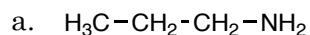
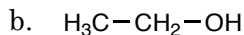


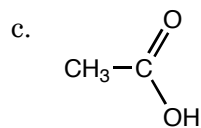
1. (5 pts. each) Identify the following functional groups.



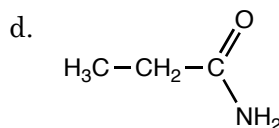
_____ amine _____



_____ alcohol _____

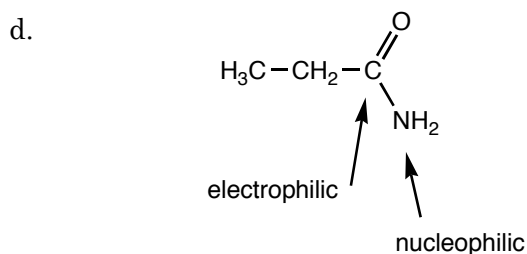
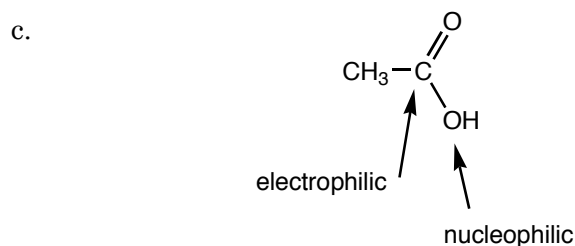
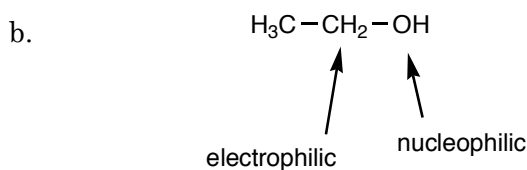
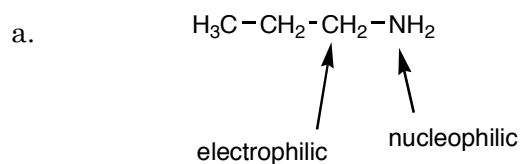


_____ carboxylic acid _____

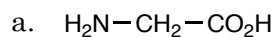


_____ amide _____

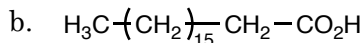
2. (16 pts.) Identify the nucleophilic atoms and identify electrophilic carbon atoms.



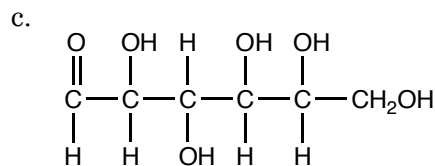
3. (5 pts. each) Identify the following classes of biomolecules.



