



Chemical Bonding with Dr. B

Exclusive learning content for [channel members](#).

Updated
December
2023

Practice!

To be successful do the practice below and figure out what is stopping you. Then go to the guide for that step and practice until you get it!

- [Finding Oxidation Numbers](#)
- [Writing Half Reactions](#)
- [Balancing Half Reactions](#)
- [Matching Electrons, Combining Half Reactions](#)
- [Balancing Redox in Basic Medium](#)



[Full Redox Playlist](#)

*Work to identify areas where
you need to improve.*

Practice Balancing Redox Reactions (answers below):

Conceptual Problems

1. What exactly are we balancing in redox reactions?
2. In balancing half reactions, are we able to add H₂O?
3. When you have the final balanced redox equation, how do you check to be sure you have the correct answer?
4. How do we know if we are balancing in an acidic solution or a basic solution?
5. Is every reaction a redox reaction? How can you tell?

Simple Redox Reactions

1. $\text{Mg}(s) + \text{Ag}^+(aq) \rightarrow \text{Mg}^{2+}(aq) + \text{Ag}(s)$
2. $\text{Zn}(s) + 2\text{H}^+(aq) \rightarrow \text{Zn}^{2+}(aq) + \text{H}_2(g)$
3. $\text{Fe}^{3+}(aq) + \text{Cu}(aq) \rightarrow \text{Cu}^{2+}(aq) + \text{Fe}^{2+}(aq)$
4. $\text{Al}(aq) + \text{Cu}^{2+}(aq) \rightarrow \text{Al}^{3+}(aq) + \text{Cu}(aq)$
5. $\text{Cu}(s) + \text{Ag}^+(aq) \rightarrow \text{Cu}^{2+}(aq) + \text{Ag}(s)$

Redox Rxns in Acidic Medium/Solution

1. $\text{Cr}_2\text{O}_7^{2-} + \text{ClO}_2^- \rightarrow \text{Cr}^{3+} + \text{ClO}_4^-$
2. $\text{Cr}_2\text{O}_7^{2-} + \text{HNO}_2 \rightarrow \text{Cr}^{3+} + \text{NO}_3^-$
3. $\text{Zn}(s) + \text{Cu}^{2+}(aq) \rightarrow \text{Zn}^{2+}(aq) + \text{Cu}(s)$
4. $\text{NaOH} + \text{CuSO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{Cu}(\text{OH})_2$
5. $\text{Fe}^{2+} + \text{MnO}_4^- \rightarrow \text{Fe}^{3+} + \text{Mn}^{2+}$
6. $\text{MnO}_4^- + \text{SO}_3^{2-} \rightarrow \text{MnO}_2 + \text{SO}_4^{2-}$
7. $\text{K}_2\text{Cr}_2\text{O}_7 + \text{HCl} \rightarrow \text{KCl} + \text{CrCl}_3 + \text{Cl}_2 + \text{H}_2\text{O}$
8. $\text{Cr}_2\text{O}_7^{2-} + \text{SO}_2 \rightarrow \text{Cr}^{3+} + \text{SO}_4^{2-}$
9. $\text{Fe}_2\text{O}_3 + \text{CO} \rightarrow \text{Fe} + \text{CO}_2$
10. $\text{H}_2\text{O}_2 + \text{Cr}_2\text{O}_7^{2-} \rightarrow \text{Cr}^{3+} + \text{O}_2$



Redox in Basic Solutions (*practice*)

- $\text{Cl}_2\text{O}_7 + \text{H}_2\text{O}_2 \rightarrow \text{ClO}^{2-} + \text{O}_2$
- $\text{Fe}(\text{OH})_3 + \text{OCl}^- \rightarrow \text{FeO}_4^{2-} + \text{Cl}^-$
- $\text{Cr}(\text{OH})_4^- + \text{H}_2\text{O}_2 \rightarrow \text{CrO}_4^{2-} + \text{H}_2\text{O}$
- $\text{Ag}_2\text{S} + \text{Cr}(\text{OH})_3 \rightarrow \text{Ag} + \text{HS}^- + \text{CrO}_4^{2-}$
- $\text{Al} + \text{H}_2\text{O} \rightarrow \text{Al}(\text{OH})_4^- + \text{H}_2$

Disproportionation (*practice*)

- $\text{H}_2\text{O}_2 \rightarrow \text{O}_2 + \text{H}_2\text{O}$
- $\text{NO}_3^- \rightarrow \text{N}_2\text{O} + \text{O}_2$ (balance in basic solution)
- $\text{NO}_2^- \rightarrow \text{NO}_3^- + \text{NO}$

Answers**Conceptual Problems** (answers)

- The number of atoms *and* number of electrons transferred.
- Because almost all reactions take place in water so there is H_2O present.
- You make sure the number of atoms is the same on both sides of the equation *and* the charge on both sides is balanced.
- You will be told which it is in the problem. If not, assume that it is in acidic medium.
- No, not all reactions are redox (double displacement are not redox). You can tell because oxidation numbers will change on elements from products to reactants.

