

PROBLEM SET #1 (lectures 14-16)

You should be familiar with the following terms:

Hydrogen bonds	Okazaki fragment
nucleoside	origin of replication
nucleotide	phosphodiester bond
DNA polymerase I	Theta structures
DNA polymerase II	replication fork
DNA ligase	
telomerase	

1. In what component parts do RNA and DNA differ? How do their general structures differ?
2. A new organisms has been found and the base composition of its DNA was determined to be 22 percent cytosine.

What is the percentage of thymine? guanine? adenine? The uracil content of RNA is found to be 24 percent. Explain.
3. What holds the DNA double helix together? What is an easy way to destroy the double helix structure?
4. What is the difference between conservative and semi-conservative replication?
5. Why does replication proceed from the 5' to 3' direction?
6. The rate of DNA replication averages 1000 nucleotides per second. How long does it take *E. coli* to replicate its 4,000 kb genome if replication is bidirectional from one origin? Unidirectional from one origin? How long would it take to replicate a human chromosome of 150,000 kb if replication is bidirectional from one origin at the centromere and the rate is 3,000 nucleotides per minute? From 1,000 origins?
7. What is meant by discontinuous replication?
8. What are the three physical requirements for DNA polymerase to proceed?
9. What is a primer?