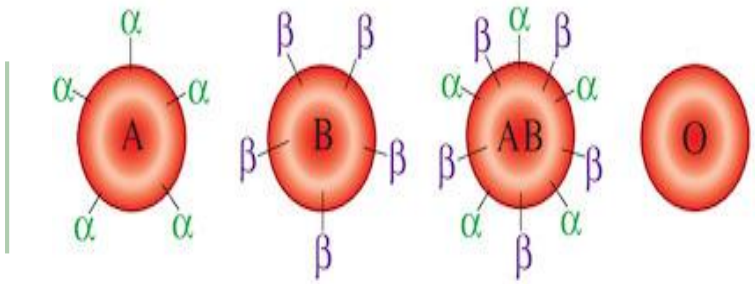
ABO Blood Grouping & Rh Groups

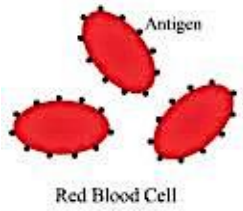
BCH 471

قسم الكيمياء الحيوية
Biochemistry Department
College of Science - King Saud University

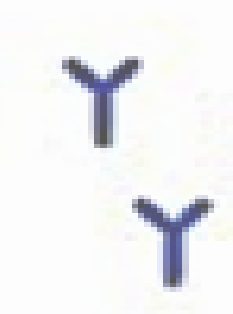


Blood Group Substances

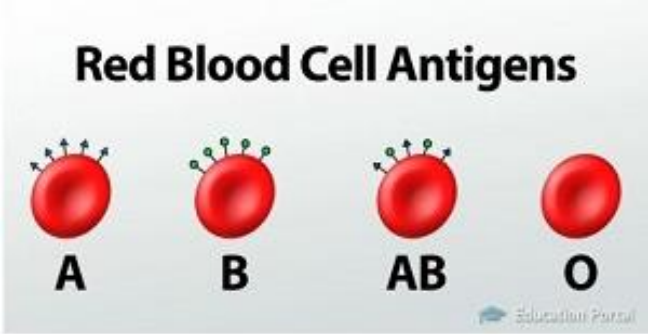
- The differences in human blood are due to the presence or absence of certain molecules called antigens and antibodies.
- The antigens are located on the surface of the red blood cells



- Antigens are also found in a wide variety of tissues and biological fluids such as saliva, milk , seminal fluid, urine , and gastric juice.
- The antibodies are proteins in the blood plasma to attack foreign antigens, resulting in clumping (agglutination)



ABO Blood Type System



- The ABO blood type system is the major blood type classification system.
- The four blood types in the ABO system (A, B, AB, and O) refer to different versions of oligosaccharides which are present on the surface of RBCs.

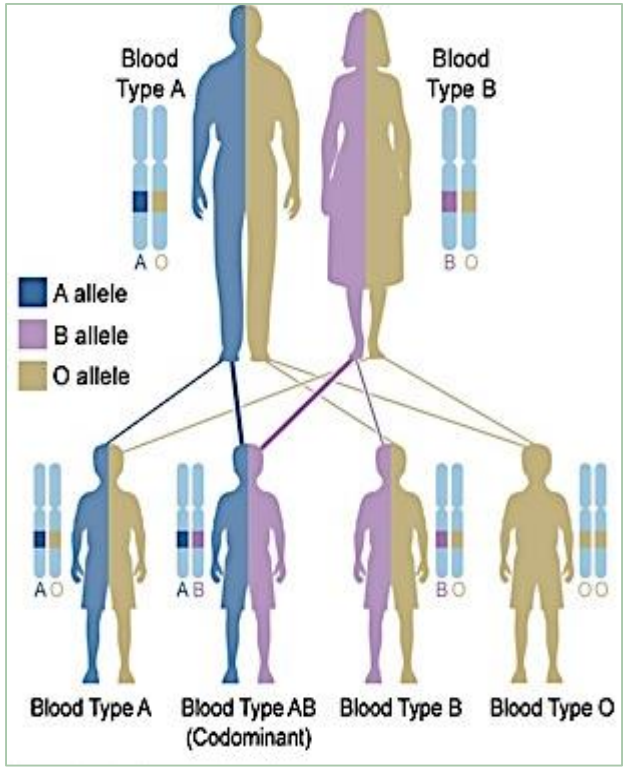
People with:	Have:
Type A blood	Type A carbohydrate molecules on their red blood cells
Type B blood	Type B carbohydrate molecules on their red blood cells
Type AB blood	Both type A and type B carbohydrate molecules on their red blood cells
Type O blood	Neither type A nor type B carbohydrate molecules on their red blood cells

