

# The Peroxidase Mechanism

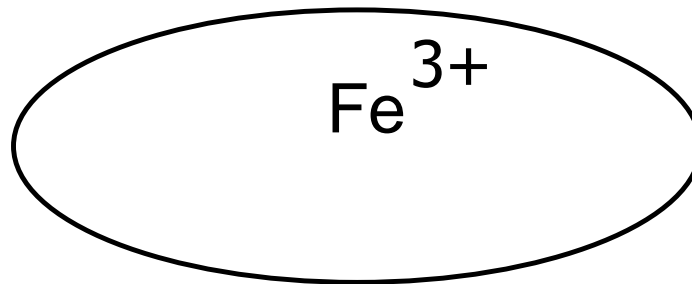
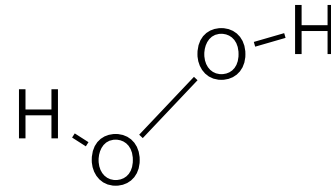
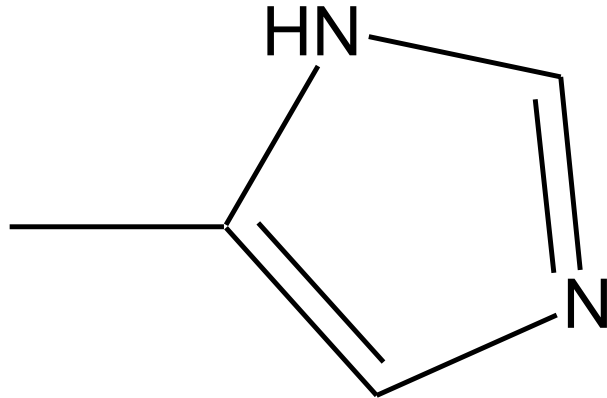
## Poulos-Kraut Mechanism

