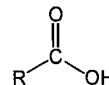


THIS IS ONLY A GUIDE!

0 too many multiple choice

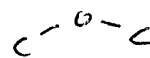
1. (4 pts.) For each of the definitions listed in parts (a) – (d), find a corresponding term from the following list: alkane, alkene, alkyne, alcohol, ether, aldehyde, ketone, carboxylic acid, & ester.

a) carboxylic acid an organic compound that has the following functional group:

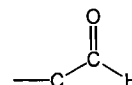


b) alkyne a hydrocarbon that contains a carbon-carbon triple bond

c) ether an organic compound that contains an oxygen atom bonded to two carbon atoms



d) aldehyde an organic compound that has the following functional group:



2. (4 pts.) *Matching:* In the spaces provided, indicate which choice given on the right matches the description shown on the left. (Note: Some choices will not be used.)

a) Triacylglycerols are formed from glycerol and iv.

i) Hydrolysis

b) vi is the functional group found in triacylglycerols.

ii) An ether

c) v is the process of converting unsaturated fats into saturated fats.

iii) Insolubility in water

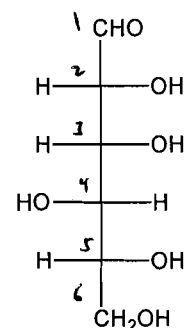
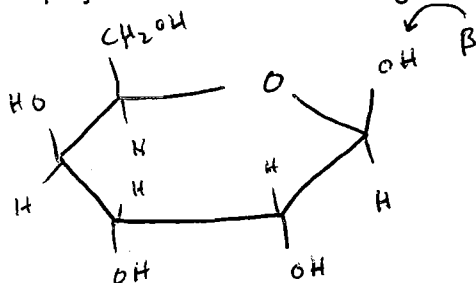
d) iii is a common characteristic of lipids.

iv) Fatty acids

v) Hydrogenation

vi) An ester

3. (4 pts.) Provide the Haworth projection of the β form of the monosaccharide D-glucose, whose Fisher projection is shown to the right.



aldo ketose

4. (2 pts.) The lipid shown to the right is an example of a

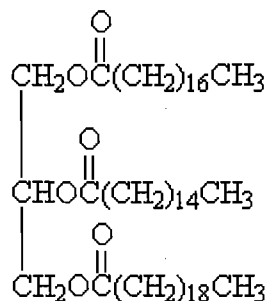
a) triacylglycerol

b) wax

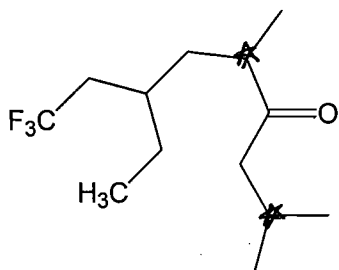
c) glycerol phospholipid

d) steroid

e) fatty acid



5. (3 pts.) First, provide the **definition** of a *chiral carbon atom* in the space provided. Next, **draw** a star on all chiral carbon atoms that are present in the molecule shown below.



A chiral carbon is a carbon atom bonded
to 4 different groups. Its mirror
image is non-superimposable

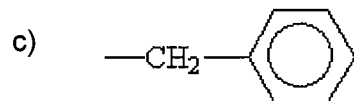
6. (2 pts.) A key difference that distinguishes the blood types A, B, and O from each other is that each of these blood types contains a different number/type of _____ attached to red blood cells.

- a) amino acids
- b) fatty acids
- c) steroids
- d) amides

e) monosaccharide units

7. (4 pts.) The tremendous diversity of protein molecules results because there are virtually endless ways to combine the 20 amino acids with each other. The different properties/polarities of these amino acids in proteins lead to differences in the 3-dimensional structure of the protein molecules, and thus largely affect how the proteins function. Amino acids that have similar R groups will tend to cluster together, and this property helps to determine the overall molecular shape. Based on this information, which R group of an amino acid would most likely be found in a *hydrophobic* area of the structure of a protein? **For full credit, briefly explain how you determined your answer.**

