

NAME: _____

STUDENT #: _____

BIO 1140 Introduction to Cell Biology

MIDTERM #2, March 22, 2014

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 10 multiple choice questions **on the Scantron sheet** provided. Choose only one answer from among the choices. (10 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. 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.
3. Chromatin remodelling
 - a. is subject to well-characterized stages of regulation by the cell.
 - b. blocks access to genes that should not be expressed in a particular cell.
 - c. is unaffected by alterations to the DNA sequences of a cell.
 - d. results in specific patterns of gene expression.
 - e. all of the above.
4. 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

5. In what ways do RNAs differ from DNA?
 - a. RNAs often have nonstandard mismatched base pairs.
 - b. RNAs often have modified nitrogenous bases.
 - c. RNAs have an extra oxygen atom on the pentose sugar of their nucleotides.
 - d. The nitrogenous bases of RNA are adenine, guanine, cytosine and uracil instead of the adenine, guanine, cytosine and thymine of DNA.
 - e. all of the above

6. Which of the reasons listed below explains the high degree of conservation seen in histones?
 - a. Histones interact with the DNA backbone, which is identical in all organisms.
 - b. Histones H bond to water quite extensively.
 - c. Nearly all amino acids in a histone molecule interact with either DNA or another histone.
 - d. Very few amino acids in a histone can be replaced with another without severely affecting its function.
 - e. a, c and d

7. 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

8. It is difficult to predict the tertiary structure of RNA because
 - a. RNA bases are modified after synthesis.
 - b. RNA folding does not follow Watson-Crick rules.
 - c. the computer algorithms are not sufficiently good.
 - d. all of the other answers are true.

9. Why must RNA splicing be absolutely precise?
 - a. A single base error at a splice junction will cause a large deletion.
 - b. A single base error at a splice junction will cause a large addition.
 - c. A single base error at a splice junction will change the reading frame and result in mRNA mistranslation.
 - d. b and c
 - e. A single base error at a splice junction will cause a large inversion.

10. If an exon is not supposed to be included in the mature mRNA, it must be excised. With what other RNA sequences is it excised?
 - a. the flanking exons
 - b. the flanking introns
 - c. one flanking exon and one flanking intron
 - d. the promoter
 - e. the poly(A) sequence

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FILL IN THE BLANKS (10 Marks)
Everyone must answer this question! Each answer is worth 0.5 marks.

Chromatin is organized into different structural levels – we call it hierarchical organization.

The genome contains many types of sequences in addition to the genes. Four types of sequences found in your genome are _____, _____, _____, and _____. Some sequences have interesting properties. For example _____ need to be removed before translation; and some can move by processes called _____ and _____.

Transcription is the process by which the DNA sequences in your cell are copied into RNA. This process requires _____ RNA polymerases because _____ and _____.

Chromatin consists of DNA, _____ protein and _____ protein. 146bp of DNA wrapped around the 8 histones is called the _____ (two words). When viewed by electron microscopy we see this as the _____ fibre.

When H1 is added to this structure, we now have the _____.

The next level of organization is the _____. When viewed by electron microscopy we see this as the _____ fibre. This structure can further fold into a _____ and finally into a chromosome.

A key element in hierarchical organization is that when a structure forms, DNA that was _____ is now _____.

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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. Describe the role that the X-ray picture of DNA taken by Rosalind Franklin was used to define the DNA width and repeat distance.
2. Some DNAs are circular and some are linear. How do these facts affect DNA synthesis?
3. RNA is transcribed into a pre-mRNA and then modified. What modifications affect the protein sequence of the gene and how do they do it (2 examples).
4. Codons can be synonymous. Codon changes can be conservative. What do these mean?

Response to Question: _____

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