**Biology 150: 4th in-class examination** **Name**_____
**November 21, 2011**

**Indicate the lab you are registered in:**

**Tuesday, 8-9:50** _____ **Tuesday, 10-11:50** _____ **Tuesday, 12-1:50** _____

**Tuesday, 3-4:50** _____ **Tuesday, 5-6:50** _____ **Thursday, 3-4:50** _____

Answer the questions in the space provided and you may also use the back of the page to complete your response. There are 14 questions worth a total of 50 points (plus a couple of bonus questions worth three points total). The point value of individual questions appears in parentheses.

**Note: a copy of the genetic code is printed on the last page.**

1. The double helix model for the structure of DNA depended on the discoveries of Erwin Chargaff and Rosalind Franklin. What did Chargaff and what did Franklin discover? (3)

2. Describe the double helix model for the structure of DNA and indicate how it accounted for the discoveries of Chargaff and Franklin (4)

3. Who first proposed the double helix model for the structure of DNA? (1)

4. DNA replication in eukaryotes begins when regulatory molecules (i.e. DNA binding proteins) bind at several points along each chromosome called _____. Binding of these DNA binding proteins allows an enzyme that separates the strands called _____ to bind. Tension produced by separating the strands is relieved by the enzyme _____. Separated strands are stabilized and kept apart by _____. The new daughter strands produced by replication are designated by different names. The strand formed following the separating stands is called the _____ strand. The stand formed in a "backstitch" pattern, bit by bit, away from the separating strands is called the _____ strand. Actual DNA synthesis can only occur after an enzyme called _____ first synthesizes 10 base RNA segments called a _____. The blunt ends of these RNA segments allows an enzyme complex called _____ to bind and synthesize DNA always travelling in the _____ direction along the template strand of the DNA. The new DNA of the "backstitched" strand is synthesized as 1000-2000 base stretches called _____. Later an enzyme called _____ replaces the short stretches of RNA with DNA and an enzyme called _____ connects the sections of DNA together. (13)

5. Describe the method used to solve the genetic code. Which was the first codon solved? (3)

6. Define gene. (1)

7. Define codon. (1)

8. Describe what happens during transcription. Where does it start? What performs the function? What is produced? How does it terminate? (4)

9. What three things happen in RNA processing? What is a spliceosome? What does it contain? Which RNA(s) is(are) subject to processing? (6)

10. Assume the following base sequence represents one end of a mRNA (shown 5' to 3'):

    methyl-GGAAGGAGGUAACACAUGCCUUCCUUAACUGCGGAGGAUAAA....

    a) list the first 3 amino acids that would appear in the resulting peptide. *Hint: where does transcription start?* (1)

    b) list the anti-codons, in order, of the first 3 tRNAs involved in the synthesis of that peptide (1)

    c) list the base sequence of the template strand of the gene. (1)

11. What is a frameshift mutation? What kind(s) of DNA changes produce these types of mutations?(1)

12. Missense, nonsense, and silent mutations are all consequences of what kind of mutation? How do they differ from each other? The mutation resulting in sickle-cell disease is an example of which of these? (5)

13. Describe and/or diagram the lac operon. Name and indicate the relative location of the different elements. Describe how changing lactose concentration alters function. (4)

14. How do inducible and repressible operons differ? Give an examples of each. (1)

Bonus questions:

(1) How many introns occur in the human B-globin gene? (1)

(2) Erwin Chargaff, Rosalind Franklin, Francis Crick, James Watson, Marshall Nirenberg, and Har Gobind Khorana were all relatively young when they made their famous contributions to science decades ago. Which two are still alive today? (2)