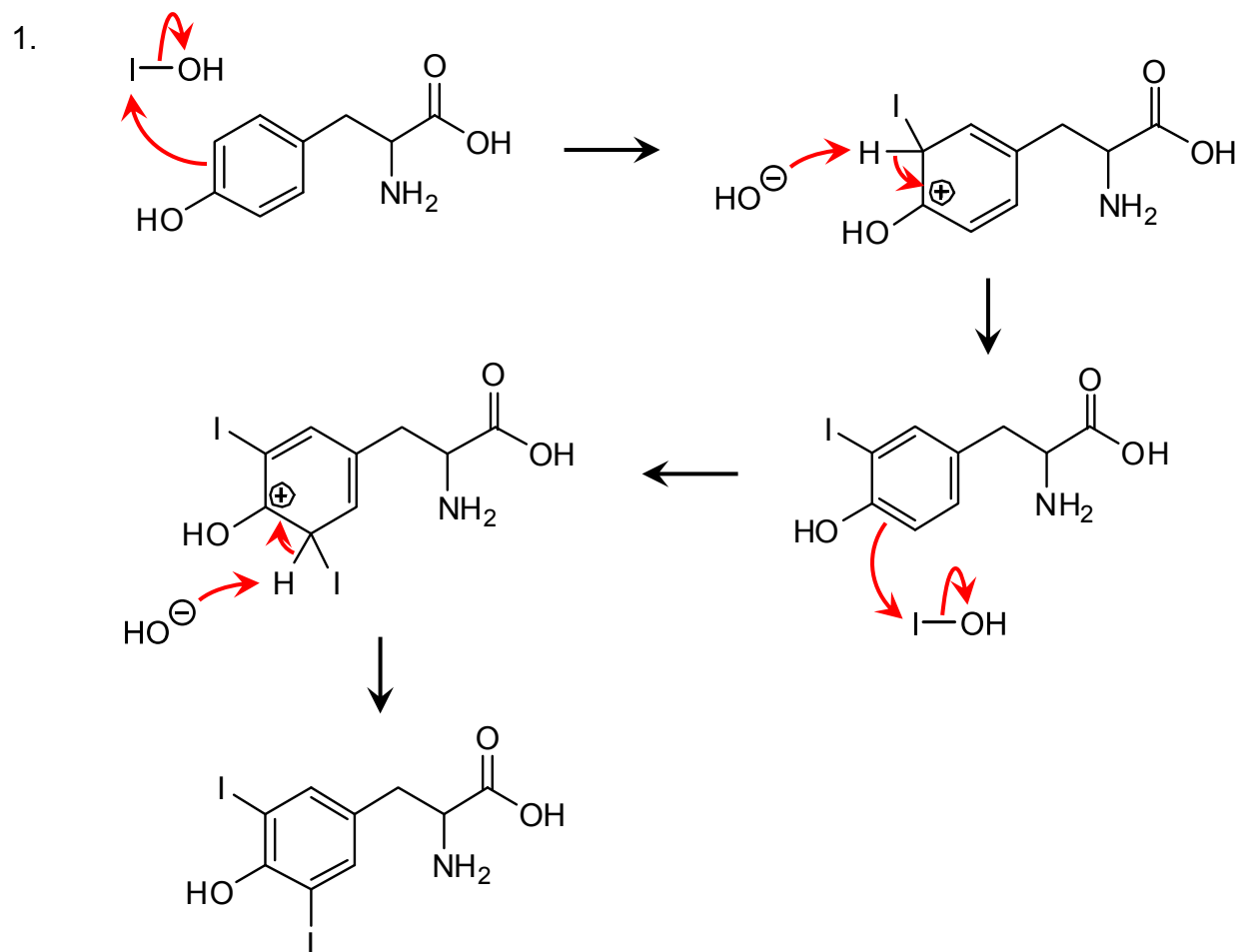
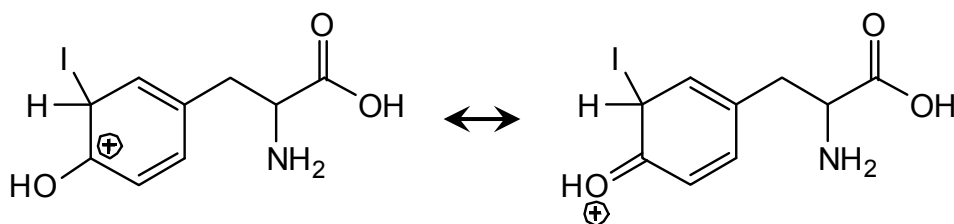


**Workshop 8 Solutions**  
**Electrophilic Aromatic Substitution in the Thyroid**



2. The aromatic ring in tyrosine has two substituents: an alkyl group, which is mildly electron-donating; and an alcohol group, which is a strong  $\pi$ -donor. Because the -OH group is a stronger electron-donating group, it should direct the electrophile *ortho*- and *para*- to it. The *para*-position is blocked (by the alkyl group), so iodine atoms go *ortho* to the -OH. In each case, the intermediate cation is stabilized by resonance with the -OH group:



3. The second iodine should add less easily, because the first added halogen is deactivating. Even so, there are two activating groups on the ring, and I would still expect the second iodination to succeed (even if it was slower).