NATURE OF ANTIGEN-ANTIBODY REACTIONS

• A. Lock and Key Concept
  The combining site of an antibody is located in the Fab portion of the molecule and is constructed from the hypervariable regions of the heavy and light chains.

• X-Ray crystallography studies of antigen-antibody interactions show that the antigenic determinant nestles in a cleft formed by the combining site of the antibody.

• Thus, our concept of antigen-antibody reactions is one of a key (i.e. the antigen) which fits into a lock (i.e. the antibody).

• The bonds that hold the antigen to the antibody combining site are all non-covalent in nature. These include hydrogen bonds, electrostatic bonds, Van der Waals forces and hydrophobic bonds.

• Since antigen-antibody reactions occur via non-covalent bonds, they are by their nature reversible.
How antigen – antibody reactions in vitro helps in Dx?

• **Infectious disease**
  By determining whether an individual has developed antibodies in response to infection.
  By detecting antigen of a particular infectious agent from blood or other body fluids.

• **Autoimmune disease**
  By detecting antibodies against particular self antigen in case of autoimmune diseases.

• **Tumors**
  By detecting tumor markers.

• **Metabolic diseases**

• **Physiological conditions**
Enzymes and Signal Amplification Systems

The use of specific detection methodologies to directly increase the signal in proportion to the amount of target in the reaction.

Examples include the use of branched DNA probes that contain a reporter group or enzyme amplification.

How are signals amplified inside cells?

A signal may reach a cell in the form of a single hormone molecule.

Inside the cell, the signal must be amplified so that the response is carried out multiple times rather than just be a single molecule.

Amplification is built into the system.

Any molecule that catalyzes a reaction can do so multiple times producing more than one product molecule.