**NC State University**

# Peroxidase Function

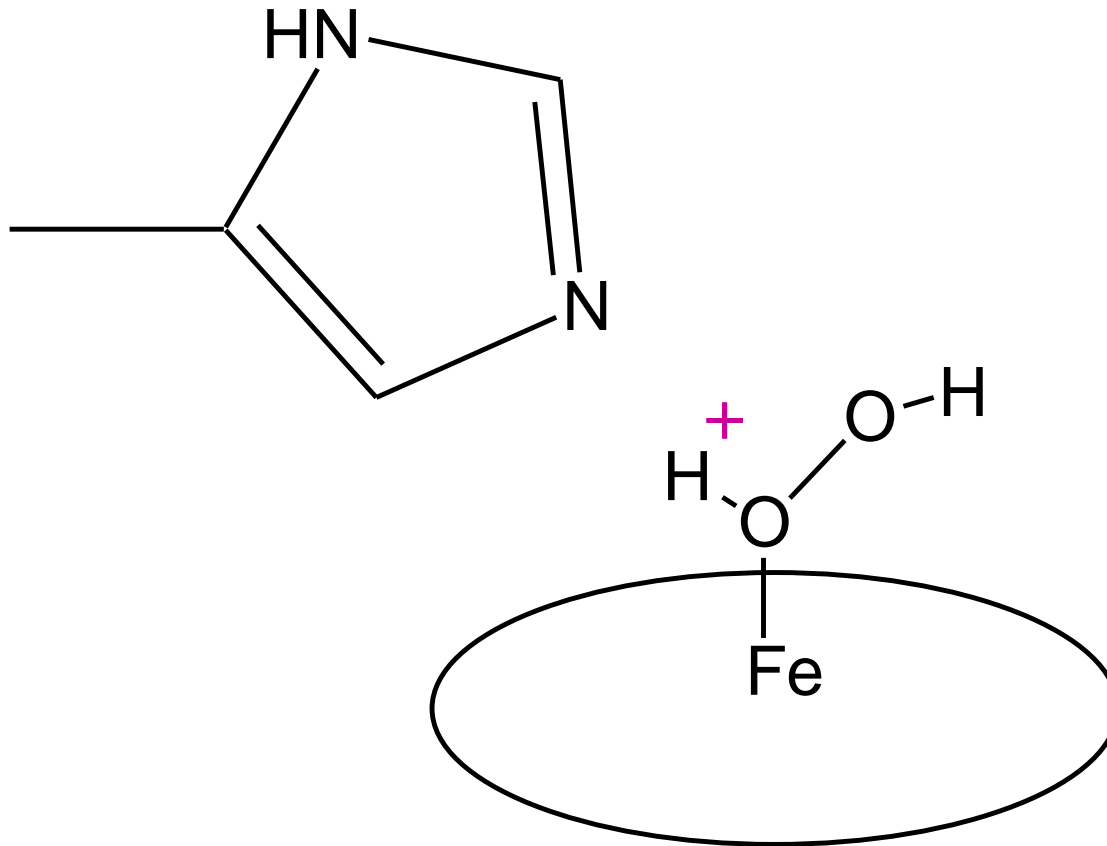
## Poulos-Kraut mechanism

**Distal histidine is required for peroxidase function.  
So is arginine (not shown).**



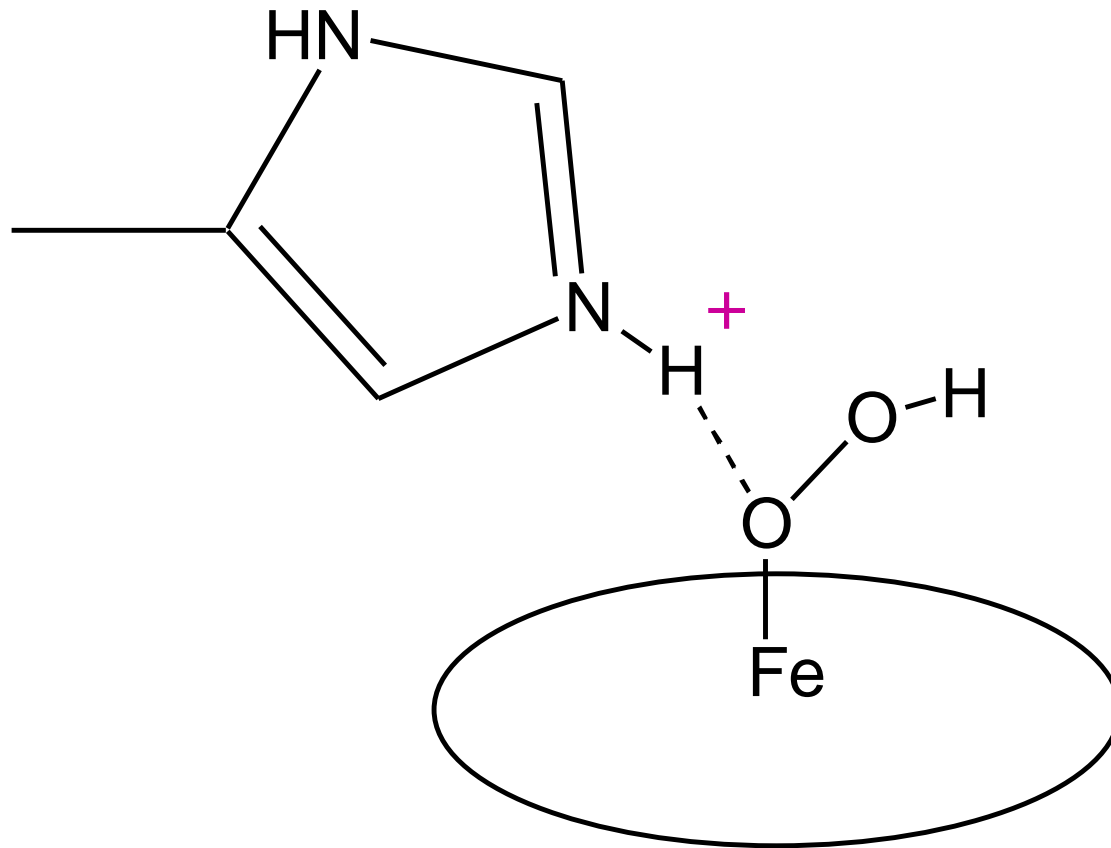
# Step 1: Peroxide binds to heme

**Histidine acts as an acid-base catalyst.**



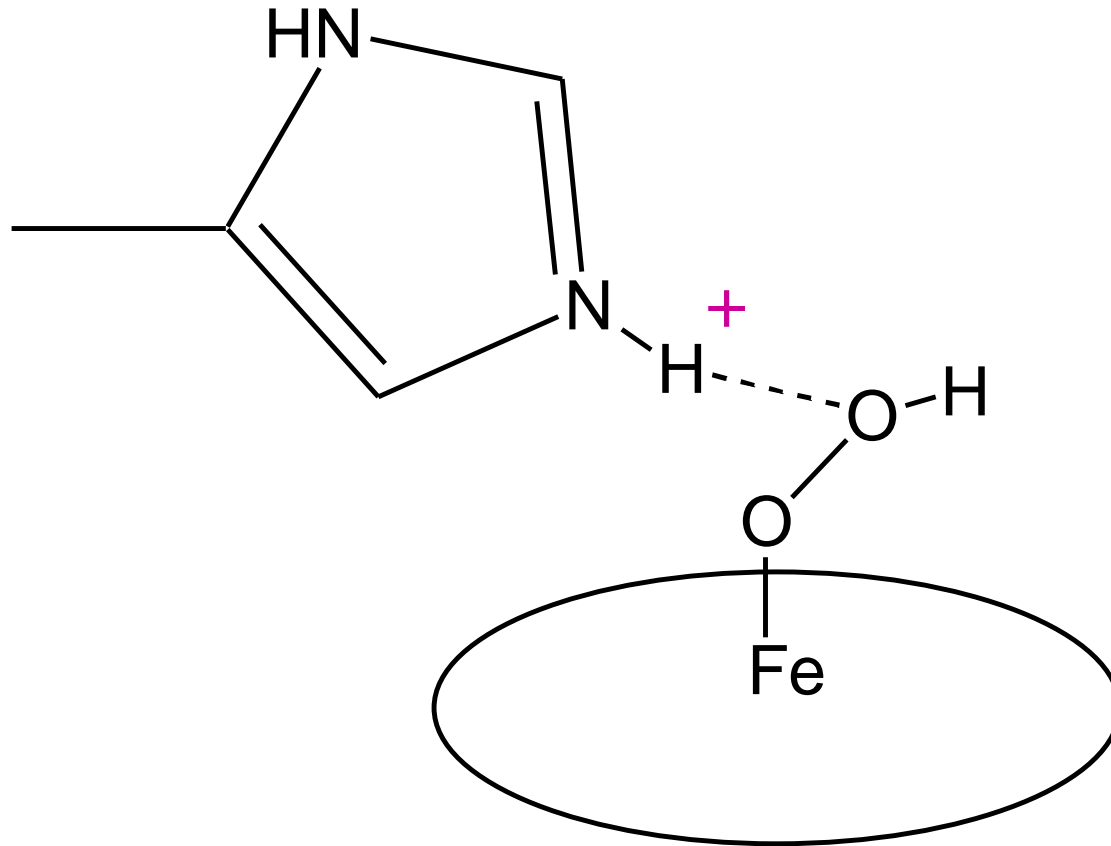