- a) $-\text{CH}_2\text{OH}$
- b) $-\text{CH}_2\text{COO}^-$



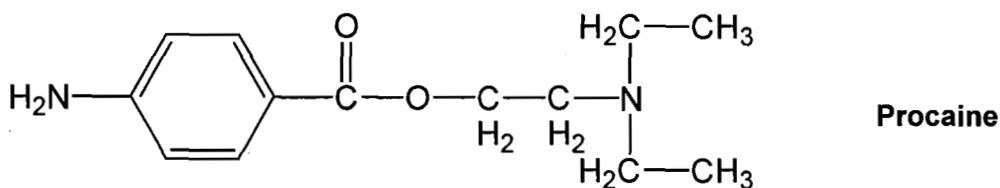
- d) $-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_3^+$
- e) none of the above

N/A
 FOR TEST 3

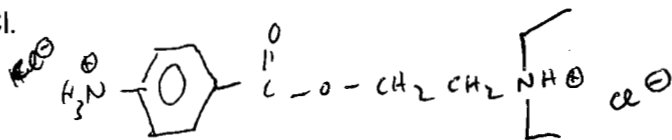
8. (4 pts.) Based on your knowledge of the properties of saturated and unsaturated triacylglycerols, why would an animal that lives in a cold climate have more unsaturated triacylglycerols in its body fat than an animal that lives in a warm climate?

unsaturated have lower mp and are thus less likely to freeze at cold temps!

9. Novocain, a local anaesthetic, is the hydrochloride salt of procaine.



a) (2 pts.) Draw the structural formula of the amine salt (Novocain) that is formed when procaine reacts with HCl.

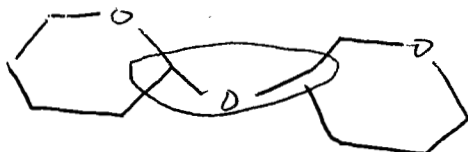


b) (3 pts.) Based on the properties of amine salts, explain why Novocain is used as a drug in preference to the free base, procaine.

greater water solubility makes for better uptake

10. (2 pts.) A glycosidic bond between two monosaccharides would be classified as a(n) _____ in organic chemistry.

- a) double bond.
- b) ester bond.
- c) ether bond.
- d) achiral bond.
- e) alcohol bond

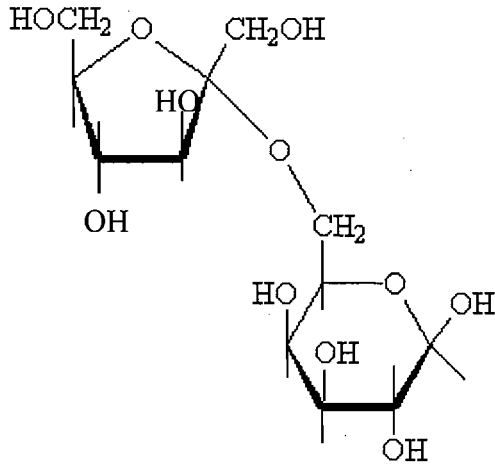


11. (2 pts.) The peptide bonds that link amino acids together in a protein are

- a) ester bonds.
- b) ether bonds.
- c) amide bonds.
- d) glycosidic bonds.

N/A
FOR TEST 3

Refer to the disaccharide below to answer questions 14-17.



12. (2 pts.) In the figure above, the monosaccharide unit on the left is a(n)

- a) aldopentose.
- b) ketopentose.
- c) aldohexose.
- d) aldoheptose.
- e) ketohexose.

