11 — DNA structure and replication

I. Overview

A. DNA is a polymer of **nucleotides** (=nucleic acid)
1. **Genes** are segments of DNA which code for proteins
2. **Chromosomes** are molecules of DNA
a. contain many genes
b. prokaryotic chromosome is circular
c. eukaryotic chromosomes
1) multiple, linear chromosomes
2) proteins associated with DNA

B. Sequence of information:
1. DNA can copy itself by **replication**
2. RNA made from DNA by **transcription**
3. Proteins made from RNA intermediate by **translation**
4. pathway
a. DNA replication is in nucleus
b. **transcription** of DNA makes RNA **in nucleus**
c. RNA exits nucleus through nuclear pores
d. RNA is **translated** into proteins at ribosomes on rough ER **in cytoplasm**

II. DNA is a polymer of nucleotides

A. Nucleotides contain:
1. 5-carbon sugar
a. ribose if RNA (thus ribonucleic acid)
b. deoxyribose if DNA (thus deoxyribonucleic acid)
(no O on carbon 2 of sugar)
2. phosphates attached to carbon 5 of sugar (5′ carbon)
3. a nitrogen-containing base
a. for DNA: G, A, T, C
b. for RNA: U replaces T

B. DNA structure deduced by Watson & Crick in 1953 (*Time*, Feb. 17, 2003, pp. 49–61)

C. How nucleotides are hooked together
1. nucleotides are hooked together by connecting
a. phosphate of one nucleotide (on 5′ carbon of sugar)
b. to the –OH (hydroxyl) on carbon 3 of the next sugar (3′ carbon)
2. so get backbone of sugar-phosphate-sugar-phosphate-sugar-phosphate, *etc.*
3. bases hang off of backbone

4. DNA is double stranded
a. 2 strands associate due to "base pairing"
b. A pairs with T; G pairs with C