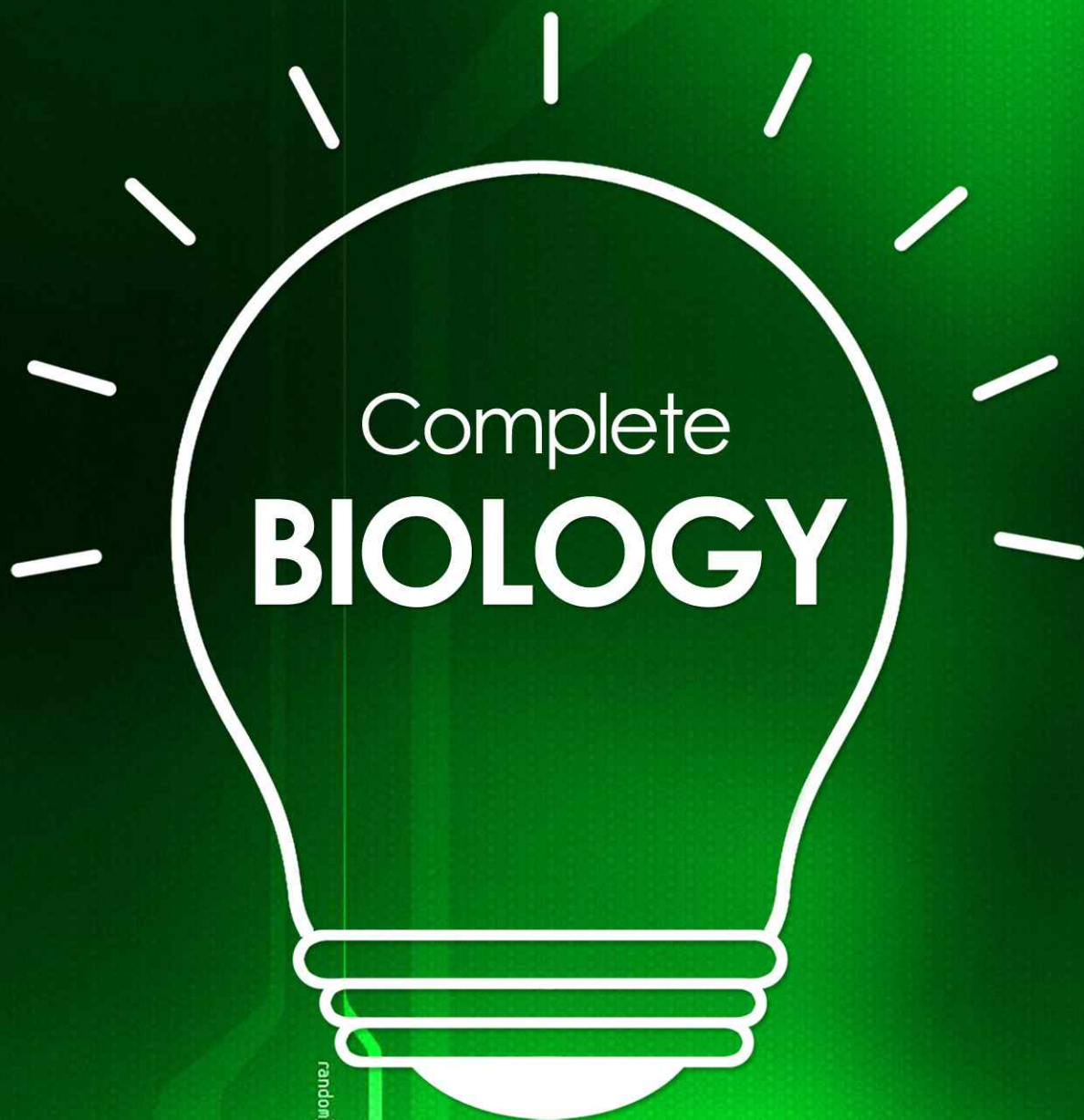




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CLASS 11th

**Body Fluids
and Circulation**

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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** (1900) in human beings. AB blood group was reported by **de Castello** and **Steini** (1902).

Table Types of blood groups					
Phenotypes (their percentage in human population)	Genotypes	Antigens on RBC membrane	Antibodies in plasma	Can receive blood from	Can donate blood to
A(40%) B(10%)	$I^A I^A$ or $I^A I^O$ $I^B I^B$ or $I^B I^O$	A B	Anti - B Anti - A	A,O B,O	A, AB B,AB
AB(4%)	$I^A I^B$	A and B antigen	No	A,B, AB,O (universal recipient)	AB only
O(46%)	$I^O I^O$	No	Anti-A and Anti- B	O only	A,B, AB, O (universal donor)

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⁺) and in whom this antigen is not present are called **Rh negative** (Rh⁻). Rh⁺ is dominant to Rh⁻.

06. Rh Incompatibility

During pregnancy It is seen that when father's blood is Rh⁺ and mother's blood is Rh⁻. Rh⁺ being a dominant character expresses in the foetus and causes a serious problem. The first child of Rh⁻ mother will not suffer, but blood of foetus (Rh⁺) stimulates the formation of anti-Rh⁺ factors in the mother's blood. In the subsequent pregnancies the anti-Rh antibodies in the mother's blood destroy the foetal RBCs and results in Haemolytic Disease of the Newborn (HDN) or **erythroblastosis foetalis** or rhesus baby syndrome. **During blood transfusion** The first transfusion between Rh⁺ and Rh⁻ blood causes no harm because Rh⁻ person develops anti-Rh antibodies in his blood. But, in the second transfusion of Rh⁺ blood to Rh⁻ blood, the anti-Rh antibodies in the later's blood destroy the RBCs of the RBCs of the donor.