13. (2 pts.) Hydrolysis of the disaccharide above gives the monosaccharides

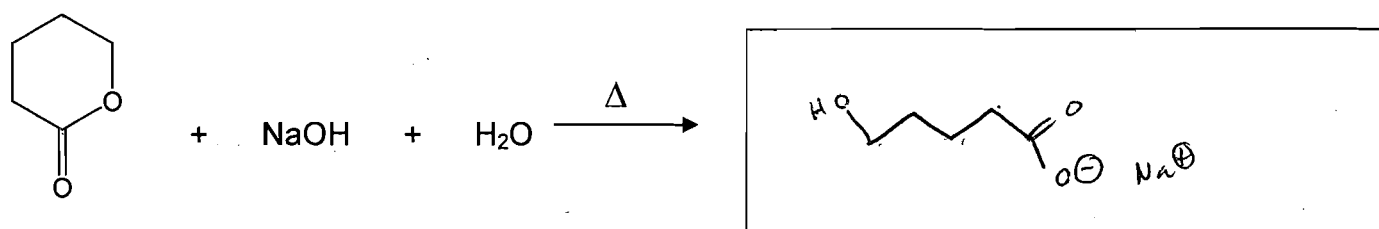
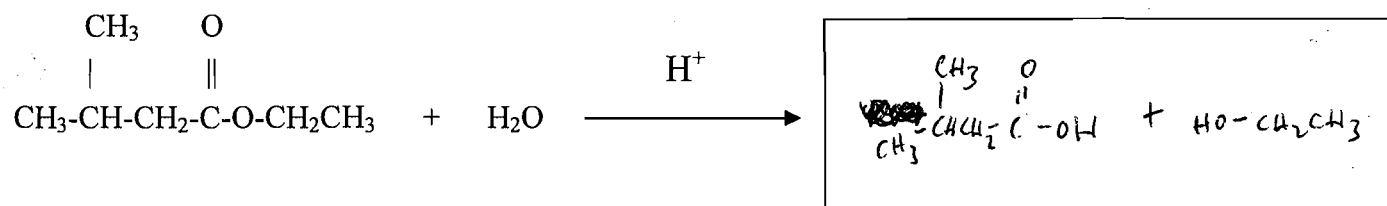
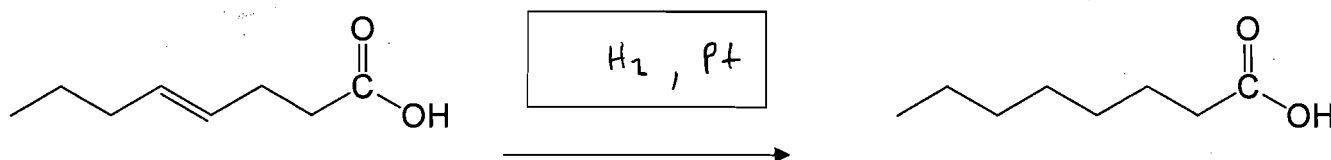
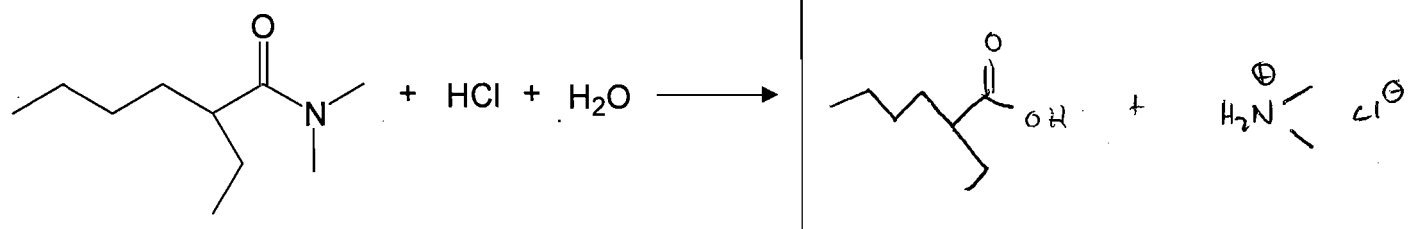
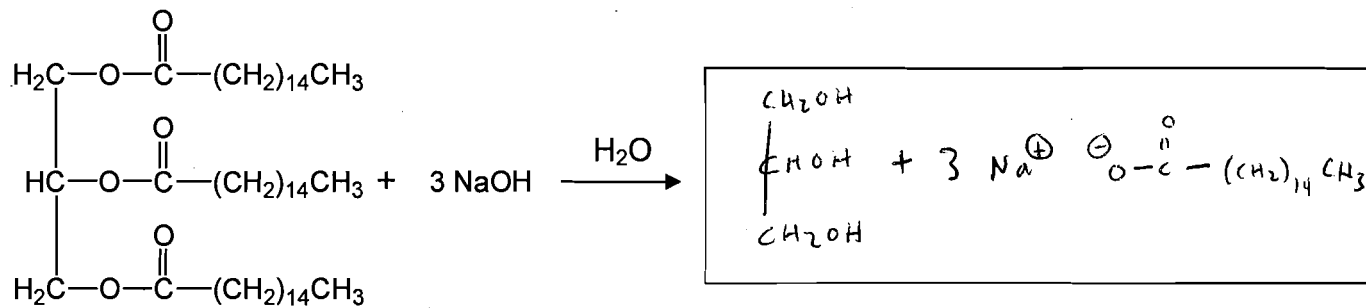
- a) fructose and ribose.
- b) fructose and galactose.
- c) ribose and glucose.
- d) ribose and galactose.
- e) fructose and lactose.

