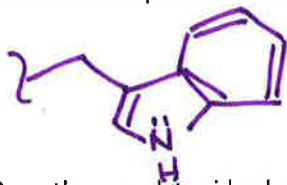
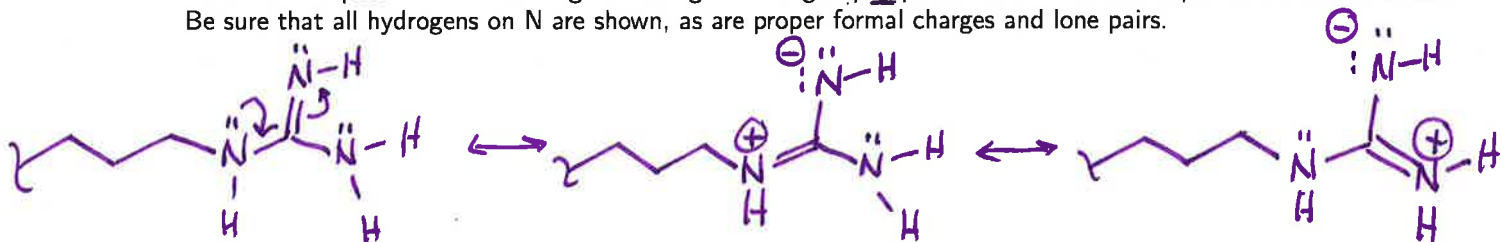


Exploring Amino Acid Side Chains

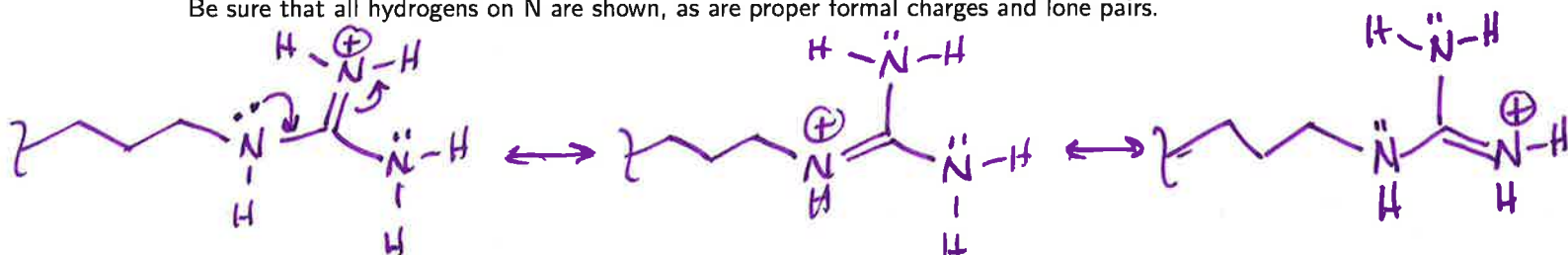
1. Draw the complete side chain of trp, including any H's on heteroatoms, formal charges and lone pairs.



2. Draw the complete side chain of arg with the guanidine group unprotonated. Draw two important resonance forms. Be sure that all hydrogens on N are shown, as are proper formal charges and lone pairs.

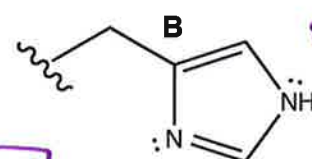
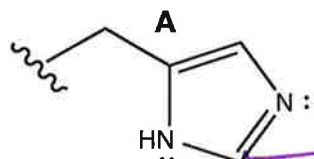


3. Draw the complete side chain of arg with the guanidine group protonated. Draw two important resonance forms. Be sure that all hydrogens on N are shown, as are proper formal charges and lone pairs.



4. What is the difference between these two structures? What word or phrase best describes them?

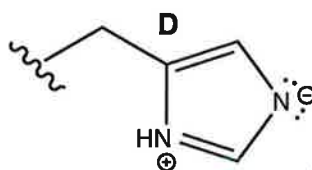
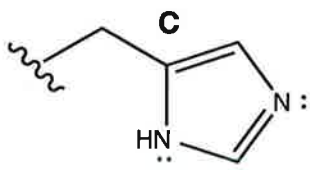
this is the imidazole side chain of histidine



tautomers

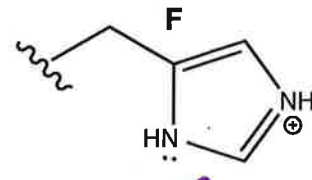
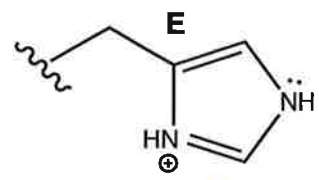
The H has shifted 1,3 along w/ the π bonds. Both are histidine

5. What is the difference between these two structures? What word or phrase best describes them?



No nuclei have moved, only e⁻. These are resonance forms

6. What is the difference between these two structures? What word or phrase best describes them?



these are resonance forms of the protonated histidine (imidazolium ring)