NAME: _____ STUDENT #: _____

BIO 1140 Introduction to Cell Biology
MIDTERM #2, March 23, 2013
Dr. D.A Johnson
Total points on this exam is 32 pts

YOU HAVE ONE HOUR TO COMPLETE THIS EXAM

MULTIPLE CHOICE QUESTIONNAIRE GG

Instructions:
1. Make sure that you have a complete test package. You should have a set of multiple choice questions with a written-answer questionnaire, and a Scantron. Both components must be returned at the end of the midterm.
2. Fill in the Scantron with your name, student number and course code **BIO 1140 GG**.

Answer the following 16 multiple choice questions **on the Scantron sheet** provided. Choose only one answer from among the choices. (16 marks)

1. DNA binding proteins often can read the sequence of nucleotides along the DNA without having to separate the chains. How do they do this?
   a. The conformations of the phosphate groups reflect the DNA sequence.
   b. The conformations of the deoxyribose sugars reflect the DNA sequence.
   c. The conformations of the ribose sugars reflect the DNA sequence.
   d. The DNA binding proteins often contain domains that fit into the DNA grooves.

2. The two strands of a DNA double helix are said to be antiparallel. This means that
   a. the 5' end of one strand is directly paired with the 5' end of the other strand.
   b. since the double helix twists, it is not perfectly parallel.
   c. one strand has a negative charge and the other strand has a positive charge.
   d. the 5' end of one strand is directly paired with the 3' end of the other strand.

3. In a right-handed double helix, if one looks down the central axis of the molecule _____.
   a. each strand follows a clockwise path moving away from the observer
   b. each strand follows a counterclockwise path moving away from the observer
   c. each strand follows a counterclockwise path moving toward the observer
   d. each strand follows a clockwise path moving toward the observer
   e. one strand follows a clockwise path moving away from the observer, the other follows a clockwise path moving toward the observe

4. The DNA of an organism is studied and found to contain 30% adenine. Based on this you would predict that the DNA of this organism also contains 30%
   a. thymine.
   b. cytosine.
   c. each of cytosine and guanine.
   d. each of thymine and guanine.

5. What happens if histone H1 is selectively extracted from compacted chromatin (30 nm fibers)?
   a. 30-nm fibers uncoil to form a thinner, more extended beaded filament.
   b. 30-nm fibers coil to form a thicker, less extended cylindrical filament.
   c. 30-nm fibers completely disassemble to their component nucleotides.
   d. 30-nm fibers break into small fragments.
   e. 30-nm fibers break up into large fragments.

6. The Barr body found in mammalian females is an X chromosome compacted to the level of
   a. euchromatin.
   b. 10-nm chromatin fibres.
   c. heterochromatin.
   d. nucleosomes.

7. During the chromatin remodelling that accompanies gene expression, acetylation
   a. adds an acetyl group (CH_3CO) to the cyotsine nucleotides of DNA.
   b. adds an acetyl group (CH_3CH_2) to the DNA of a promoter sequence.
   c. adds an acetyl group (CH_3CO) to the histone protecting the transcription unit of a gene.
   d. adds an acetyl group (CH_3CO) to the histone protecting the promoter region of a gene.

8. Amino acid residues in histone tails are most susceptible to _____.
   a. methylation
   b. acetylation
   c. phosphorylation
   d. sulfation
   e. a, b and c

9. What word below most accurately describes transposable elements?
   a. stable
   b. offspring
   c. helpers
   d. genetic parasite
   e. genetic symbionts

10. Since a DNA polymerase cannot synthesize DNA without a primer, some molecule other than DNA must be laid down as a primer to start replication. What molecule is laid down as a primer and which end of that molecule must be free and thus available to attach to new nucleotides?
    a. carbohydrates, free 5' end
    b. RNA, free 5' end
    c. carbohydrate, free 3' end
    d. RNA, free 3' end
    e. protein, free 3' end

11. What is the most common mechanism for repairing damage to DNA?
    a. direct repair of the damage
    b. selective excision of the damaged section and use of the complementary strand to replace excised portion
    c. simple removal of damaged portion without replacement
    d. simplistic repair of the damage
    e. altruistic repair of the damage

12. Individuals with xeroderma pigmentosum inherit a faulty DNA repair mechanism. As a consequence, they
    a. are sterile.
    b. have no proofreading during DNA replication.
    c. cannot join the Okazaki fragments produced during DNA replication.
    d. easily develop skin cancer when exposed to sunlight.

