BIO/BCH3170: Mid-Term 1 = breakdown of marks

Section 1: Multiple choice questions (2 marks each):
#1 à #17 **/34 marks**

Section 2: Assay questions (5 to 10 marks each):
#1 à #6 **/46 marks**

Total: **/80 marks**

Mid-Term 1 = 30% of your final mark of the course

Instructions

WRITE YOUR NAME and STUDENT NUMBER on TOP of EVERY page of the Questionnaire.

Absolutely NO books, handouts, or recordings are permitted. Electronics including calculators, computers or phones are NOT allowed.

Write your answers to the multiple choice questions on the RED scantron. SELECT ONLY ONE ANSWER AND SELECT THE BEST ANSWER.

Write your answers to essay questions, both short and long, directly on the Questionnaire. Limit your answers to the space provided.
At the end of the examination period, you must return the scantron and the Questionnaire.

NEW ACADEMIC REGULATION AT UOTTAWA:
Cellular phones, unauthorized electronic devices or course notes (unless an open-book exam) are not allowed during this exam. Phones and devices must be turned off and put away in your bag. Do not keep them in your possession, such as in your pockets. If caught with such a device or document, the following may occur: you will be asked to leave immediately the exam, academic fraud allegations will be filed which may result in you obtaining a 0 (zero) for the exam.

By signing below, you acknowledge that you have ensured that you are complying with the above statement.

SIGNATURE: _____

Section 1: Multiple choice questions: #1 à #17
2 marks each (Total section 1 = 34 marks

1. Select the true answer regarding the tautomeric forms of nucleotides and the consequence on base pairing in the DNA double helix. ANSWER = C

A. The enol form of G pairs with A.
B. The enol form of A pairs with G.
C. The imino form of A pairs with C.
D. The enol form of T pairs with C.
E. None of the above.

2. Identify the statement that is FALSE regarding the fidelity of DNA replication: ANSWER = C

A. Requires the 5’ to 3’ polymerization activity of DNA polymerase.
B. Requires the 3’ to 5’ editing activity of DNA polymerase.
C. Requires the 5’ to 3’ editing activity of DNA polymerase.
D. Requires the base and nucleotide excision repair mechanisms.
E. All of the above answers.

Section 1: Multiple choice questions: #1 à #17
2 marks each for a total of 34 marks

3. Which of the following statements is TRUE regarding Holliday junctions:
ANSWER = E

A. Isomerization of the junction creates an open, asymmetrical structure.
B. Heteroduplex migration is an energy-independent process.
C. Occur during cell mitosis but never during cell meiosis.
D. The pairing of DNA strands from 2 different DNA molecules occurs in non-homologous regions only.
E. Junction formation involves the activity of RecA proteins.

Section 2: Assay questions: #1 à #6
Between 5 and 10 marks each (Total section 2 = 46 marks)

#1. Name all the enzymes involved in the base excision repair mechanism of DNA and briefly define their role. (8 marks).

ANSWER : 1 mark for each enzyme and 1 mark for role.

1. DNA glycosylase: recognition of the distortion in the DNA double helix and cleavage of the glycosidic bond between the sugar and the base.
2. AP endonuclease: cleavage of the phosphodiester bonds on both sides of the sugar that has lost its base.
3. DNA polymerase: synthesis of DNA to replace the nucleotide removed.
4. DNA ligase: ligation, synthesis of the phosphodiester bond to seal the nick.

Section 2: Assay questions: #1 à #6
Between 5 and 10 marks each (Total section 2 = 46 marks)

1. How is the DNA double helix structure formed in water? Why are the bases located at the center of the helix while sugars are located at the periphery? (10 marks)

ANSWER: Water molecules will maximize the number of hydrogen bonds they can forr (2 marks).

When DNA is added to water, the molecules of water will try to form hydrogen bonds with DNA molecules forcing the bases to be at the center of the helix (2 marks).

Bases are at the center of the DNA double helix because they form much fewer hydrogen bonds with water molecules than sugars (2 marks).

The hydroxyl groups (-OH) of the sugars will form more hydrogen bonds with water molecules compared to bases and therefore sugars will be located at the periphery of the helix. (2 marks).

The arrangement that water molecules take will dictate the structure of the DNA double helix. (2 marks).