Q2 Outline the principles of compatibility testing of blood for transfusion (Sept 2010)

Compatibility testing of donor and recipient blood is done prior to transfusion to check for red cell compatibility and the presence of specific antibodies. It involves:

1. **Blood typing (ABO and Rh group) of donor and recipient blood**
    - There are over 400 red cell antigens, the most important being ABO and Rhesus blood groups
    - ABO grouping encodes for the presence of antigenic carbohydrates on the end of a universal H stem. Possible groups are O (45% of population), A (40%), AB(5%), B(10%). Most people have IgG and IgM antibodies to the antigens they do not express
    - Rhesus antigens (C, D and E) are expressed on all red cells, however D is the most antigenic. Rhesus D is termed Rhesus positive and is present in 85% of the population.
    - Blood typing involves addition of known antibodies (A and B) to donor RBCs to test for agglutination; 'backtesting' involves addition of RBC with known antigens to recipient serum to confirm.

2. **Antibody screening**
    - Routine screening of the recipient serum checks for the presence of minor antibodies and is done by adding group matched RBC with a known minor antibody (such as Kelly or Duffy) to the recipient serum → agglutination indicates presence of minor antibody

3. **Crossmatching** - this involves the saline test to check compatibility, and the Coombs test
    a. Saline test – a sample of donor RBC and recipient serum is mixed together with saline and observed for reaction. Part two of this test involves addition of a low ionic strength salt solution (LISS test) and incubation at 37 degrees, which allows for identification of warm antibodies or incomplete agglutinating antibodies.

    b. The Coombs test is done to check for specific IgG antibodies which might cause a haemolytic reaction if transfused. It involves:
        - **Washing with saline** → to remove any serum and unbound IgG antibodies
        - **Testing with Coomb's reagent** → the additional of rabbit polyspecific IgG, causes agglutination if any IgG-RBC complexes are present
        - **Control step** → only done if Step 3 is negative and involves the addition of Coombs control cells to the negative Coomb's solution leftover from step 3. This should cause agglutination – if not, it suggests the Coomb's reagent is faulty.

Compatibility testing also involves an extensive questionnaire for donors, rigorous identification procedures and testing of donor blood for blood borne viruses prior to transfusion.