RAMA UNIVERSITY

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FACULTY OF ENGINEERING &TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

Prokaryotic DNA Replication

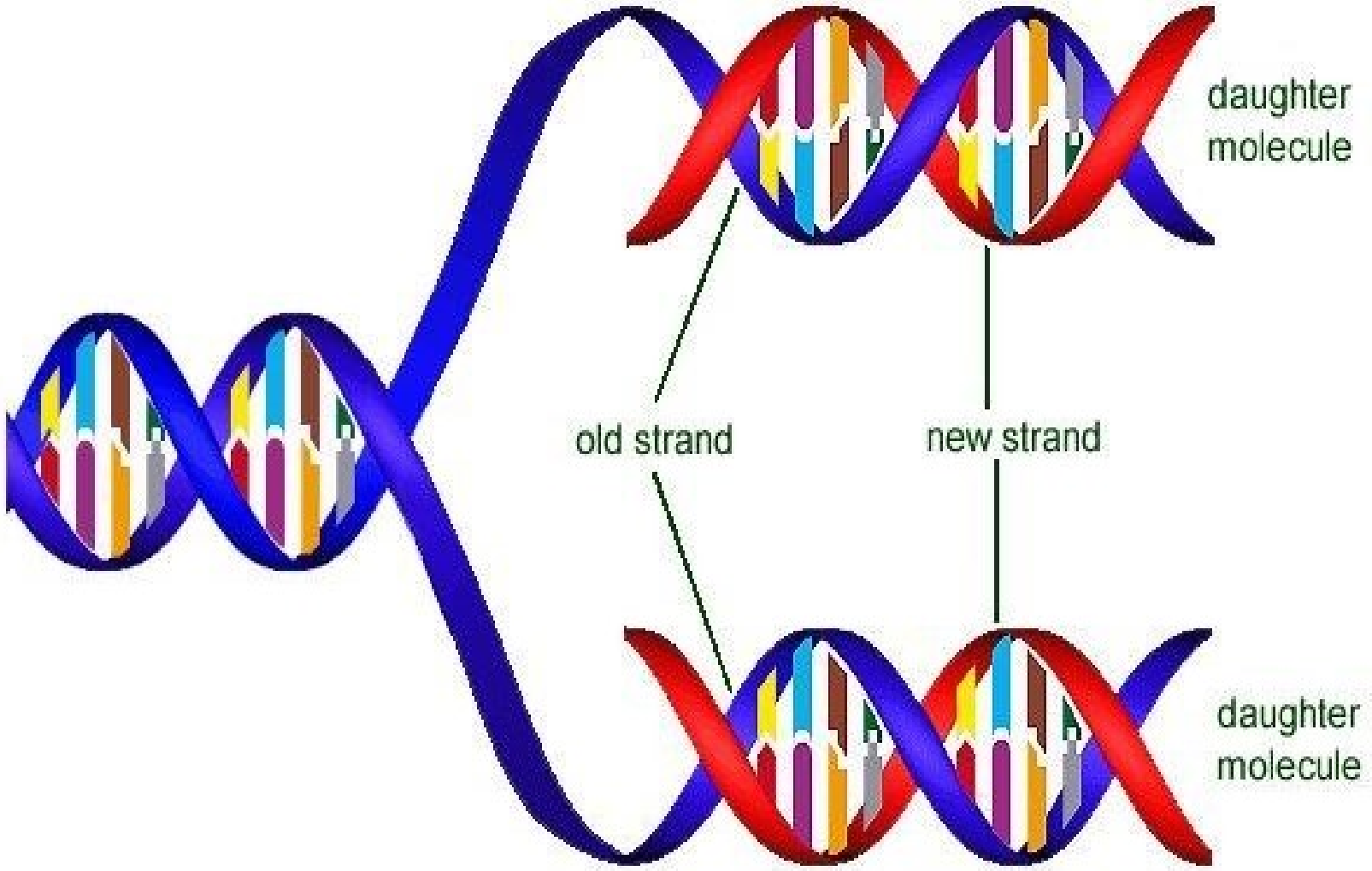
- When cell divides a daughter cell receives identical copies of genetic information from a parent cell.
- **Definition** of **DNA Replication** :Replication of DNA is the process in which DNA copies produce identical daughter molecules of DNA.

