

Name: \_\_\_\_\_ Student ID: \_\_\_\_\_

1) Briefly explain why it is necessary for telomerase to have a reverse transcriptase subunit? (1 pt.)

-See reader pg.80 and Lehninger pgs.1025-1026

2a) In one sentence, please describe how eukaryotic DNA is "organized"?

Eukaryotic DNA is organized like "beads on a string".

-**Note:** You guys should know the overall processes for DNA packaging, but this question is asking something very specific. For example, why did I put that word in quotation marks? If you get a question like this on the final exam and aren't sure, ASK a TA! There may be many correct answers but the graders and professor are looking for the BEST answer. Please please please don't wait until you've lost points to realize that you would have greatly benefited from just asking during the exam! So, don't be a pessimist, it can never hurt to try to get more info.!

b) Please draw and label the components that make up a nucleosome particle. (1 pt.)

-See reader pg. 48-49

3) Explain briefly why RNA is alkali labile (unstable at pH 10) but DNA is not. (1 pt.)

- See reader pg. 14. Ribonucleotides contain a 2'-OH group which is absent in the deoxyribonucleotides. Alkali induces deprotonation of the 2'-OH group facilitating its nucleophilic attack on the adjacent phosphorous atom, thereby cleaving the RNA backbone.

4) If DNA polymerase I is not the "real" polymerase, briefly explain what the enzymes involved in DNA replication are and list their function? (2 pts.)

-Kornberg's DNA Pol I is able to synthesize DNA but is not required for this process & is not the main molecule for synthesis. DNA replication is carried out by a number of enzymes and their main functions in *E.coli* are:

Helicase: unwind DNA with energy from ATP

DNA Topo I: relax DNA by removing pos. & neg. supercoils by nicking DNA

DNA Topo II (DNA gyrase): introduce neg. Supercoils (Lk dec.) using ATP for NRG

DNA Pol III: main Pol for synthesizing DNA in 5'-3' direction

DNA Pol I: repair gaps, remove primers via exonuclease activity & proofread DNA that was synthesized- 3' to 5' exonuclease

Primase (DnaG): synthesize short RNA primers

DNA ligase: seal nicks

DNA Pol II: can proofread DNA and polymerize, but not an essential molecule

5) Draw a simple schematic of what happens at the origin (ORI C) in *E.coli*. Please be sure to label all components and directionality. (1 pt.)

-See reader pg.76

Bonus Question: Draw the structure of Uracil.

-See reader pg. 7