Importance of The ABO System

- Blood group antigens must be determined to secure a safe practice of **blood transfusion**.
- They are also useful in determining **familial relationships** in forensic medicine.

Genetics of Blood Types

- Your blood type is established before you are born, by specific GENES inherited from your parents.
  - You have two copies of this gene, one inherited from your **MOTHER** and the other inherited from your **FATHER**.



father \ mother	A	B	O
A	AA	AB	AO
B	BA	BB	BO
O	OA	OB	OO

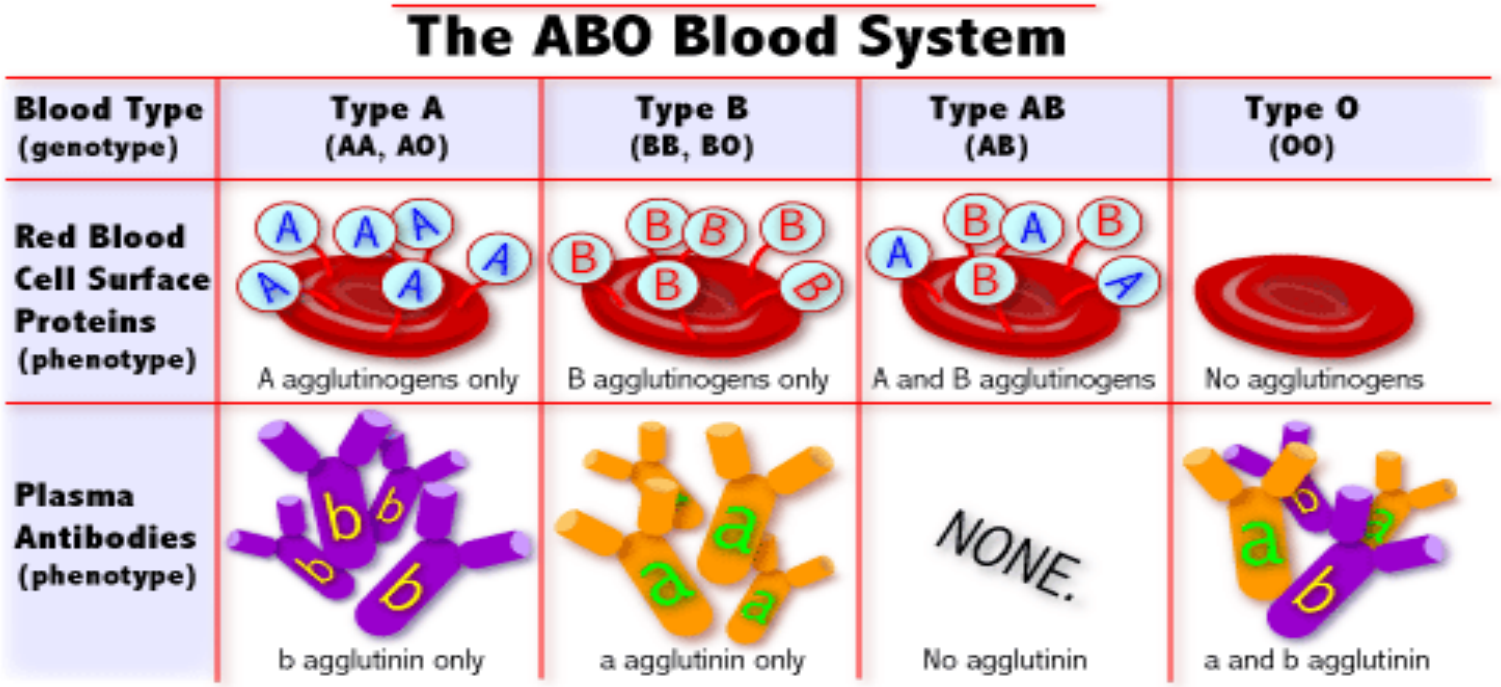
alleles	blood type
A+A	= A
A+O	= A
A+B	= AB
B+B	= B
B+O	= B
O+O	= O

