## Vitamins

Vitamins are organic compounds required in the diet in small amounts to perform specific biological functions for normal maintenance of optimum growth and health of the organism. Most of the vitamins cannot be synthesised in our body, but plants can synthesise almost all of them, so they are considered essential food factors.

## Classification of Vitamins

Vitamins are classified into two groups depending on their solubility in water or fat.

| Fat-soluble vitamins | Water-soluble vitamins |
|---|---|
| These vitamins are soluble in fat and oils but insoluble in water. | These vitamins are soluble in water. |
| They are stored in the liver and adipose (fat-storing) tissues. | Water-soluble vitamins must be supplied regularly in the diet because they are readily excreted in urine and cannot be stored (except Vitamin B12) in our body. |
| Examples: Vitamins A, D, E and K | Examples: Vitamins B and C |

## Important Vitamins, their Sources and their Deficiency Diseases

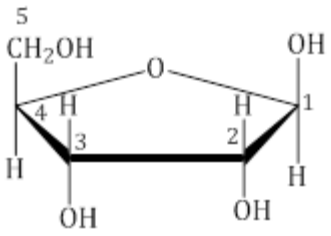
| Name of vitamin | Source | Deficiency diseases |
|---|---|---|
| Vitamin A | Fish liver oil, carrots, butter and milk | Xerophthalmia (hardening of the cornea of the eye) Night blindness |
| Vitamin $B_1$ (Thiamine) | Yeast, milk, green vegetables and cereals | Beriberi (loss of appetite, retarded growth) |
| Vitamin $B_2$ (Riboflavin) | Milk, egg white | Cheilosis (fissuring at the corners of the mouth and lips), digestive disorders and burning sensation of the skin |
| Vitamin $B_6$ (Pyridoxine) | Yeast, milk, egg yolk, cereals and gram | Convulsions |
| Vitamin $B_{12}$ | Meat, fish, egg and curd | Pernicious anaemia (RBC deficient in haemoglobin) |
| Vitamin C | Citrus fruits, amla and | Scurvy (bleeding gums) |

| | | |
|---|---|---|
| (Ascorbic acid) | green leafy vegetables | |
| Vitamin D | Exposure to sunlight, fish and egg yolk | Rickets (bone deformities in children) and osteomalacia (soft bones and joint pain in adults) |
| Vitamin E | Vegetable oils such as wheat germ oil, sunflower oil | Increased fragility of RBCs and muscular weakness |
| Vitamin K | Green leafy vegetables | Increased blood clotting time |

**Nucleic acids:**

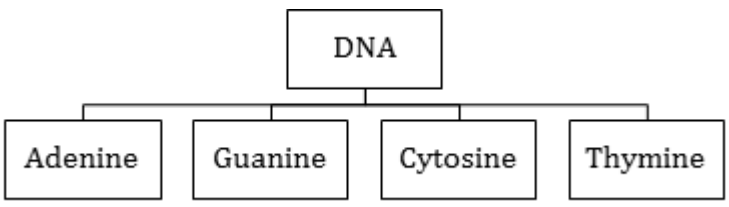
1. Nucleic acids are mainly of two types:
1. Deoxyribonucleic acid (DNA)
2. Ribonucleic acid (RNA)
1. **Chemical Composition of Nucleic Acids**
    1. DNA or RNA on complete hydrolysis yields a pentose sugar, phosphoric acid and nitrogen containing heterocyclic compounds.
    2. In DNA molecules, the sugar moiety is β-D-2-deoxyribose.

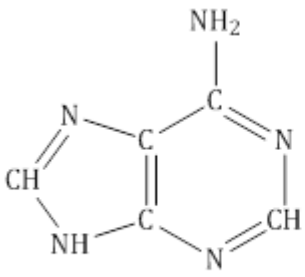
1. In RNA molecule, the sugar moiety is β-D-2-ribose.



