8.12: Solutions for Selected Problems.

Bonds Broken:

$$C-C\ 6\times 80\frac{kcal}{mol}=480\frac{kcal}{mol}$$

$$C-H\ 16\times 100\frac{kcal}{mol}=1600\frac{kcal}{mol}$$

$$O=O\ 7\times 120\frac{kcal}{mol}=840\frac{kcal}{mol}$$

Total: 2,920 kcal/mol

Bonds Made:

$$C=O\ 14\times(-190\frac{kcal}{mol})=-2660\frac{kcal}{mol}$$

$$O-H\ 16\times(-110\frac{kcal}{mol})=-1760\frac{kcal}{mol}$$

Total: -4,420 kcal/mol

Overall: $1240-4420\frac{kcal}{mol}=-1500\frac{kcal}{mol}$

Bonds Broken:

$$C-C\ 7\times 80\frac{kcal}{mol}=560\frac{kcal}{mol}$$

$$C-H\ 18\times 100\frac{kcal}{mol}=1800\frac{kcal}{mol}$$

$$O=O\ 12.5\times 120\frac{kcal}{mol}=1500\frac{kcal}{mol}$$

Total: 3,860 kcal/mol

Bonds Made:

$$C=O\ 16\times(-190\frac{kcal}{mol})=-3040\frac{kcal}{mol}$$

$$O-H\ 18\times(-110\frac{kcal}{mol})=-1980\frac{kcal}{mol}$$

Total: -5,020 kcal/mol

Overall: $3860-5020\frac{kcal}{mol}=-1160\frac{kcal}{mol}$

Bonds Broken:

$$C-C\ 6\times 80\frac{kcal}{mol}=480\frac{kcal}{mol}$$

$$C-H\ 7\times 100\frac{kcal}{mol}=700\frac{kcal}{mol}$$

$$C-O\ 7\times 85\frac{kcal}{mol}=595\frac{kcal}{mol}$$

$$O-H\ 5\times 110\frac{kcal}{mol}=550\frac{kcal}{mol}$$

$$O=O\ 6\times 120\frac{kcal}{mol}=840\frac{kcal}{mol}$$

Total: 3,165 kcal/mol

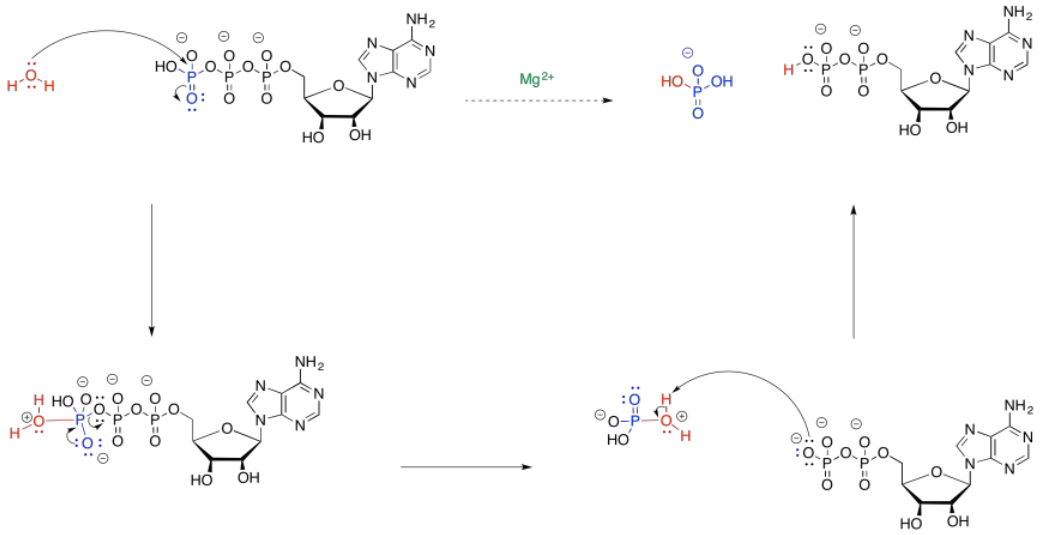
Bonds Made:

$$C=O\ 12\times(-190\frac{kcal}{mol})=-2280\frac{kcal}{mol}$$

$$O-H\ 12\times(-110\frac{kcal}{mol}=-1320\frac{kcal}{mol}$$

Total: -3,600 kcal/mol

Overall: $3165-3600\frac{kcal}{mol}=-435\frac{kcal}{mol}$



In the mechanism for hydrolysis, water acts as a nucleophile and ATP acts as an electrophile. That's a problem because ATP is negatively charged. It will not attract electrons very easily. By binding to magnesium ion (Mg^{2+}), the charge on the ATP will be lowered, accelerating the reaction with water.

$$glucose+2ATP\rightarrow 2G3P+2ADP$$

$$G3O+NAD^{+}+PO_4^{3-}+2ADP\rightarrow pyr+NADH+2ATP+H_2O$$

First we need to realise that one glucose gives rise to two molecules of G3P, so the second phase occurs twice for every glucose molecule consumed.

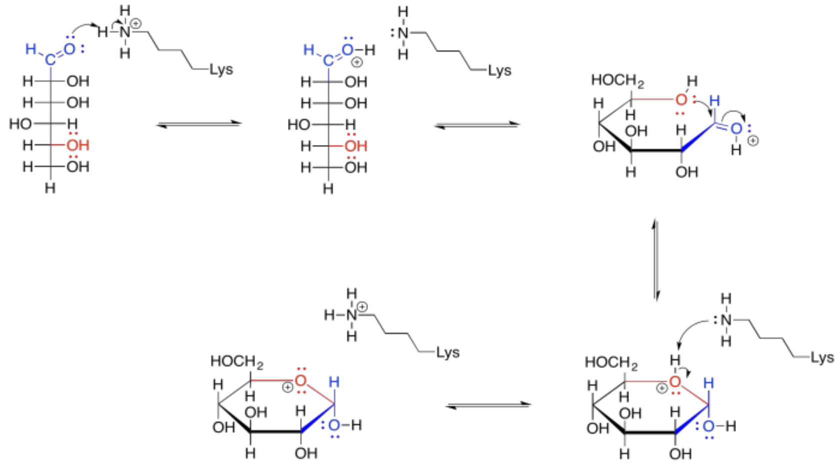
$$2G3P+2NAD^{+}+2PO_4^{3-}+4ADP\rightarrow 2pyr+2NADH+4ATP+2H_2O$$

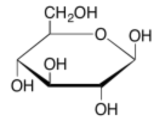
Adding the equations for the two phases together gives:

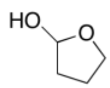
$$glucose+2ATP+2G3P+2NAD^{+}+2PO_4^{3-}+4ADP\rightarrow 2G3P+2ADP+2pyr+2NADH+4ATP+2H_2O$$

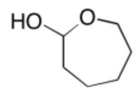
That equation can be simplified, because some things appear on both the left and the right. It's just like algebra.

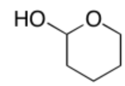
$$glucose+2NAD^{+}+2PO_4^{3-}+2ADP\rightarrow 2pyr+2NADH+2ATP+2H_2O$$

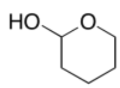


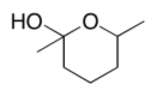


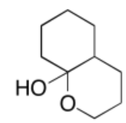
a) 

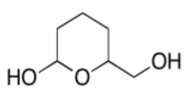
b) 

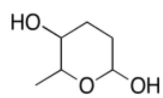
c) 

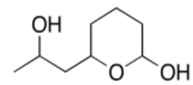
d) 

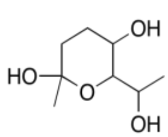
e) 