Codominance

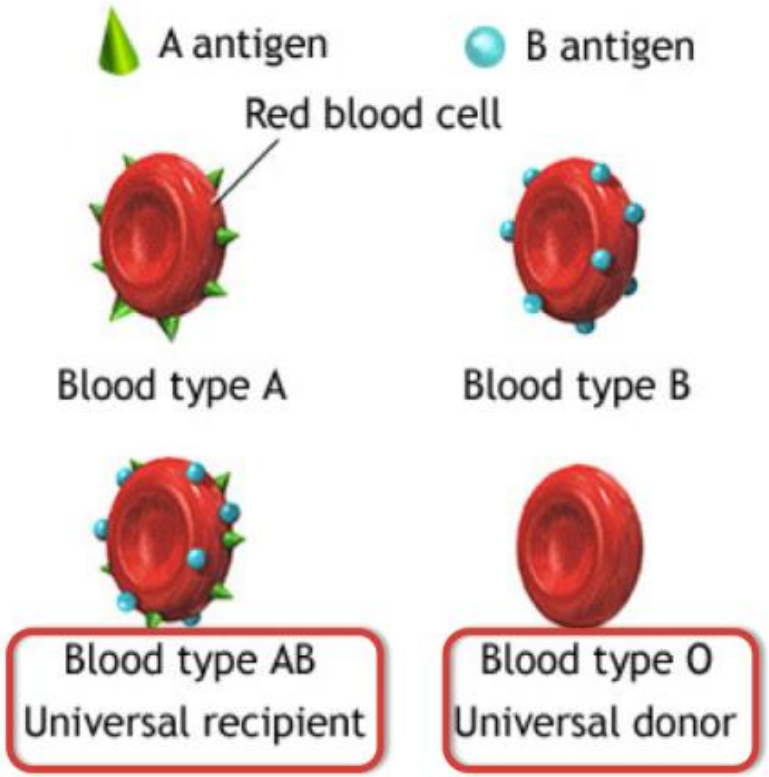
is a condition in which the alleles of a gene pair in a heterozygote are fully expressed thereby resulting in offspring with a phenotype that is neither dominant nor recessive