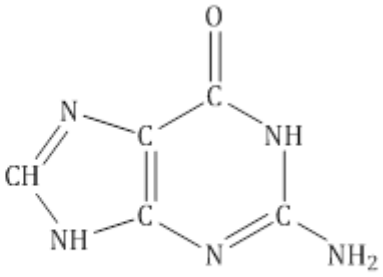

β-D-2-ribose

2. DNA contains four bases:

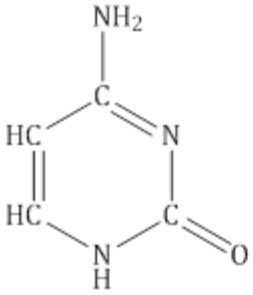




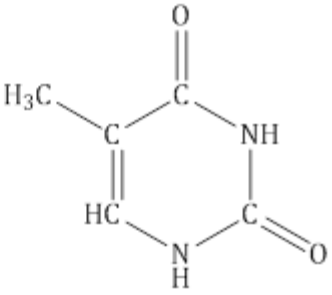

Adenine (A)




Gaunine (G)

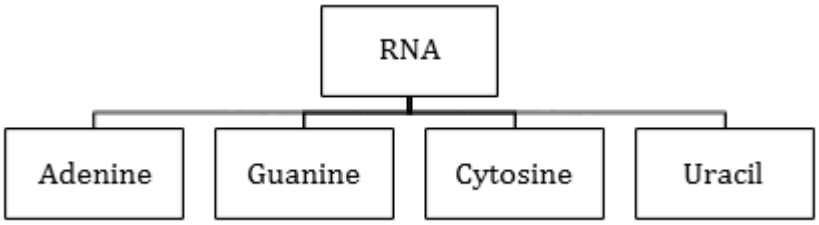


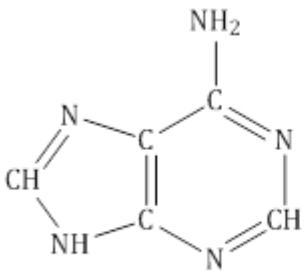

Cytosine (C)



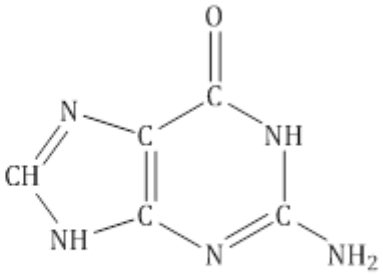

Thymine (T)

3. RNA contains four bases:

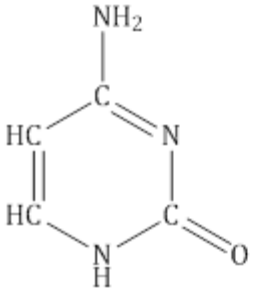




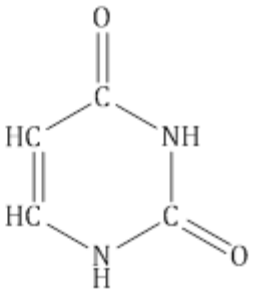

Adenine (A)




Gaunine (G)



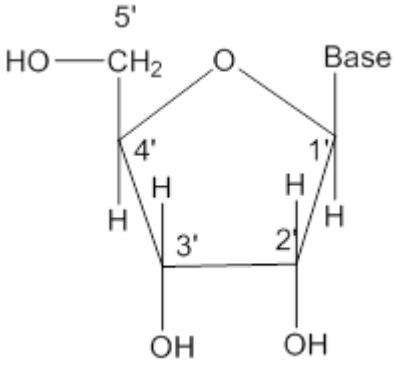

Cytosine (C)




Uracil (U)

