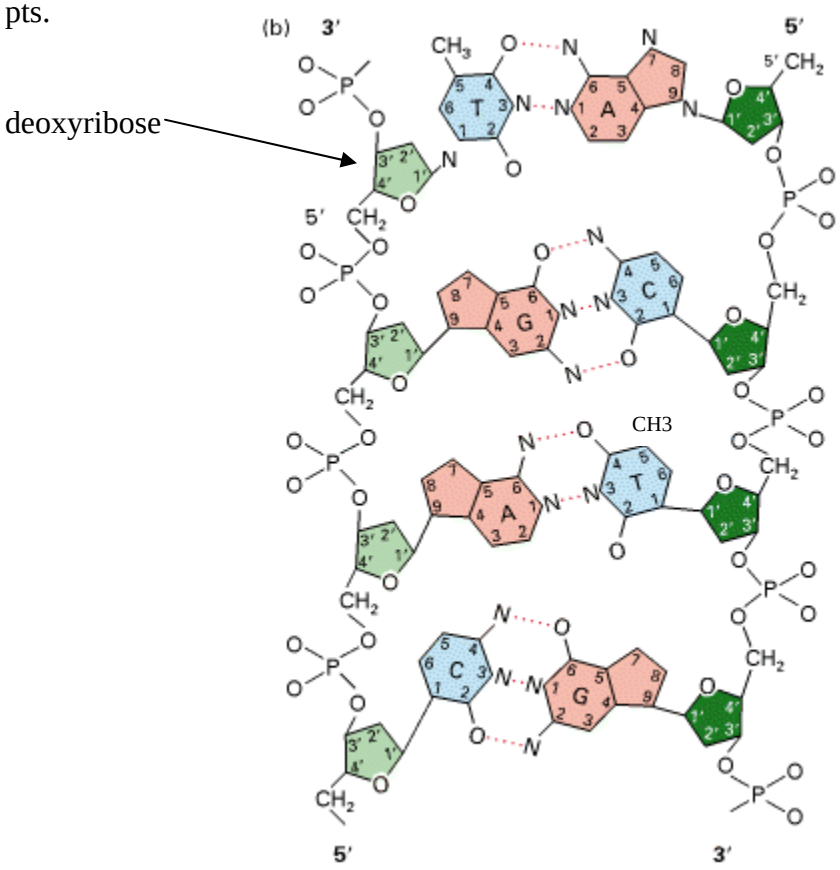
MCB 102 QUIZ 5

NAME: _____ SECTION: _____

1. In the diagram below label ALL of the bases, sugars, the 5' and 3' ends of the strands and ALL of the 5' and 3' carbons that contribute to the 5→3' direction of the DNA strand. 2 pts.



2a. The linking number (*Lk*) of a closed-circular, double-stranded DNA molecule is changed by:

A) breaking a strand, then rejoining it.
B) breaking a strand, unwinding or rewinding the DNA, then rejoining it.
C) breaking all hydrogen bonds in the DNA.
D) supercoiling without the breaking of any phosphodiester bonds.
E) underwinding without the breaking of any phosphodiester bonds.

2b. It is correct to say that DNA supercoiling cannot:

A) be induced by strand separation.
B) be induced by underwinding of the double helix.
C) form if there is Z-DNA structure present.
D) occur if a closed circular double-stranded DNA molecule has a nick.
E) result in compaction of the DNA structure.

3. Calculate values for the following topological properties of a closed-circular DNA molecule containing 2,000 base pairs (for simplicity, assume there are 10 base pairs per turn in the relaxed DNA). (1pt)

   (a) The linking number when the DNA is relaxed

   200

   (b) The linking number when the DNA has been underwound by 10 enzymatic turnovers of DNA gyrase (+ATP)

   180 (each cycle of DNA gyrase reduces linking number by 2)

4. DNA replication in *E. coli* begins at a site in the DNA called the (a) _____. At the replication fork the (b) _____ strand is synthesized continuously while the (c) _____ strand is synthesized discontinuously. On the strand synthesized discontinuously, the short pieces are called (d) _____ fragments. An RNA primer for each of the fragments is synthesized by an enzyme called (e) _____, and this RNA primer is removed after the fragment is synthesized by the enzyme (f) _____, using its (g) _____ activity. The nicks left behind in this process are sealed by the enzyme (h) _____.

   Ans: (a) origin; (b) leading; (c) lagging; (d) Okazaki; (e) primase; (f) DNA pol I; (g) $5' \rightarrow 3'$ exonuclease; (h) DNA ligase 2pts.