Mutation – changes in the arrangement of bases in an individual gene or in the structure of a chromosome, which changes the arrangement of genes on a chromosome and lead to the production of different amino acids in a polypeptide chain. It can be caused by insertion, deletion, inversion or duplication of a single base unit in a DNA strand.

Point mutations – the change of one base; miscopying of one or small number of nucleotides. A change in the gene itself.

Chromosomal mutations – changes of the positions of the genes within the chromosomes.

Whole-chromosome mutations – An entire chromosome is lost during meiosis or duplicated in one cell by errors in the process. Eg. Down syndrome

Mutations	
Advantages	**Disadvantages**
• A new and superior protein that can lead to reproductive advantage • Natural selection	• Cancer where there a tumour is formed • Gamete mutations are passed onto offspring. • Can lead to the eradication of a species (extinction)

Mutagens – speed up the rate of mutations occurring eg. X – rays

Enzymes

Enzymes are biological catalysts that speed up the rate of chemical reaction without themselves being altered. They are globular proteins that are insoluble in water and speed up the breakdown of substrates into smaller more useful products (catabolic reactions) by forming enzyme-substrate complexes, and by providing an alternative route with a lower activation energy for the reaction to take place. They have one-entry specific active sites that are highly specific to the enzyme and can only accommodate a specific substrate; this means that they have a high-specificity. Enzymes are affected by the changes in temperature and in pH and have their optimum temperature and pH where the most enzyme-substrate complexes form.

As the temperature starts to increase above the optimum temperature of the enzyme, the enzyme tertiary and quaternary structure starts to unravel and it loses its high specificity. This means that it is no longer able to do its function.