Simple Redox Reactions (answers)

- $\text{Mg}(s) + 2\text{Ag}^+(aq) \rightarrow \text{Mg}^{2+}(aq) + 2\text{Ag}(s)$
- $\text{Zn}(s) + 2\text{H}^+(aq) \rightarrow \text{Zn}^{2+}(aq) + \text{H}_2(g)$
- $2\text{Fe}^{3+}(aq) + \text{Cu}(s) \rightarrow \text{Cu}^{2+}(aq) + 2\text{Fe}^{2+}(aq)$
- $2\text{Al}(s) + 3\text{Cu}^{2+}(aq) \rightarrow 2\text{Al}^{3+}(aq) + 3\text{Cu}(s)$
([video solution](#))
- $\text{Cu}(s) + 2\text{Ag}^+(aq) \rightarrow \text{Cu}^{2+}(aq) + 2\text{Ag}(s)$
([video solution](#))

Redox Rxns in Acidic Medium/Solution (answers)

- $2\text{Cr}_2\text{O}_7^{2-} + 3\text{ClO}_2^- + 16\text{H}^+ \rightarrow 4\text{Cr}^{3+} + 3\text{ClO}_4^- + 8\text{H}_2\text{O}$
- $\text{Cr}_2\text{O}_7^{2-} + 3\text{HNO}_2 + 5\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{NO}_3^- + 4\text{H}_2\text{O}$
- $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$ ([video solution](#))
- Not redox! Oxidation numbers do not change.
- $5\text{Fe}^{2+} + \text{MnO}_4^- + 8\text{H}^+ \rightarrow 5\text{Fe}^{3+} + \text{Mn}^{2+} + 4\text{H}_2\text{O}$
- $2\text{MnO}_4^- + 3\text{SO}_3^{2-} + 2\text{H}^+ \rightarrow 2\text{MnO}_2 + 3\text{SO}_4^{2-} + \text{H}_2\text{O}$
([video solution](#))
- $\text{K}_2\text{Cr}_2\text{O}_7 + 14\text{HCl} \rightarrow 2\text{KCl} + 2\text{CrCl}_3 + 3\text{Cl}_2 + 7\text{H}_2\text{O}$
([video solution](#))
- $\text{Cr}_2\text{O}_7^{2-} + 3\text{SO}_2 + 2\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{SO}_4^{2-} + \text{H}_2\text{O}$
([video solution](#))
- $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ ([video solution](#))
- $3\text{H}_2\text{O}_2 + \text{Cr}_2\text{O}_7^{2-} + 8\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{O}_2 + 7\text{H}_2\text{O}$

Redox in Basic Solutions (answers)

- $\text{Cl}_2\text{O}_7 + 4\text{H}_2\text{O}_2 + 2\text{OH}^- \rightarrow 2\text{ClO}_2^- + 4\text{O}_2 + 5\text{H}_2\text{O}$ ([video solution](#))
- $\text{Fe}(\text{OH})_3 + \text{OCl} + 3\text{OH}^- \rightarrow \text{FeO}_4^{2-} + \text{Cl}^- + 3\text{H}_2\text{O}$
- $2\text{Cr}(\text{OH})_4^- + 3\text{H}_2\text{O}_2 + 2\text{OH}^- \rightarrow 2\text{CrO}_4^{2-} + 8\text{H}_2\text{O}$
- $3\text{Ag}_2\text{S} + 2\text{Cr}(\text{OH})_3 + 7\text{OH}^- \rightarrow 6\text{Ag} + 3\text{HS}^- + 2\text{CrO}_4^{2-} + 5\text{H}_2\text{O}$
- $2\text{Al} + 6\text{H}_2\text{O} + 2\text{OH}^- \rightarrow 2\text{Al}(\text{OH})_4^- + 3\text{H}_2$

Disproportionation (answers)

- $2\text{H}_2\text{O}_2 \rightarrow \text{O}_2 + 2\text{H}_2\text{O}$
- $2\text{NO}_3^- + \text{H}_2\text{O} \rightarrow \text{N}_2\text{O} + 2\text{O}_2 + 2\text{OH}^-$
- $3\text{NO}_2^- + 2\text{H}^+ \rightarrow \text{NO}_3^- + 2\text{NO} + \text{H}_2\text{O}$

To get the learn quickest and remember the longest:

- Read through the guides.
- Work each example and check your work.
- Do the practice problems until you can get them correct.
- If you get stuck, watch the video solution provided.
- Redo any problems you did not get right. Be sure to identify where you went wrong.

Work in 20 minute blocks with 2 minute breaks between. During the break move some and stretch while focusing on taking deep breaths. When you start again, quickly summarize what you learned and note any areas where you are confused. Focus on resolving any confusion and move on.

Spread learning over several days if possible. Always review what you previously learned at the beginning of each study session.

Report errors and suggestions to DrB@breslyn.org

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](#)

Practice, Practice, Practice (this guide)