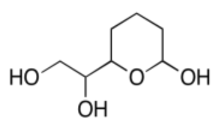
f) 

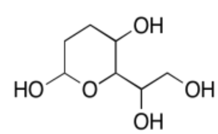
a) 

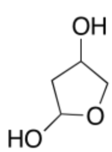
b) 

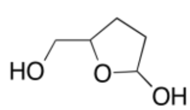
c) 

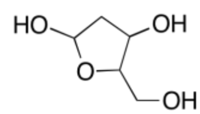
d) 

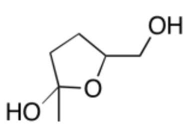
e) 

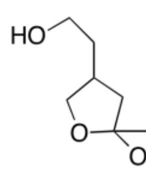
f) 

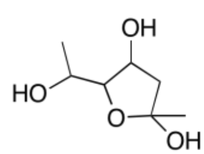
a) 

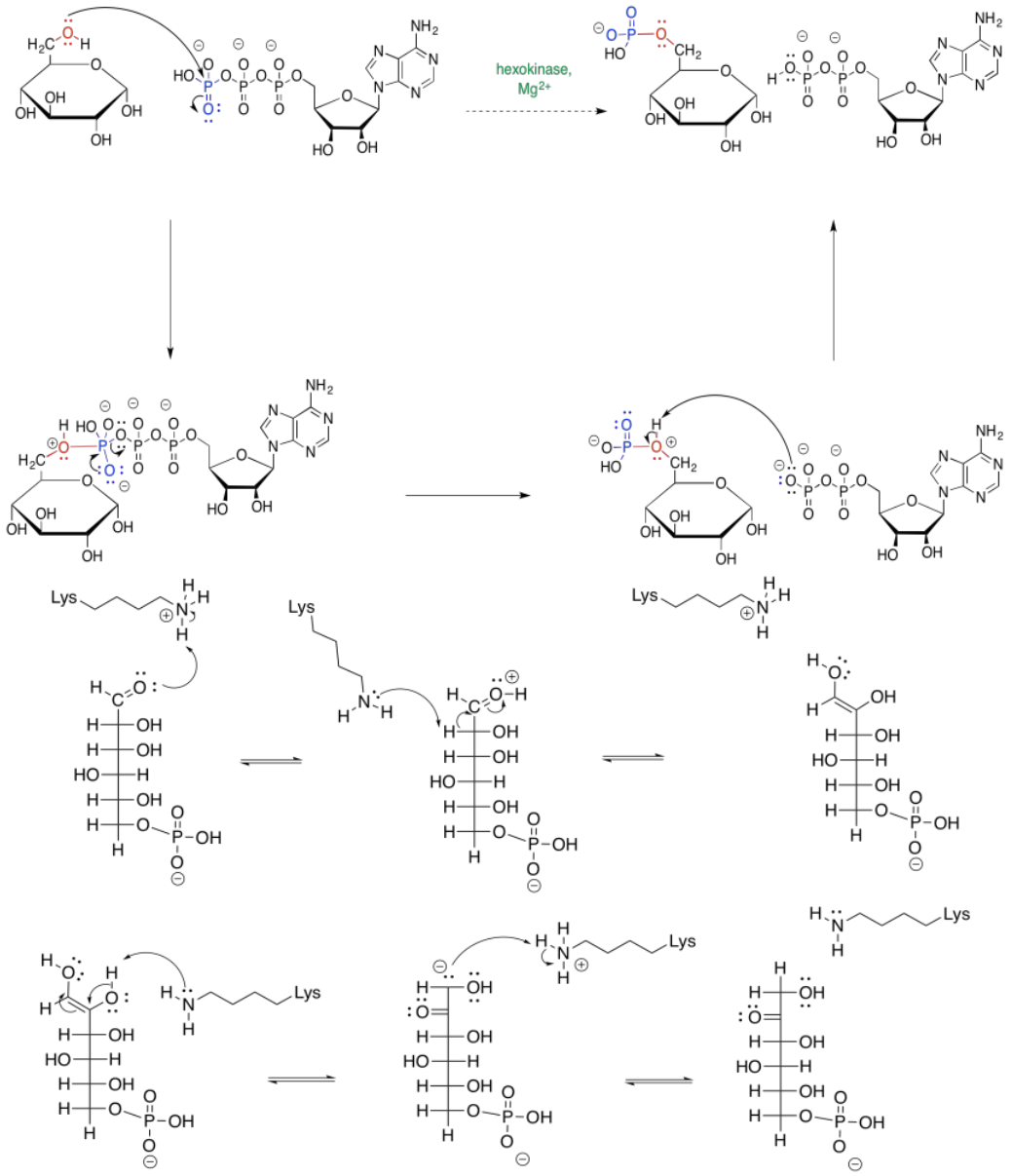
b) 

