MODULE 6: Structure and Functions of Nucleic Acids

Q.1. Fill in the blanks.

(a) Double helix structure of DNA was proposed by ----- and ----

(b) DNA double helix is ---- handed along its perpendicular axis.

(c) r-RNA and protein combine to form (i) ribosome (ii) mitochondrion (iii) Golgi bodies (iv) Sn RNA

(d) m-RNA is generated by process of ----.

(e) The four arms of t-RNA are ---, ---, ---- and ----.

Ans:

(a) Watson and Crick

(b) Right

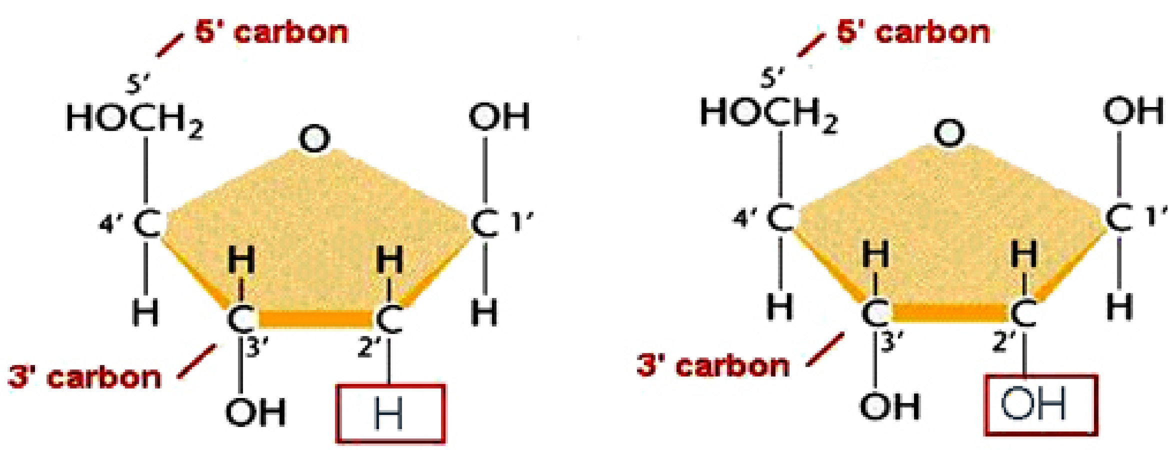
(c) (i) Ribosome

(d) Translation

(e) Dihydrouridine (DHU), anticodon, pseudouridine (TψC) arms and one small optional arm .

Q.2. Use Harworth projection to show how ribose is structurally different from deoxyribose?

Ans: Galactose.

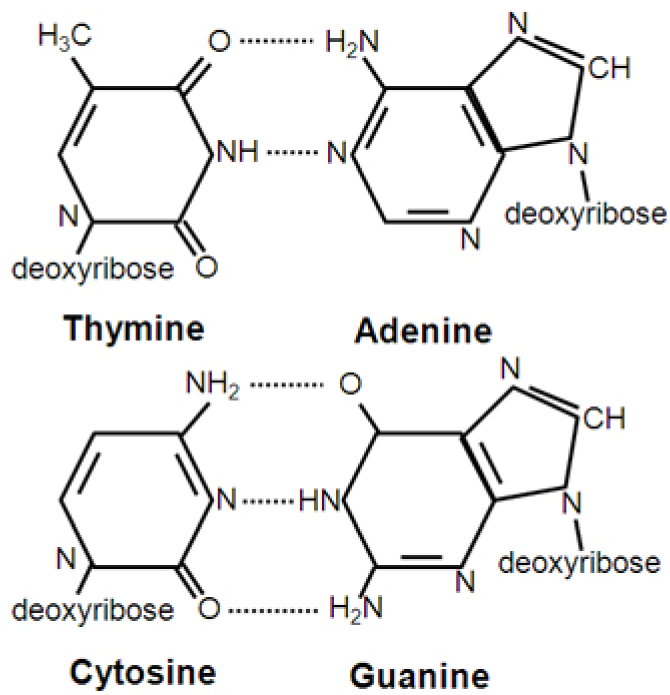


2-Deoxyribose

Ribose

Q.3. Diagrammatically represent H-bonding between complimentary base pairs. Why DNA with greater GC content more stable than one with greater AT pairs?

Ans:



The base-pairs composed of G and C contain three H-bonds, whereas those of A and T contain two H - bonds. For this reason G-C base-pairs are stronger than A-T base-pairs. The outcome will be that DNA having more GC base pairs will be more stable than the one having more AT pairs.

Q.4. Identify and name the fatty acid from the following representation:

(a) 6:0
(b) 16:0
(c) 20:0
(d) 18:1 Δ^9
(e) 18:3 $\Delta^{9,12,15}$

Ans:

(a) 6:0- caproic acid
(b) 16:0-palmitic acid
(c) 20:0- arachidic acid
(d) 18:1 Δ^9 –Oleic acid
(e) 18:3 $\Delta^{9,12,15}$ -Linolenic acid

Q.5. Enlist the stabilizing factors for the DNA molecule?

Ans:

- The bases pairs are hydrogen bonds with each other and impart stability to the structure.
- Bases are stacked over each other in the double helix.
- Hydrophobic interactions between stacked bases also stabilize the DNA.
- The sugar phosphate backbone of each strand is negatively charged (due to phosphate group (pKa being near to zero). These charges are stabilized by Mg^{2+}.

Q.6. Explain Chargaff's rule?

Ans: The key points of the Chargaff's rule are:

- A always bonds with T; G always bonds with C.
- A forms double hydrogen bond with T while G forms triple hydrogen bond with C
- Concentration of purine = Concentration of pyrimidine i.e. A+G=C+T
- (A+T) / (G+C) = constant for a species.

Q.7. Schematically represent a DNA double helix. If DNA sample has 23%A on molar basis, what is the percentage of other bases present?

Ans: 23% T, 27% G, 27% C.