

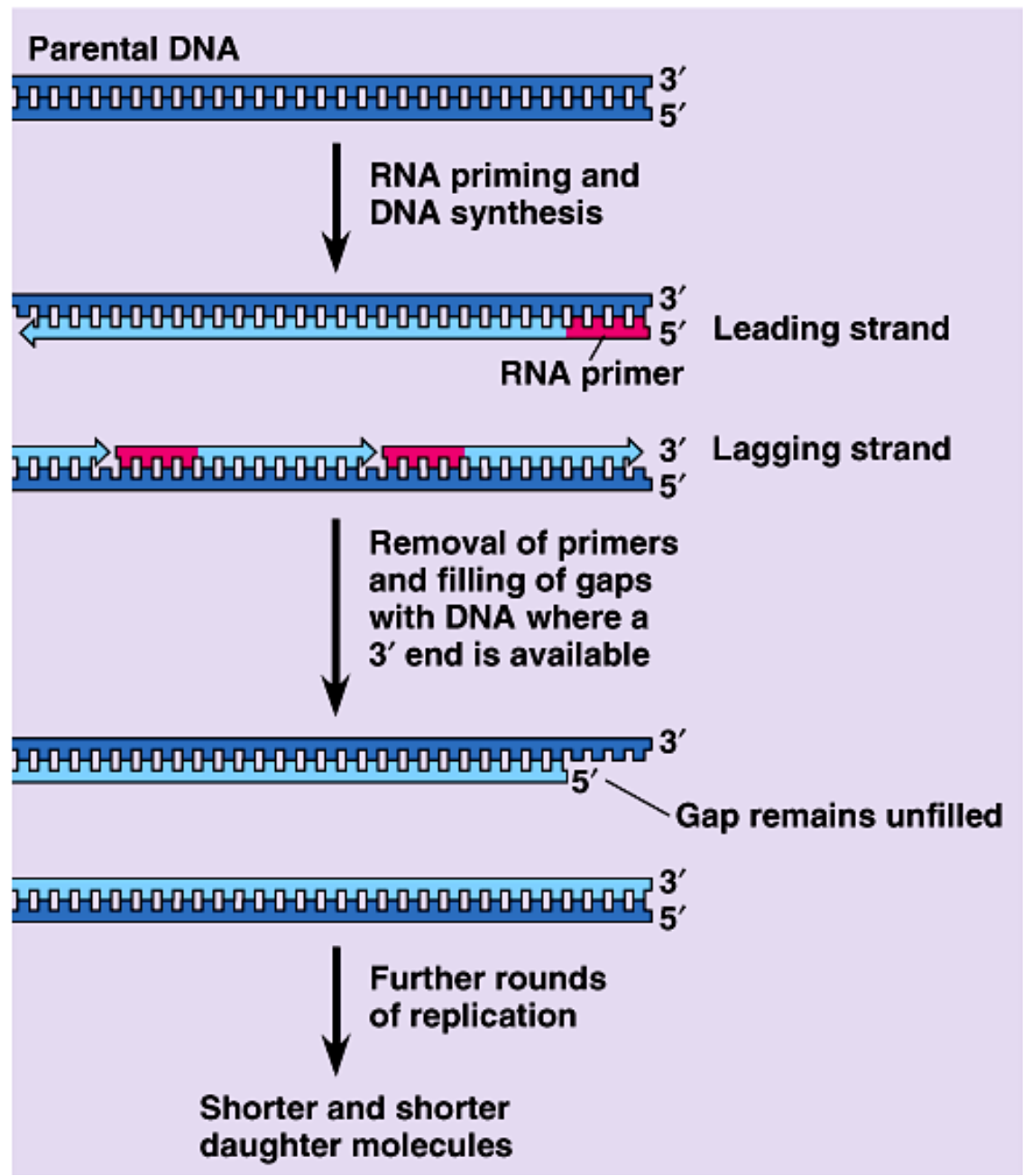
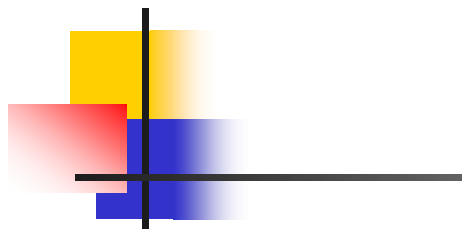
Aim: What is the function of telomeres in DNA replication?



