Names of all students (please print) Answer Key

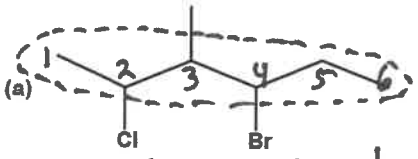
CHEM 243 Organic Chemistry I **Points**_____ **(10 max)**

Worksheet #7: September 24, 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.

Note: As we get into the "nuts and bolts" of organic chemistry, you should expect to see more questions where I will ask you to explain your reasoning.

(1) Nomenclature. If a name is given draw an accurate zig-zag line structure. If a structure is drawn, give an accurate IUPAC name. **HINTS:**

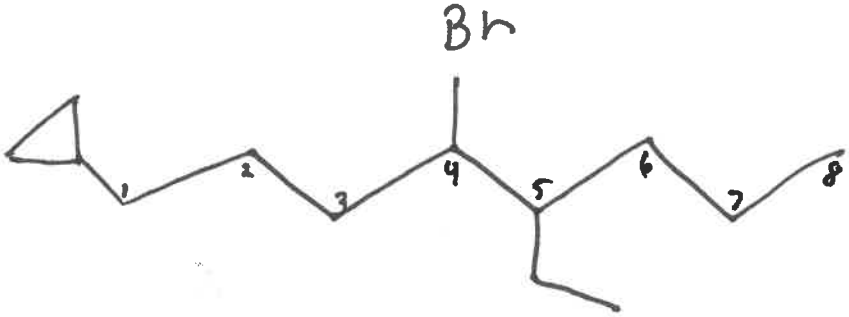
(i) Determine the number of carbons in the "parent chain" (longest continuous carbon chain).
(ii) Identify and name all substituents.
(iii) Number the parent chain (L → R or R → L) such that the substituents have the lowest numerical sequence.
(iv) List the substituents alphabetically with the name of the parent chair last.

(a) 

4-bromo-2-chloro-3-methyl hexane

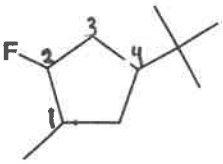
parent chain = 6C = hexane
2-chloro 4-bromo
3-methyl

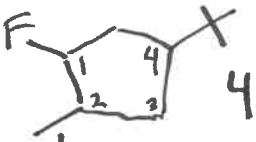
(b) 4-bromo-1-cyclopropyl-5-ethyl octane



parent

*Connected 9-27-21

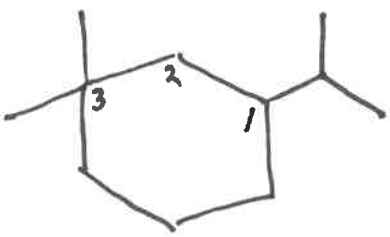
(c) 

OR 

4-tertbutyl-2-fluoro-1-methyl-cyclopentane
OR 4-1-2-cyclopentane

parent = cyclopentane
1-tertbutyl 4-methyl
3-Fluoro

(d) 1-isopropyl-3,3-dimethyl cyclohexane



parent

(2) Introduction to Molecular Models. Unknown letter of the molecular model on your table: _____

(a) Draw the zig-zag structure below.

Atom key: **black = C** **white = H** **blue = F** **green = Cl** **red = Br**

A = 2-chloro-4-ethyl hexane

B = 1-bromo-1-cyclopentyl pentane

C = 2-chloro-4-isopropyl heptane

D = 2-fluoro-4-methyl octane

E = 2-chloro-4-ethyl heptane

F = 3-ethyl-2-fluoro hexane

G = 1-chloro-3-cyclopentyl pentane

H = 4-chloro-4-isopropyl heptane

(b) Give an accurate IUPAC name for your model:

(3) Calculations: % Recovery and % Yield.

(a) Before being used in a reaction, 0.3371 grams of **impure** **Compound A ($C_6H_{12}O_2$)** were purified by recrystallization. After purification, 0.3019 g of **pure** Compound A were recovered.

Calculate the % Recovery: 89.56 %

Compound A ($C_6H_{12}O_2$) was converted into Compound B ($C_5H_{12}O$):

$$C_6H_{12}O_2 \xrightarrow{\text{heat}} C_5H_{12}O + CO_2$$

0.3019 g of **pure** Compound A were converted into 0.1794 g of Compound B.

(b) Complete the following table to calculate the % Yield.

Compound	Molecular mass	grams	moles
Pure (A) $C_6H_{12}O_2$	116.2 g/mole	0.3019 g	0.002598 mole
(B) $C_5H_{12}O$	88.15 g/mole	0.1794 g	0.002035 mole
Theoretical Yield = 0.002598 mole			% Yield = 78.33 %

$$\text{percent yield} = \frac{\text{moles of product}}{\text{Theoretical yield of product (moles)}} \times 100$$

(theoretical yield of product is proportional to the Limiting Reactant)

(c) In your own words, how do % Recovery and % Yield differ from each other? Consider the purpose by which each is used.

- % Recovery is based on the mass of a compound recovered after some "process" (not a reaction). You compare the recovered mass to the original mass of the same compound.
- % Yield is based on a comparison of the actual moles of product obtained in a reaction to the "theoretical" or "expected" amount of product based on the Limiting Reactant.