

Balancing Equations: Oxidation Number

Balance the following reaction:



① Identify reduced & oxidized species

$\text{PbS} \rightarrow \text{S is } -2$ (based on similarity to O)
 $\rightarrow \text{Pb is } +2$ (to balance charge)

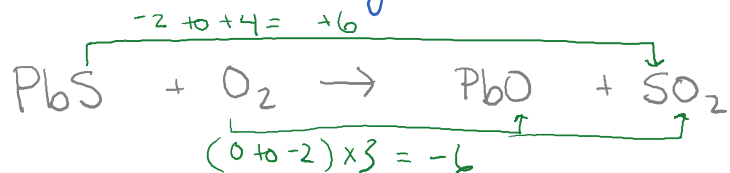
$\text{O}_2 \rightarrow \text{O is } 0$ (pure element)
 $\text{PbO} \rightarrow \text{O is } -2$ (from "THE RULES")
 $\rightarrow \text{Pb is } +2$ (to balance charge)

$\text{SO}_2 \rightarrow \text{O is } -2$ (from "THE RULES")
 $\rightarrow \text{S is } +4$ (to balance charge)

$0 \rightarrow -2$
O is REDUCED

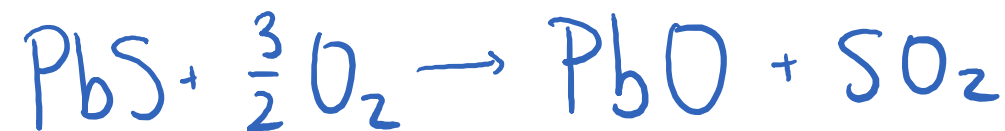
$-2 \rightarrow +4$
S is OXIDIZED

② Balance charge transfer ($\oplus = \ominus$)



$+6 = -6 \Rightarrow$ charge transfer balanced

3. Balance atoms using uncharged/not redox-active species

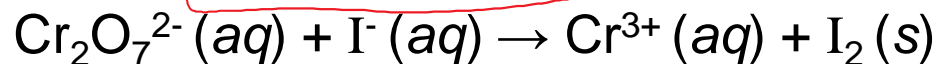


✓ Write balanced reactions and half-reactions for redox reactions, and identify half-reactions as reduction or oxidation.

Balancing Reactions: Half-Reaction (Acidic)

Balance this reaction in acidic solution:

we will use H^+ & H_2O to finish balancing



① Split reaction into 2 halves \rightarrow each following one particular atom:



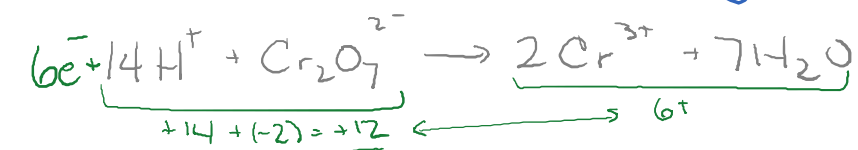
② Balance the non-H & O atoms:



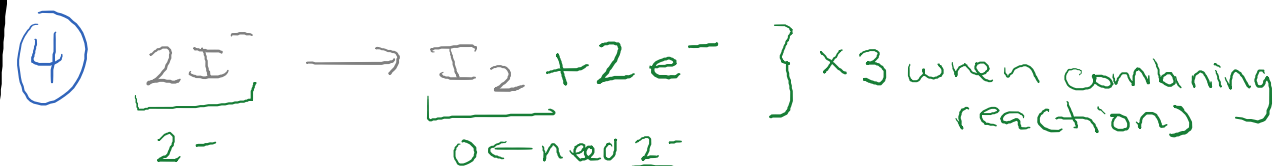
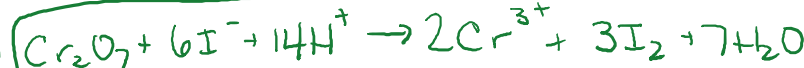
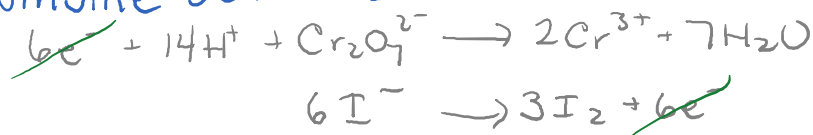
③ Use H_2O to balance O, then H^+ for H:



④ Use e^- to balance charges:



⑤ Combine both $\frac{1}{2}$ reactions \rightarrow so that e^- cancel overall:

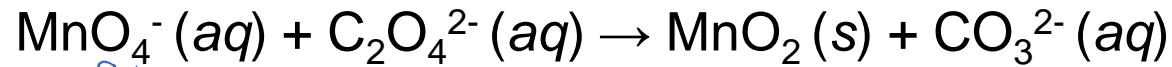


It looks like you can simplify the I^-/I_2 , but don't! we need the e^- they bring

✓ Write balanced reactions and half-reactions for redox reactions, and identify half-reactions as reduction or oxidation.

