BCH 4054 **PRE-TEST 5** **GROUP NAME _____**
November 22, 2000

This test is take-home and open book, and it is intended that all members of the group contribute to completing it. Only one copy is to be submitted by the group, and all members who participated should sign their names below. **Test is due at the end of class on Monday, December 4.**

Please use dark pencil or ink and write legibly.

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Points

(8) 1. Explain the structural organization and catalytic activities of DNA Polymerase I from E. Coli. How does its role in replication differ from that of DNA Polymerase III?

(8) 2. NAD^+ plays an unusual role as a cosubstrate in the DNA ligase reaction. Explain chemically what it does.

(4) 3. Type II topoisomerases have two distinct roles in bacterial replication. What are they?

(8) 4. Describe an Okasaki fragment. When and where is it made, and what happens to it?

(10) 5. When DNA polymerase inserts a new nucleotide into the growing DNA chain, a mistake in base pairing can be made if the base happens to be in the wrong tautomeric form. There are two mechanisms to correct this mistake. Describe them.

(8) 6. Describe the role of a glycosylase and an AP endonuclease in excision repair.

(6) 7. Since thymine and uracil both base pair with adenine, one might think the extra energy involved in synthesis of thymine is a waste and that evolution might eliminate this process in favor of the more efficient use of uracil in DNA. What advantage does the use of thymine offer to the cell?

(10) 8. There are two mechanisms to repair thymine dimers. Explain them.

(8) 9. Dam methylase is an enzyme that methylates DNA in E. coli as a mechanism to differentiate newly synthesized DNA from old DNA. Strains defective in Dam methylase have high mutation rates. Interestingly, strains that overproduce Dam methylase also have high mutation rates. Explain how both a decrease in methylase activity and an increase in methylation activity could increase mutation rates.

(15) 10. Eucaryotic cells have three types of RNA polymerase. Give the function of each and the sensitivity of each to α-amanitin.

11. Unlike DNA replication, synthesis of RNA involves copying only short sequences of the DNA template

(5) (a) Describe initiation of transcription in prokaryotes, including recognition of the start site.

(5) (b) Describe the initiation of transcription in eukaryotes, including recognition of the start site.

(5) (c) Describe the termination of transcription in prokaryotes.