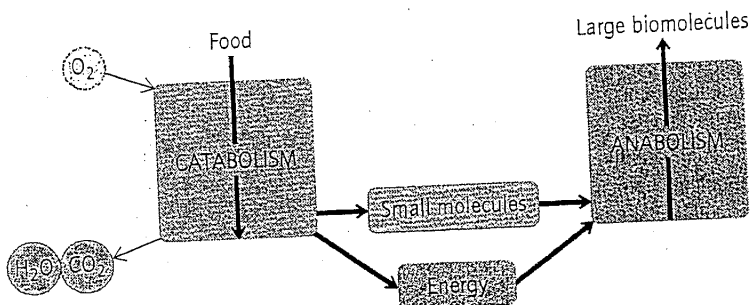


Funcn Grp Part 1

Exercises

1. Use the following diagram to answer the questions below.



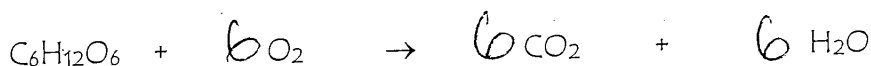
a) In addition to food, what is the other reactant of catabolism?



b) What are the four products of catabolism?

H₂O + CO₂ + small molecules + energy

c) Many of the large food molecules are broken down into glucose, C₆H₁₂O₆. Balance the chemical reaction for catabolism of glucose.



$$6 + 2x = 120 + 60 = 180's$$
$$2x = 12 \quad x = 6$$

d) In the reaction above, is the glucose oxidized or reduced? Explain your reasoning.

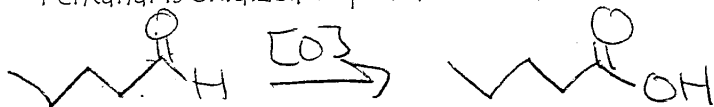
Oxidized b/c it loses H atoms

e) What is the other name for the reaction in part (c)?

Combustion

2. Use skeletal-line structures to write the ~~balanced~~ chemical equation for each reaction below using [O] for oxidation, [H] for reduction, + H₂O for hydration, and - H₂O for dehydration, and H⁺ with Cl⁻ as a spectator ion for protonation.

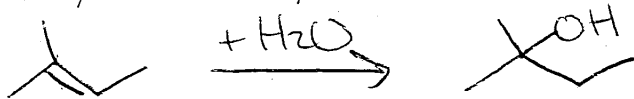
a) Pentanal is oxidized to pentanoic acid.



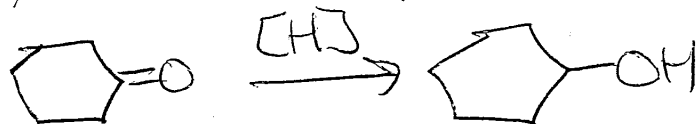
b) Acetic acid is reduced to ethanol.



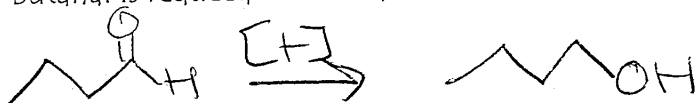
c) 2-methyl-2-butene is hydrated to 2-methyl-2-butanol.



d) Cyclohexanone is reduced to cyclohexanol.



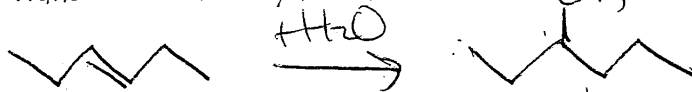
e) Butanal is reduced to 1-butanol.



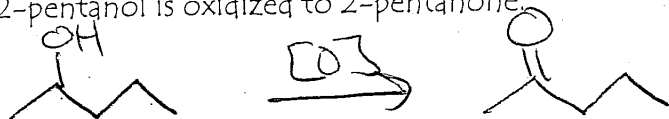
f) 2-pentanamine is protonated to 2-pentanamine hydrochloride.