c) 

d) 

e) 

f) 



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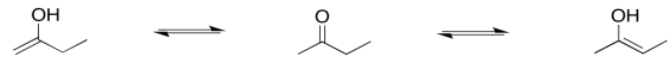

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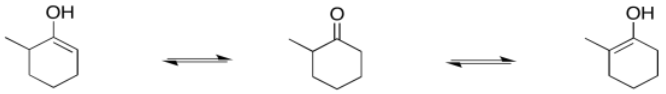

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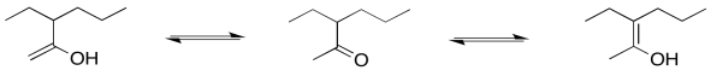

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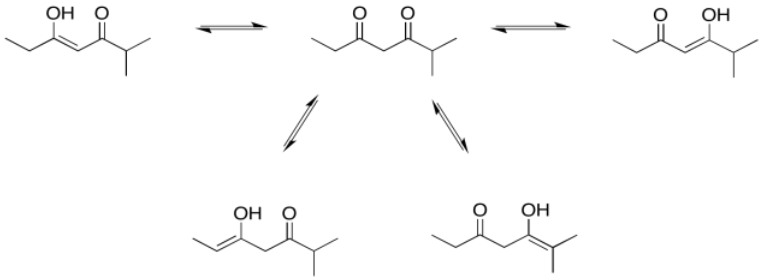

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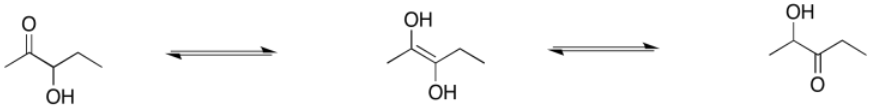

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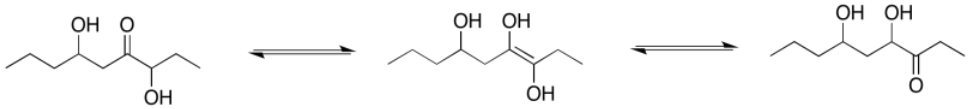

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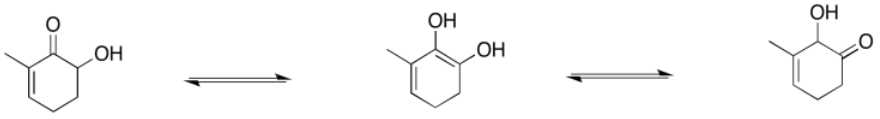

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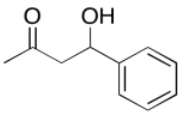

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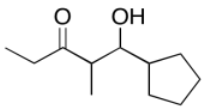

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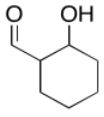

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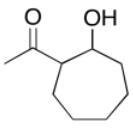

