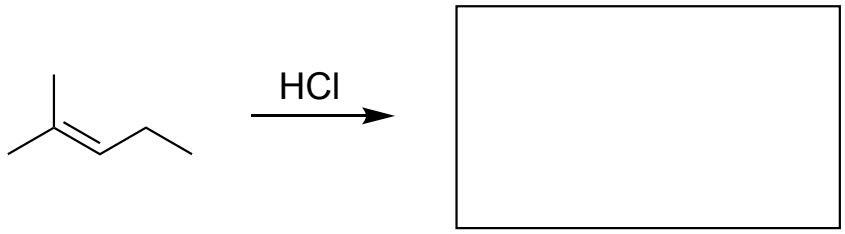
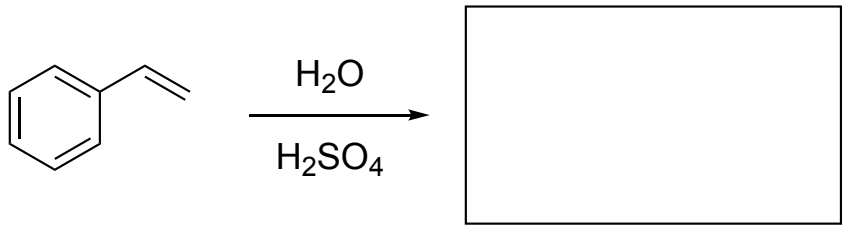
CHEM 8B Chapter 12 Homework – Alkene Reactions

Predict the **product** in each reaction.

1.

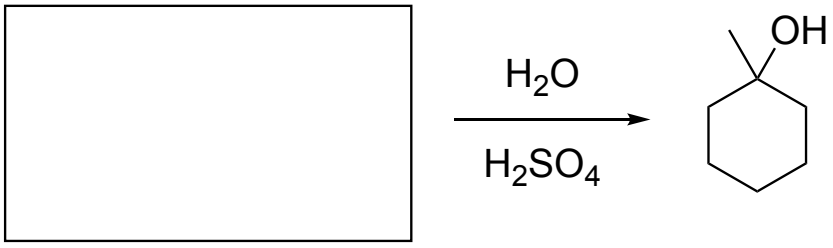


2.

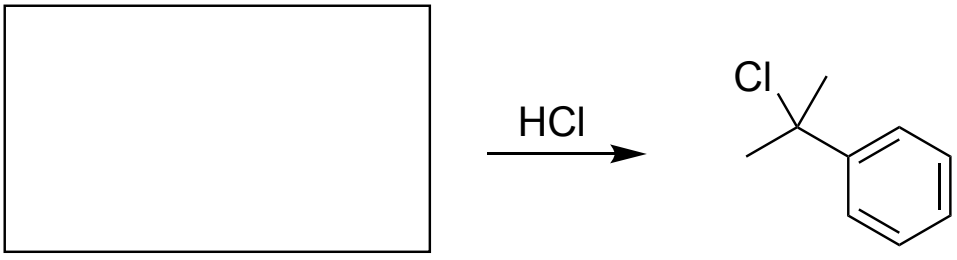


Draw the structure of the **alkene** that would give the product.

3.

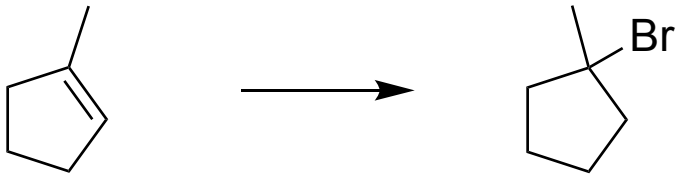


4.

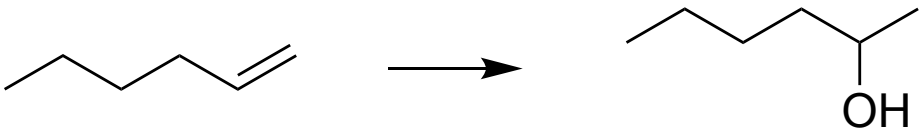


Fill in the missing **reagent(s)** to complete each reaction.

