

PRACTICE EXAM #3 (Ch. 6-8)

Chem21, Introduction to Organic and Biochemistry

Instructions: Don't panic. There are three (3) total pages for this exam. For every question, read all given directions and follow them completely. Clearly and logically show all your work and reasoning where applicable. Box all final answers.

1.) Consider decanoic acid, also known as capric acid found in coconuts and palms. (18 pts)

a.) Draw the line-angle structure of the above-named compound.

b.) Label the part of the structure that is a hydrogen bond **donor**, and the part that is a hydrogen bond **acceptor**.

c.) Given that hexanoic acid is insoluble in water, would you expect decanoic acid to be soluble or insoluble in aqueous solution? Explain.

d.) As a fatty acid, is decanoic acid more likely to be solid or liquid at room temperature? Explain.

2.) Consider the following carbohydrate. (27 pts)

a.) Is it a *mono-, di-, or polysaccharide*?

b.) Star the **anomeric carbon(s)**.

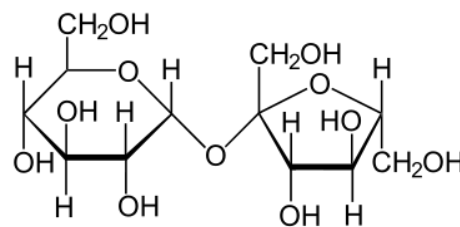
c.) Circle the **glycosidic bond(s)** and label it α or β .

d.) Name the **left** saccharide unit.

e.) Name the **right** saccharide unit.

f.) Is the **left** saccharide unit α or β ?

g.) Does the **left** contain a *hemiacetal* or an *acetal* group?



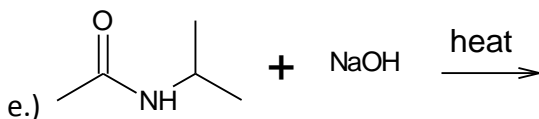
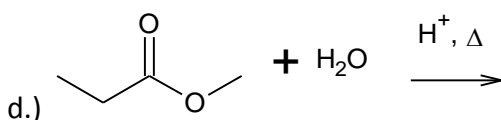
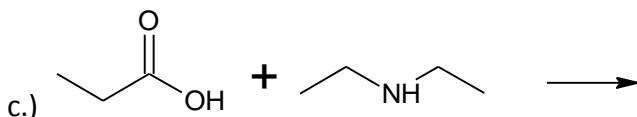
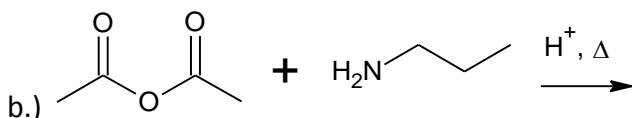
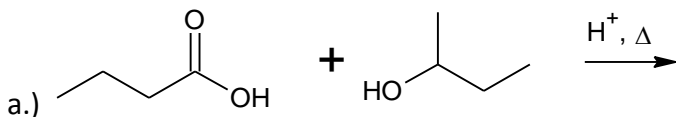
3.) Consider dibutylamine (b.p. = 160°C) and butyldiethylamine (b.p. = 136°C). (26 pts)

a.) Draw the line-angle structure of **dibutylamine**.

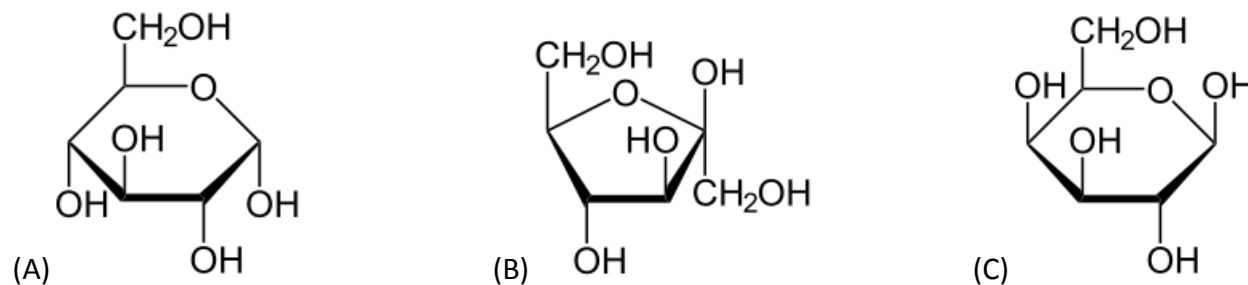
b.) Draw the line-angle structure of **butyldiethylamine**.

c.) Explain why dibutylamine has a *higher* boiling point than butyldiethylamine, despite being constitutional isomers.

4.) For each set of reactants, predict the products. If there are multiple products, be sure to include all of them. (40 pts, 8 pts ea)



5.) Identify the following saccharides. **Include** α/β designations and **circle** and **identify** the hemiacetal or hemiketal group in each. (21 pts, 7 pts ea)

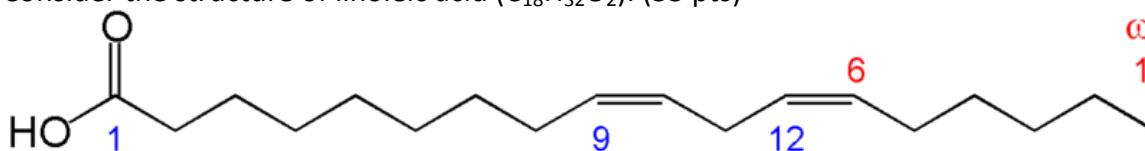


(A) _____

(B) _____

(C) _____

6.) Consider the structure of linoleic acid ($C_{18}H_{32}O_2$). (33 pts)



a.) Is it *saturated* or *unsaturated*? _____

b.) Is it *cis* or *trans*? _____

c.) Label the **polar** and **nonpolar** ends. Which is **hydrophilic**? _____

d.) Is it more likely to be an **oil** or a **fat**? _____

e.) Draw the structure of the triglyceride that forms between glycerol and excess linoleic acid. You may abbreviate the acid's side chain as "R".

f.) Draw the structure of the soap formed from saponification with NaOH of the triglyceride formed in (e).

g.) Draw the structure that results from *complete hydrogenation* of linoleic acid.