Balancing Reactions: Half-Reaction (Basic) WAY 1 $\rightarrow \text{OH}^- + \text{H}_2\text{O}$ directly

Balance this reaction in basic solution: \leftarrow use $\text{OH}^-/\text{H}_2\text{O}$ to balance H & O in equation



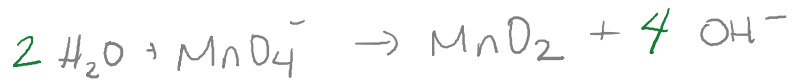
① Split into two halves- each following one atom:



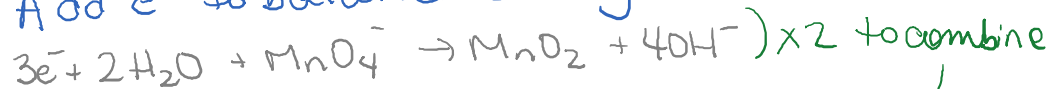
② Balance non-H & O atoms



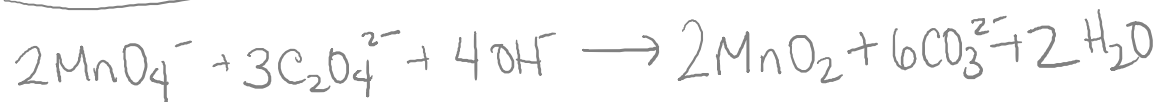
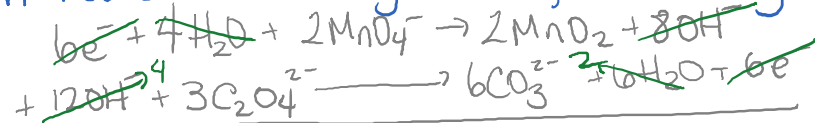
③ Add OH^- & H_2O to balance H & O \rightarrow HINT - try adding OH^- to the "less negative" side first



④ Add e^- to balance charges



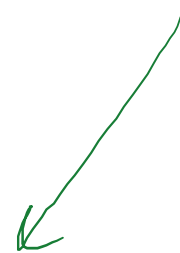
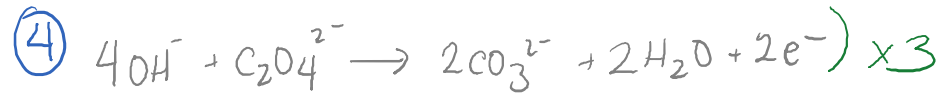
⑤ Sum reactions together, cancelling electrons



①



②

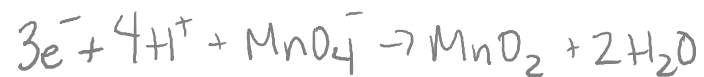


✓ Write balanced reactions and half-reactions for redox reactions, and identify half-reactions as reduction or oxidation.

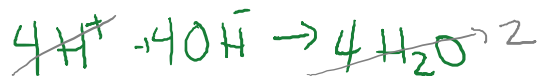
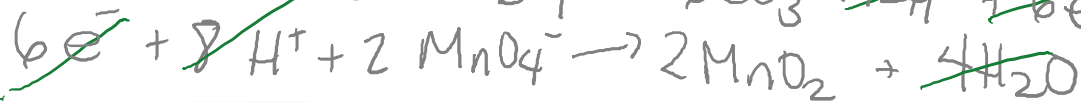
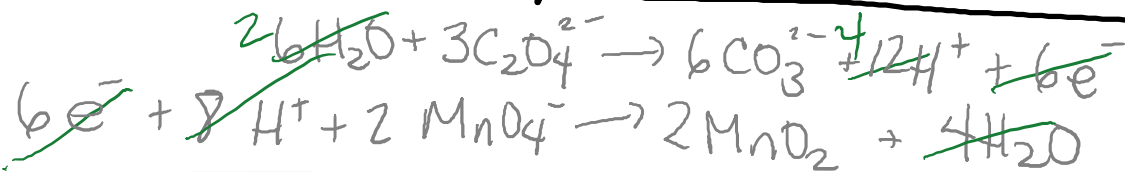
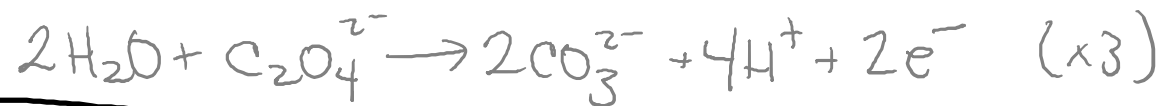
Balancing Reactions: Half-Reaction (Basic) WAY 2 - Convert from acid

Balance this reaction in basic solution: \leftarrow use $\text{OH}^-/\text{H}_2\text{O}$ to balance H & O in equation

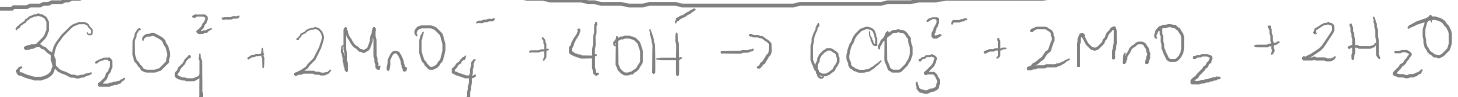
①-5 Balance & sum together like in acid solution:



(x2)



⑥ Add $\text{H}_2\text{O} \rightarrow 2\text{H}^+ + 2\text{OH}^-$
to cancel H^+ &
make basic.



✓ Write balanced reactions and half-reactions for redox reactions, and identify half-reactions as reduction or oxidation.