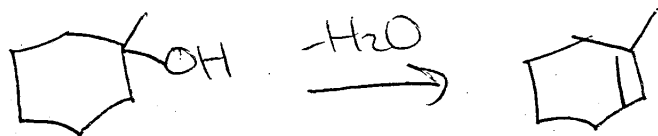
g) Trans-3-hexene is hydrated to 3-hexanol.



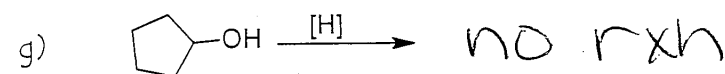
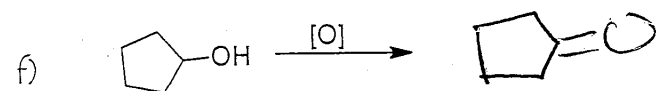
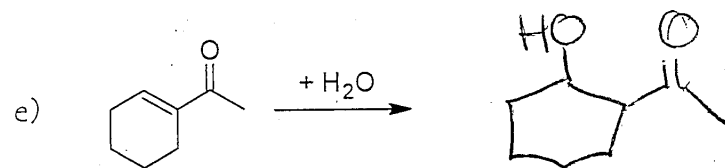
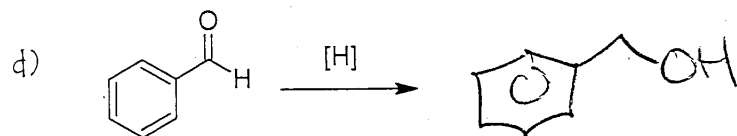
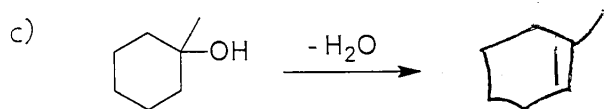
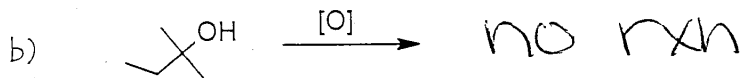
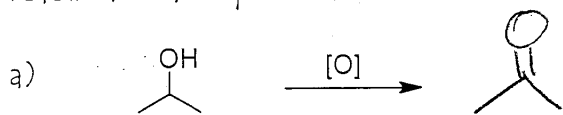
h) 2-pentanol is oxidized to 2-pentanone.



i) 1-methyl-cyclohexanol is dehydrated to 1-methyl cyclohexene.

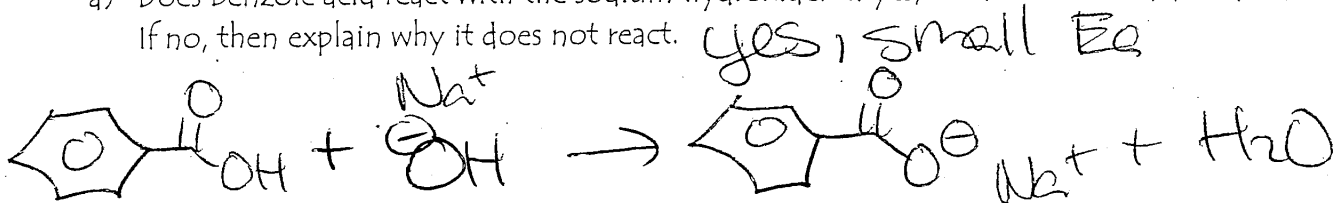


3. Predict the products - if a reaction occurs. Assume that there is a catalyst present for all reactions that require one.



4. There are two samples of benzoic acid. One sample is in a solution of sodium hydroxide. The other sample is in a solution with a reducing agent. Neither solution contains a catalyst.

a) Does benzoic acid react with the sodium hydroxide? If yes, then write the balanced reaction. If no, then explain why it does not react.



b) Does benzoic acid react with the reducing agent? If yes, then write the balanced reaction. If no, then explain why it does not react.

