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12.007 Geobiology
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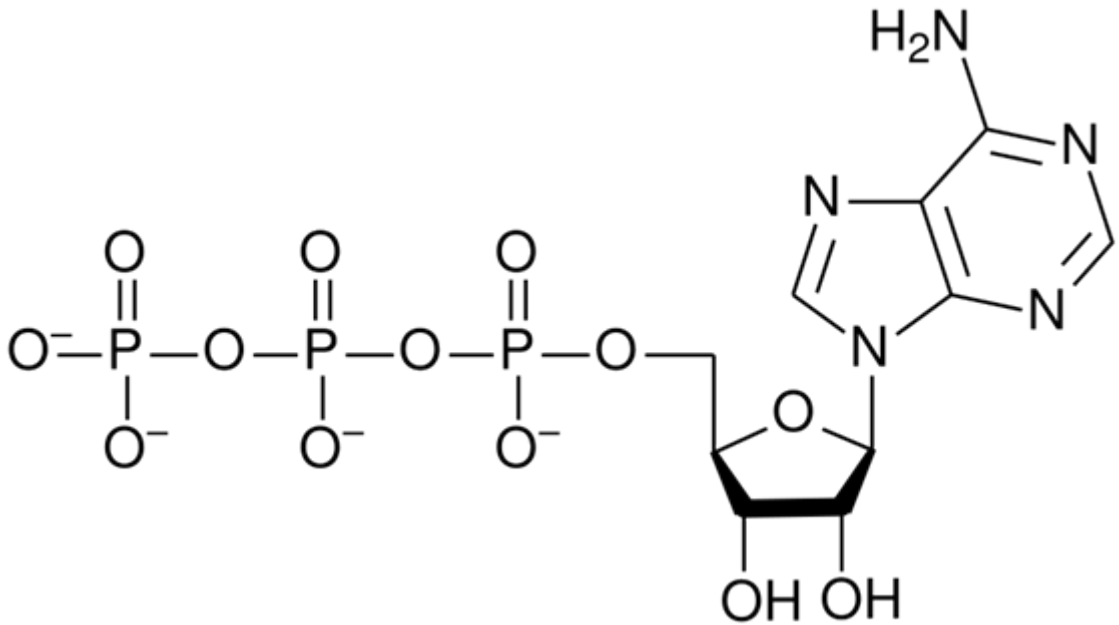
ATP – energy currency of the cell



ATP SYNTHASE

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Please see: http://www.mrc-dunn.cam.ac.uk/research/atp_synthase/movies.php

5 rules for determining the formal charge of an atom

1. The elementary state has a redox state of 0

   H_2, O_2, S^0

2. The oxidation state is equal to an ion's charge

   $Fe^{3+} = 3$, $H^+ = 1$

3. In most compounds… O = -2 and H = +1

4. A neutral molecule has zero net redox state

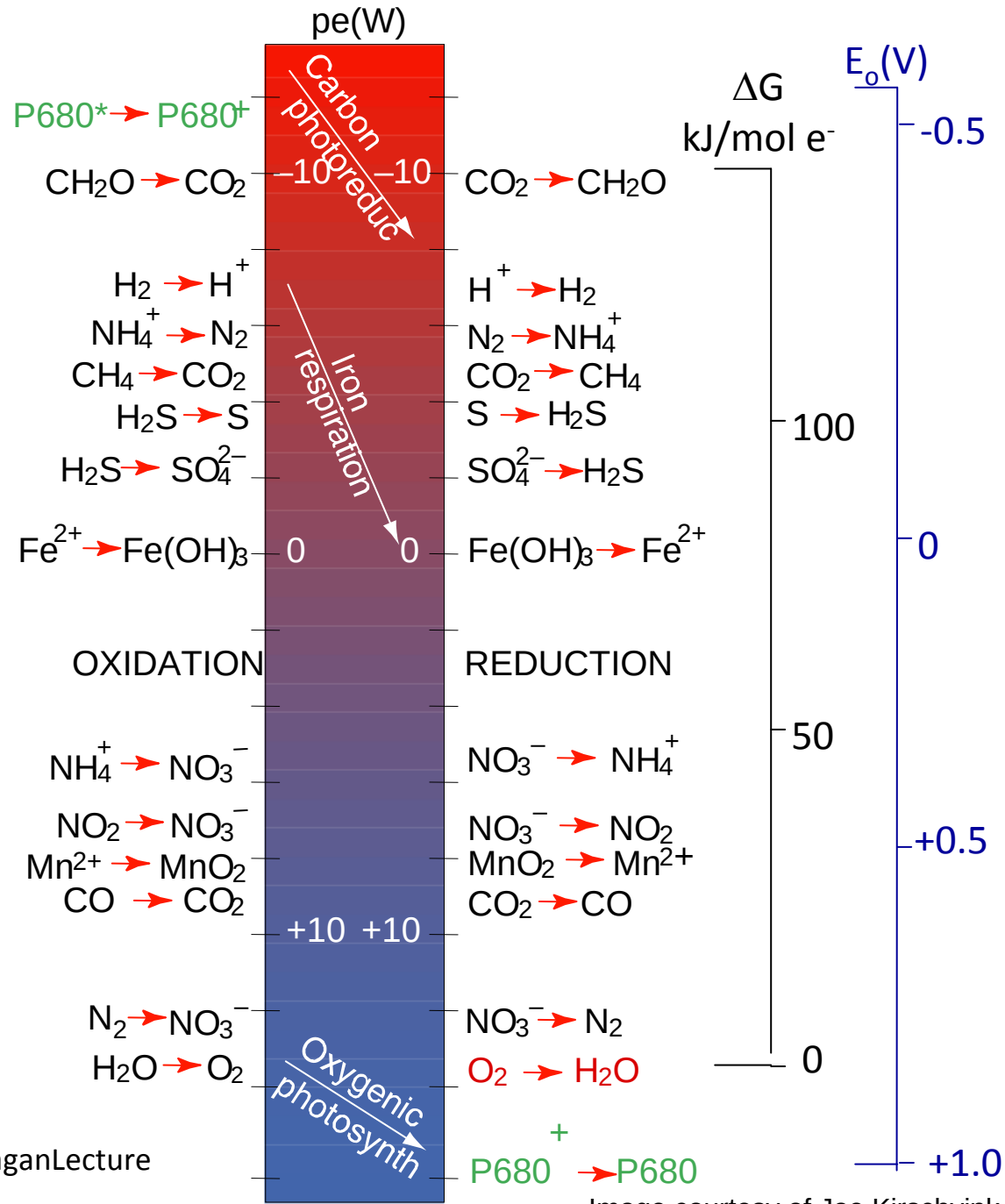
   H_2O

5. A charged species has net redox state equal to its charge

   OH- = -1

Steps for balancing redox reactions

1. Write the unbalanced half-reactions for the oxidation and reduction
2. Balance all elements other than H and O
3. Balance O with H_2O molecules
4. Balance H with H^+ ions
5. Balance charge with e^-
6. Balance number of e^- in two half-reactions
7. Add the two half-reactions
8. Adjust for pH if necessary
9. Check that charge and atoms balance



Adapted from TheCarlSaganLecture
By Joe Kirschvink

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