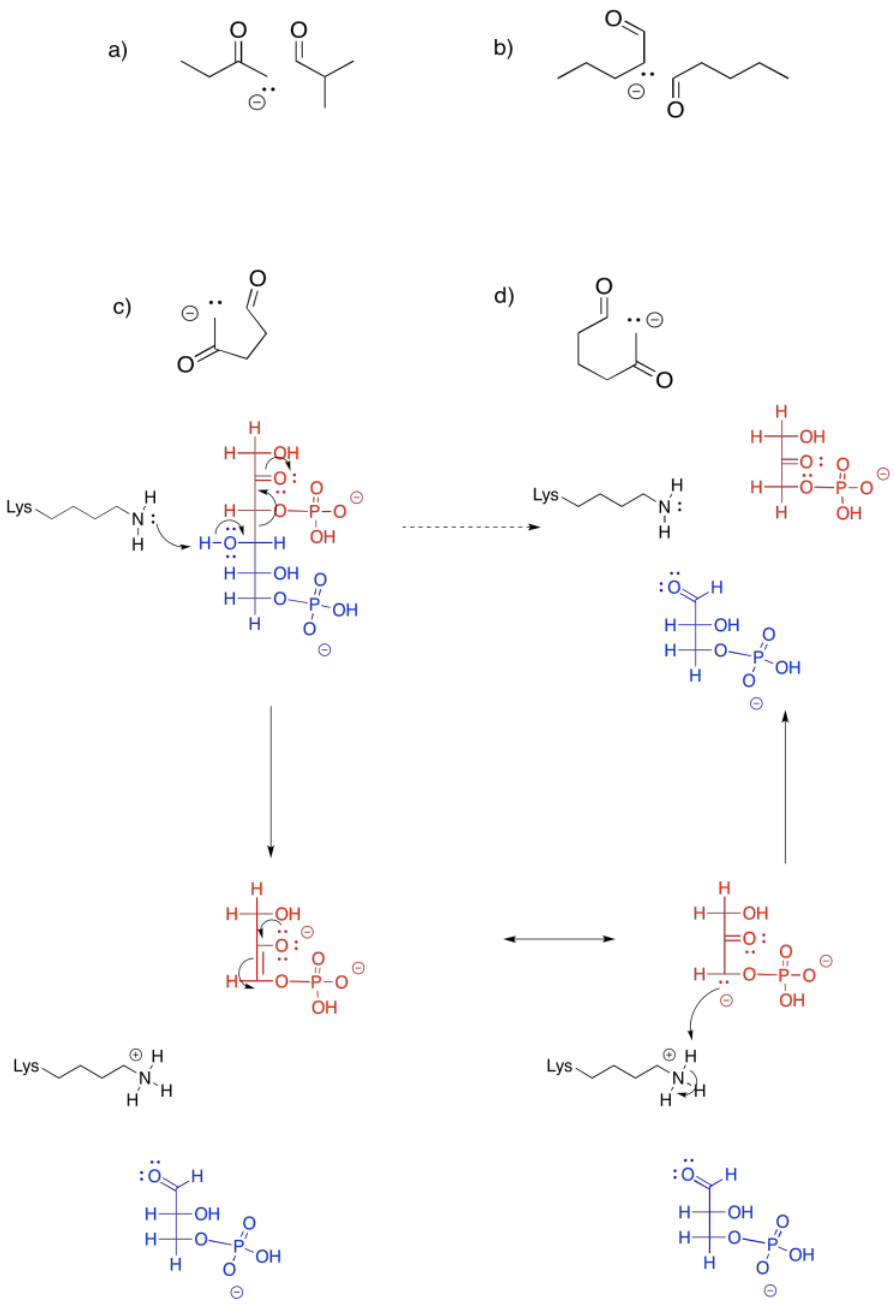
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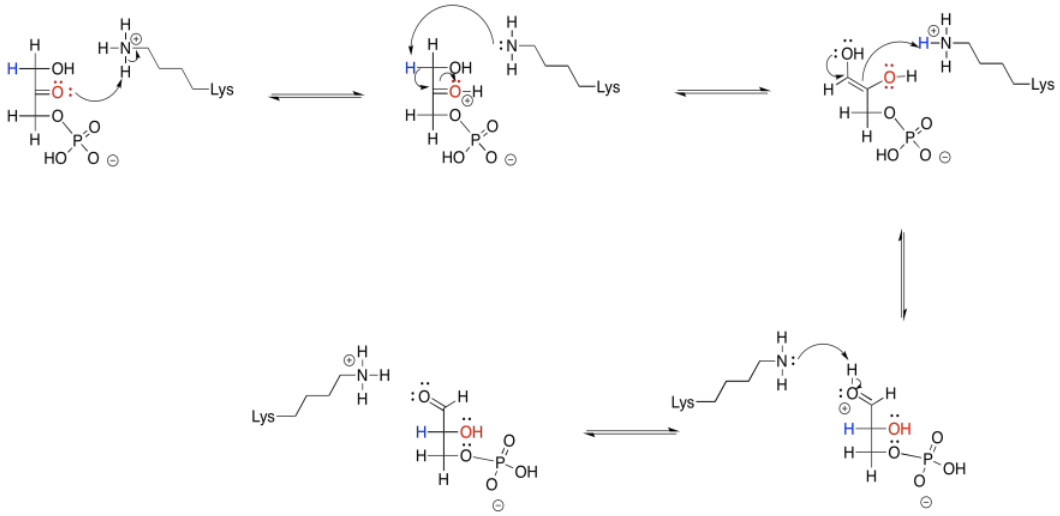