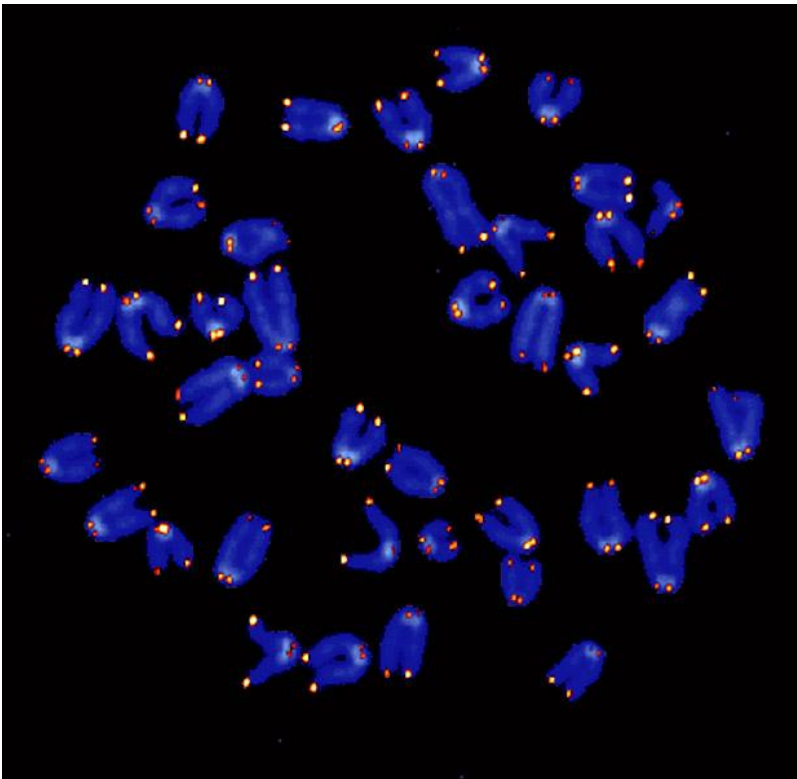
The ends of DNA molecules are replicated by a special mechanism



- Limitations in the DNA polymerase create problems for the linear DNA of eukaryotic chromosomes.
- The usual replication machinery provides no way to complete the 5' ends of daughter DNA strands.
 - Repeated rounds of replication produce shorter and shorter DNA molecules.



- The ends of eukaryotic chromosomal DNA molecules, the **telomeres**, have special nucleotide sequences.
 - In human telomeres, this sequence is typically TTAGGG, repeated between 100 and 1,000 times.
- Telomeres protect genes from being eroded through multiple rounds of DNA replication.

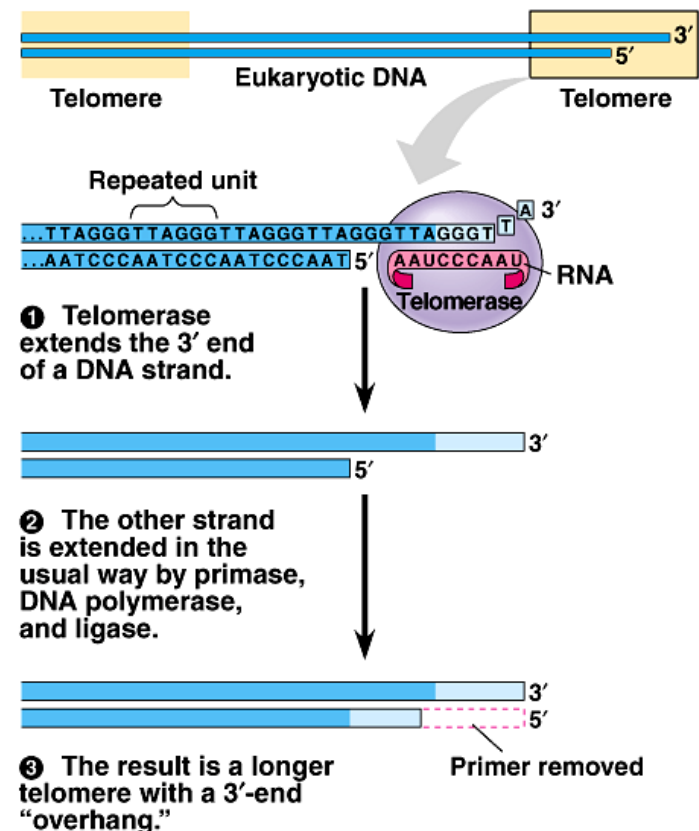


- Eukaryotic cells have evolved a mechanism to restore shortened telomeres.

- **Telomerase** uses a short molecule of RNA as a template to extend the 3' end of the telomere.

- There is now room for primase and DNA polymerase to extend the 5' end.

- It does not repair the 3'-end “overhang,” but it does lengthen the telomere.



- Telomerase is *not* present in most cells of multicellular organisms.



- Therefore, the DNA of dividing somatic cells and cultured cells does tend to become shorter.

- Thus, telomere length may be a limiting factor in the life span of certain tissues and the organism.

- Telomerase is present in germ-line cells, ensuring that zygotes have long telomeres.

- Active telomerase is also found in cancerous somatic cells.

- This overcomes the progressive shortening that would eventually lead to self-destruction of the cancer.