ABO/Rh Blood Typing

Early attempt to transfer blood from one person to another produced varied results. Sometimes it seemed to help the recipient and other times it produced very serious consequences. Eventually, it was discovered that blood contains substances that are unique to an individual.

ABO blood type is determined by the presence or absence of specific proteins called antigens on an individual's red blood cells (RBC). The serious reactions were caused by antibodies present in the blood that protected an individual from foreign proteins and diseases. Antibodies cannot distinguish a disease protein from a RBC protein. The reaction of the antigens and the antibodies of the mismatched blood will cause clumping and could lead to a stroke in the recipient.

There are four ABO types of blood – A; B; AB; O. This is an example of codominance and multiple alleles. The codominance is the result of both dominant alleles (A & B) being expressed when present. Because there are more than two alleles for blood type it is possible to have four blood types.

Phenotype	**Genotype**	**Protein on RBC (antigen)**	**Antibodies in blood plasma**
Type A blood	I^AI^A or I^Ai	A	B
Type B blood	I^BI^B or I^Bi	B	A
Type AB blood	I^AI^B	A and B	none
Type O blood	ii	none	A and B

There are many other blood typing systems in addition to the ABO classification system. The Rh factor is also a commonly used classification system. Rh factor is inherited just like the ABO system, but follow a simple dominant/recessive inheritance pattern. Another difference seen in Rh factors is that the antibodies do not appear spontaneously, but only after exposure to an Rh factor that is not like the individual's Rh factor.

This means that an Rh^- person will not react to the initial exposure of Rh^+ blood, but will with a second exposure. This becomes important when an Rh^- woman becomes pregnant with an Rh^+ fetus for the first time. If during birth the some of the baby's Rh^+ blood gets into the mother's Rh^- blood, she may produce anti-Rh antibodies. If the woman becomes pregnant again with an Rh^+ fetus the anti-Rh antibodies could pass through the placental membranes and react with the fetus' blood. Women who are Rh^- carrying an Rh^+ fetus are given two injections to prevent her body from producing anti-Rh antibodies.

Part 1 – Key terms
Define the following terms

ABO/Rh Antigens –

Antibodies –

Multiple Alleles –

Codominance –

Part 2 – Questions
Genetics of Blood Types

1. ABO blood type is determined by the presence or absence of specific _____ on an individual's red blood cells.
2. What is another name for these proteins? _____
3. A person whose RBCs contain the protein A and the protein B are blood type _____.
4. A person whose RBCs lack the protein A and the protein B are blood type _____.
5. A person with the genotype I^AI^A has the blood type _____.
6. A person with the phenotype B has the genotype _____ or _____.
7. A person with the genotype ii has the blood type _____.
8. A person with B antibodies in their blood plasma has the blood type _____.
9. A person with A and B antibodies in their blood plasma has the blood type _____.
10. A person with A and B antigens on their RBCs has the blood type _____.
11. If a RBC has Rh antigens, the blood type is considered _____.
12. If a RBC has no Rh antigens, the blood type is considered to be _____.

Blood Transfusions

1. Why would blood type AB be called the "universal receiver"?

2. Why would blood type O be called the "universal donor"?

3. When does an Rh^- person begin producing Rh antibodies?

4. Explain the seriousness of having a mother with Rh^- blood and a second pregnancy with an Rh^+ fetus.