

BIOLOGY

CLASS NOTES FOR CBSE

Chapter 18. Body Fluids and Circulation

01. Introduction

All living cells require nutrients, oxygen and other essential materials for their growth and survival. These substances take part in various metabolic processes of the cell. Various toxic substances are also formed during these processes which need to be eliminated. It is therefore, essential to have an efficient mechanism for the movement of these substances to and from the cells. In higher organisms like humans, these substances are carried through special body fluids called **blood** and **lymph**.

02. Body fluids

These are the medium of transport in the body. They may either be intracellular or extracellular fluid. The intracellular fluid contains large amount of potassium ions, phosphate ions and proteins. Extracellular fluids include blood, lymph, cerebrospinal fluid, etc.

Blood

It is a specialised connective tissue consisting of a fluid matrix, plasma and a cellular portion called **formed elements**. The formed elements include erythrocytes (RBC), leucocytes (WBC) and thrombocytes (platelets).

03. Blood Groups

There are certain molecules on the surfaces of all cells in the body of an organism that can be recognised as foreign if introduced in the body of another organism. These molecules are known as **antigens**. These can induce immune response by secreting a class of proteins called **antibodies** that **binds** in a specific fashion with antigens. Depending on the nature of antigens present on the membrane of RBCs various types of blood grouping has been done. Two such grouping are the ABO and Rh blood grouping.

04. ABO Blood Groups

Discovered first time by **Karl Landsteiner** (1990) in human beings. AB blood group was reported by **de Castello** and **Steini** (1902).

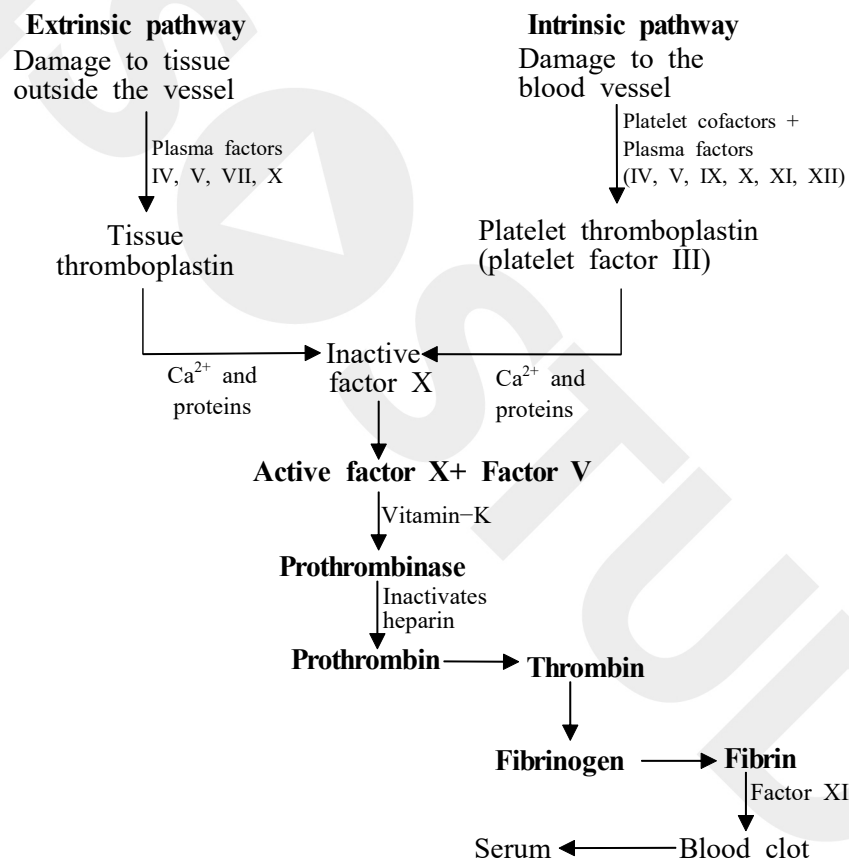
05. Rhesus (Rh) Blood Group

It was discovered by **Landsteiner** and **Wiener** in the blood of rhesus monkeys. Later, It was also observed on the surface of RBCs of majority of human beings. The individuals with **Rh antigen** are called **Rh positive** (Rh+ve) and in whom this antigen is not present are called **Rh negative** (Rh-ve). Rh⁺ is dominant to Rh⁻.

06. Coagulation of Blood

Coagulation of blood

The pathway or mechanism of blood clotting are of two types, i.e. extrinsic pathway and intrinsic pathway. It can be summarised as follows



07. Lymph

It is colourless or yellowish fluid present in the lymph vessels. In real sense it is the component of blood left in tissue fluid during normal circulation of blood. It amounts to about 10% of total blood volume. The composition of lymph is the same as that of blood plasma, but lymph has lower protein contents.



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As compared to the tissue fluid, the lymph contains very small amount of nutrients and oxygen, but contains abundant carbon dioxide and other metabolic wastes. Some amoeboid-shaped white blood corpuscles may also be seen in lymph.

08. Circulatory System

Simple organisms like sponges and coelenterates have mechanisms to circulate water of their surroundings through their body cavities. The complex organisms including humans have special body fluids, i.e. blood and lymph to circulate these substances. The system, which is primarily meant for the circulation of substances through body fluids is called circulatory system.

9. Types of Circulatory System

William Harvey (1628) was the first person who discovered the functioning of circulatory system in human. The two basic types of circulatory system that have evolved in animals are

- (i) Open circulatory system (in many invertebrates) and
- (ii) Closed circulatory system (invertebrates).

10. Open Circulatory System

In this system, the blood comes in direct contact with tissue cells. It may or may not flow in larger blood vessels. When vessels are completely absent it flows in blood sinuses or lacunae or open spaces, e.g. arthropods (like prawn, insects, etc.) while in most molluscs blood is flown in larger blood vessels, but at tissue level blood vessels are absent (e.g. snails, clams, oyster, etc).

11. Closed Circulatory System

In this system blood does not come in direct contact with tissue cells. In this circulation very fine blood vessels called **capillaries** are present at tissue level to prevent direct connectivity of tissue and blood, e.g. in annelids (like *Pheretima*), echinoderms, some molluscs (squids) and all vertebrates. In simple word we can say that, it is the presence or absence of capillaries at tissues level, which differentiates between these two systems. The advantage of closed circulatory system is that it increases the efficiency of circulation and regulates blood flow. This type of blood flow in closed system is from the **circulation circuits**.