HUMAN ANATOMY AND PHYSIOLOGY-I, BP-101(T)

UNIT-III (Body fluids and blood)

CLASS:3

TOPIC – Hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation

Hemopoiesis:

- Hemopoiesis, also known as hematopoiesis, is the process by which the body produces new blood cells. It occurs in the bone marrow and involves the differentiation and proliferation of bloodstem cells into various types of blood cells, including red blood cells, white blood cells, and platelets.
- The process of hemopoiesis is regulated by a complex system of cytokines and growth factors that stimulate the differentiation and proliferation of blood stem cells. These signals come from the surrounding environment of the bone marrow, including other cellsin the bone marrow and the blood itself.
- Red blood cells (erythrocytes) are produced through a process called erythropoiesis. In this process, red blood cell precursors, called erythroblasts, divide and differentiate into mature red blood cells. These cells contain haemoglobin, a protein that carries oxygenfrom the lungs to the body's tissues.
- White blood cells (leukocytes) are produced through a process called leukopoiesis. There are several types of white blood cells,each with different functions in the immune system. These cells are involved in fighting infections and diseases.
- Platelets are produced through a process called thrombopoiesis.Platelets are involved in blood clotting, which is important for preventing excessive bleeding.
- Overall, hemopoiesis is a complex and highly regulated process that is essential for maintaining a healthy blood supply and proper immune function. Dysregulation of hemopoiesis can leadto various blood disorders, including anaemia, leukaemia, and thrombocytopenia.

Formation of haemoglobin:

Haemoglobin is a protein found in red blood cells that is responsible for carrying oxygen from the lungs to the body's tissues. The process of haemoglobin formation is called erythropoiesis and involves several steps:

- Stem cells in the bone marrow differentiate into immature red blood cells, called erythroblasts.
- Erythroblasts start to synthesize haemoglobin. Haemoglobin is made up of four protein chains called globins, and each globin chain is associated with a heme group that contains an iron atom.

MECHANISM OF COAGULATION

Coagulation: Coagulation, also known as clotting, is the process by which blood changes from a liquid to a gel, forming a blood clot.

- It potentially results in haemostasis, the cessation of blood loss from a damaged vessel, followed by repair.
- The mechanism of coagulation involves a complex series of interactions between blood cells, clotting factors, and the endothelium (the inner lining of blood vessels).
- There are two main pathways involved in the coagulation process: the extrinsic pathway and the intrinsic pathway.
- These pathways eventually converge to form the common pathway, which leads to the formation of a fibrin clot.

Extrinsic pathway:

- Tissue factor is released from damaged endothelial cells or from tissue outside the blood vessel.
- Tissue factor binds to and activates factor VII.
- Activated factor VII, along with factor III (tissue factor), activates factor X.

Intrinsic pathway:

♣ Factor XII, also known as the Hageman factor, is activated by contact with

exposed collagen and other substances in the blood.

♣ Activated factor XII activates factor XI.

♣ Activated factor XI activates factor IX.

♣ Activated factor IX, along with factor VIII, calcium ions, and phospholipids, activates factor X. Common pathway:

♣ Activated factor X combines with factor V, calcium ions, and phospholipids to form prothrombinase.

♣ Prothrombinase converts prothrombin into thrombin.

♣ Thrombin then converts fibrinogen into fibrin.

♣ Fibrin strands combine to form a fibrin clot, which stabilizes the platelet plug and prevents further bleeding. The coagulation process is carefully regulated to prevent excessive clotting, which can lead to thrombosis or blockage of blood vessels. Anticoagulant proteins like anti-thrombin, protein C, and protein S help to balance the coagulation process and prevent unwanted clotting.

Disorders of coagulation can lead to bleeding disorders, such as haemophilia, or clotting disorders, such as thrombophilia.

These conditions can increase the risk of bleeding or thrombosis and may require medical intervention to manage.

Anaemia:

- A condition in which the blood doesn't have enough healthy red blood cells.
- Anemia results from a lack of red blood cells or dysfunctional red blood cells in the body. This leads to reduced oxygen flow to the body's organs.
- Symptoms may include fatigue, skin pallor, shortness of breath, lightheadedness, dizziness or a fast heartbeat.
- Treatment:
- Treatment depends on the underlying diagnosis. Iron supplements can be used for iron deficiency.
- Vitamin B supplements may be used for low vitamin levels.
- Blood transfusions can be used for blood loss. Medication to induce blood formation may be used if the body’s blood production is reduced.

IMPORTANT QUESTIONS:

2M QUESTIONS:

1. Define blood.
2. Classify blood groups.
3. What is haemoglobin.
4. Define Artery and Vein.
5. Define: 1. blood Pressure 2. Hematopoiesis 3. Erythropoiesis 4. Anaemia.
6. Explain blood transfusion.
7. Explain reticulo-Endothelial System.

8. Define blood coagulation and enlist its pathways.
9. What is lymph.

5M QUESTIONS:

1) Write about coagulation of blood.
2) Explain the process of haemoglobin formation in brief.
3) Write about composition and functions of blood.
4) Write a note on anemia with its types.
5) Write an explanatory note on lymphatic system.
6) Discuss about ABO blood group system.

10M QUESTIONS:

1. Write about coagulation of blood.
2. Write about composition and functions of blood.
3. Write an explanatory note on lymphatic system.
4. Discuss about ABO blood group system.