CHEM 243 Organic Chemistry I   **Points**_____ **(10 max)**

Worksheet #3: September 10, 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) Structure Identification and IR. An unknown organic compound has a formula of C_7H_{12}.

(a) Calculate the Hydrogen Deficiency for this unknown: _____

(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 IR spectrum for this unknown is given below. What does the IR spectrum suggest about this unknown?

Answer:
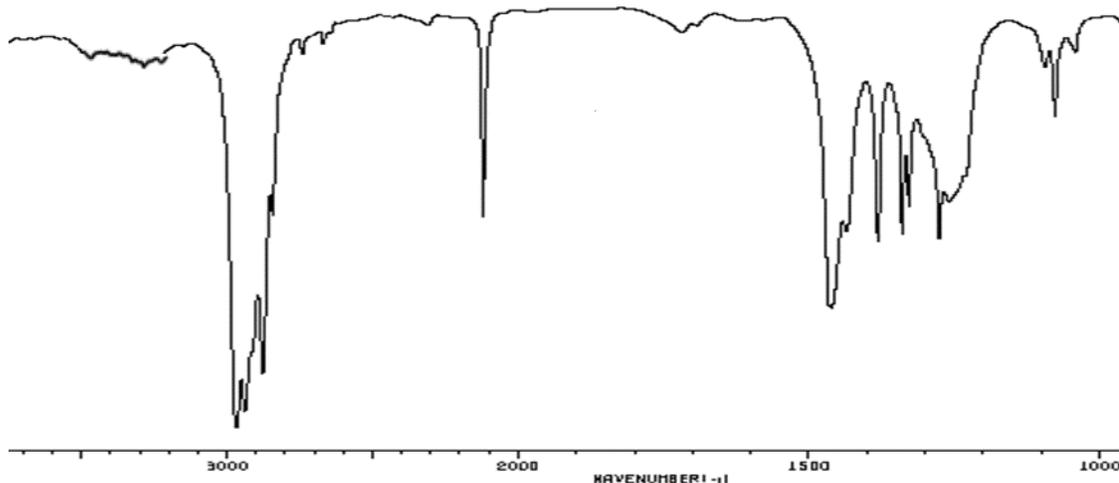
(d) In addition to all the data given in parts a, b and c above, the unknown also has:

               three 1° carbons   **one 2° carbon**   **one 3° carbon**

In the space below, draw <u>three</u> constitutional isomers for this unknown that are consistent with all the data given to you. HINT: Using all data, first make a list of the simplest C group for 1°, 2°, and 3° carbons. For example, the simplest 2° carbon group is a -CH_2-. Then take these "puzzle pieces", along with the piece suggested by the IR, and put them together to form the constitutional isomers.

(2) Practice Calculations. For the compound in problem #1 (C_7H_{12}):

(a) Determine the molecular mass of this molecule (4 significant figures): _____

(b) If you had 0.03101 moles of this compound, how many grams would you have? _____

(c) You accidently spilled this compound on the lab bench. You used a glass pipette to recover as much as possible. After re-weighing, you now have 2.233 g.

Calculate your % Recovery _____

Show your work below and use correct significant figures and units:

(3) "Zig-Zag" structures. Re-draw each of the following four compounds as "zig-zag" structures.

(4) Comparing Organic Structures. Are the following pairs of compounds:

Identical   or   **Different**   or   **Constitutional Isomers?**

$H_3C-CH-CH=C$ with CH_3 group and Br, CH_3 **and**   cyclohexane with Cl and CH_3 _____

$CH_3-CH(OH)-CH=CH_2$ **and** $CH_3-C(=O)-CH_2-CH_3$ _____

$HO-CH(CH_2-CH_3)-CH(CH_3)-CH_3$ with H_3C **and**   structure with OH _____