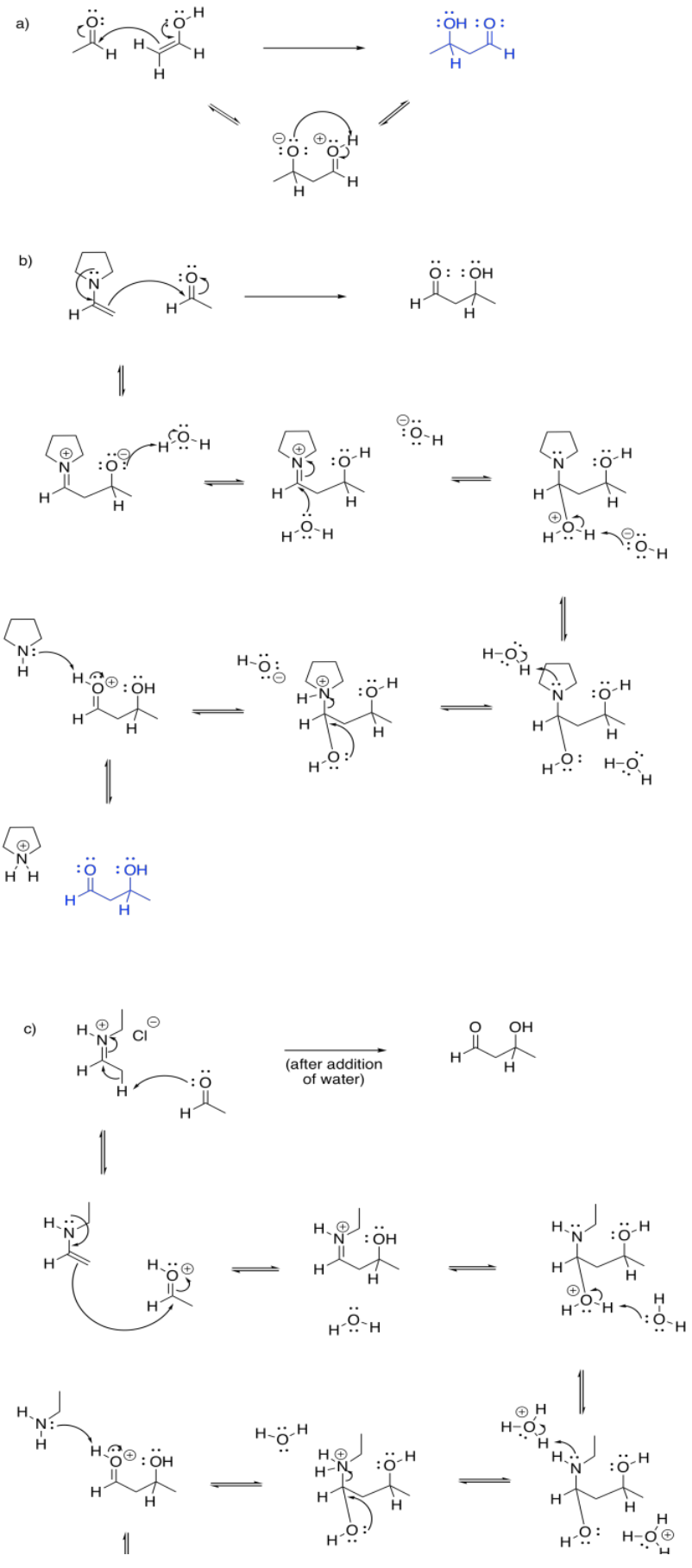

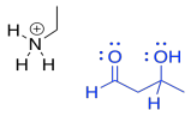

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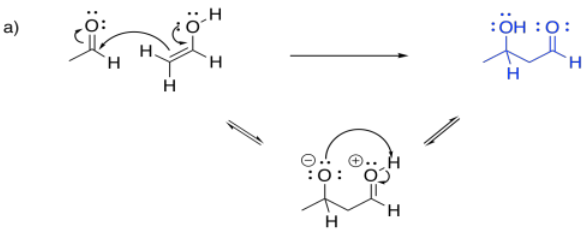

