Structure of a Chromosome
Origins of replication in *E. coli* and eukaryotes

(a) Origin of replication in an *E. coli* cell

- Origin of replication
- Bacterial chromosome
- Double-stranded DNA molecule
- Replication fork
- Replication bubble
- DNA is circular
- Two daughter DNA molecules

(b) Origins of replication in a eukaryotic cell

- Origin of replication
- Eukaryotic chromosome
- Double-stranded DNA molecule
- Replication fork
- Bubble
- DNA is linear with much packing proteins
- Two daughter DNA molecules

Wow! Hundreds or even thousands of origins of replication in eukaryotes.

Only one origin of replication in prokaryotes.
In the eukaryotic cell, DNA is precisely combined with proteins in a complex called chromatin.

Chromosomes fit into the nucleus through an elaborate, multilevel system of packing.
Chromatin undergoes changes in packing during the cell cycle:

At interphase, some chromatin is organized into a 10-nm fiber, but much is compacted into a 30-nm fiber, through folding and looping.

Histones can undergo chemical modifications that result in changes in chromatin organization.
Interphase chromosomes occupy specific restricted regions in the nucleus and the fibers of different chromosomes do not become entangled.

Most chromatin is loosely packed in the nucleus during interphase and condenses prior to mitosis as seen in chromosome painting.

Dense packing of the chromatin makes it difficult for the cell to express genetic information coded in these regions.
The continuity of life is based on heritable information in the form of DNA, and structure and function are correlated at all levels of biological organization. Describe how the structure of DNA is correlated with its roles as the molecular basis of inheritance.