# Step 2: Protonation of histidine

**Histidine acts as an acid-base catalyst.**



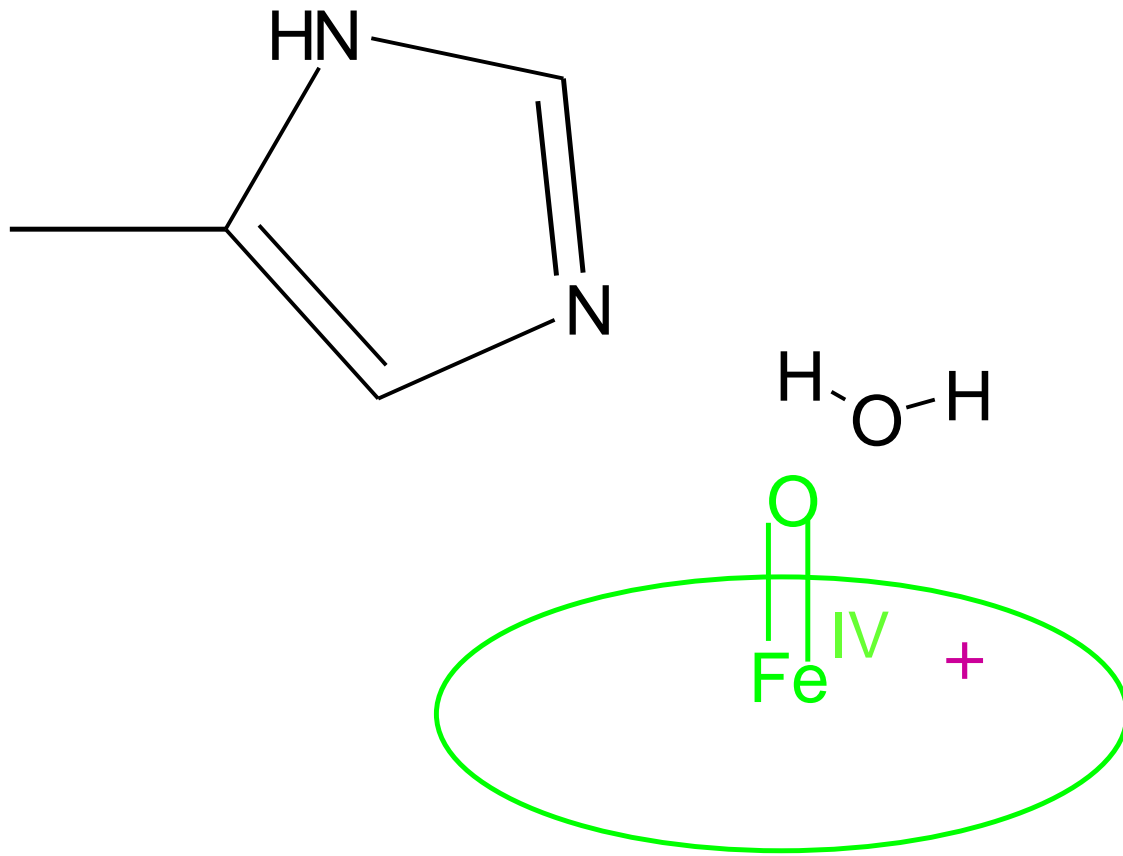
# Step 3: Reprotonation of $\text{H}_2\text{O}_2$

**Histidine acts as an acid-base catalyst.**



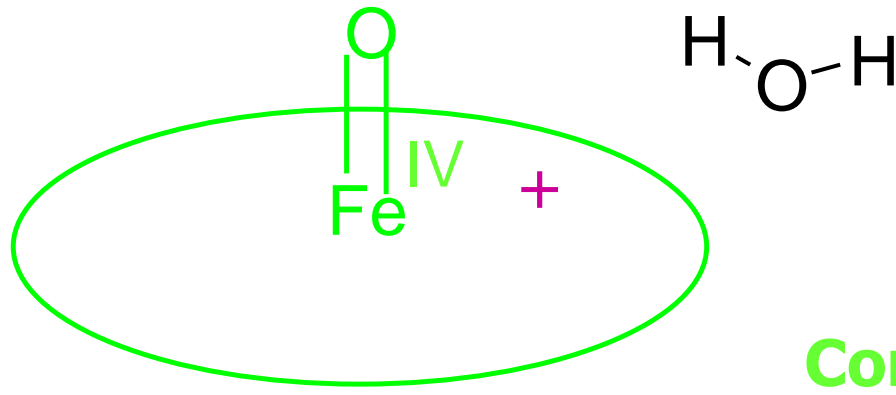
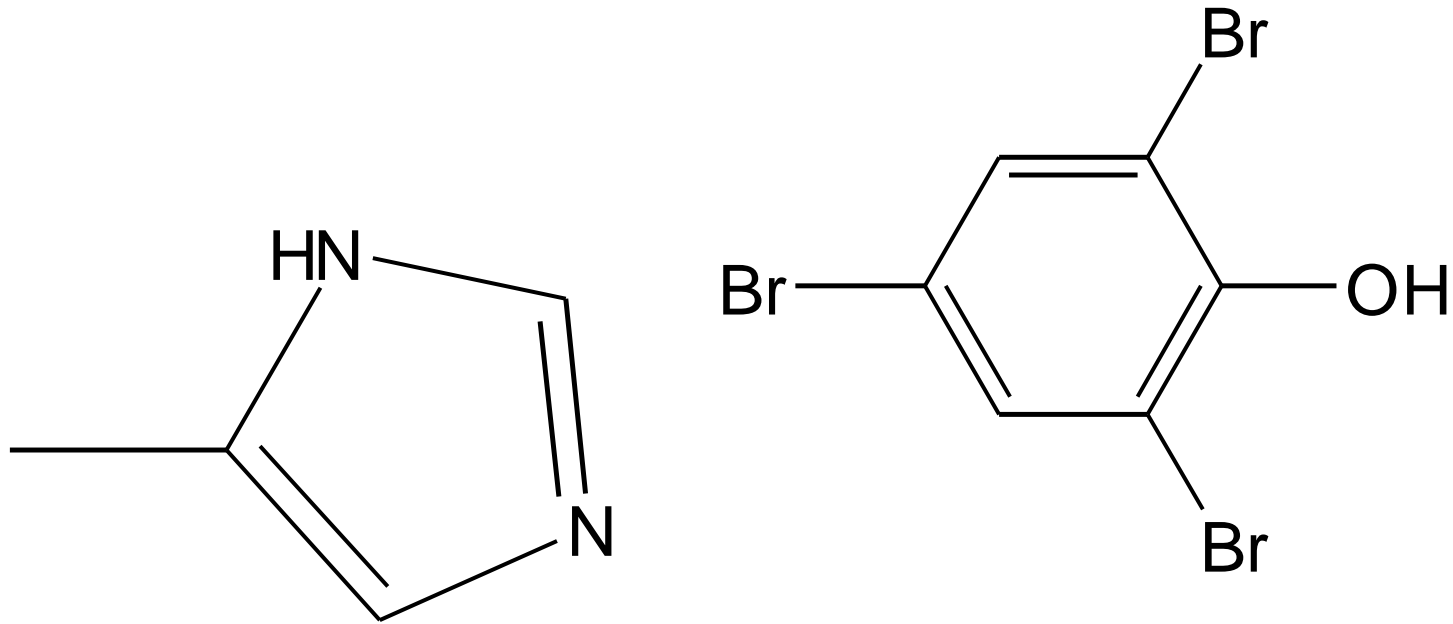
# Step 4: Scission of the O-O bond