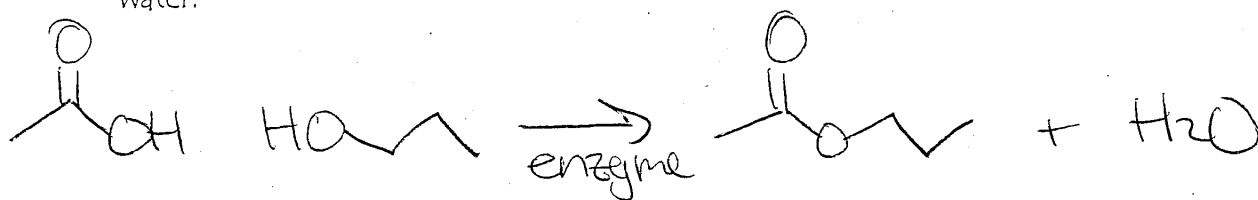
no, b/c the large E_a requires an enzyme

Funcn Grp Part 2

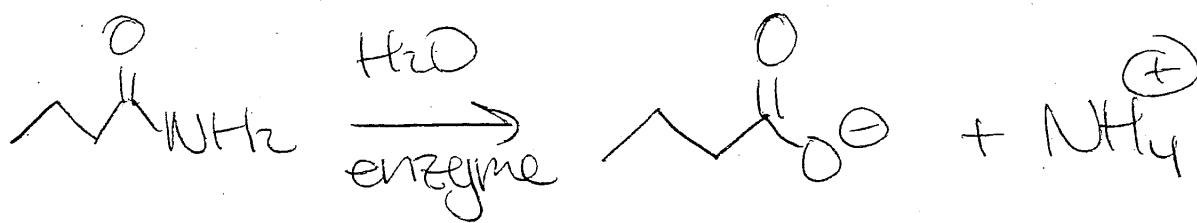
Exercises

1. Use skeletal-line structures to write the equation for each of the following reactions at physiological pH. Draw the reactants in their neutral form and the products at physiological pH. We will assume that any necessary catalyst is present.

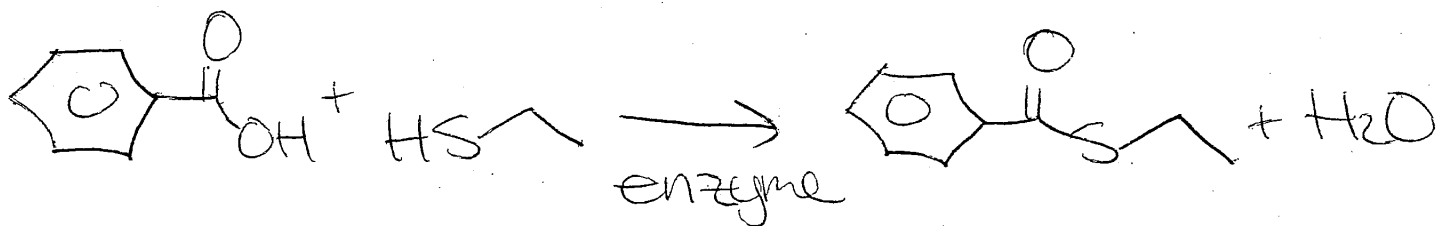
- a) 1-propanol undergoes synthetic dehydration with acetic acid to produce propyl acetate and water.



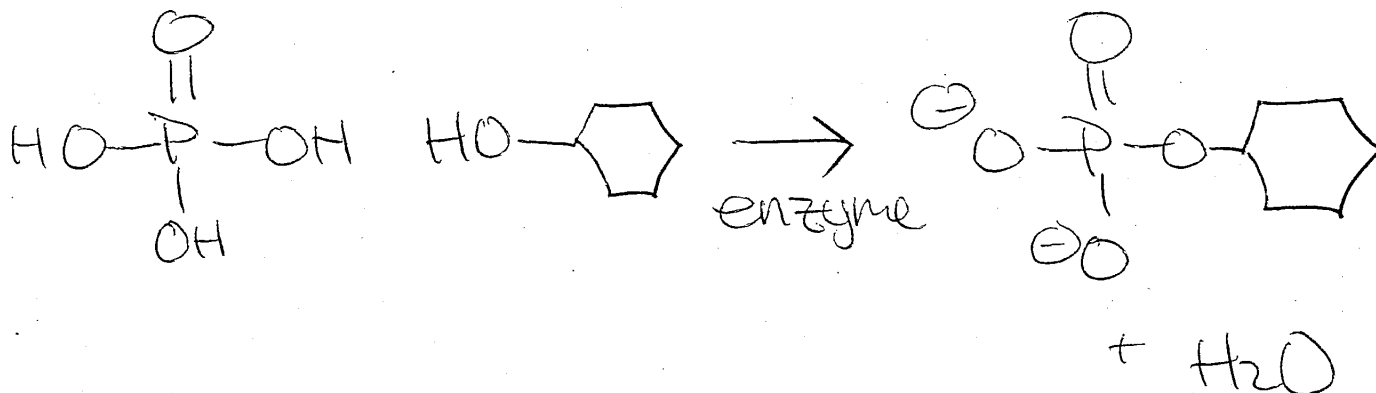
- b) Butanamide undergoes a hydrolysis reaction to produce butanoic acid and ammonium ions.



