

Redox Reactions

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CHEMISTRY 161
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www.mioy.org/chem161

What is an oxidation state?

The oxidation state is a hypothetical charge of an element IF it were 100% ionic.

Take-home message: Treat oxidation number/state like a charge.

Some general rules:

1. Pure elements have oxidation number = 0
Ex) Br₂: each Br is 0
Ex) Mg: Mg is 0
2. Hydrogen usually has an oxidation number = +1
Ex) H₂O; CH₄
3. Oxygen usually has an oxidation number = -1
Ex) H₂O; CO₂
4. Everything else: follow the rules for ionic charges!
Ex) NaCl: Na = +1; Cl = -1
Ex) CF₄: C = +4; F = -1
Ex) CO₂: C = +4; O = -2

Some reactions involve a change in the oxidation state of an atom/element!

What is a redox reaction?

A reaction in which the oxidation states of some elements change.

There are two types:

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RIG = Reduction Is Gaining

Choose whatever mnemonic works best for you!

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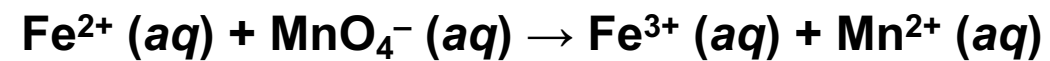


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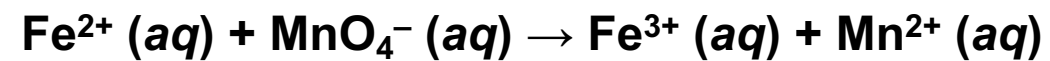


These are called half-reactions because we typically have a both reactions occurring, or a **reduction-oxidation** (redox) reaction.

How do I balance redox reactions?

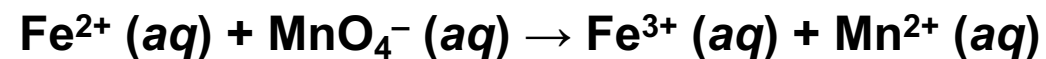


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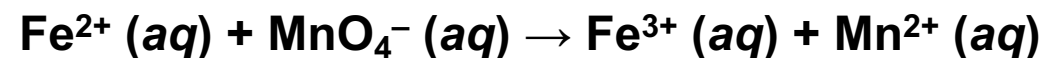


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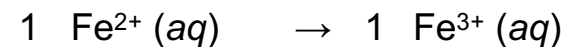
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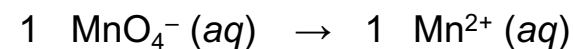
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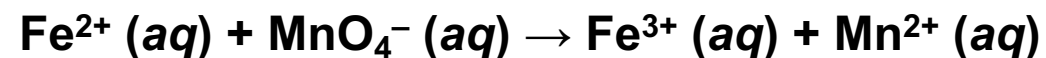


Red



Overall

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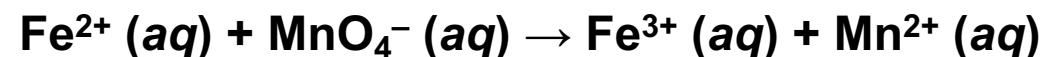


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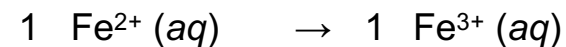
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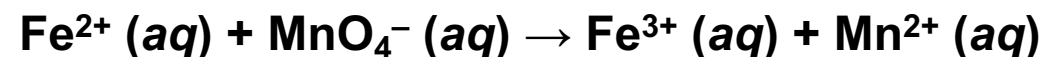


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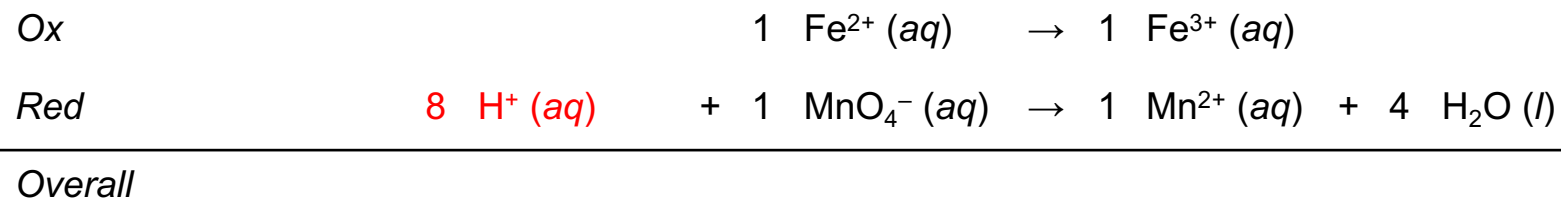