**Heterolytic bond cleavage occurs.**

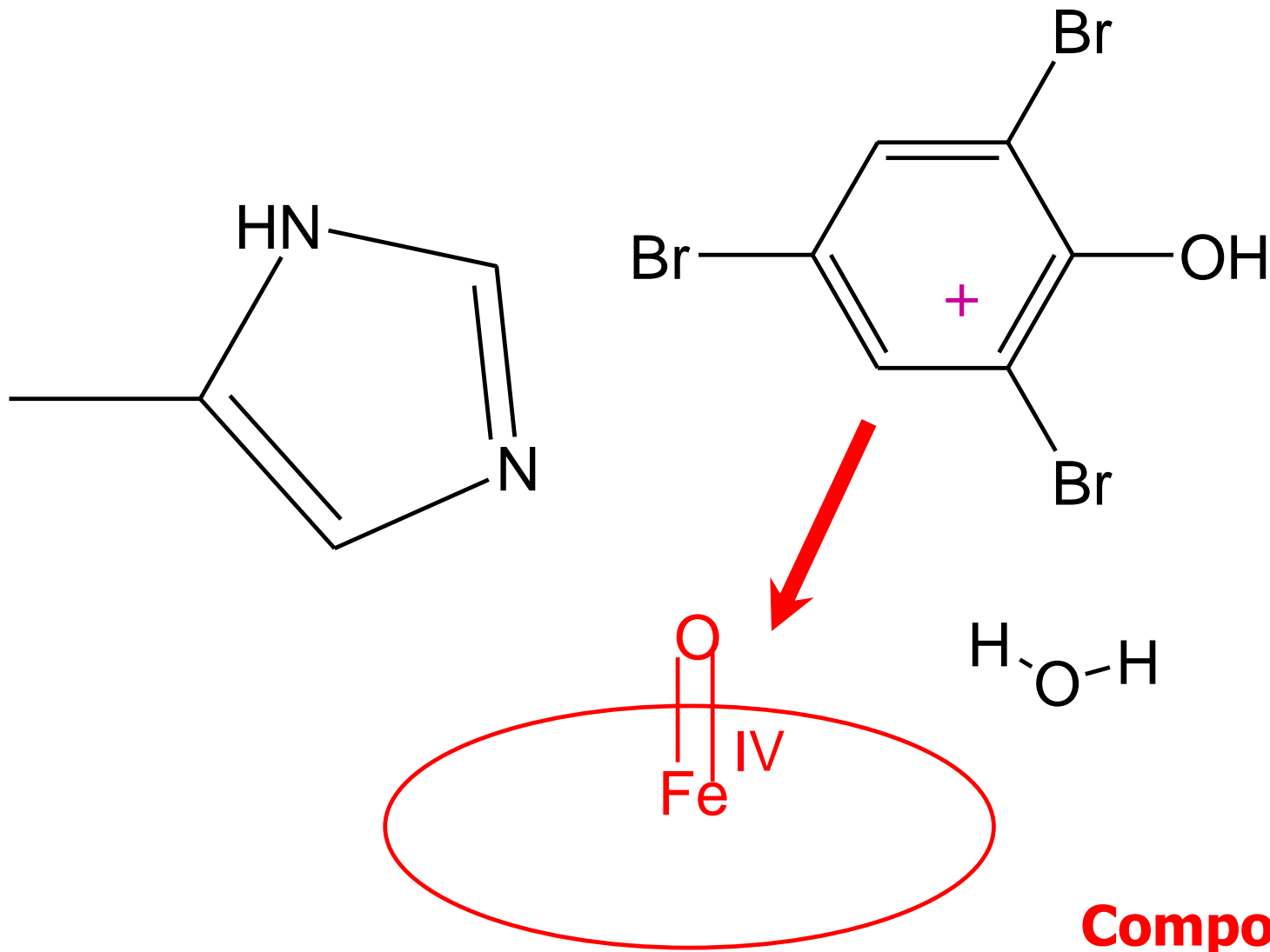


**Compound I**

# Step 5: Substrate binding

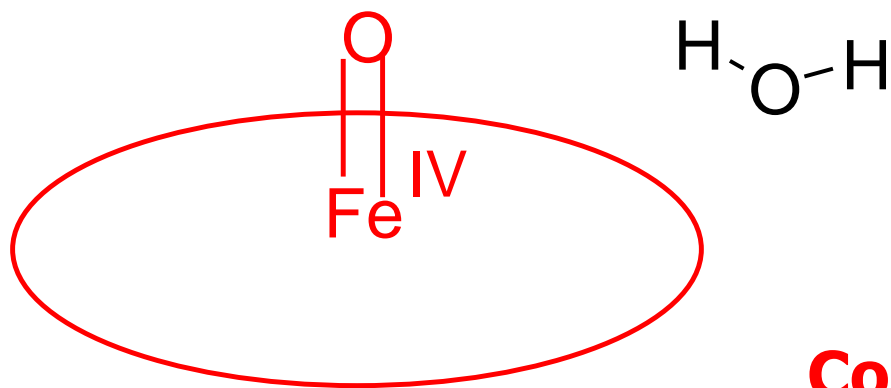
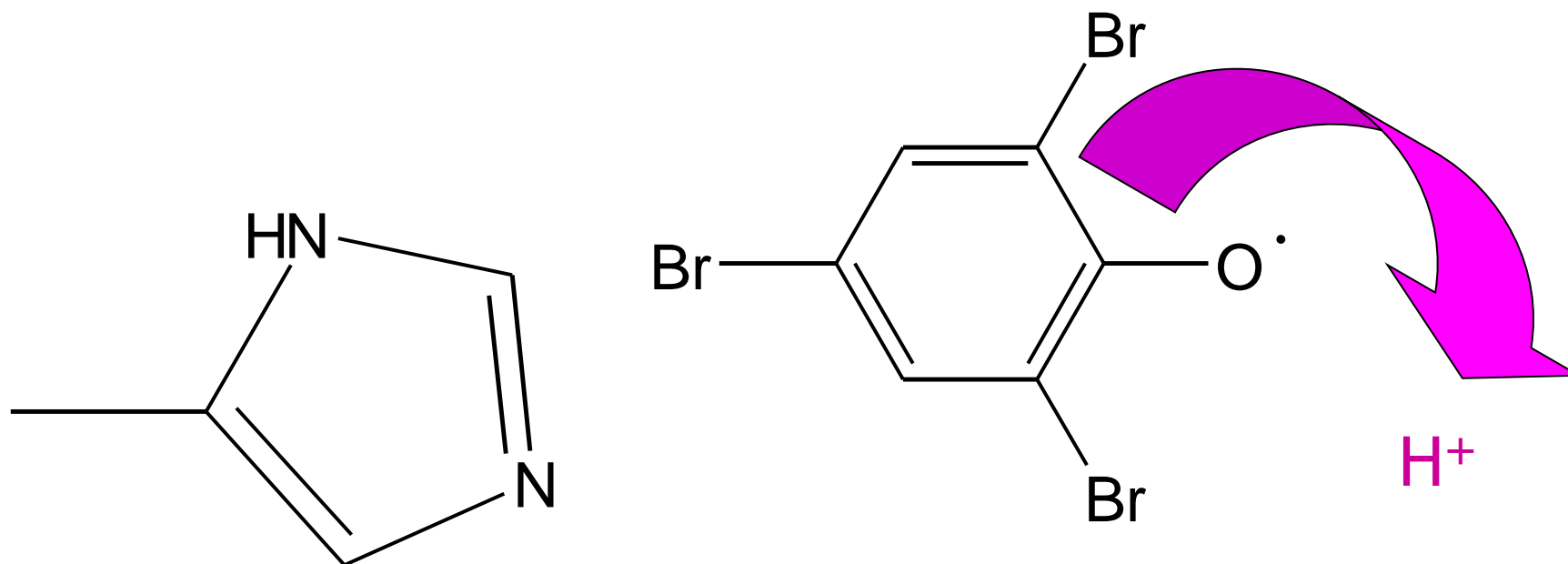


