**Chemistry 4055 (Spring 2013)**

**Biochemistry I- Introduction to the Chemistry of the Animal Cell**

**Chapter 8 HW Assignment**

1. What are the general constituents of nucleosides and nucleotides, and what type of bonds are involved in each of these structures?

2. Which nucleobases are commonly found in DNA? In RNA? How do the nucleobases base pair in these structures and how many number of hydrogen bonds are involved?

3. How does the UV absorption property of the nucleobases help to quantify DNA? How do the interactions of the nucleobases in DNA effect the absorbance of the individual nucleobases?

4. Why is RNA sensitive to alkaline hydrolysis, whereas DNA is not?

5. Draw the structure of guanosine with the nucleobase in the anti conformation.

6. Describe the hydrophilic backbone and hydrophobic interior of the Watson-Crick Model of DNA (B form DNA). What major structural component makes the handedness of this form of DNA different from that of the Z form?

7. Why can’t mirror repeats form hairpin structures?

8. How is base pairing distinct in triplex DNA strands?

9. What would be the sequence of the complementary strand for the portion of a single-stranded RNA listed below?

5´-…CCUUCAAAUGGA…-3´

Considering the type of nucleotides in this sequence, what factor might affect how this portion of the strand would prefer to base stack and how it would interact with a complementary strand in a duplex structure? Would the sequence of this complementary strand be different from the one you wrote initially?

10. What is the folding mechanism that defines the tertiary structure of DNA?

11. What technique must you apply in order to determine if you have isolated DNA of the right size by agarose gel electrophoresis?

12. Nucleic acid samples have been isolated from three different organisms. The nucleic acids have the following base ratios (%):

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | A | T | U | G | C | A+T/G+C | A+G/C+T |
| Sample 1 | 29 | 19 | 0 | 22 | 30 | 0.92 | 1 |
| Sample 2 | 24 | 0 | 16 | 24 | 36 | 0.4 | 1.3 |
| Sample 3 | 17 | 17 | 0 | 33 | 33 | 0.5 | 1 |

Which sample(s) are DNA? Which sample would you expect to have the highest Tm (melting point)?

13.You wish to determine the relative degree of sequence similarity for DNA from different species of Galapagos finches (referred to as species A, B, and C). You make hybrid duplexes of the DNA between A and B, A and C, and B and C. You measure the increase in the absorption of UV light with increasing temperature for each of the duplex solutions and obtain the following data:

|  |  |
| --- | --- |
| Hybrid Duplex | Tm (°C) |
| A + B | 80 |
| A + C | 87 |
| B + C | 83 |

Which two species have a greater degree of similarity in their DNA sequences? Why? What factors should be taken into account when trying to interpret these data?

14. What type of DNA mutation does our body usually not have a repair mechanism for?