



# Redox in Basic Medium/Solution

More guides at  
[www.breslyn.org](http://www.breslyn.org)

Video Workbook with Dr. B

The process is the same as we did with acidic solutions. *All we do is add one more step.*

You will usually be told if you need to balance in acidic or basic (also called alkaline) solution.

 [Full Redox Playlist](#)

A basic solution usually has hydroxide ions (OH<sup>-</sup>).

## Balancing Redox in Basic Medium/Solution

### Steps

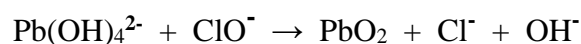
1. Balance the redox reaction as you would with an acidic solution.
2. Then add OH<sup>-</sup> to cancel out any H<sup>+</sup> ions.
3. Combine any OH<sup>-</sup> and H<sup>+</sup> to form H<sub>2</sub>O.
4. Cancel/combine any common terms (usually H<sub>2</sub>O).

Note: Some teachers add the extra step earlier in the balancing process.

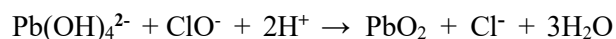
*In most cases you will be told whether the reaction takes place in acidic or basic medium. If not, assume acidic conditions.*

Sometimes basic solution/medium is called alkaline solution/medium.

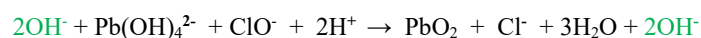
**Example:** Balance the equation below in basic solution.



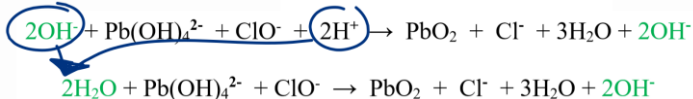
1. Balance in acidic medium to get:



2. Add OH<sup>-</sup> ions to cancel out the H<sup>+</sup> ions.



3. Combine OH<sup>-</sup> and H<sup>+</sup> to form H<sub>2</sub>O.



4. Cancel out like terms to get the final balanced equation:



This is redox eq. we need to balance.

We followed the same process as before to get the balanced equation in acidic medium.

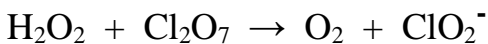
There are 2H<sup>+</sup> ions in the reactants so we add 2OH<sup>-</sup> ions **to each side** of the equation.

When we have H<sup>+</sup> and OH<sup>-</sup> on the same side of the equation we combine them to form H<sub>2</sub>O.

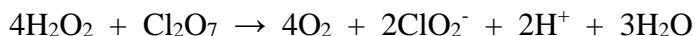
There are 2H<sub>2</sub>O in the reactants and 3H<sub>2</sub>O in the products. We simplify this to 1H<sub>2</sub>O in the products. We write this as just H<sub>2</sub>O.



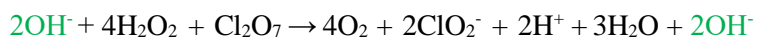
**Practice:** Balance the equation below in basic solution.



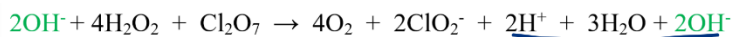
1. Balance in acidic medium to get:



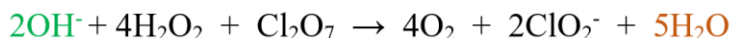
2. Add  $\text{OH}^-$  ions to cancel out the  $\text{H}^+$  ions:



3. Combine  $\text{OH}^-$  and  $\text{H}^+$  to form  $\text{H}_2\text{O}$ .



4. Combine like terms to get the final balanced equation:



This is redox eq. we need to balance.

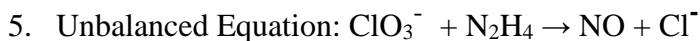
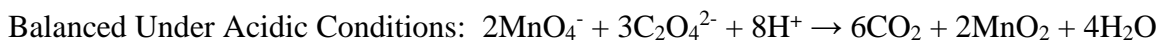
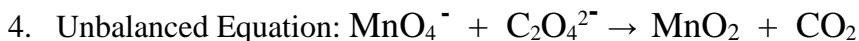
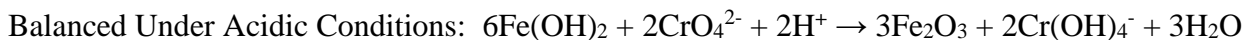
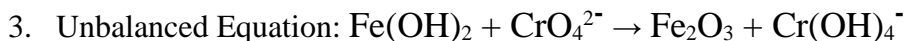
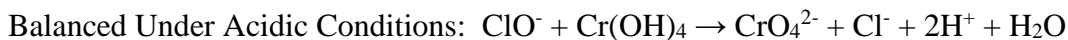
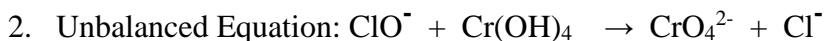
We followed the same process as before to get the balanced equation in acidic medium.

There are  $2\text{H}^+$  ions in the reactants so we add  $2\text{OH}^-$  ions to **each side** of the equation.

When we have  $\text{H}^+$  and  $\text{OH}^-$  on the same side of the equation we combine them to form  $\text{H}_2\text{O}$ .

Here we have  $3\text{H}_2\text{O}$  and  $2\text{H}_2\text{O}$  in the products. We add them together to get  $5\text{H}_2\text{O}$ .

**Practice Problems:** Given the equation balanced under acidic conditions, *balance the following reactions in basic medium.*



Answers:

1. Balanced Under Basic Conditions:  $2\text{Co}(\text{OH})_3 + \text{Sn} + \text{OH}^- \rightarrow 2\text{Co}(\text{OH})_2 + \text{HSnO}_2^- + \text{H}_2\text{O}$   
([video solution](#))
2. Balanced Under Basic Conditions:  $\text{ClO}^- + \text{Cr}(\text{OH})_4 + 2\text{OH}^- \rightarrow \text{CrO}_4^{2-} + \text{Cl}^- + 3\text{H}_2\text{O}$
3. Balanced Under Basic Conditions:  $6\text{Fe}(\text{OH})_2 + 2\text{CrO}_4^{2-} \rightarrow 3\text{Fe}_2\text{O}_3 + 2\text{Cr}(\text{OH})_4^- + 2\text{OH}^- + \text{H}_2\text{O}$   
([video solution](#))
4. Balanced Under Basic Conditions:  $2\text{MnO}_4^- + 3\text{C}_2\text{O}_4^{2-} + 4\text{H}_2\text{O} \rightarrow 6\text{CO}_2 + 2\text{MnO}_2 + 8\text{OH}^-$
5. Balanced Under Basic Conditions:  $4\text{ClO}_3^- + 3\text{N}_2\text{H}_4 \rightarrow 6\text{NO} + 4\text{Cl}^- + 6\text{H}_2\text{O}$   
(There aren't any  $\text{H}^+$  so you didn't need to add any  $\text{OH}^-$ ).

---

## Redox Guides

[Introduction to Redox](#)

[Finding Oxidation Numbers](#)

[Writing Half Reactions](#)

[Key Terms: Oxidized, Reduced, Oxidizing Agent, Reducing Agent](#)

[Balancing Half Reactions](#)

[Matching Electrons, Combining Half Reactions](#)

Balancing Redox in Basic Medium (this guide)

[Practice, Practice, Practice](#)

Report errors and suggestions to [DrB@breslyn.org](mailto:DrB@breslyn.org)



[www.Breslyn.org](http://www.Breslyn.org)