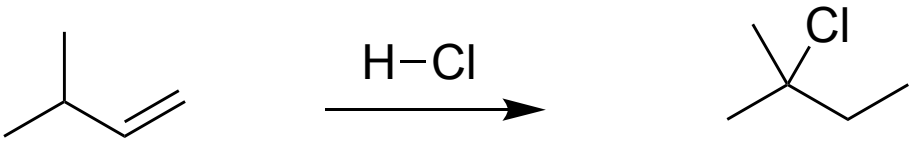
5.



6.



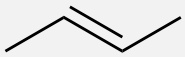
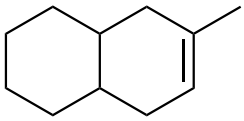
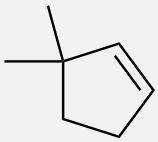
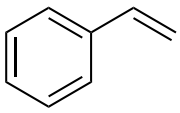
7. Draw the **full arrow-pushing mechanism** for the reaction below, including all charges and intermediates. Hint: there is a carbocation rearrangement.

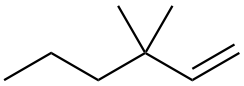
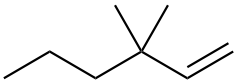
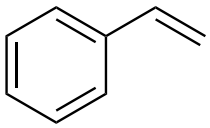
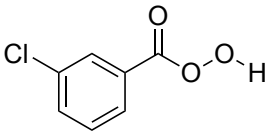


CHEM 8B Chapters 13-14 Homework – Alkene Reactions and Conjugated/Aromatic Compounds

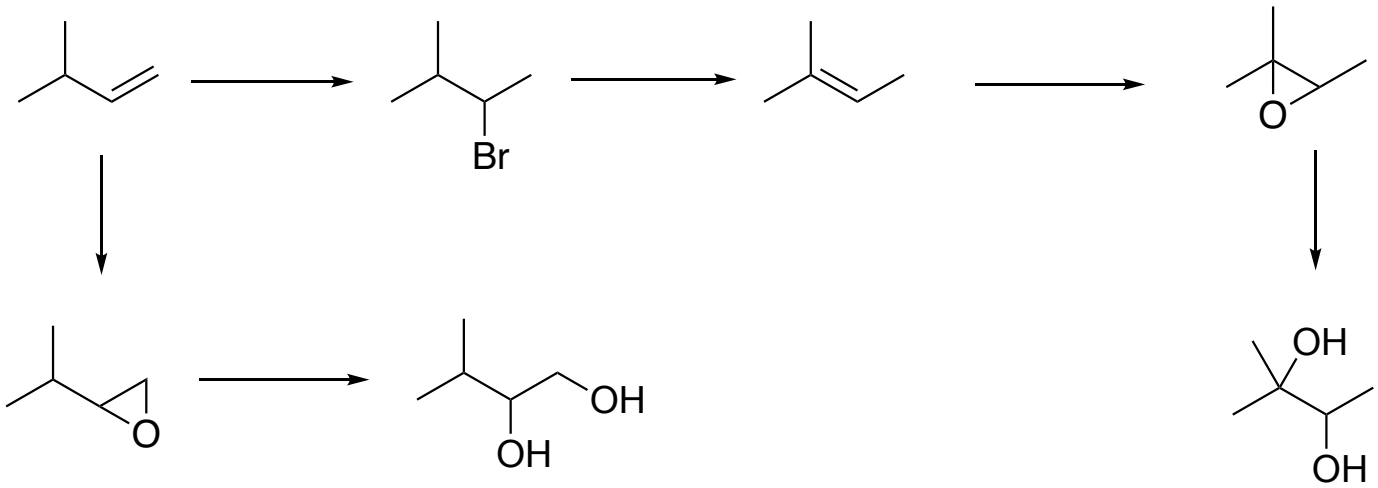
Includes Chapter 12 alkene reactions

- Draw the product of each reaction: **starting material + reagent → Product.**
- Several correct products may be possible. **Draw ONE product to be graded** in the box.

