Names of all students (please print) _____

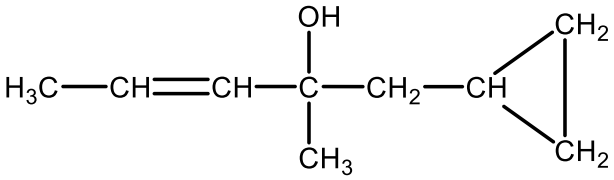
_____

CHEM 243 Organic Chemistry I **Points_____ (10 max)**

Worksheet #2: September 8, 2021. Complete the following worksheet by collaborating with a group of 3-4 students. You can use a text book or your lecture video notes. You must work together, with the names of all students included on **ONE** sheet and turned in for a group grade.

(1) Characterizing sp3 carbons.

(a) In the molecule drawn at the right, indicate the **total number** of 1° (primary), 2° (secondary) and 3° (tertiary) carbons.
NOTE: The 1°, 2°, 3° designations only apply to sp3 carbons.



1° carbons _____ 2° carbons _____ 3° carbons _____ –OH (alcohol) carbon is: **1°** **2°** **3°** (CIRCLE)

(b) For the structure drawn above: (i) How many pi bonds are there? _____

(ii) How many rings are there? _____

(iii) Based on your answers to (i) & (ii), what is the Hydrogen Deficiency? _____
(HINT: It is not necessary to calculate the HD)

(2) Hydrogen Deficiency. An unknown has the formula C_4H_8.

(a) Calculate the Hydrogen Deficiency (HD): _____

(b) Based on the HD and Formula, what type(s) of functional groups might be present? CIRCLE all possibilities from the list below:

alkene	**carbonyl**	**alkyne**	**alcohol**	**ether**	**cycloalkyl**
(C=C double bond)	(C=O double bond)	(C≡C triple bond)	(R-OH)	(R-O-R)	(C atoms form a ring)

(3) Drawing Structures. An unknown compound has a formula $C_4H_{10}O$.

(a) Calculate the Hydrogen Deficiency (HD): _____

(b) Based on the HD and Formula, what type(s) of functional groups might be present? CIRCLE all possibilities from the list below:

alkene	**carbonyl**	**alkyne**	**alcohol**	**ether**	**cycloalkyl**
(C=C double bond)	(C=O double bond)	(C≡C triple bond)	(R-OH)	(R-O-R)	(C atoms form a ring)

(c) The unknown has one 3° carbon, three 1° carbons, and the oxygen is bonded to a 1° carbon. In the space at the right, draw an accurate structure that fits these data (bond-line or zig-zag).

(4) Basic Calculations. The purpose of these calculations is to help prepare you for the laboratory. The compound you drew in problem #3 above, **$C_4H_{10}O$, has a molecular mass of 74.12 g/mole.** Answer the following questions using correct significant figures and units.

(a) If you had 0.01389 moles of this compound, how many grams would you have? _____

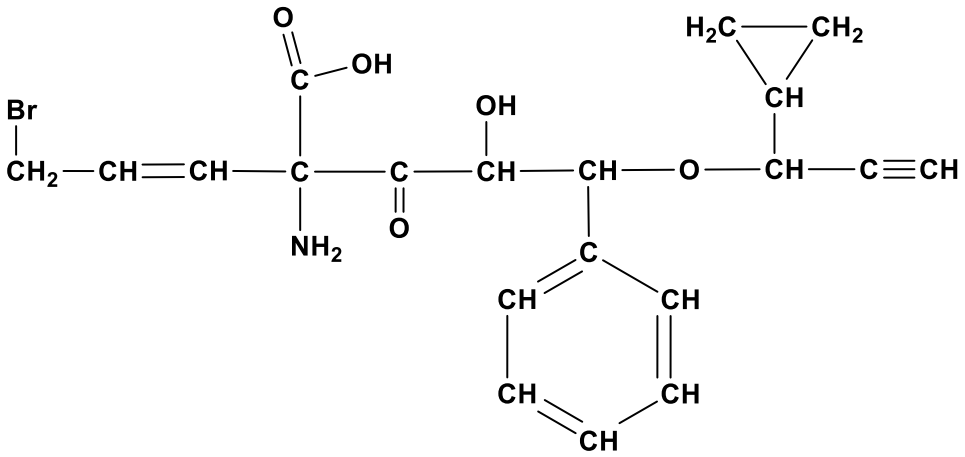
(b) Assuming this compound is a liquid, based on your answer to (a),
how many mL would you have if the density is 0.8994 g/mL? Answer: _____

Use this space for your calculations:

(5) Functional Groups.

(a) In the molecule drawn below, label each functional group using the (a – k) letter codes given. Some codes may be used once, others not at all.

(a) alkene
(b) internal alkyne
(c) terminal alkyne
(d) cycloalkyl
(e) benzene
(f) halogen
(g) alcohol
(h) ether
(i) carbonyl
(j) carboxylic acid
(k) amine



(b) For the structure drawn above:

(i) How many pi bonds are there? _____

(ii) How many rings are there? _____

(iii) Based on your answers to (i) & (ii), what is the Hydrogen Deficiency? _____
(HINT: It is not necessary to calculate the HD)

When your group has completed this Worksheet…..

- Copy your best answers to a fresh worksheet with the names of all students from your group.
- Hand in to Dr. Brush.
- You are free to leave!