

A scientific investigation of the bases & their interactions

**This worksheet is divided into tasks 8-11 and is accompanied by a rubric that totals 100 points**

### **Task 8: Things fall apart**

Mutations aren't magic. They're chemistry, and they're the engine of evolution. What is the relationship between chemical alterations of the base structures and change in 'information' (mutation)? First, let's compare a base and its 'decayed' derivative.

Click the 'Just Look' checkbox at the lower right of the screen. Select Adenine on the *left* and Hypoxanthine in the right window.

**?What are the chemical differences between Ade and HypX? How do you think hypoxanthine arises in cells? (10 pts)**

What's going on here? Just water. It's an easy chemical reaction that's going on in your cells *right now*. Rungs in the ladder of your DNA are undergoing 'plastic surgery' and changing their faces. To consider the consequences, do the following...

Uncheck the 'Just look' checkbox again. Put hypoxanthine in the **LEFT** window and *cytosine* in the right. Once you've 'marked' the basepairing positions on hypoxanthine, see what you can achieve with pairing.

Click the 'Add Pairing' button (adds **HC**). (10 pts)

### **Task 9: "just visiting": the bases 'flicker' into other forms (the tautomers)**

One problem with molecules made of C, H, O, and N is that they can 'snap' into alternate shapes that are less likely but not chemically 'forbidden'. One common change is a movement of exactly where a proton (H+) sits, and where a nearby double bond forms in order to end up with proper shell-filling and electron distribution. Each of the bases can undergo such a 'snap', and these happen in very unfortunate places: the 'faces' where the bases pair.

Create a pairing between the tautomer of Gua (fGuaTaut) and Thy. Once they are lined up properly Click 'Add pairing'. (10 pts)

Now, do the same with the tautomer of Cyt (fCytTaut) and Ade. Again Click 'Add pairing'. (10 pts)

**? Consequence:** Examine *one* of the tautomer-partner pair you created. Given the original, 'unsnapped' identity of the tautomerized base, who 'should' it's partner be? Who does its tautomer pair with? How could this be dangerous? (10 pts)

### **Task 10: Extracting meaning (50 points!!! Be brief, but concrete and thoughtful)**

#### **?Summary:**

- Justify/explain the statement 'mutation is inevitable'. Refer back to what you have explored in the previous tasks of this assignment. (10pts)
- If the single cell that you started as (we all start out as one cell at the moment of conception) had a change in its DNA, how many of the cells that are currently 'you' have that change in their DNA? (10pts)
- If the DNA in one of your skin cells were to change, how many of the cells that are 'you' would have that change to their DNA? (10pts)
- Think back to the processes of transcription and translation that we learned about in this lab and the previous lab. Why do some mutations (changes in DNA sequence) cause no change to a protein? Why do some cause minor changes? Why do some cause major changes? (Looking at the Translation and Mutation Assessor may be useful for answering this question). (20pts)