14. (4 pts.) The disaccharide above contains a(n) α -1,6-glycosidic linkage.

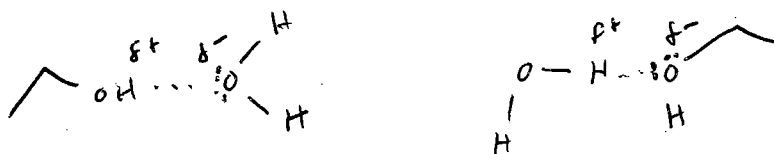
15. (2 pts.) Is the disaccharide above in the α or β form?

β

16. (20 pts. total) For each reaction shown, **predict the product or products formed or provide the reagents necessary to complete the reaction.**

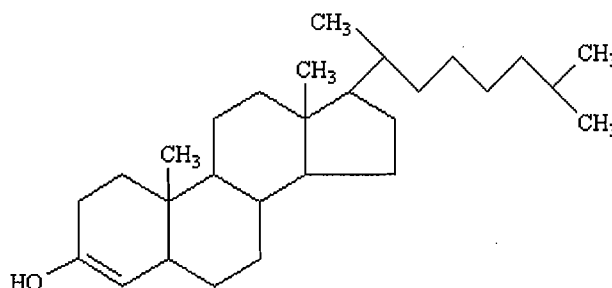


17. (4 pts.) The primary reason that methanol (CH_3OH) is miscible (i.e. will dissolve) in water is because methanol and water can hydrogen bond with each other. In the space below, show two different ways in which these molecules can hydrogen bond to each other.

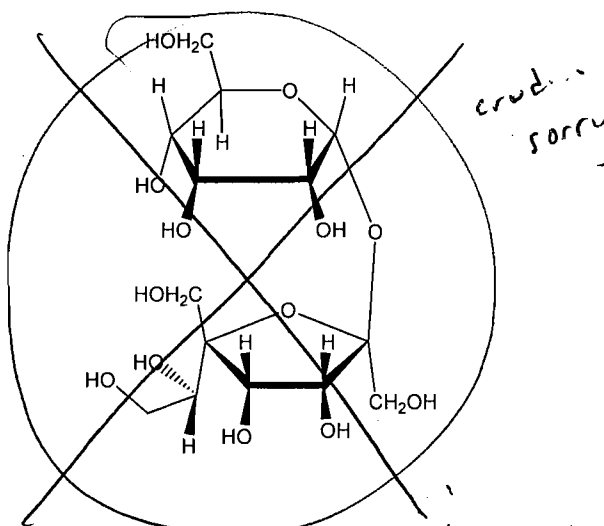
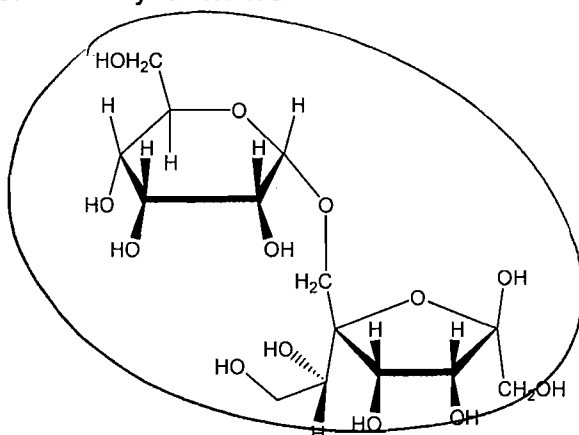


18. (2 pts.) The lipid shown to the right is an example of a

- a) triacylglycerol
- b) wax
- c) glycerol phospholipid
- d) steroid
- e) fatty acid



19. (a) (5 pts.) Consider the two disaccharides shown below. Place a *circle* around the disaccharide that you believe is a reducing sugar? Provide a clear *explanation* of how determined your choice.



~~reducing~~ The anomeric carbon for the 2nd monosaccharide unit of the disaccharide shown on the left does not participate in a glycosidic bond and can thus ring-open to the straight-chain form. As a straight chain, it's susceptible to oxidation and is thus a reducing sugar.

