fluid.

Physiology

21. What is the primary physiological stimulus for the release of erythropoietin (EPO) from the kidneys?

- A. High blood pressure
- B. Low iron levels
- C. Tissue hypoxia
- D. High carbon dioxide levels

22. In the coagulation cascade, which factor represents the convergence point of both the intrinsic and extrinsic pathways to initiate the common pathway?

- A. Factor VIII
- B. Factor X
- C. Factor II (Prothrombin)
- D. Factor XII

23. Which of the following conditions causes a 'shift to the right' in the oxygen-hemoglobin dissociation curve, facilitating oxygen offloading in tissues?

- A. Decreased temperature
- B. Increased pH (Alkalosis)
- C. Decreased 2,3-BPG
- D. Increased pCO₂

24. Vitamin K is essential for the gamma-carboxylation of which of the following sets of clotting factors?

- A. Factors I, V, VIII, XIII
- B. Factors II, VII, IX, X
- C. Factors XI, XII, Prekallikrein
- D. Factor VIII and von Willebrand factor

25. An individual with blood type O negative is considered a universal red blood cell donor because their red blood cells:

- A. Contain both A and B antigens, and Rh antigen.
- B. Lack A, B, and Rh antigens.
- C. Lack naturally occurring anti-A and anti-B antibodies in their plasma.
- D. Have mutated antigens that do not react with human antibodies.

26. Which plasma protein is primarily responsible for the transport of iron through the bloodstream?

- A. Ferritin
- B. Hemosiderin
- C. Transferrin
- D. Ceruloplasmin

27. Pernicious anemia is caused by a deficiency in Intrinsic Factor, which is secreted by gastric parietal cells. Intrinsic Factor is essential for the absorption of:

- A. Iron
- B. Vitamin B12
- C. Folic acid
- D. Vitamin C

28. What is the average lifespan of a normal human red blood cell in circulation?

- A. 10 - 14 days
- B. 30 - 45 days
- C. 120 days
- D. 365 days

29. What is the primary role of plasmin in the hemostatic system?

- A. To convert fibrinogen to fibrin.
- B. To activate platelets.
- C. To break down fibrin clots (Fibrinolysis).
- D. To cross-link fibrin strands.

30. Which of the following correctly describes the Bohr effect?

- A. Oxygen binding to hemoglobin promotes the release of carbon dioxide.
- B. High carbon dioxide and low pH decrease hemoglobin's affinity for oxygen.
- C. Carbon monoxide binds to hemoglobin with higher affinity than oxygen.
- D. Fetal hemoglobin has a higher affinity for oxygen than adult hemoglobin.

Answer Key & Rationales

Q#	Section	Correct Answer	Rationale
1	Anatomy	Splenorenal ligament	<i>The splenorenal ligament connects the spleen to the left kidney and transmits the splenic vessels and the tail of the pancreas.</i>
2	Anatomy	Junction of the left internal jugular and left subclavian veins	<i>The thoracic duct empties into the left venous angle.</i>
3	Anatomy	Stomach	<i>The gastric impression is the largest and most anterior impression on the spleen.</i>
4	Anatomy	Third pharyngeal pouch	<i>The thymus develops from the ventral wings of the third pharyngeal pouch.</i>
5	Anatomy	Submental nodes	<i>The central part of the lower lip and the tip of the tongue drain primarily into the submental lymph nodes.</i>
6	Anatomy	Neck of the pancreas	<i>The portal vein is formed posterior to the neck of the pancreas.</i>
7	Anatomy	Internal thoracic artery	<i>The thymus receives its main blood supply from branches of the internal thoracic and inferior thyroid arteries.</i>
8	Anatomy	T12	<i>The thoracic duct, along with the aorta and azygos vein, passes through the aortic hiatus at T12.</i>
9	Anatomy	Ribs 9, 10, and 11	<i>The spleen lies in the left hypochondrium, its long axis parallel to the 10th rib, spanning ribs 9 to 11.</i>
10	Histology	Bone marrow	<i>Bone marrow and the thymus are primary lymphoid organs where lymphocytes are formed and mature.</i>
11	Histology	Megakaryocyte	<i>Megakaryocytes are large cells whose cytoplasmic fragmentation produces platelets.</i>
12	Histology	Periarteriolar lymphoid sheaths (PALS)	<i>T-cells mainly populate the PALS surrounding the central arteries in the white pulp.</i>
13	Histology	Hassall's corpuscles	<i>Hassall's corpuscles are concentrically arranged, keratinized epithelioreticular cells unique to the thymic medulla.</i>

Q#	Section	Correct Answer	Rationale
14	Histology	Type III collagen	<i>Reticular fibers are composed of heavily glycosylated Type III collagen.</i>
15	Histology	Orthochromatophilic erythroblast (Normoblast)	<i>This cell has a small, pyknotic nucleus which it extrudes to become a reticulocyte.</i>
16	Histology	Paracortex	<i>The paracortex (inner cortex) houses the majority of T-cells in the lymph node.</i>
17	Histology	Eosinophil	<i>Eosinophils have a bilobed nucleus and large, eosinophilic (red/pink) granules.</i>
18	Histology	Stave cells	<i>Stave cells are elongated endothelial cells that allow healthy RBCs to squeeze through into the sinuses.</i>
19	Histology	Neutrophil	<i>Neutrophils are the most abundant leukocytes, making up 50-70% of the total WBC count.</i>
20	Histology	To prevent antigens from reaching developing T-cells in the thymic cortex.	<i>The barrier protects developing thymocytes in the cortex from premature exposure to foreign circulating antigens.</i>
21	Physiology	Tissue hypoxia	<i>A decrease in tissue oxygenation (hypoxia) is the main trigger for the kidneys to secrete EPO.</i>
22	Physiology	Factor X	<i>Activation of Factor X (to Xa) is the first step of the common pathway.</i>
23	Physiology	Increased pCO₂	<i>Higher pCO₂ (and lower pH) shifts the curve to the right, decreasing Hb's affinity for O₂ (Bohr effect).</i>
24	Physiology	Factors II, VII, IX, X	<i>These four factors require Vitamin K for their synthesis in the liver.</i>
25	Physiology	Lack A, B, and Rh antigens.	<i>Type O negative RBCs have no A, B, or Rh antigens to trigger an immune reaction in the recipient.</i>
26	Physiology	Transferrin	<i>Transferrin binds free iron in the blood and transports it to target cells like erythroblasts.</i>
27	Physiology	Vitamin B12	<i>Intrinsic Factor binds to Vitamin B12 (cobalamin) to allow its absorption in the terminal ileum.</i>
28	Physiology	120 days	<i>Normal RBCs circulate for about 120 days before becoming senescent and being destroyed by the spleen.</i>

Q#	Section	Correct Answer	Rationale
29	Physiology	To break down fibrin clots (Fibrinolysis).	<i>Plasmin is an enzyme that degrades fibrin polymers, dissolving the blood clot once tissue repair is complete.</i>
30	Physiology	High carbon dioxide and low pH decrease hemoglobin's affinity for oxygen.	<i>This is the Bohr effect, which facilitates oxygen unloading in actively metabolizing tissues.</i>