2. (a) Distinguishes the differences between eukaryotic and prokaryotic DNA replications

1. The size of the DNA molecule in a eukaryotic chromosome is much larger than that of a circular DNA molecule of a bacterium.
2. Therefore prokaryotes usually have one Ori while an Eukaryotic chromosome has several Ori.
3. The DNA polymerases in eukaryotes and prokaryotes are different from each other in their structure, while having the same functions.
4. The DNA replication of the prokaryotes occurs continuously, whereas in eukaryotes it happens only in the S-phase of cell cycle.

(b) Briefly describes the basic structure and organization of prokaryotic and eukaryotic genomes and their differences

5. Prokaryotic chromosome is a single double stranded circular DNA molecule associated with a few protein molecules.
6. Packaging of DNA in prokaryotes is facilitated by the proteins associated with the DNA molecule.
7. The DNA molecule is initially coiled into loops and these loops then independently supercoil into domains identifiable in electron micrographs.
8. The loops of compacted mass of DNA are bound to a 'core' consisting of RNA and protein.
9. The 'core' also attaches the chromosome to the membrane.
10. Eukaryotes have several chromosomes, each consisting of a single double stranded linear DNA associated with histones and other protein molecules.
11. Eukaryotic chromosomes are associated with a large number of proteins called histones that helps to organize the DNA inside the nucleus.
12. This DNA-protein complex is known as chromatin.
13. The chromatin may be lightly packed as in euchromatin or tightly packed as in heterochromatin.
14. Euchromatin is rich in genes and is probably active in transcription.
15. Heterochromatin consists nucleotide sequences which are mostly inactive.
16. In the first level, the double helix winds around a complex of eight histone molecules.
17. These are called nucleosomes and they look like beads of a necklace.
18. The adjoining beads of nucleosomes are linked together by a stretch of DNA: linker DNA.
19. In the second level, the nucleosomes twist and pack in a spiral fashion to form a chromatin fibre of roughly 30 nm in diameter: 30 nm fibres from 10 nm fibres.
20. At the third level, the 30 nm fiber forms loops, called looped domains, attached to a protein scaffold.
21. This structure has a thickness of 300 nm.
22. Finally, at the fourth level, the looped domains coil, fold and further compact to form the mitotic chromosome.
23. The diameter of a chromatid is about 700 nm.
24. In the metaphase chromosome, the chromatids are already replicated.

Sampath HiOlogy

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UNIT 07

Recombinant DNA Technology

Molecular Basis of Genetic Material