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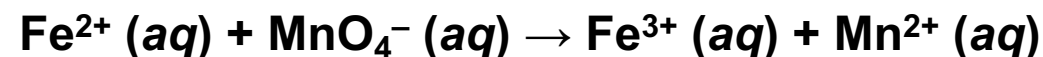
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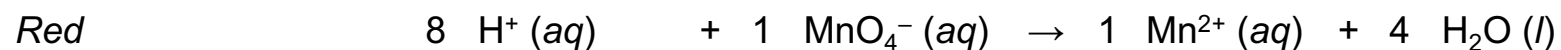
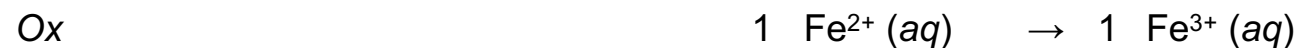
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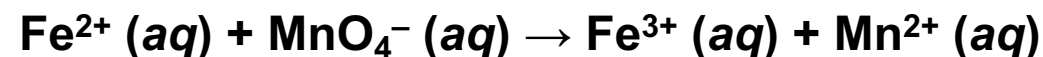


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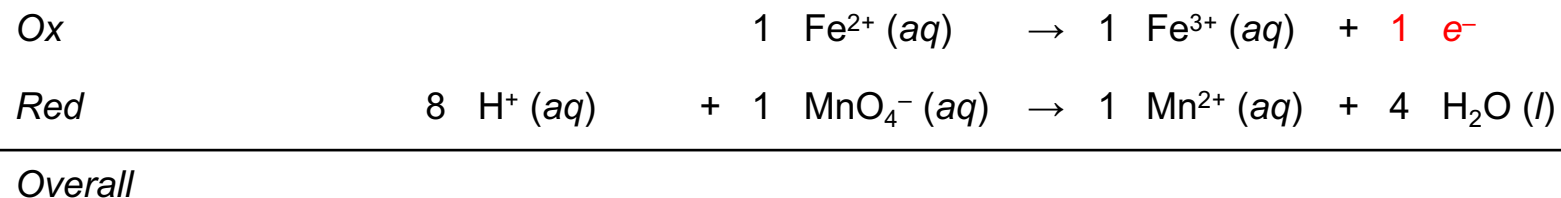
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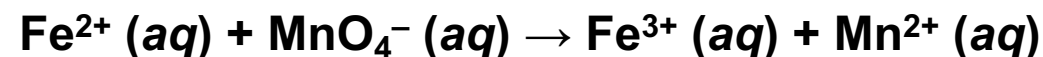


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For the oxidation reaction: the reactants have a total charge of 2+ and the products have a total charge of 3+, so we need 1 extra electron on the product side.

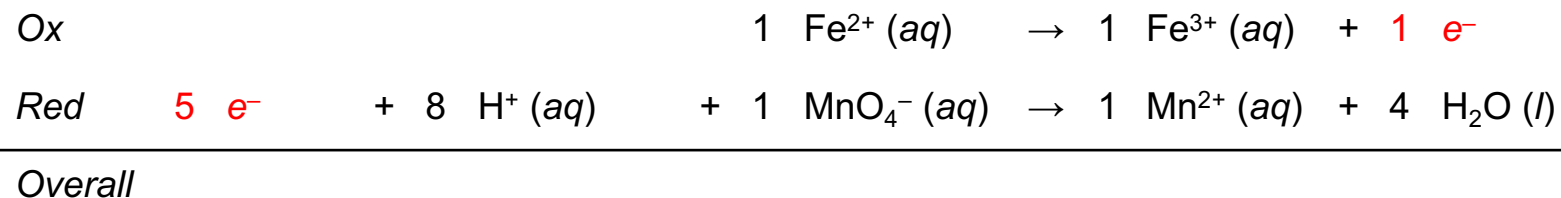


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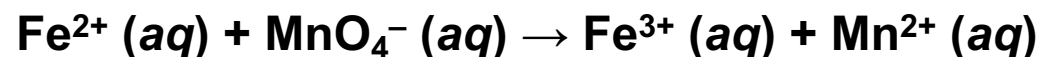


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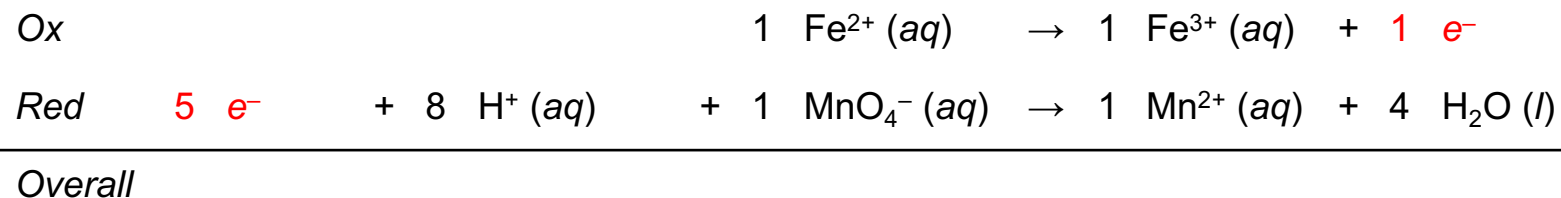
For the reduction reaction: the reactants have a total charge of 7+ and the products have a total charge of 2+, so we need 5 extra electron on the reactants side.