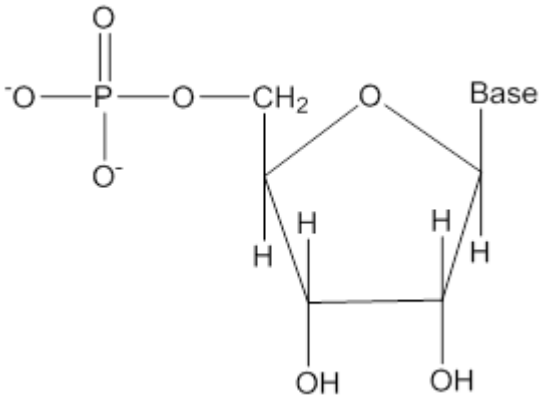
4. **Structure of Nucleic Acids**
   **Nucleoside**

1. Nucleotide is a unit formed by linking a base to 1’ position of sugar.
2. The sugar carbons are numbered as 1’, 2’, 3’ etc. in order to distinguish from the bases.

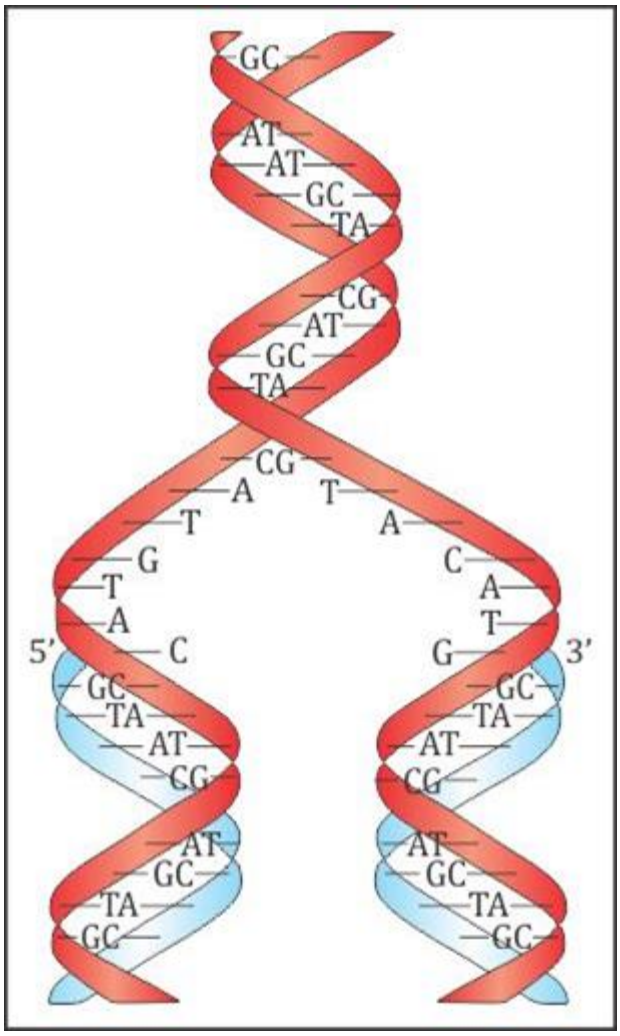



**Nucleotide**

1. It is obtained when nucleoside is linked to phosphoric acid at 5’-position of sugar moiety.




2. Nucleotides are linked by phosphodiester linkage between 5’ and 3’ carbon atoms of the pentose sugar.
3. James Watson and Francis Crick gave a double strand helix structure for DNA.
4. In this two nucleic acids chains are wound about each other and held together by hydrogen bonds between pairs of bases.
5. The two strands are complimentary to each other because the hydrogen bonds are formed between specific pairs of bases.
6. Adenine forms hydrogen bonds with thymine whereas cytosine forms hydrogen bondsith guanine.




**RNA**

1. In secondary structure of RNA, helices are present which are only single stranded.
2. They sometimes fold back on themselves to form a double helix structure.
3. RNA molecules are of three types and they perform different functions.
4. They are named as:
    1. Messenger RNA (m-RNA)
    2. Ribosomal RNA(r-RNA)
    3. Transfer RNA (t-RNA)