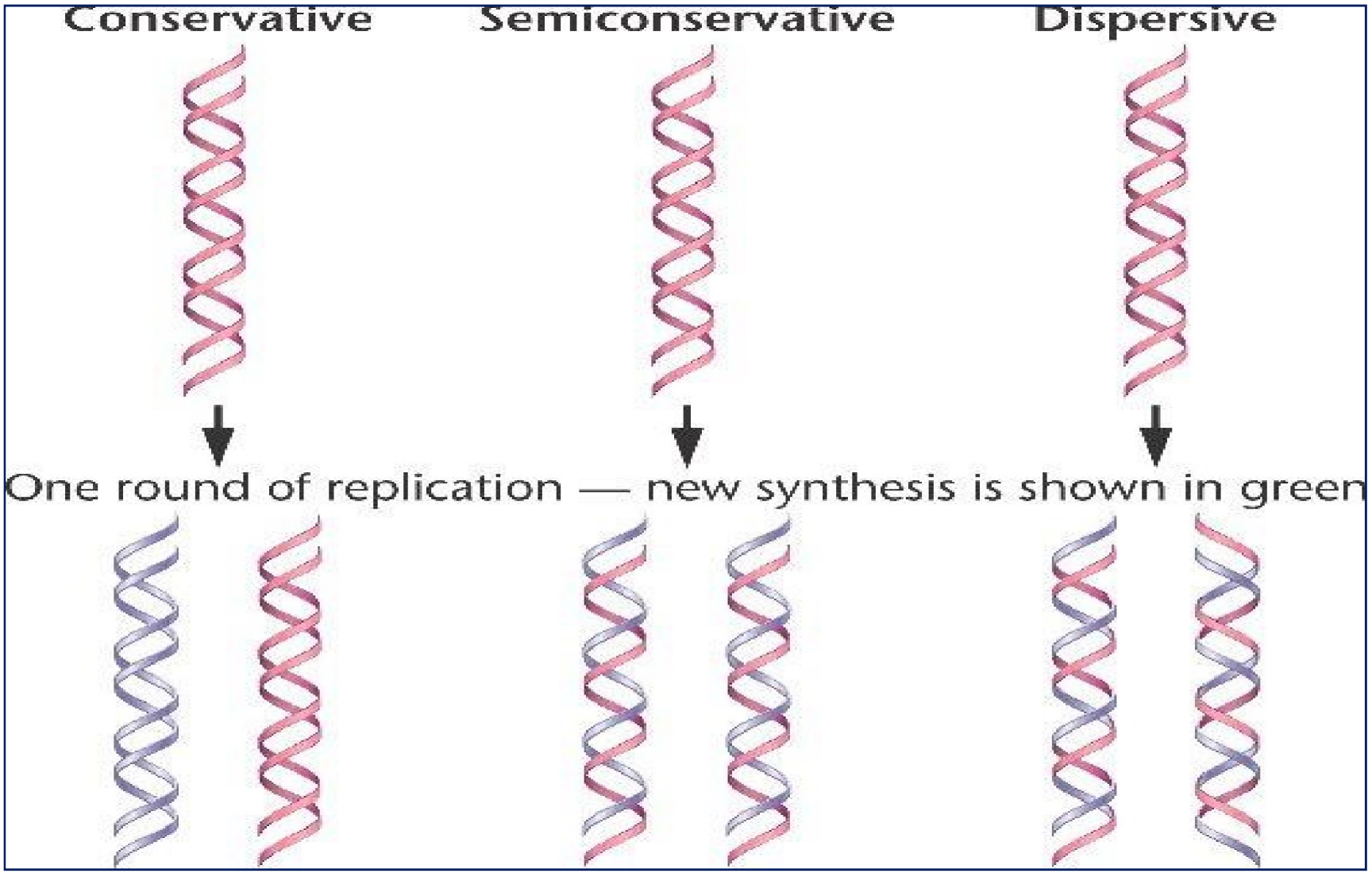
1. DNA Replication exhibits **high fidelity** which is essential for **survival of fetus**.
2. DNA Replication **is semi- conservative** :half of original DNA is conserved in the daughter DNA .(Meselson & Stahl 1958)

   Newly synthesized DNA has half of the parental DNA & one half of new DNA.

