

## GENETICS OF BLOOD TYPES (CO-DOMINANCE AND MULTIPLE ALLELES)

- **Co-Dominance** occurs when both \_\_\_\_\_ in the genotype are equally dominant.
- **Multiple Alleles** occurs when \_\_\_\_\_ than 2 genes/alleles determine a characteristic, such as in ABO blood groups.
- **Example of ABO Blood Types**  
There are \_\_\_\_\_ different blood types – **A, B, AB and O**.

<b>BLOOD TYPE OR PHENOTYPE</b>	<b>GENOTYPE</b>	<b>ANTIGEN PRESENT</b>	<b>ANTIBODY PRODUCED</b>
<b>A</b>	AA or AO	A	Anti-B
<b>B</b>	BB or BO	B	Anti-A
<b>AB</b>	AB	A and B	none
<b>O</b>	OO	none	Anti-A and Anti-B

- **Example 1 – Blood Types**

Mum has blood type AB and Dad has blood type O. The possible blood types of the children are ...

	A	B
O	AO	BO
O	AO	BO

Possible genotypes = 1 AO : 1 BO

Possible phenotypes = 1 A : 1 B

½ the children will be \_\_\_\_\_ blood type, and the other 1/2 will be \_\_\_\_ blood type.

- **Example 2 – Blood Types**

Mum has A blood type and Dad has AB blood type. The possible children's blood types are ...

*First Possibility*

	A	A
A	AA	AA
B	AB	AB

Possible genotypes = 1 AA : 1 AB

Possible phenotypes = 1 A : 1 AB

½ the children will have blood type \_\_\_\_\_, and the other ½ will have blood type \_\_\_\_\_

Second Possibility

	A	O
A	AA	AO
B	AB	BO

Possible genotypes = 1AA:1AO:1AB:1BO

Possible phenotypes = 2 A : 1 AB: 1 B

½ will have blood type \_\_\_\_\_, ¼ will have blood type AB, and ¼ will have blood type \_\_\_\_\_

**ANTIGENS AND ANTIBODIES IN ABO BLOOD TYPES**

- The blood type is so-called because the blood contains particular \_\_\_\_\_ of A, B, both A and B, or neither A nor B.
- The body's immune system produces \_\_\_\_\_ to neutralise any particle (e.g. bacteria, dust, foreign blood in transfusions) that it recognises as foreign. For example, if blood type A contains Antigen A, then it will produce antibodies against B blood type (Anti-B Antibody), because B antigens are foreign. Similarly, if blood type O contains \_\_ antigens A nor B, then a person with blood type O would produce anti-A and \_\_\_\_\_ antibodies.
- **Agglutination or 'Clumping'** – If antigen-A came in contact with the antibody against it (Anti-A), then the blood would clump or \_\_\_\_\_. This could occur in an incorrect blood transfusion.
- **Universal Recipient** – This is a person with blood type \_\_\_\_\_ who can receive a blood transfusion from any of the other blood types.
- **Universal Donor** - This is a person with blood type \_\_\_\_\_ who can donate blood to any other blood type.

	Blood Type A	Blood Type B	Blood Type AB	Blood Type O	Rh+	Rh-
Red Blood Cells						
Antigens				N/A		N/A
Antibodies			N/A		N/A	

**COMPLETE DOMINANCE OR  
DOMINANT-RECESSIVE INHERITANCE  
(AN EXAMPLE OF RHESUS FACTOR IN ABO BLOOD TYPES)**

- The ABO blood types are sub-divided into positive and \_\_\_\_\_ types also, depending on whether that blood type does or does not contain the Rhesus Factor.
- If the Rhesus Factor is present, the genotype contains one or two R genes/alleles. If the Rhesus Factor is absent, the genotype is \_\_\_\_\_.

<b><i>Blood Type</i></b>	<b><i>ABO Antigens Present</i></b>	<b><i>Rhesus Antigens Present</i></b>	<b><i>ABO Genotype</i></b>	<b><i>Rhesus Genotype</i></b>
<b><i>A+</i></b>	A	yes	Aa or AO	RR or Rr
<b><i>A-</i></b>	A	no	AA or AO	rr
<b><i>B+</i></b>	B	yes	BB or BO	RR or Rr
<b><i>B-</i></b>	B	no	BB or BO	rr
<b><i>AB+</i></b>	A and B	yes	AB	RR or Rr
<b><i>AB-</i></b>	A and B	no	AB	rr
<b><i>O+</i></b>	none	yes	OO	RR or Rr
<b><i>O-</i></b>	none	no	OO	rr