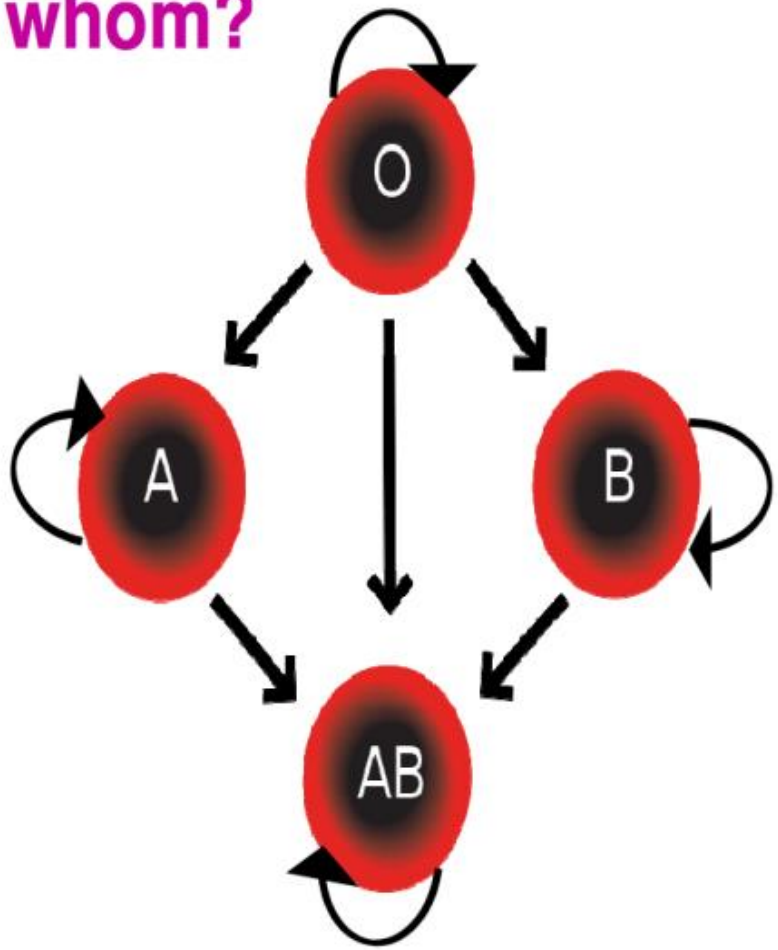
Blood Types

- There are **3 alleles or genes** for blood type: **A, B, & O**.
- Since we have 2 genes, there are 6 possible combinations.

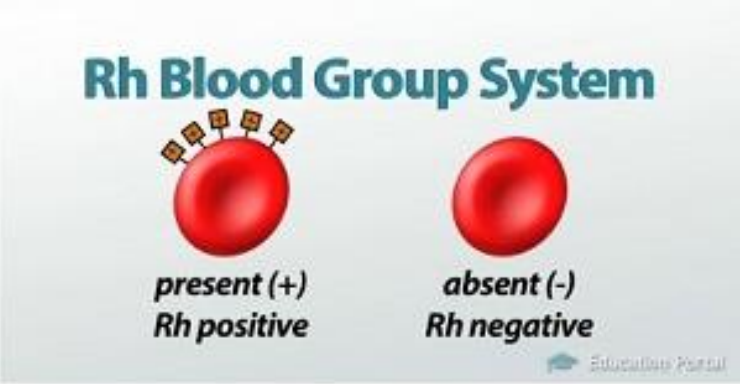


Blood transfusions – who can receive blood from whom?





