Name:_____ Dr. Reichler's Bio 325-uex Fall 2008 Quiz 10/30

1) What is different in a cell in G1 and G2 phases of the cell cycle?

2) Can DNA replication initiate anywhere on the DNA?

3) What is different between DNA replication on the leading and lagging strand?

4) Helicase unwinds the DNA, and then DNA polymerase copies the unwound DNA, so these two proteins both act on the same region of DNA. Of the other proteins involved in DNA replication, which ones act on the same regions of the DNA?

5) Why is it important for a cell to be able to identify recently copied DNA? How does *E. coli* do this?

6) What is the problem at the ends of DNA replication, and how is this problem resolved?

7) What does the problem in #6 protect you from?

8) In what human cells would you expect to find the shortest telomeres?

9) What can be learned by looking at the length of someone's telomeres?

10) By looking at a cell under a microscope, what would you see that would tell you that the cell was undergoing mitosis?

11) Would you expect many genes to be expressed during mitosis?

12) Why are multiple mutations required for a cell to become cancerous?

13) Are short telomeres a positive or negative signal for mitosis?

14) How could looking at someone's genes help determine their risk of developing cancer? Could data about someone's environment help determine their risk of developing cancer? Explain.

Answers:

1) The DNA is replicated in G2.

2) No, there are specific origins of replication. But the primase puts primers randomly along the DNA.

3) The mechanism is the same, but the frequency is different. The lagging strand replicated discontinuously while the leading strand is replicated continuously.

4) There are several answers: Helicase and primase, ligase, or gyrase all eventually act on the same region of DNA. DNA polymerase and primase, ligase, or gyrase all eventually act on the same region of DNA. Primase and ligase all eventually act on the same region of DNA.

5) If there are mismatches, the cell needs to know which is the correct sequence so it can replace the mismatched nucleotides. E. coli methylate their DNA about 10 minutes after DNA replication so the unmethylated DNA is recognized as the newly replicated strand.

6) The last primer on the lagging strand cannot be replaced by DNA. The problem is not really solved, there is always a gap at the end of a DNA strand. However, telomerase can elongate the DNA.

7) Shortening telomeres are a measure of DNA replication and replication errors.

8) Any cell that divides regularly or is exposed to DNA damage such as the lining of the stomach, blood cells, skin, liver, kidneys, etc.

9) How damaged their DNA is. Longevity may be reduced in people with short telomeres.

10) The formation of discrete DNA chromosomes.

11) No, the DNA is tightly packaged.

12) There are several checkpoints and positive and negative signals for each checkpoint.

13) *Short telomeres inhibit cell division. They are a negative signal.*

14) *Mutations in genes that code for products that regulate the cell cycle can lead to cancer. Many of these mutations are induced by toxins from the environment.*