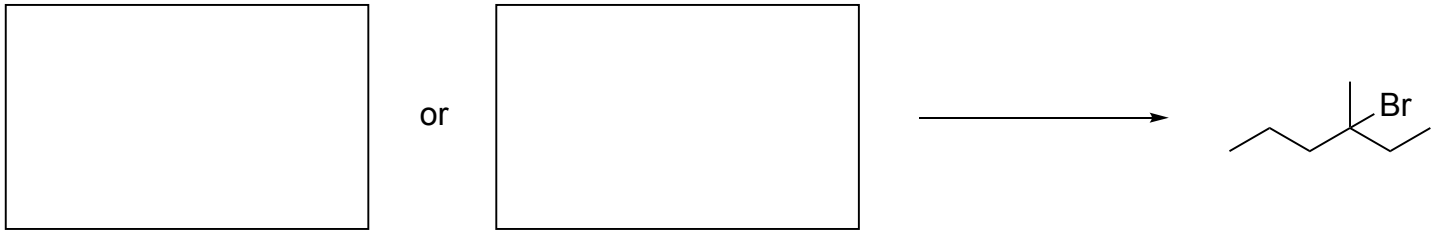
	Starting Material	**Reagents** *& translation* * know this mechanism	**Draw ONE Product**	**Alternate reagent**
1		*** (a) HBr** *Hydrobromic acid* (Chapter 12 reaction)		Different halide, same mechanism: **HCl**, hydrochloric acid **HI**, hydroiodic acid
2		***(b) Cl_2** *Chlorine*		Different halide, same mechanism: Br_2, bromine I_2, iodine
3		***(c) Cl_2, H_2O** *Chlorine in water*		Different halide, same mechanism: Br_2, H_2O bromine in water I_2, H_2O in water
4		**(d) H_2, Pd** Hydrogen gas over palladium metal		H_2 with Pt, Ni, Ni_2B
5		**(e) 1. BH_3, THF** **2. H_2O_2, NaOH** *Hydroboration with borane in THF, then oxidation with basic peroxide*		No alternate reagent; this is a very unique reaction!

	Starting Material	**Reagents** *& translation* * know this mechanism	**Draw ONE Product**	**Notes / Alternate reagents**
6		**(f)** 1. $Hg(OAc)_2$, **H_2O** 2. $NaBH_4$ *Oxymercuration with mercury (II) acetate,* ***water****, then reduction with sodium boro****hydride***		Similar to **H_2O, H_2SO_4 -** except mechanism does not include carbocation (no hydride or alkyl shift possible)
7		***(g) H_2O, H_2SO_4** *Dilute sulfuric acid* (Chapter 12 reaction)		**H_3O^+** **Hydronium** is the reactive species in the mechanism
8		**(h) *m*CPBA**  *meta-chloro****peroxy****benzoic* ***acid***		peroxy acids peracetic acid CH_3CO_3H

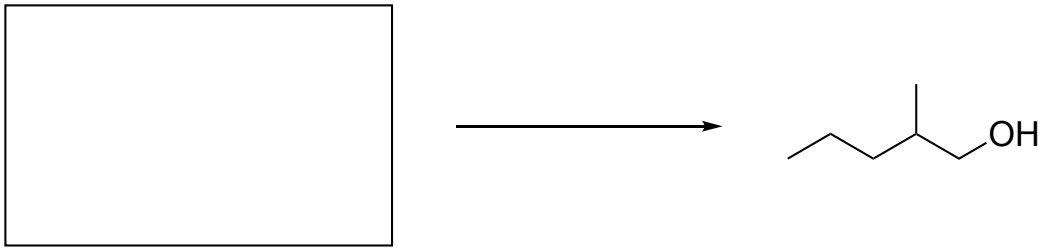
9. Fill in the missing reagent(s) over each arrow.