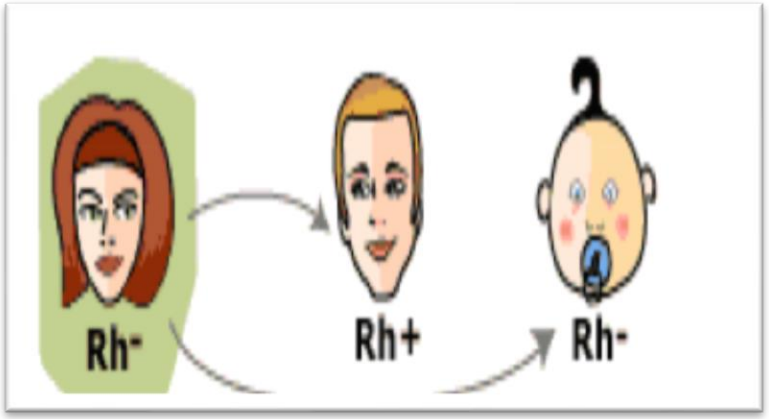
Rhesus Blood Group

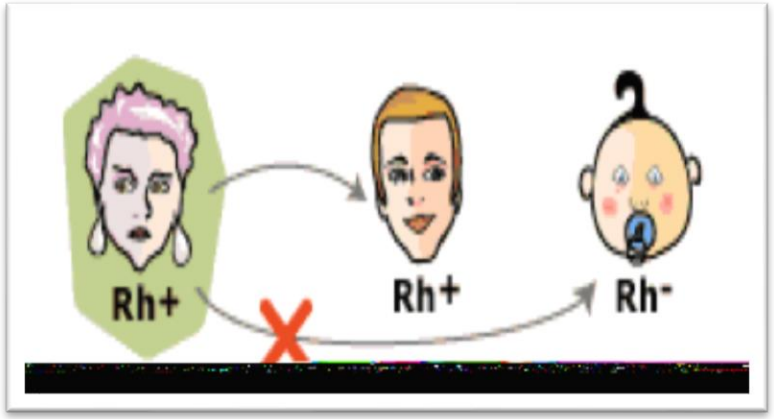


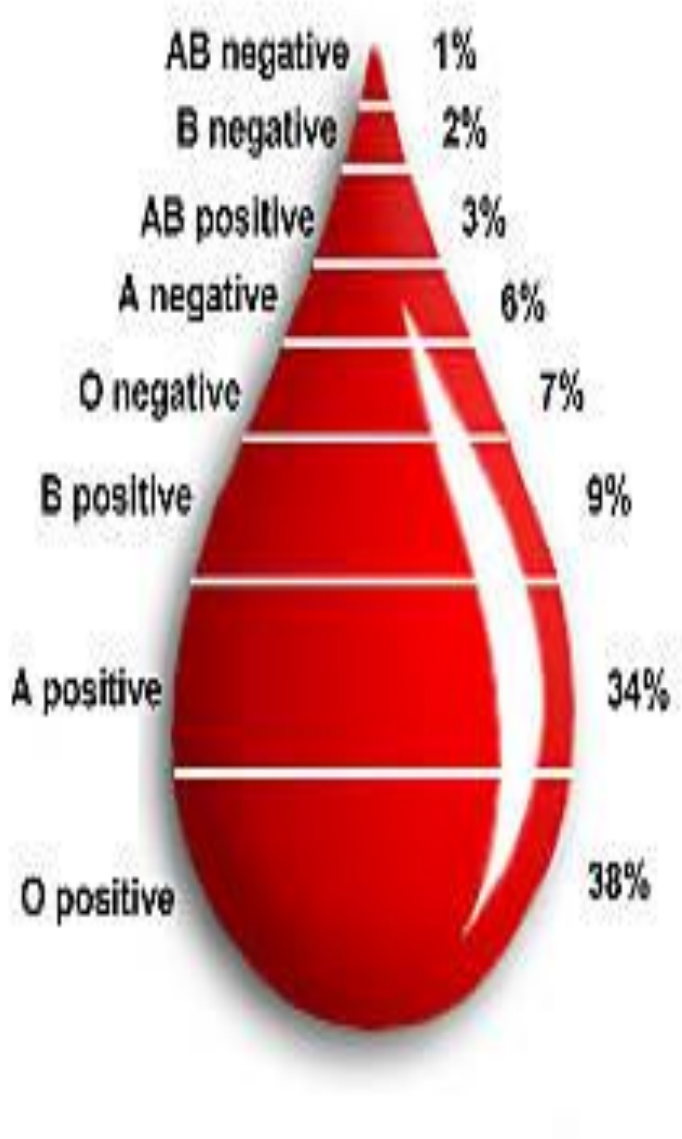
- First studied in rhesus monkeys.
- Is the second most significant blood group system in human transfusion.
- The **D antigen (RhD)** is the most important.
- If it is present on RBCs' surface, the blood is **RhD positive** (~80% of the population), if not it's **RhD negative**.
- So, for example, some people in group A will have it, and will therefore be classed as A+ (or A positive), while the ones that don't, are A- (or A negative) and so it goes for groups B, AB and O.