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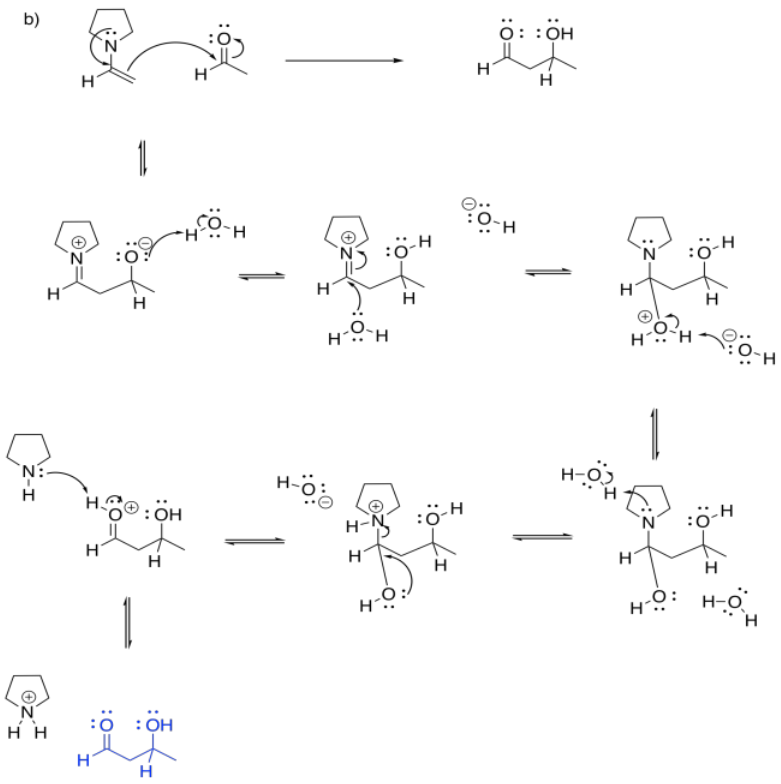

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