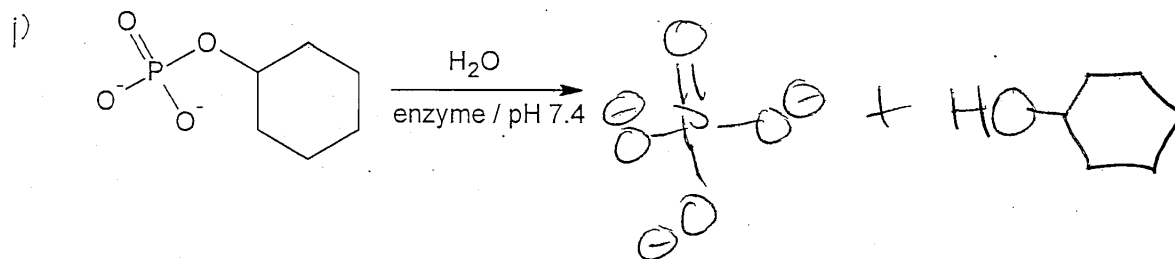
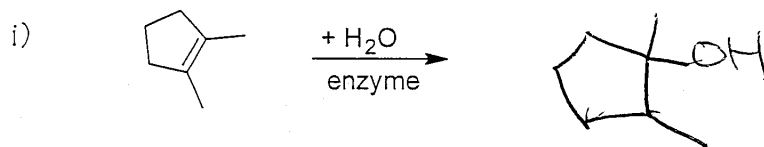
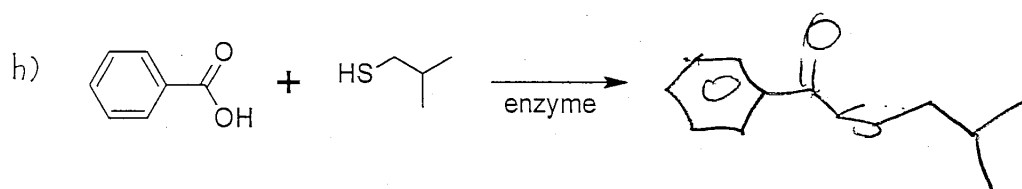
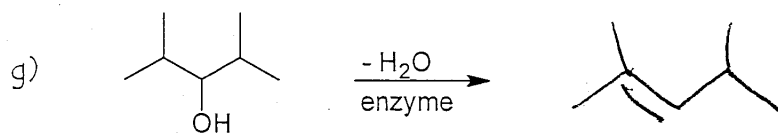
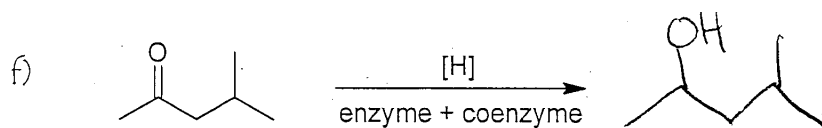
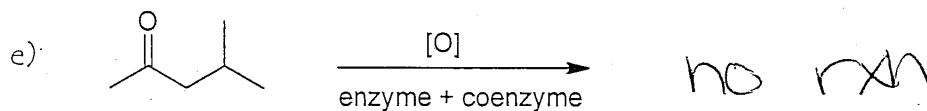
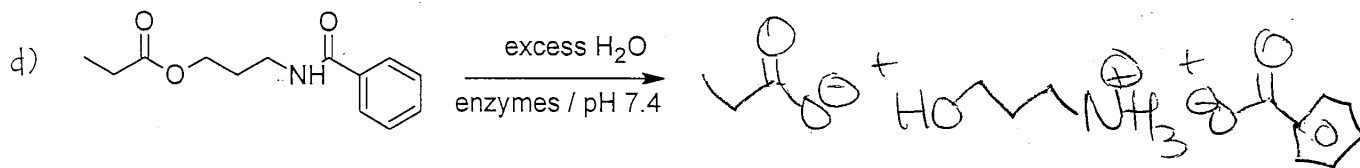
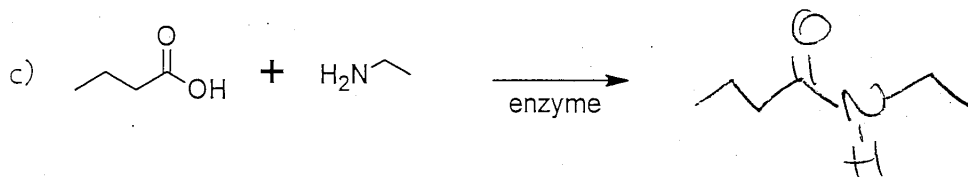
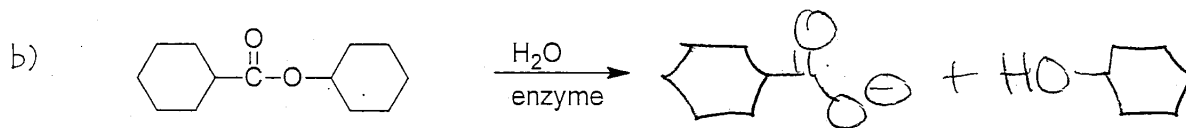
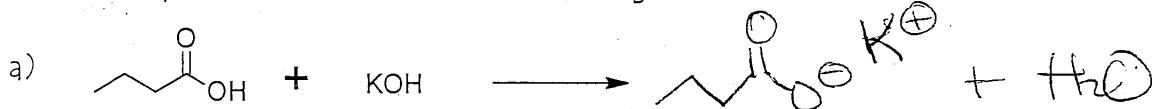
- c) Ethanethiol reacts with benzoic acid to produce S-ethylbenzene carbothioate and water.