Rh Blood Group Transfusion

- A person with Rh+ blood can receive blood from a person with Rh- blood without any problems
- A person with Rh- blood can develop Rh antibodies in the blood plasma if he or she receives blood from a person with Rh+ blood, whose Rh antigens can trigger the production of Rh antibodies





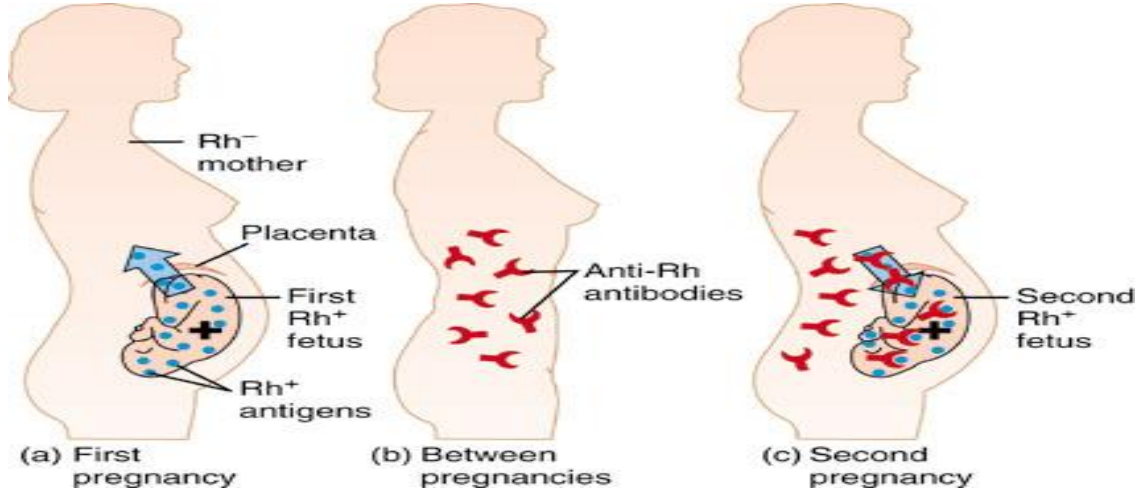


RED BLOOD CELL COMPATIBILITY TABLE

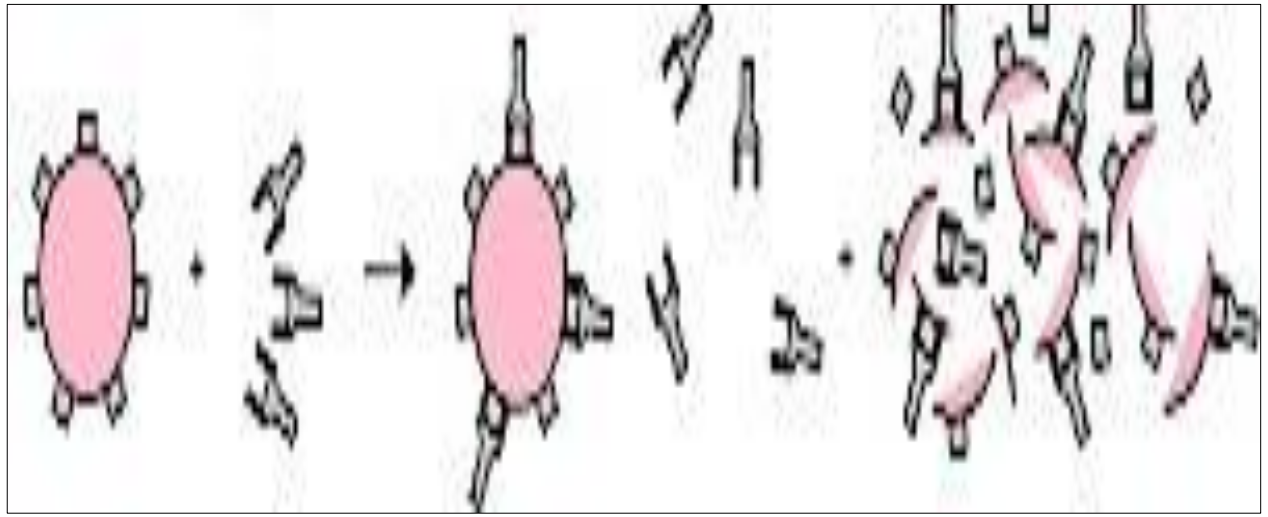
Recipient	Donor							
	O-	O+	A-	A+	B-	B+	AB-	AB+
O-	✓	✗	✗	✗	✗	✗	✗	✗
O+	✓	✓	✗	✗	✗	✗	✗	✗
A-	✓	✗	✓	✗	✗	✗	✗	✗
A+	✓	✓	✓	✓	✗	✗	✗	✗
B-	✓	✗	✗	✗	✓	✗	✗	✗
B+	✓	✓	✗	✗	✓	✓	✗	✗
AB-	✓	✗	✓	✗	✓	✗	✓	✗
AB+	✓	✓	✓	✓	✓	✓	✓	✓