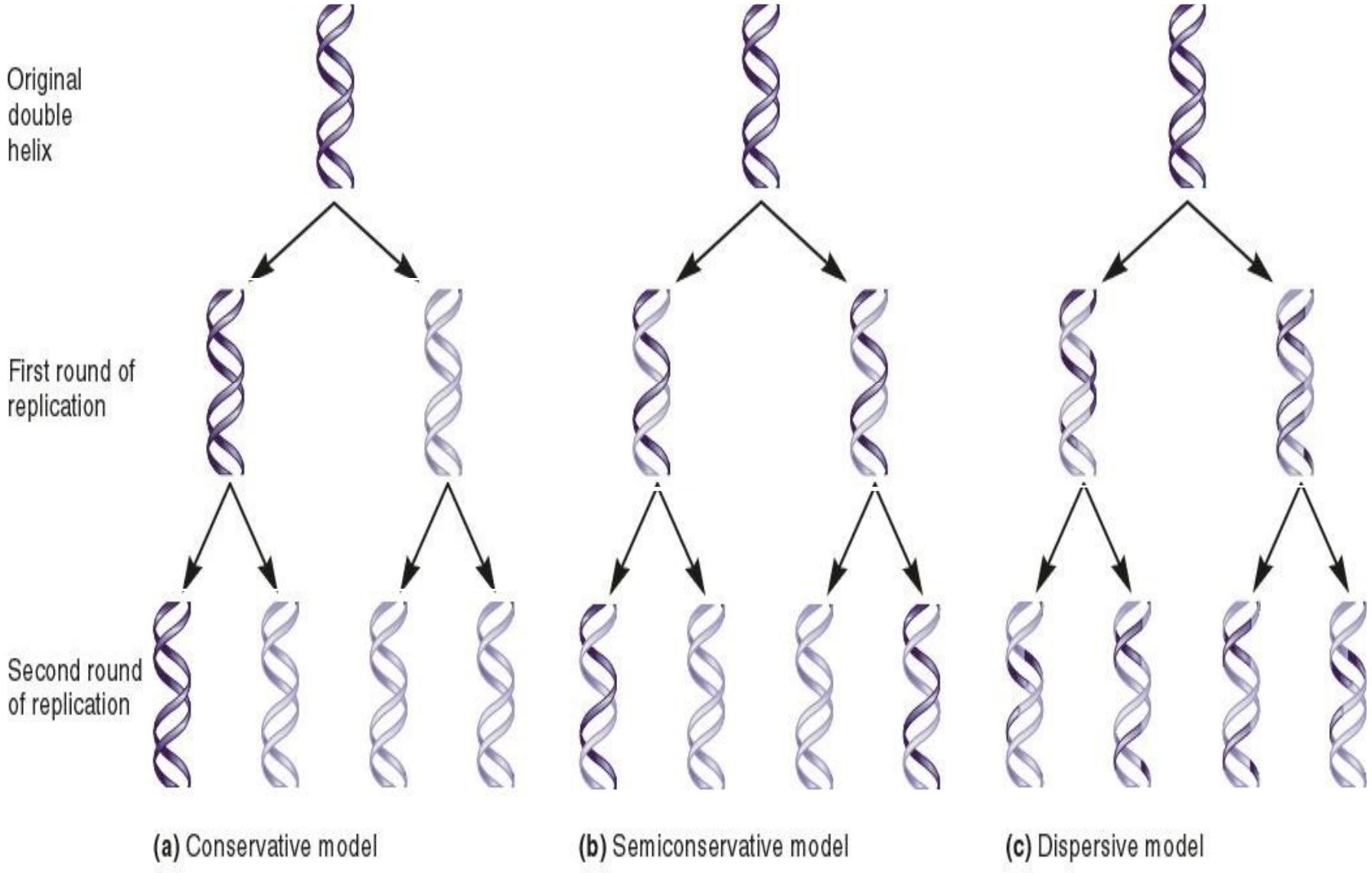
Features of DNA Replication in Prokaryotes:

- **Semi- continuous, semi–conservative & bi-directional**
- Replication proceeds in 5'→3' direction
- Simultaneously both strands of DNA
- Replication in **Leading strand is continuous & forward .**
- Replication in Lagging strand is discontinuous & short pieces of DNA (15-250 nucleotides).**Okazaki fragments** are produced on Lagging strand .
- **DNA Synthesis** :bidirectional from point of origin in replication bubble
- Two replication forks move in opposite directions from replication bubble or replication eye ,which becomes lager and assumes a □ shaped structure.
- 3 Stages of replication : initiation ,elongation and termination.


