

**Answer ALL questions.**

- 1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

**Haemolytic disease**

Haemolysis is the term used to describe the bursting of red blood cells. Haemolytic disease occurs when the red blood cells burst in the body of a foetus in a pregnant woman. The bursting of the red blood cells affects the development of the foetus into a baby.

- 5 The red blood cells burst when certain antibodies from the mother pass across the placenta. The antibodies attach to protein molecules called antigens. These antigens are on the surface of the foetal red blood cells. The protein antigen is called the rhesus factor and is made using the genetic code found on the dominant allele, D, during the production of red blood cells in bone marrow.
- 10 Homozygous dominant and heterozygous individuals have cells with the antigen. These individuals have the rhesus positive blood group. Homozygous recessive individuals have cells that do not have the antigen. These individuals have the rhesus negative blood group.

- 15 During the birth of a rhesus positive baby, some red blood cells may leak into the circulatory system of the mother. This happens as the placenta pulls away from the wall of the uterus. A rhesus negative mother will make antibodies that destroy rhesus positive red blood cells. This is not a problem for the child that has just been born. However, if the mother becomes pregnant again with another rhesus positive foetus, the antibodies will harm the foetus.

- 20 Haemolytic disease can be avoided by treating a rhesus negative woman at risk of having a second rhesus positive child. This treatment involves the mother having an injection during and after pregnancy. The injection destroys rhesus positive cells in the mother's blood before the cells can cause an immune response.

- 25 If the foetus is rhesus positive, the pregnancy is carefully monitored for signs of haemolytic disease. Monitoring includes regular ultrasound scans of the foetus and measuring the amount of antibody in the mother's blood. A change in the concentration of the antibody in the mother's blood, due to her secondary immune response, can lead to dangerous haemolysis. If a foetal blood test confirms a low number of red blood cells, a blood transfusion can be done
- 30 *in utero* to replace the burst foetal red blood cells.

