1. List three properties of the Kornberg DNA polymerase (Pol I) that seemed to Cairns to make it an unlikely enzyme for replication of the genomic DNA.

2. Which of Cairns's objections are in fact compatible with the known mechanism of DNA replication as we understand it today. Explain.

3. The cloning vector pBR322 is a closed, circular double-stranded DNA containing 4.3 kbp of DNA. During transcription, RNA polymerase causes local unwinding of 14 bp of DNA to expose the template strand. If 10 RNA polymerases are transcribing each pBR322 molecule, what linking number is required to prevent any supercoiling during transcription? (You can assume that there are 10 bp per Watson-Crick helical repeat).

4. If, starting with a fully base-paired, non-supercoiled pBR322 DNA, topoisomerase II is used to relax the supercoiling caused by the transcription in problem #5, how many ATPs would be consumed?
5. What are the functions of the following in DNA replication?

DNA ligase
3'-exonuclease of DNA polymerase III
DNA gyrase
SSB
Primase
_ subunit of DNA polymerase III
DNA polymerase I
Okazaki fragments

6. Why must eukaryotic chromosomes end in telomeres?