daughter
molecule
old strand
new strand
daughter
molecule

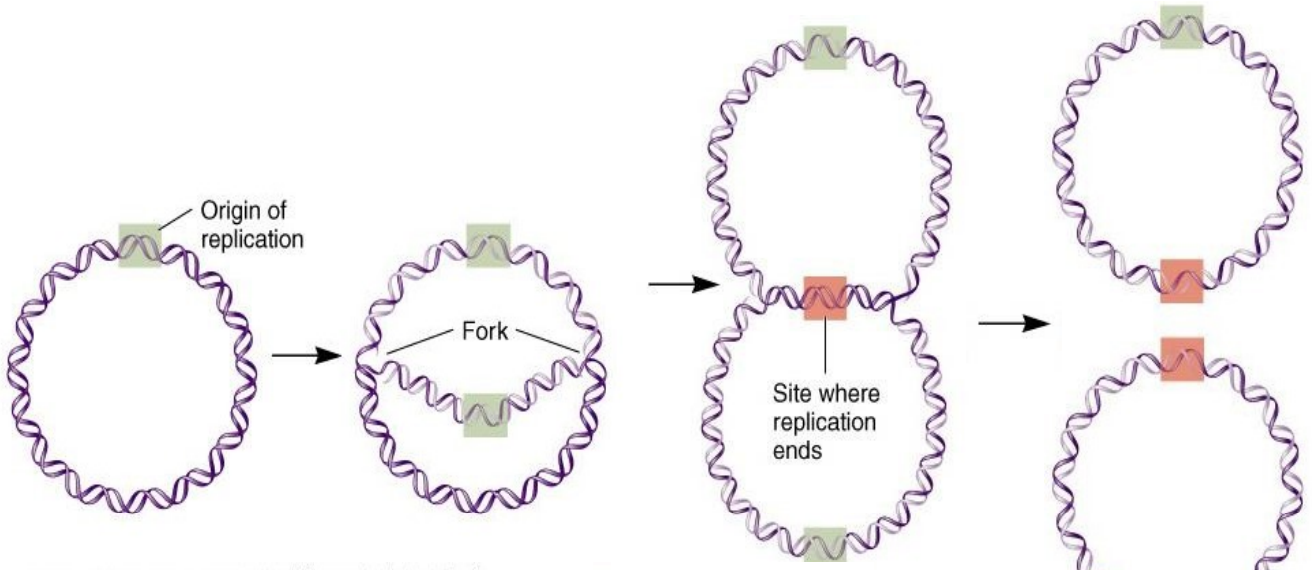

Conservative
Semiconservative
Dispersive
One round of replication — new synthesis is shown in green