# Step 6: Edge electron transfer



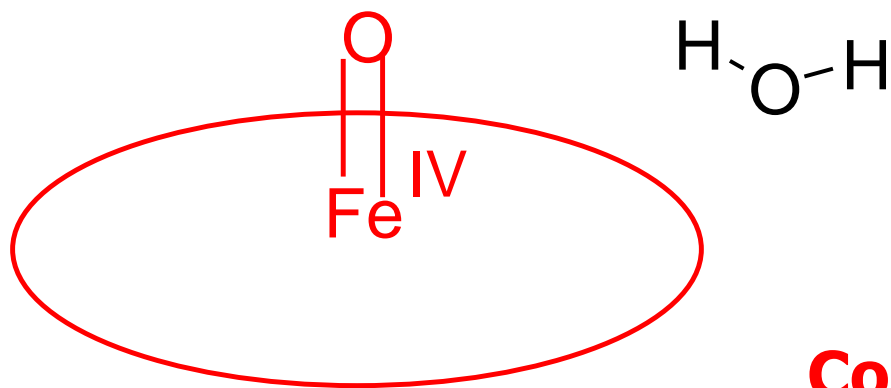
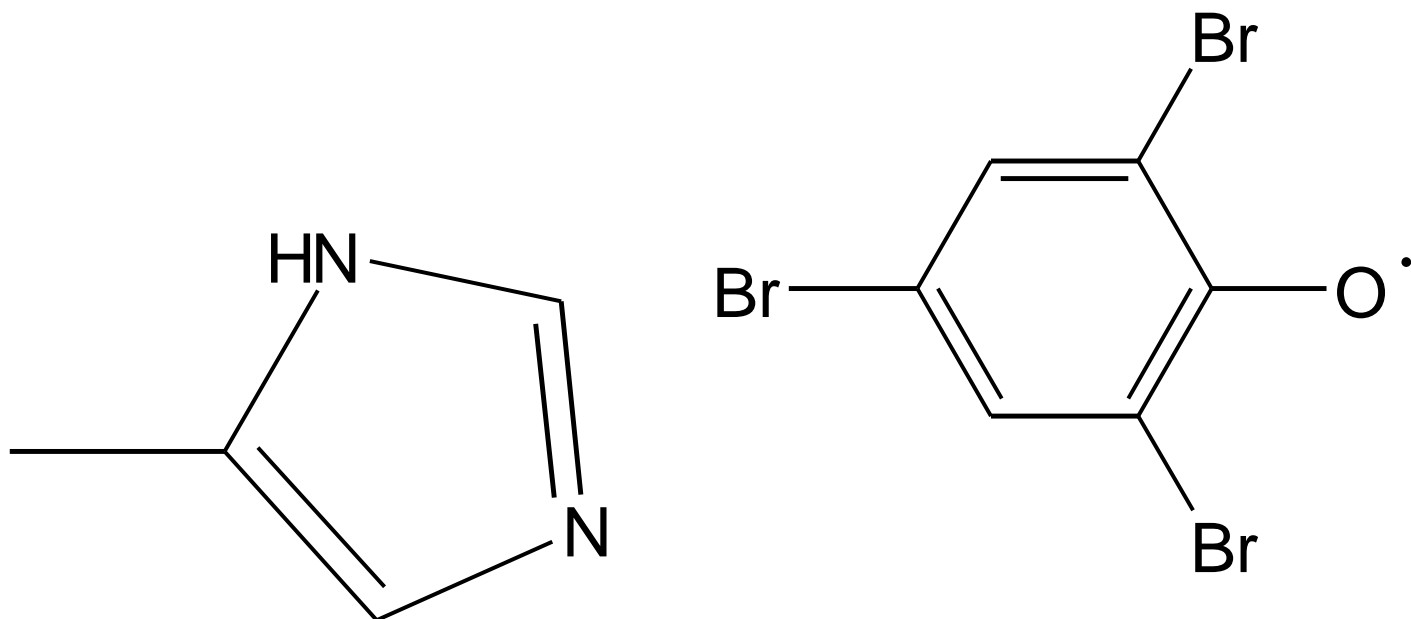