- d) Phosphoric acid and cyclohexanol undergo a phosphoryl transfer reaction to produce cyclohexyl phosphate and water.



2. Predict the product(s) for each of the following reactions if a reaction occurs.



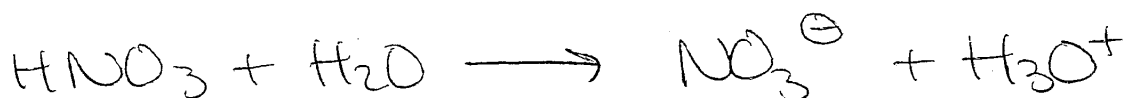
Exercises to Review for Exam 2

1. There are six strong acids. All of other acids are weak. Name the six strong acids.

Chemical Formula	Chemical Name
HCl	hydrochloric acid
HNO ₃	nitric acid
H ₂ SO ₄	sulfuric acid
HBr	hydrobromic acid
HI	hydroiodic acid
HClO ₄	perchloric acid

ClO₄⁻ = perchlorate

2. Strong acids FULLY or PARTIALLY ionize in water. Write the reaction for nitric acid with water.
(circle one)

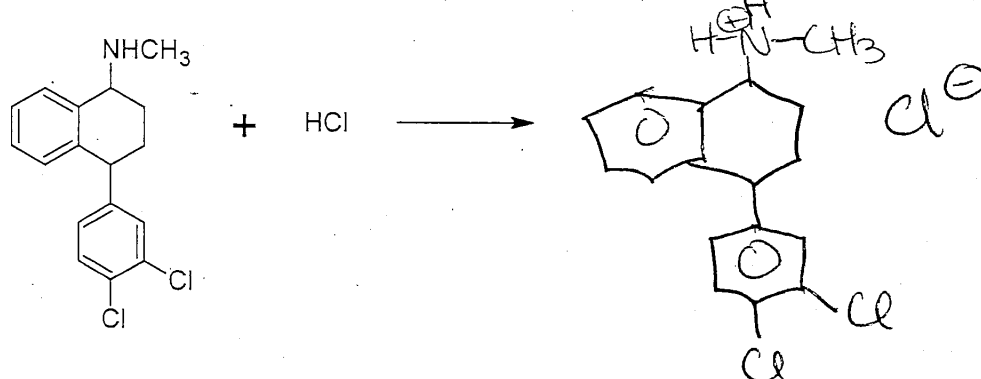


3. Weak acids FULLY or PARTIALLY ionize in water. Write the reaction for acetic with water.
(circle one)



4. We utilize the acid-base chemistry of amines to create water soluble drugs. The mental health drug sertraline is administered as Zoloft, a hydrochloride salt.

