## Gene mutation

Any change to the structure of DNA is known as a mutation. Mutations arising in body cells are not passed onto the next generation. Mutations occurring during the formation of gametes may be inherited. Any change to one or more nucleotide bases or and rearrangement of the bases, in DNA is known as a gene mutation.

## Substitution of bases

This is a type of gene mutation where a nucleotide in a DNA molecule is replaced by another nucleotide. Depending on which new base is substituted there are three possible consequences.

- 1. A nonsense mutation:- occurs if the base change results in the formation of one of the three stop codons and marks the end of a polypeptide chain prematurely. The final protein would almost certainly be significantly different and he protein could not perform its normal function.
- 2. A mis-sense mutation:- arises when the base change results in a different amino acid being coded for. The polypeptide produced will differ in a single amino acid. The significance of this change will depend upon the precise role of the original amino acid. If it is used for the formation of the tertiary structure of the final protein, then the replacement amino acid may not form the same bonds. The protein may therefore have a different shape not function properly.
- **3.** A silent mutation:-occurs when the substitute Case, although different, still codes for the same amino acid as before. It is is due to the degenerate nature of the genetic code. In which most an ino acids have more than one codon.

**Deletition by deletion Pays** A gene mutation by deletion occurs when a nucleotide is lost from the normal DNA sequence. The genetic code is read in units of three with no overlaps. If one base has been taken out then a 'frame shift' occurs one to the left. This gene is now read in the wrong three-base groups and the genetic message is altered.

## Causes of mutation

Gene mutations can arise spontaneously in DNA replication, these spontaneous mutations are permanent change in the DNA that occur without any influence. The basic mutation rate of 1 or two mutations per every 100 000 genes can be increased by outside factors known as mutagenic agents or mutagens. These include the following:-

- 1. High energy radiation that can disrupt the DNA molecule.
- 2. Chemicals that alter the DNA structure or interfere with transcription.

Mutations have both cost and benefits. One benefit is that it produces genetic diversity which is necessary for natural selection and speciation. On the other hand it can produce an organism which is less well suited to its environment. In addition mutations that occur in body cells rather than gametes can disrupt normal cellular activities, such as cell division.