# Step 7: Deprotonation



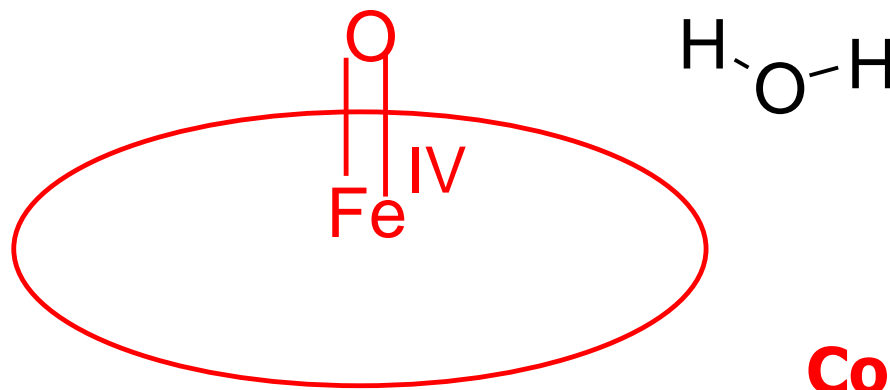
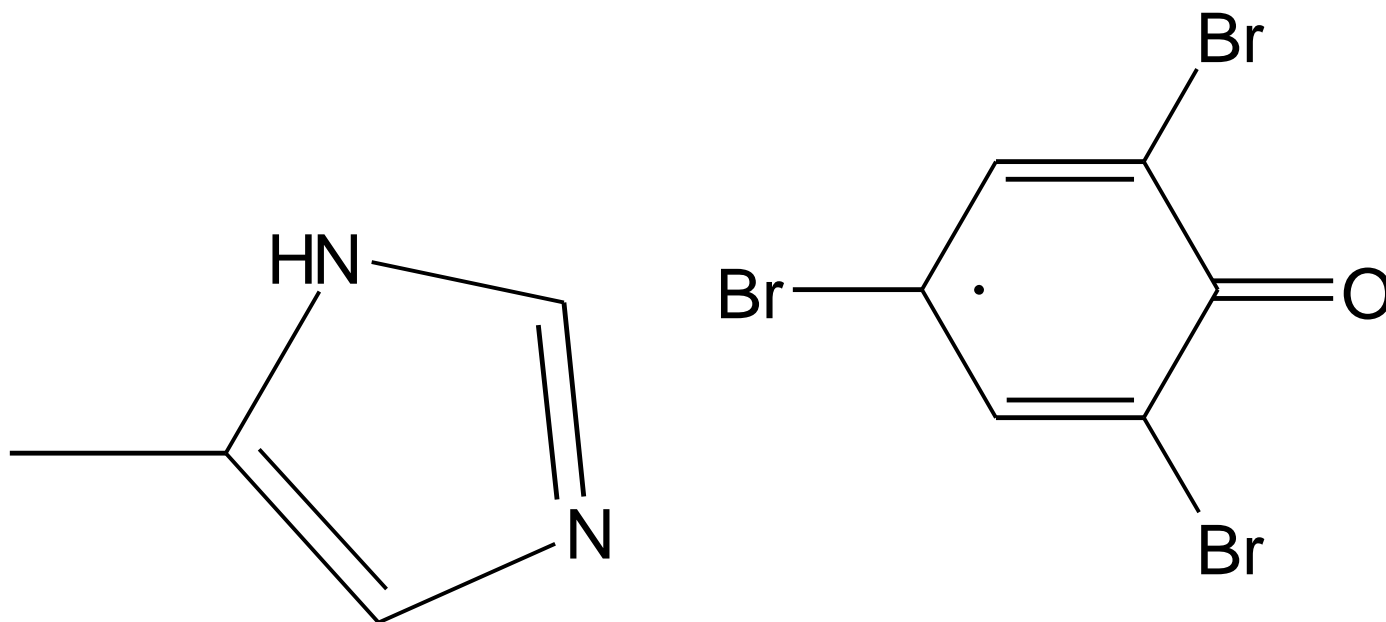
**Compound II**

