Name _____ Test 1 (2/26)
CHEM 0313 (Biochem) Spring 2025

1. (10 pts.) What features distinguish eukaryotes from prokaryotes?

1. _____

2. _____

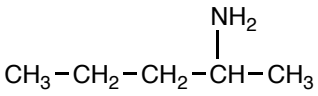
3. _____

2. a. (8 pts.) Identify/name the functional groups on the following molecules.

4. _____

b. (8 pts.) Circle any H atoms that can participate in H-bonding interactions

i.



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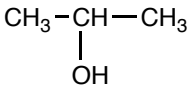
ii.

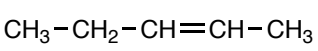


_____

5. _____

6. _____

iii.



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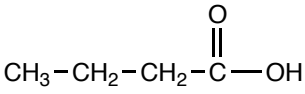
iv.



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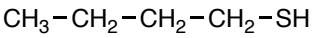
7. _____

8. _____

9. _____

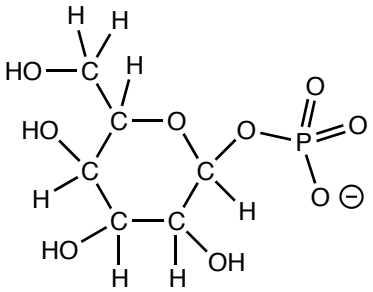
3. (8 pts.) Briefly explain why thiols, like the one drawn below, are nucleophilic.



10. _____

11. _____

4. (4 pts.) Circle the carbon atom on the organophosphate drawn below that is most likely to react with a nucleophile and (6 pts.) briefly explain why that C atom can participate in nucleophilic substitution.

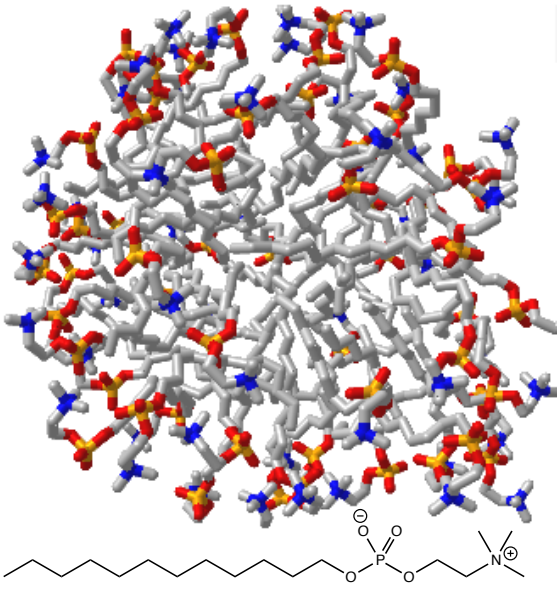


5. a. (4 pts.) For a reaction to have a favorable equilibrium constant, $\Delta G°$ needs to be positive or negative? Remember, $\Delta G° = -RT \ln K$.

b. (4 pts.) For a given reaction, do positive or negative values for ΔH contribute to making the equilibrium constant more favorable? Remember, $\Delta G = \Delta H - T\Delta S$.

c. (4 pts.) For a given reaction, do positive or negative values for ΔS contribute to making the equilibrium constant more favorable?

6. The image below from our text book is that of a micelle that would form when molecules of dodecylphosphocholine, shown below the micelle, are added to water.



a. (4 pts.) Which atoms are color coded blue, which atoms are color coded red, and which are gray.

b. (4 pts.) Briefly describe the organization of the micelle; that is, what parts of the dodecylphosphocholine are at the surface of the micelle and what parts are in the interior of the micelle.

c. (8 pts.) Name and describe the noncovalent interactions that are occurring between the surface of the micelle and the surrounding water molecules.

d. (3 pts.) Name the noncovalent interaction that are occurring in the interior of the micelle.

7. (9 pts.) Determine whether the following solutions would be buffers.

a. A solution made by dissolving 1 mole of acetic acid (CH_3CO_2H) and 1 mole of sodium acetate (CH_3CO_2Na) in a liter of water.

b. A solution made by adding 0.5 mole of sodium hydroxide (NaOH) to a solution that contains 1 mole of sodium dihydrogenphosphate (NaH_2PO_4).

c. A solution made by adding 1 mole of hydrochloric acid (HCl) to a solution that contains 0.5 moles of sodium hydroxide (NaOH).

8. (8 pts.) Using the generic acid dissociation reaction drawn below, briefly explain how buffers minimize changes in pH when an acid is added to the buffer.

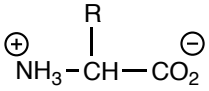
$$HA(aq) \rightleftharpoons H^+(aq) + A^-(aq)$$

9. (12 pts.) Draw a representative amino acid from the categories listed below. Do not worry about drawing the specific stereochemistry of the amino acid, but remember to provide the name of the amino acid being drawn.

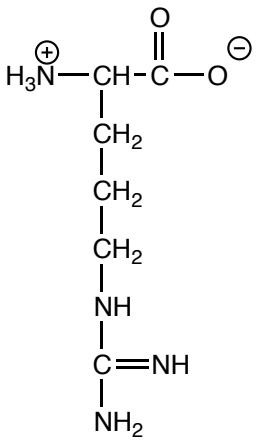
a. a neutral polar amino acid

b. a non-polar amino acid

10. (8 pts.) A generic amino acid can be represented by the condensed structure drawn below. Redraw the generic amino acid so that it would have the correct, L, stereochemistry. Either Fisher projection or wedge (◀) and dashed (⋯) bond structures are acceptable.



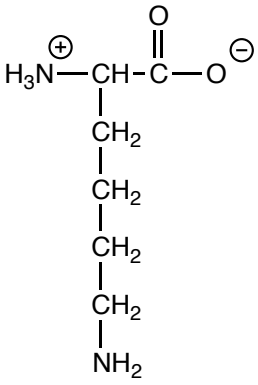
11. Of the three basic amino acids, arginine is the most basic amino acid. The unprotonated base forms of arginine and lysine are drawn below.



Arg

a. What feature of the side chains of these amino acids allows them act like bases?

b. Explain why arginine is more basic than lysine.



Lys