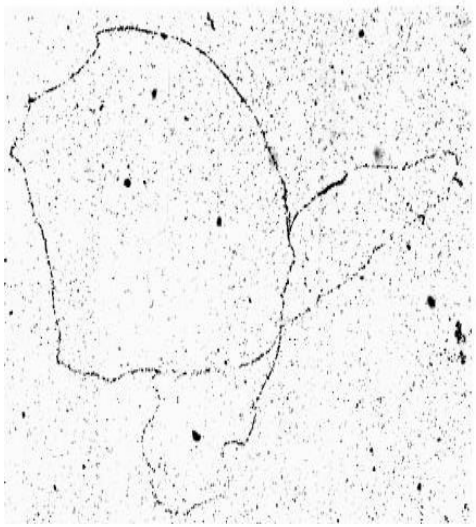
Three models for DNA replication

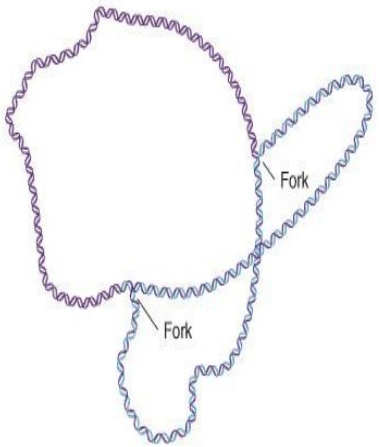


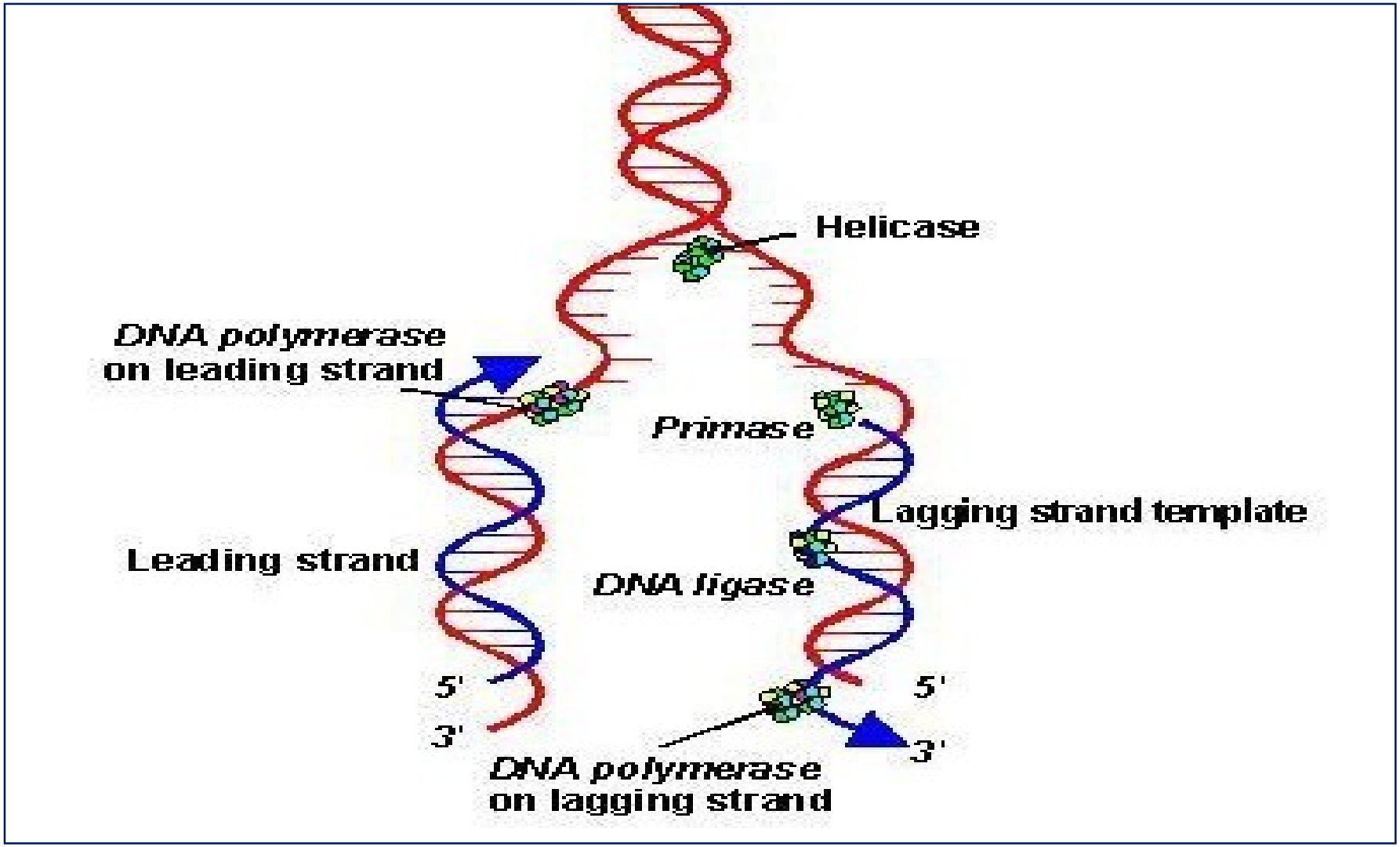
- **Replicon** : is the unit of DNA in which individual acts of replication occurs. Bacterial chromosome contains a single replicon ,eukaryotic chromosome has a large number of replicons.
- **Replication fork**: also known as growing point ,at which replication occurs. Replication may be unidirectional or multidirectional based on whether one or more replication forks starts from the origin respectively .
- **Origin of Replication** : the site at which replication begins .These sites are generally AT – rich to facilitate unwinding . Proteins and enzymes required assembled at origins.

Overview of DNA replication








Helicase
DNA polymerase
on leading strand
Primase
Lagging strand template
Leading strand
DNA ligase
5'
3'
5'
3'
DNA polymerase
on lagging strand