Molecule World DNA Binding Lab Worksheet

Part I. Learn about DNA structure

1. What kinds of elements are found in each deoxyribonucleotide? List all the elements and record the color used to identify that element in the DNA binding lab.

2. Which element is the smallest? You may want to check this with the periodic table to confirm your answer.

3. Identify two different elements in this DNA image and discuss the evidence that supports your identification.
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4. Does DNA have a positive, negative, or neutral charge? How did you determine this?

5. Is DNA hydrophobic or hydrophilic? How did you determine this?

6. How many DNA molecules are in the example of double-stranded DNA? How did you determine this?

7. What one-letter abbreviations and colors are used for each DNA residue?

8. How many residues are in a single strand of the example DNA? What evidence supports this?

9. Identify the major and minor grooves in this image of DNA.
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Part II. Look at molecules that bind to specific shapes in DNA

1. Look at the example of a protein bound in the major groove in DNA.
   
   A. What do you see when you color this example by molecule? Can you tell which part is DNA and which part is protein?

   B. What do you see when you color this example by element? Are there elements that you only see in the protein? Are there elements that you only see in the DNA?

   C. What happens when you color this example by residue? Are the residues the same in both the protein and DNA?

   D. What coloring options and drawing styles helped you see that a substance was binding to the major groove of DNA in the example?
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2. Look at the example of an anti-viral drug bound in the minor groove in DNA.
   
   A. What do you see when you color this example by element? Does the DNA contain the same elements as the previous examples? Are new elements present in this structure?

   B. What happens when you color this example by residue? Do the two molecules in the drug contain residues like the ones in DNA or protein?

   C. Which drawing and coloring modes worked best to show that the drug binds in the minor groove of DNA?

   D. What coloring and drawing modes helped show that this example is not likely to be a protein?

Part III. Practice working with DNA models to investigate proteins and drugs that bind to specific shapes in DNA.

1. Which unknown structure did you investigate?

2. Is the unknown substance in your structure binding in the major groove, minor groove, or both? Use an image of your unknown as evidence. If possible, add labels to show the locations of the major and minor grooves.

3. Is the unknown substance in your structure more likely to be a protein or a drug? Explain your answer.