_____ amino acid _____



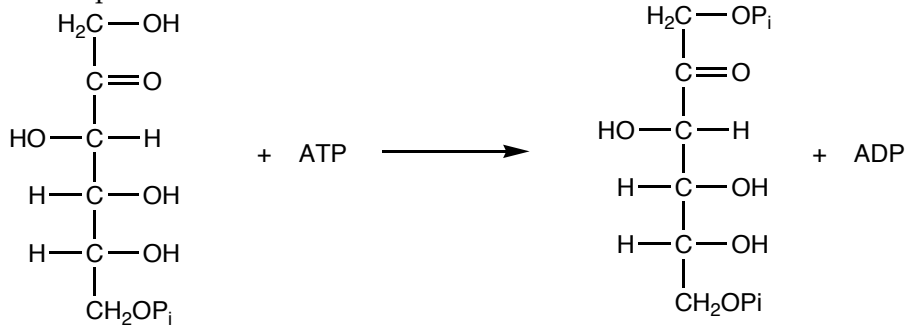
_____ fatty acid _____



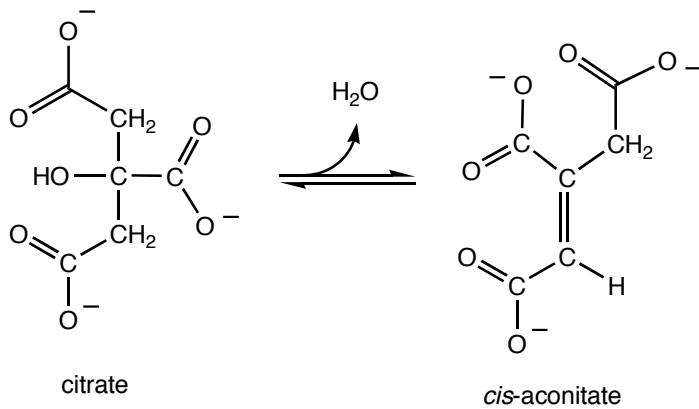
_____ sugar _____

4. (5 pts. each) Classify the following reactions as oxidation reduction, nucleophilic substitution, addition, elimination, isomerization

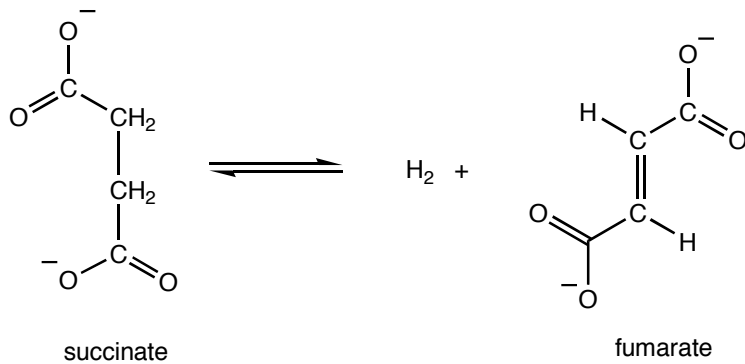
a. nucleophilic substitution



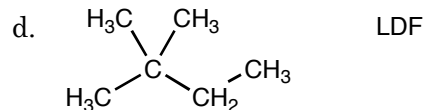
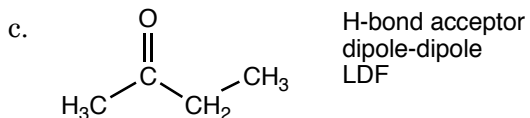
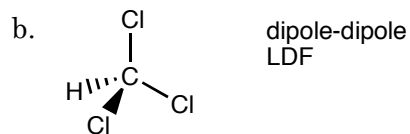
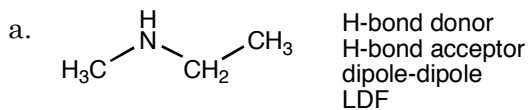
b. elimination



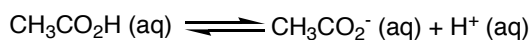
c. oxidation-reduction



5. (12 pts.) Describe how a water molecule interacts with the following molecules. (List the intermolecular forces that are involved.)



6. (8 pts.) A buffer can be made by combining acetic acid and sodium acetate.



Describe how an acetic acid buffer can consume excess protons.

Since acetate is present and since acetate is a weak base, the acetate can consume excess protons.

Describe how an acetic acid–acetate buffer can release protons in response to the addition of a base.

Since some unionized acetic acid remains, the addition of a base can be counteracted by a release of protons from the unionized acid.

7. (5 pts.) According to the 2nd Law of thermodynamics, $\Delta S_{\text{universe}}$ must be positive. Can a reaction have a negative ΔS ?

Yes, a reaction can have a negative ΔS ; however, for the reaction to be spontaneous, the reaction must also have a negative ΔH .

8. (5 pts.) A negative ΔH indicates what?

A negative ΔH indicates a release of enthalpy (heat).

9. (8 pts.) A positive ΔG implies a large or a small K ? Would this reaction favor the reactants or the products.

small K the reaction would favor the reactants

10. (8 pts.) The formation of ATP from ADP and P_i is an endergonic process as the following equation indicates.



Can the formation of ATP be driven by the hydrolysis of 1,3-bisphosphoglycerate?



Explain.

Yes, the combined reactions have a favorable ΔG . $\Delta G = -4.5 \text{ kJ/mol}$