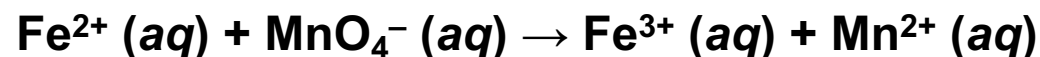
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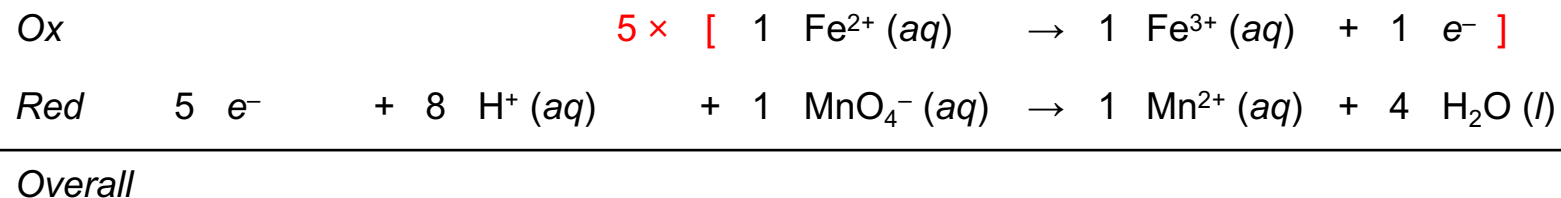
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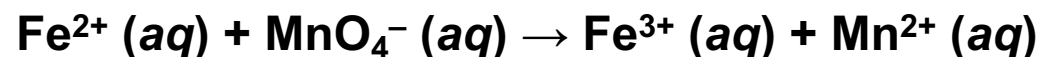
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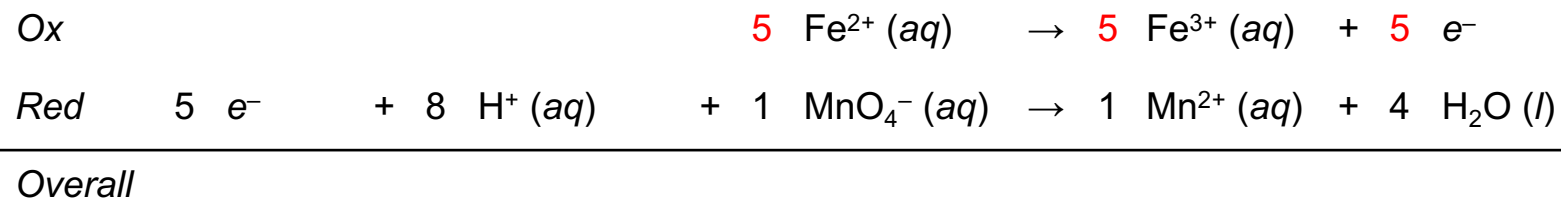
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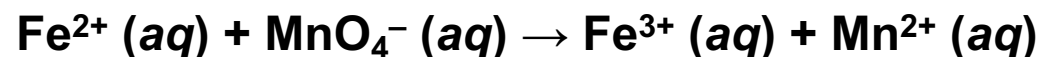
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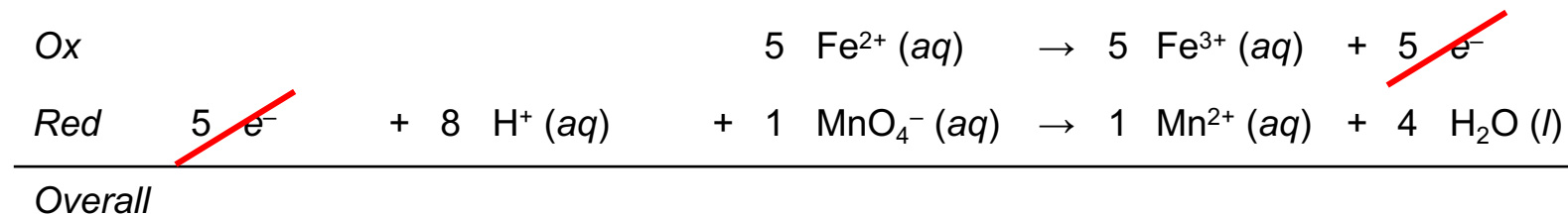
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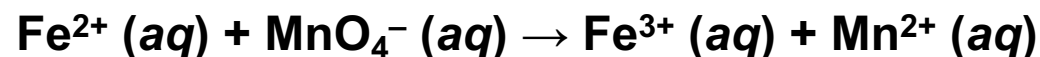
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