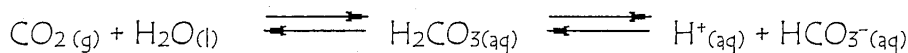
- a) Use the acid-base reaction below to draw the skeletal-line structure for Zoloft.



- b) Would we expect sertraline to be water soluble? Why or why not?

no, b/c the hydrocarbon portion is too large for the # of polar groups

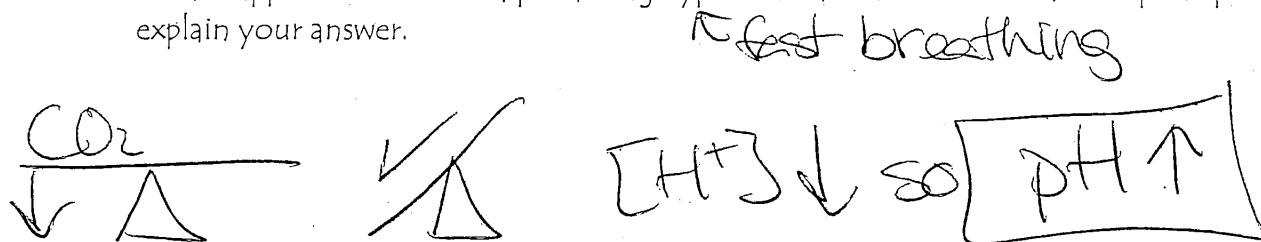
5. The equilibrium between carbon dioxide and bicarbonate helps maintain our blood pH at 7.4.



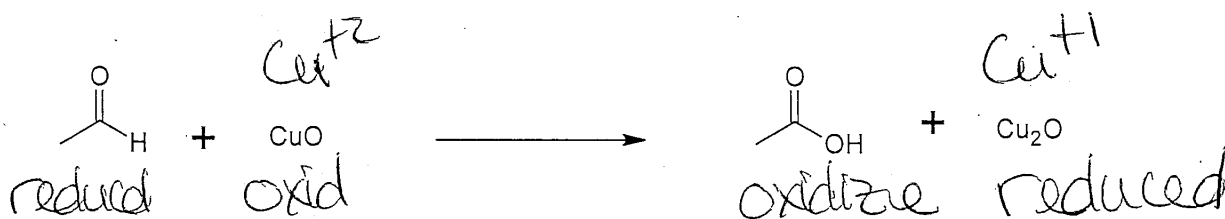
a) What happens to our blood pH during hypoventilation? Use Le Chatelier's principle to explain your answer.



b) What happens to our blood pH during hyperventilation? Use Le Chatelier's principle to explain your answer.



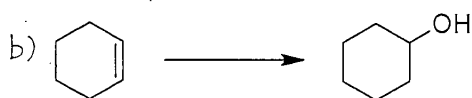
6. Label the reactants and products as oxidized or reduced.



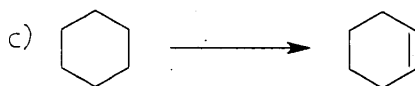
7. Classify the following reactions as oxidation, reduction, hydration, or dehydration.