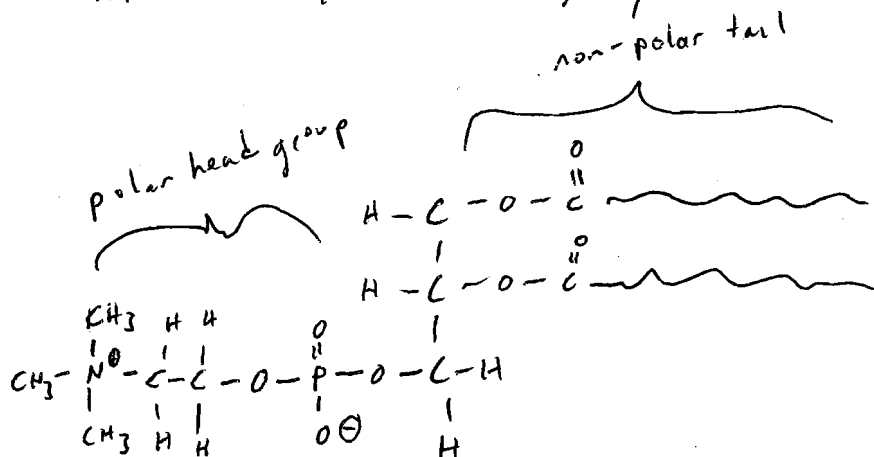
(b) (2 pts.) What chemical test could you perform in lab to verify which of these disaccharides is/is not a reducing sugar?

Benedict's Test \circ

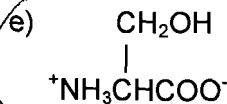
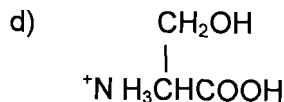
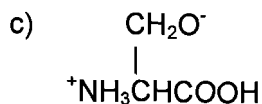
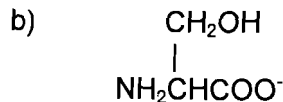
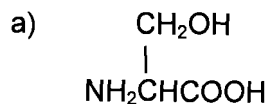
20. (6 pts.) Explain and show how glycerophospholipids can interact with both other lipids and water. For full credit show the generalized chemical structure of a glycerophospholipid.

The polar head gp. bears similar IM forces to H₂O and will thus be able to interact w/ H₂O. Analogously, the non-polar tail will be

compatible w/ other lipids (non-polar).



21. (2 pts.) The R group for the amino acid serine is -CH₂OH. As a zwitterion, serine has the structural formula

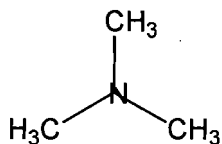


N/A

22. (2 pts.) Although the polysaccharides starch & cellulose are both composed entirely of glucose units, cellulose is not digestible by humans because it contains glucose units linked by _____-glycosidic bonds.

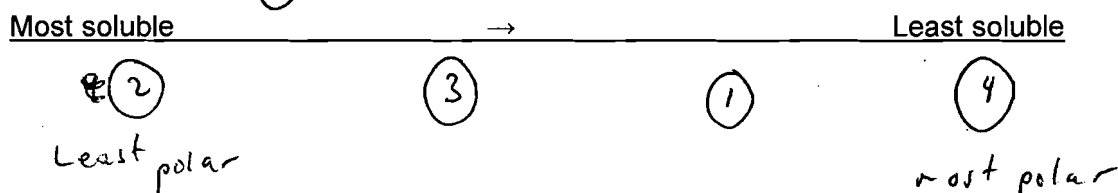
- A) α-1,2
- B) α-1,4
- C) α-1,6
- D) β-1,2
- E) β-1,4

23. (4 pts.) No matter how long you heat up a reaction mixture that contains acetic acid and the amine shown below, an amide product will not form. Based on your knowledge of amine and amide chemistry, provide a reasonable explanation of why a reaction does not occur.



Since the amine shown is a tertiary amine, it does not possess a H attached to N. Therefore, ~~the~~ mixing this amine with acetic acid cannot lead to the condensation of water which is required for the formation of the amide product.

24. (4 pts.) Rank the following compounds (that have similar mass) in order of decreasing solubility in pentane: the primary amine pentyl amine ($\text{C}_5\text{H}_{13}\text{N}$), hexane (C_6H_{14}), ethyl propyl ether ($\text{C}_5\text{H}_{12}\text{O}$), and butanoic acid ($\text{C}_4\text{H}_8\text{O}_2$).



25. (3 pts.) Pictured in the enclosed box below is one enantiomer of valine, an amino acid used by nature in synthesizing proteins. Which of the molecules on the right is the same enantiomer?