13. Which of the following reasons explains why a single-stranded DNA circle cannot serve as a DNA polymerase template?
    a. DNA polymerase cannot initiate DNA strand formation.
    b. DNA polymerase can only add nucleotides to the 3'-hydroxyl end of an existing strand.
    c. DNA polymerase can only add nucleotides to the 5'-hydroxyl end of an existing strand.
    d. DNA polymerase requires a primer.
    e. a, b and d

14. The 3' end of most eukaryotic mRNAs contains a _____, while the 5' end has a _____.
    a. poly(A) tail, methylated guanosine cap
    b. poly(U) tail, methylated guanosine cap
    c. methylated guanosine cap, poly(A) tail
    d. poly(A) tail, sulfonated guanosine cap
    e. methylated guanosine cap, poly(U) tail

15. The greatest similarities among codons specifying the same amino acid occur _____.
    a. in the first two nucleotides of the triplet
    b. in the last two nucleotides of the triplet
    c. in the first and third nucleotides of the triplet
    d. in the third nucleotide of the triplet
    e. in the middle nucleotide of the triplet

16. The clustering of codons in the genetic code provides what advantage to living organisms?
    a. Clustering assures that all amino acids are different.
    b. Clustering ensures that a single base change will often replace a hydrophobic amino acid with another hydrophobic amino acid.
    c. A single base change will often not change the amino acid that is to be inserted into the growing polypeptides.
    d. Clustering increases the lifespan of the organism.
    e. b and c

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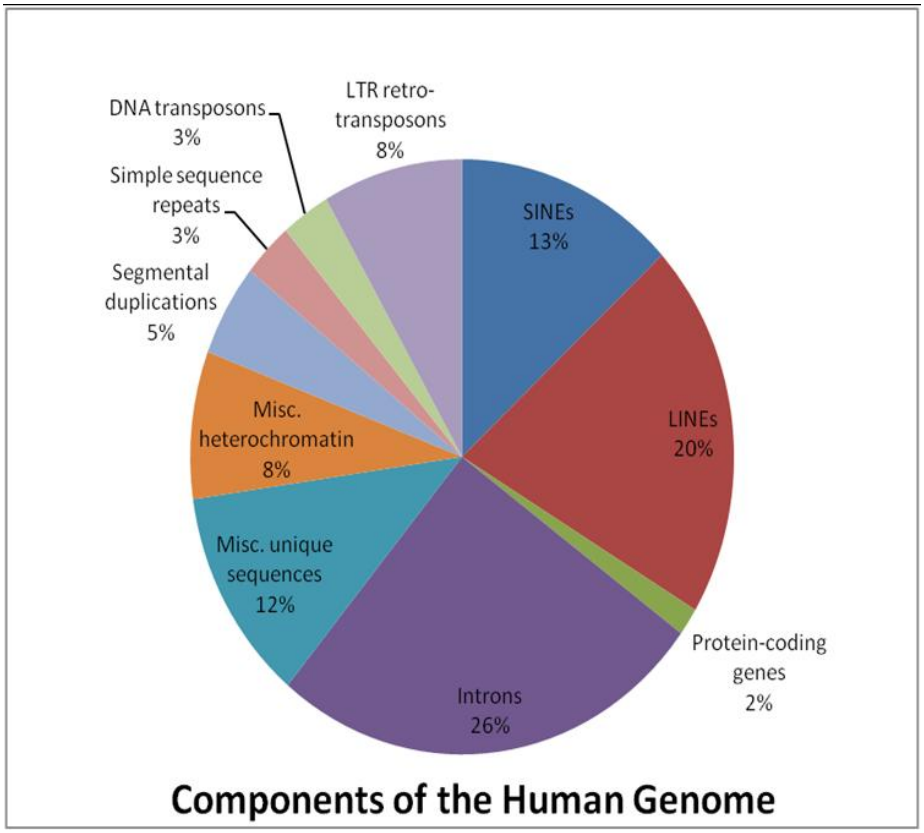
WRITTEN-ANSWER QUESTIONNAIRE GG
ONLY RESPONSES WRITTEN WITHIN THE BOXES WILL BE MARKED.

Answer 3 questions. Each is worth 4 marks.

1. How was phage infection used to determine that DNA was the genetic information?
2. What are the types of genomes in a eukaryotic cell? What is their DNA structure?
3. Explain the role of primase and DNA polymerase in leading and lagging strand DNA synthesis.
4. What is the Wobble hypothesis and what is the molecular explanation for it.

Everyone must answer this question. It is worth 4 marks.

In the original model for a genome there were genes coding for proteins with non-coding DNA between them. But the genome is much more complex that we thought. Discuss this statement while drawing examples and inspiration from this Figure.



Response to Question: ____

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