# Radical resonance structures



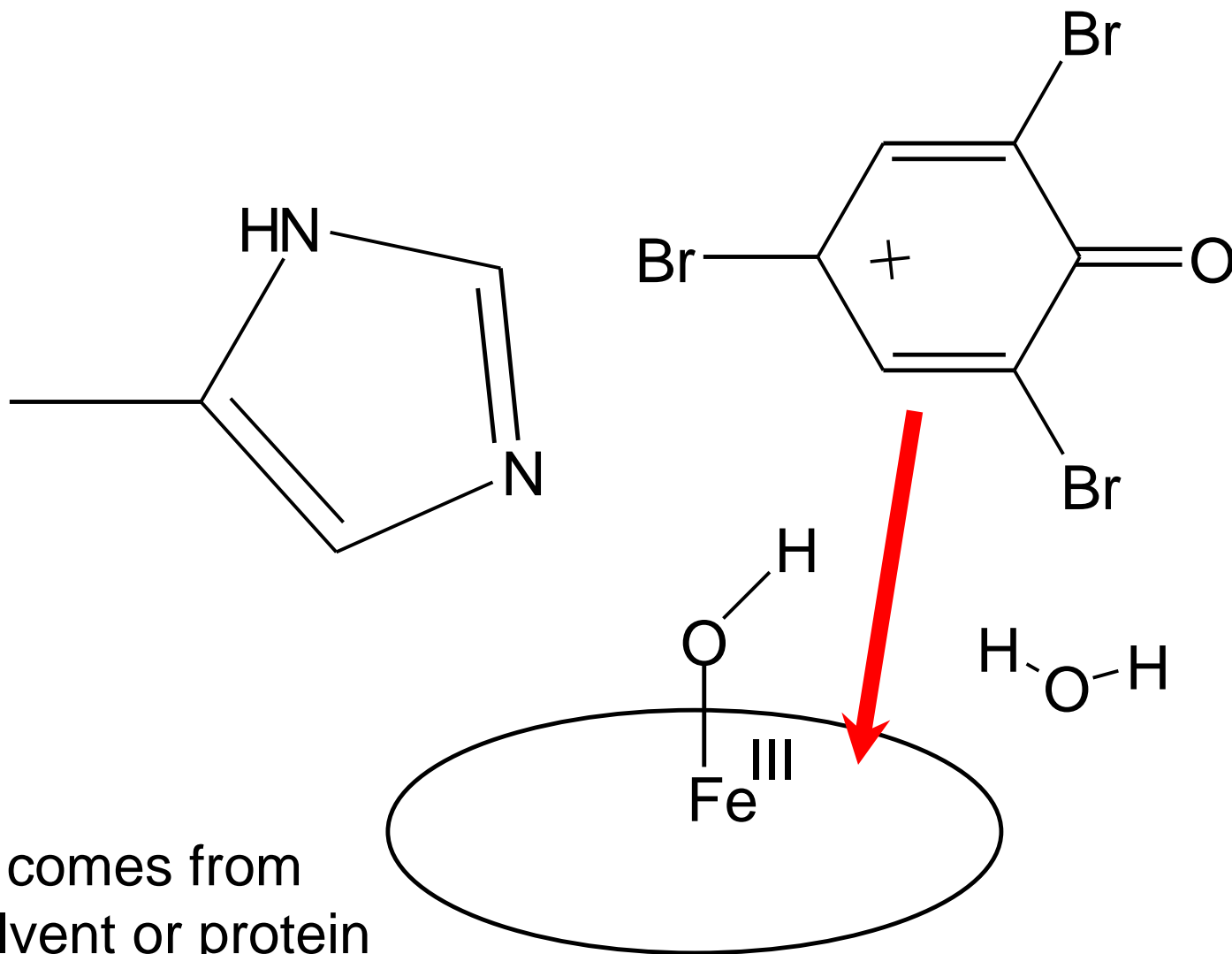
**Compound II**

# Radical resonance structures

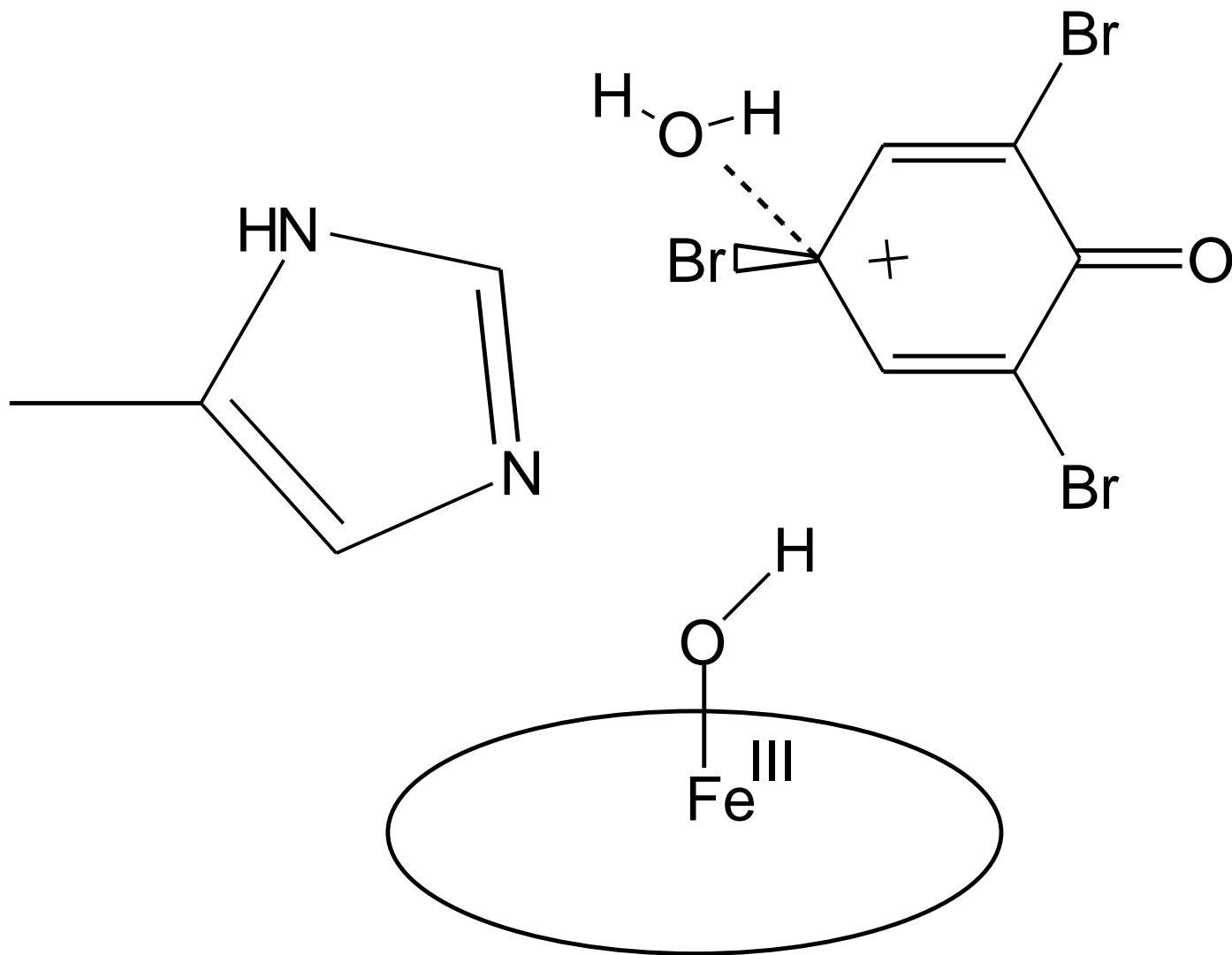


**Compound II**

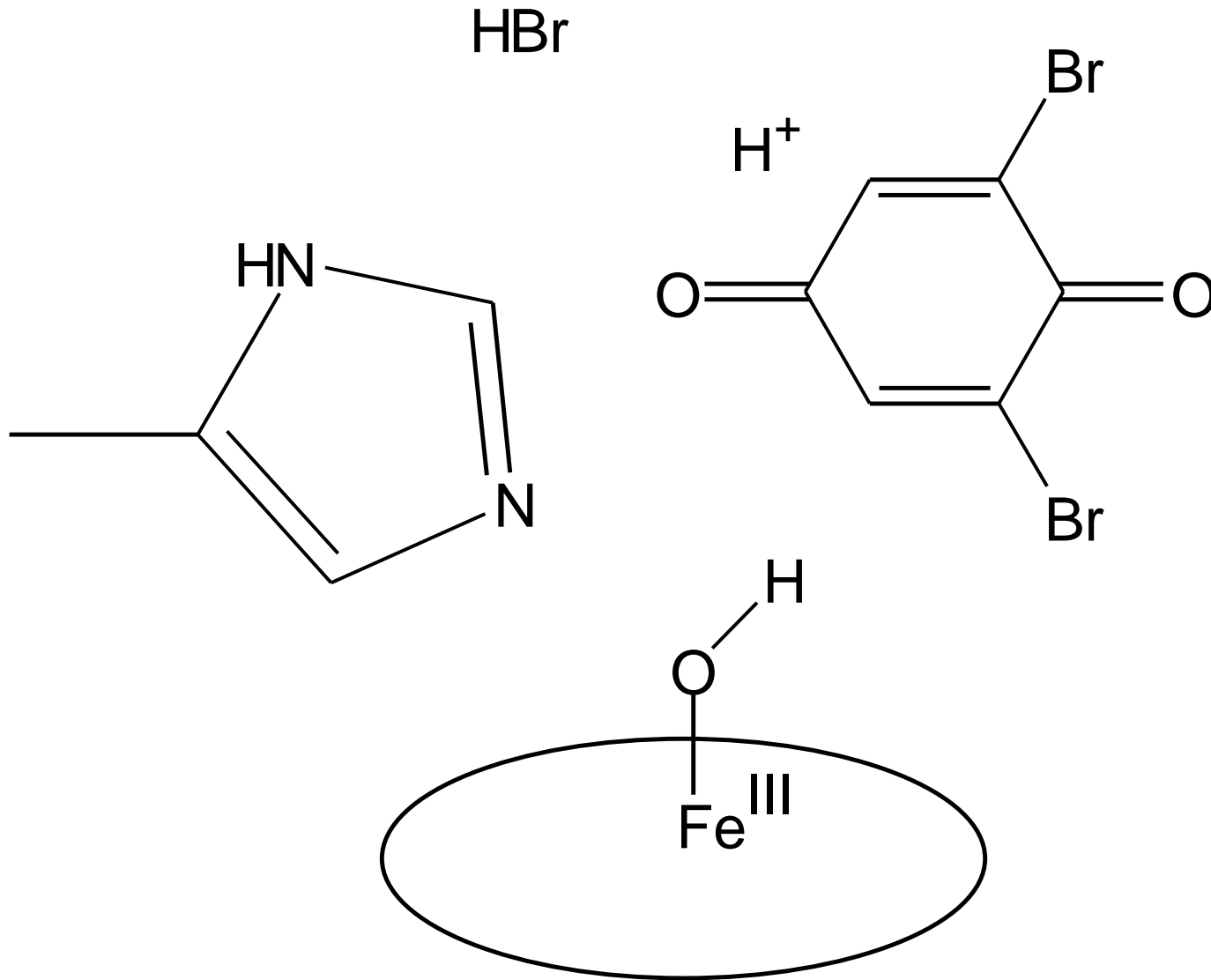