10. Draw **TWO potential alkene(s)** and necessary **reagent(s)** to synthesize this alkyl bromide.

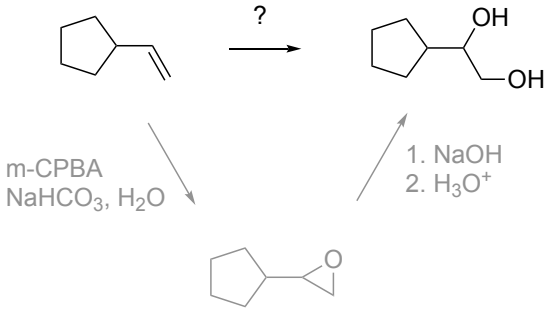


11. Draw the **alkene** and **reagents** needed to synthesize this alcohol.

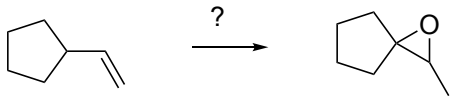


12. Use your organic reaction toolbelt to propose a **multi-step synthesis** for each transformation below.

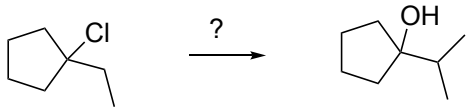
- Each problem requires **at least 2 synthetic steps** (reactions).
- **No mechanisms** (curved arrow notation) required.
- Include all **reagents** and draw the **product** of each reaction.
    - Worked Example:



(a)



(b)

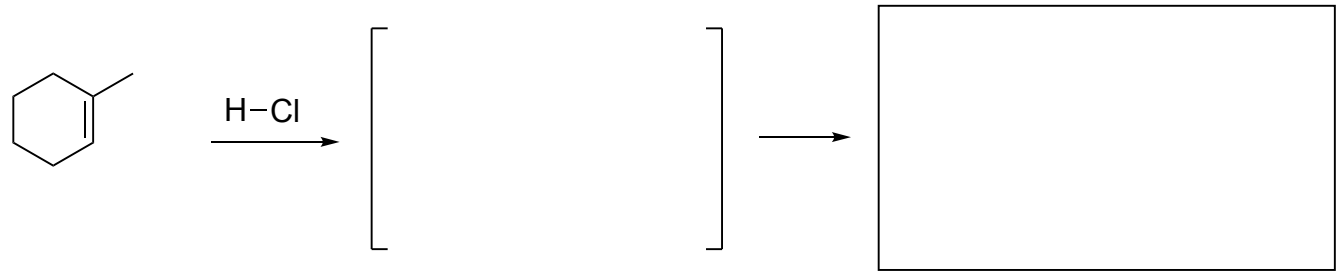


MORE PRACTICE: Mechanisms

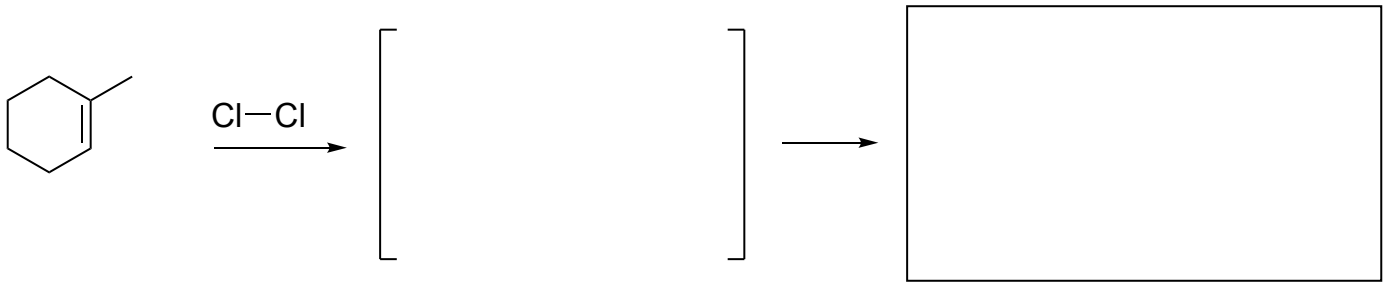
added 1-16-24, NOT required in HW submission

