

**Math 414-1 / 714-1**  
**Homework 4: DNA structure**  
**The homework set is due on Thursday, March 8th.**

**I.** Go to <http://molvis.sdsc.edu/dna/quests.htm> where you will find 3 question sets. Study all problems on the set. Turn in questions:

13, 14, 15, 18, 20, 21, 24, 25

**II.** Explain the Central Dogma of Molecular Biology. What is tRNA?

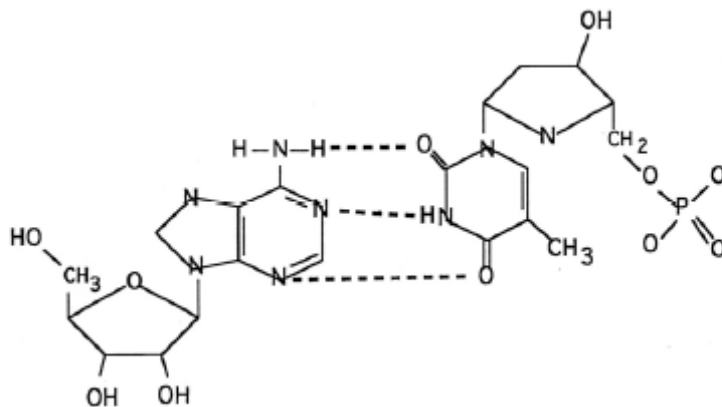
**III.** If the sequence of one strand of DNA is 5'- GAATTC - 3', then:

1. What is the sequence of the complementary strand?
2. How many H bonds are there in such segment of double-stranded DNA?

**IV.** The sequence of bases 3'- ...TCTGATATCAGTACG ... -5' occurs along one chain of a DNA duplex that has opened up at a replication fork. If synthesis of an RNA primer on this template begins by copying the base printed in bold, then what is the sequence of the first six nucleotides of this RNA primer?

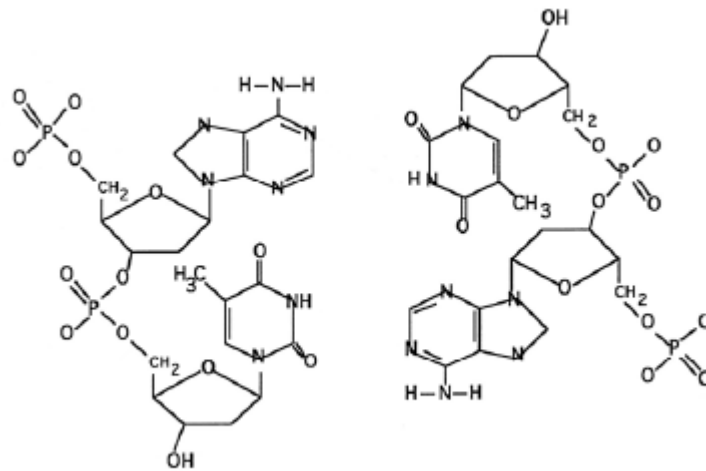
**V.** When the base composition of a DNA sample of *Mycobacterium tuberculosis* was determined, 18% of the bases were found to be Adenine. What is the percentage of Cytosine?

**VI.** Identify four mistakes in the following diagram of a DNA base pair, and identify the bases (G, A, T, or C).



**VII.** Consider the following molecular structure of two base-pairs of DNA. Based on this diagram:

1. Circle and label a deoxyribose group, a phosphodiester bond, and the bases (tell which are shown)
2. Label the 5' and 3' ends of both strands
3. Draw in the positions of the hydrogen bonds.



**VIII.** Literature search. Use the skills that you learnt during the librarian's visit to conduct the following searches:

1. Look for educational tools to explain the Central Dogma of Molecular Biology.
2. Use several databases (Math, Biology.....) to search review papers on DNA structure, and on DNA Topology.
3. Search "J. Wang and DNA helical pitch".