# Step 8: Second electron transfer



# Step 9: Attack by water

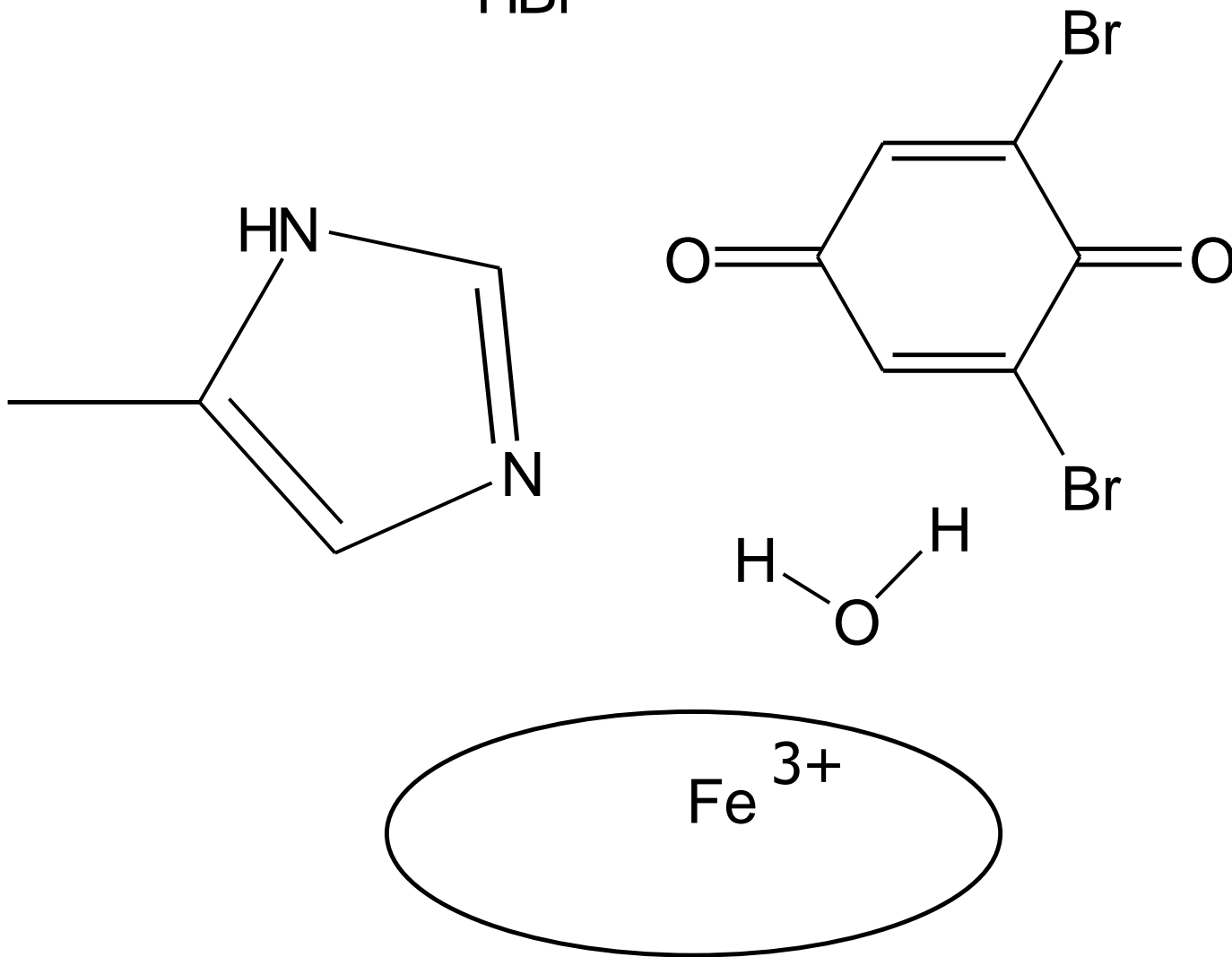


# Rearrangement to form quinone



# Step 10: Return to resting state

HBr



## One-electron followed by Polymerization



## Two-electron