13. Draw the **mechanisms** for both reactions with curved arrows and intermediate with labeled charges. Draw the **product** of the reaction in the box.

(a)



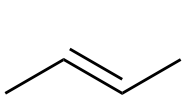
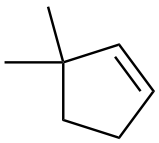
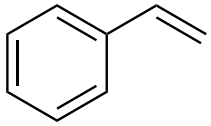
(b)



14. Draw the **mechanism** for this reaction, including curved **arrows** and **intermediates** with labeled charges.

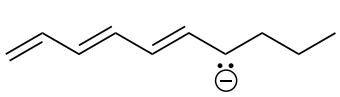
MORE PRACTICE: Mix & Match with Reaction Bootcamp!

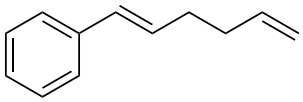
added 1-16-24, NOT required in HW submission

React each alkene **1-3** with each reagent below and draw the product in the box		**1** 	**2** 	**3** 
(a)	**HBr**			
(b)	**Cl_2**			
(d)	**H_2, Pd**			
(e)	1. BH_3, THF 2. H_2O_2, Na**OH**			
(f)	1. $Hg(OAc)_2$, **H_2O** 2. $NaBH_4$			
(h)	***m*CPBA**			

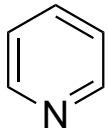
Chapter 14 HW – Conjugation and Aromaticity – Resonance City!

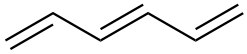
1. How many **pi electrons** in the *longest conjugated pi system* in each molecule? Write your answer (number) in the box provided.

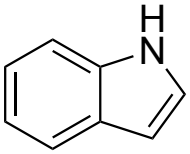


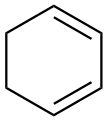


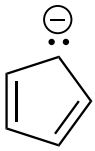
2. Circle each compound that is aromatic. Draw an X over the compounds that are NOT aromatic.





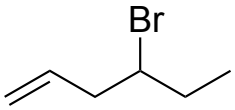


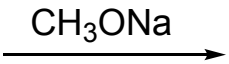




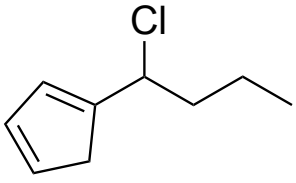
3. Draw the **major product** in each **elimination** reaction below. Ignore potential substitution products.

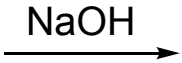
(a)





(b)

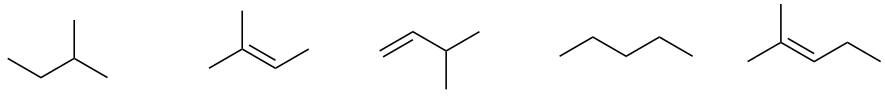




CHEM 8B Chapter 15 Homework – Mass Spectrometry (MS)

A compound's mass spectrum includes an "M^+ peak" that reveals the molecular weight of the compound!

1. **A hydrocarbon has 5 carbons and mass spectrum reveals an M^+ peak = 72.**
   a. What is its molecular formula? _____
   b. Which TWO structures fit this data?



2. **Propose the molecular formula** and **TWO structures** of molecules with **6 carbons, 1 oxygen,** and mass spectrum **M^+ peak = 102.**
   a. Molecular formula: _____
   b. Propose TWO structures that fit this data.