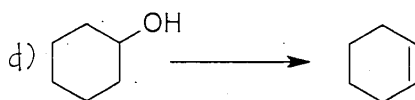
reduction



hydration

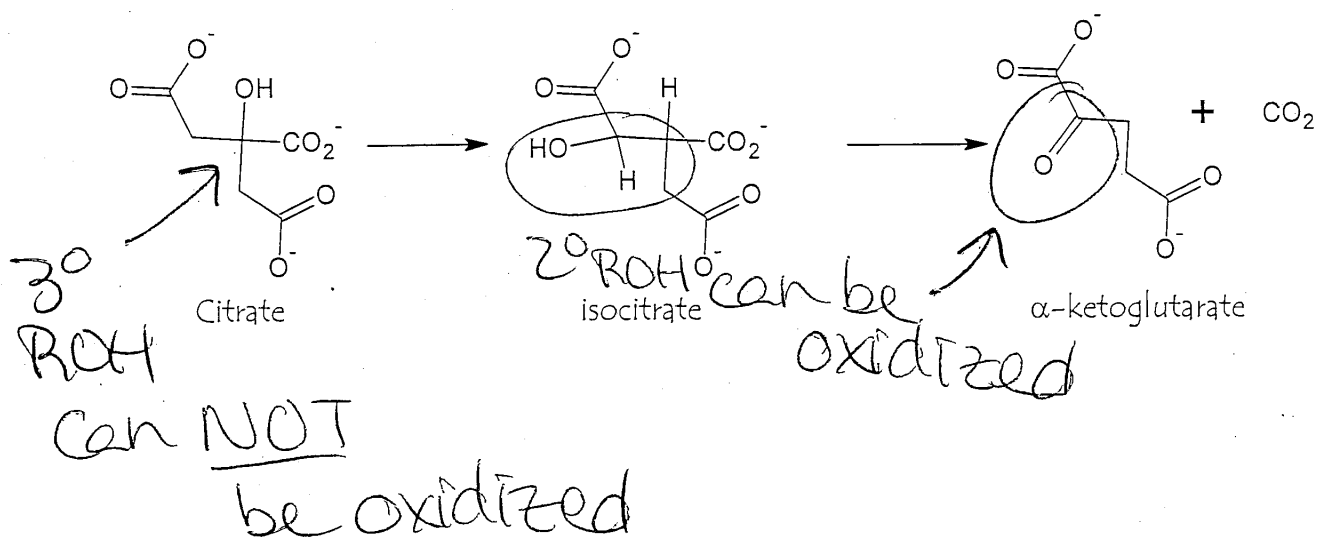


oxidation

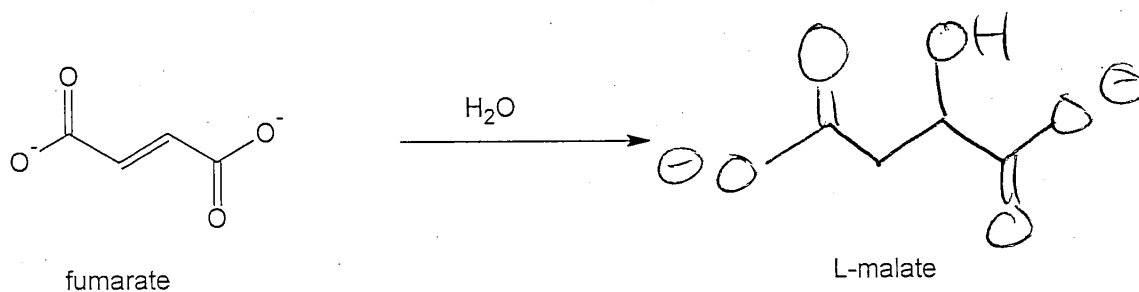


dehydration

8. Why does citrate need to isomerize to isocitrate before it can be oxidized?
Classify the ROHs to help you explain.



9. The 7th step of the Citric Acid Cycle is a hydration reaction.
Draw the skeletal line structure for L-malate, the product of step 7.



10. Show the hydrolysis products at physiological pH.