Hemolytic Disease of The Newborn (HDN)

- Also called, Erythroblastosis Fetalis
- **Mother** is Blood type Rh-, **Father and fetus** are Rh+
- First pregnancy = sensitization at delivery due to hemorrhage
- Second pregnancy = Mother produce anti-Rh IgG antibodies that cross placenta to attack fetal RBCs leading to hemolysis



Principle Of Test



Type B blood gp | Anti B antibodies | Agglutination | Hemolysis

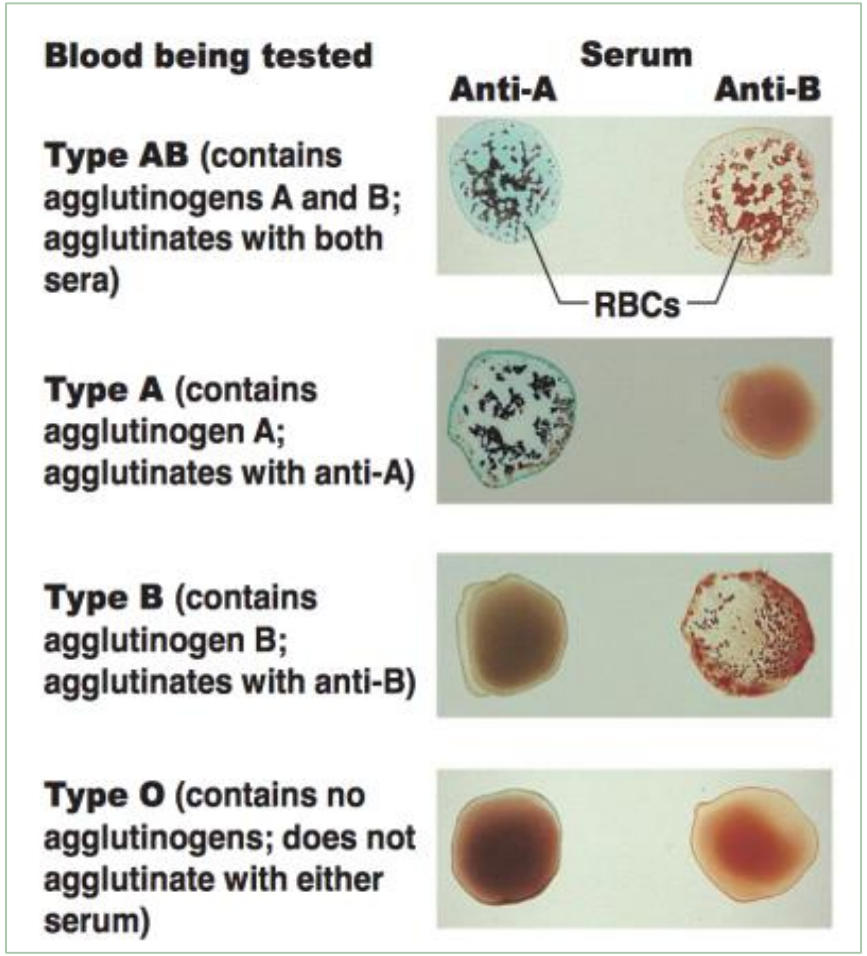
Seen as the picture

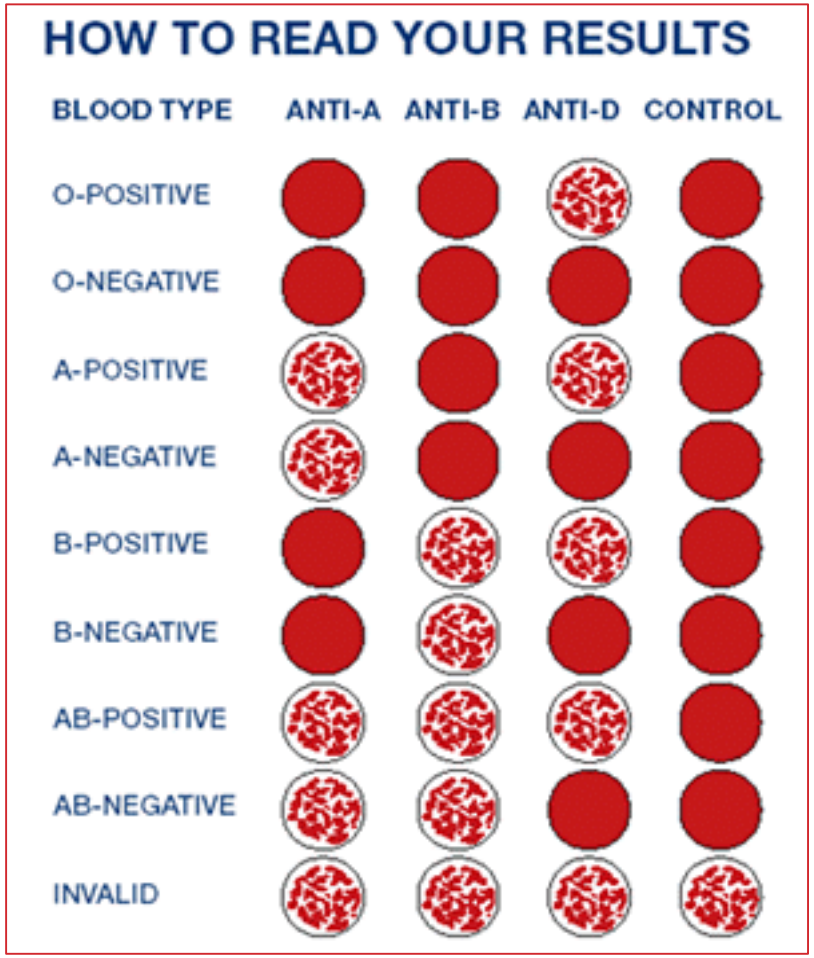
Practical Part

Objectives

- To determine the blood group according to the ABO system.
- To test for the availability of the Rh factor (D antigen).

RESULTS


Blood being tested
Serum
Anti-A
Anti-B
Type AB (contains agglutinogens A and B; agglutinates with both sera)
RBCs
Type A (contains agglutinogen A; agglutinates with anti-A)
Type B (contains agglutinogen B; agglutinates with anti-B)
Type O (contains no agglutinogens; does not agglutinate with either serum)


HOW TO READ YOUR RESULTS
BLOOD TYPE
ANTI-A
ANTI-B
ANTI-D
CONTROL
O-POSITIVE
O-NEGATIVE
A-POSITIVE
A-NEGATIVE
B-POSITIVE
B-NEGATIVE
AB-POSITIVE
AB-NEGATIVE
INVALID