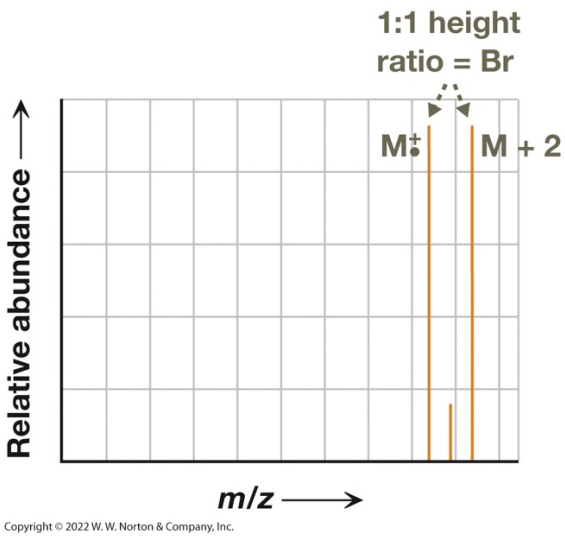
3. **An organic compound has 3 carbons and mass spectrum M^+ peak = 59**
   a. What is its molecular formula? _____
   b. Propose TWO structures that fit this data.

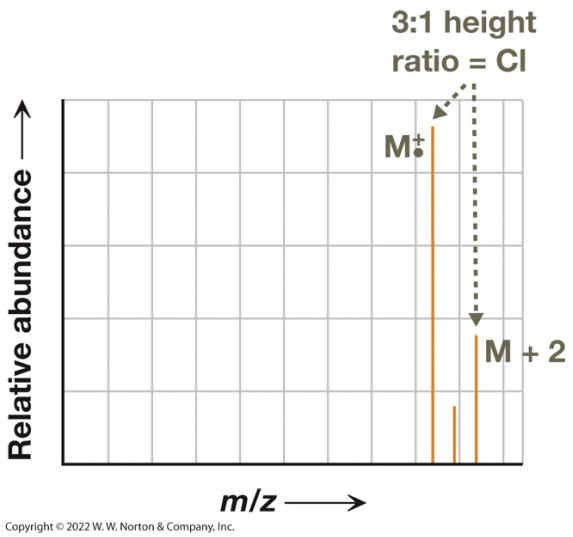
4. An organic compound has 6 carbons and mass spectrum M^+ peak = 99

a. What is its molecular formula? _____

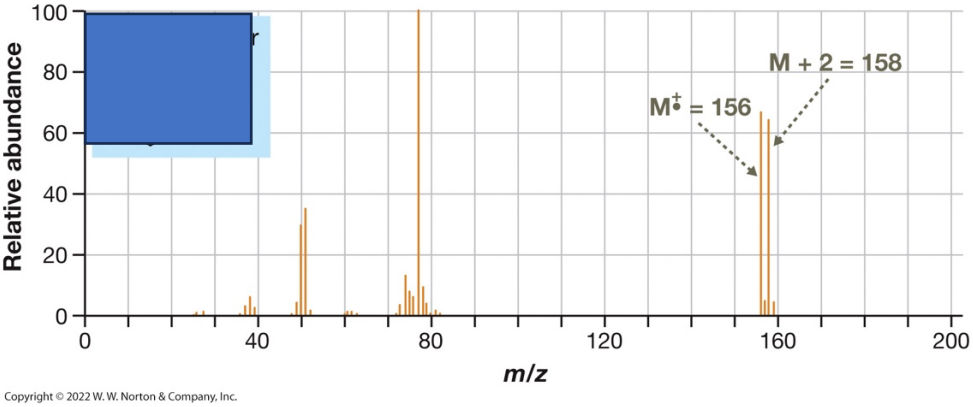
b. Propose TWO structures that fit this data.

5. Mass Spectrum Distinctive M+2 Peaks – Bromine and Chlorine Isotopes



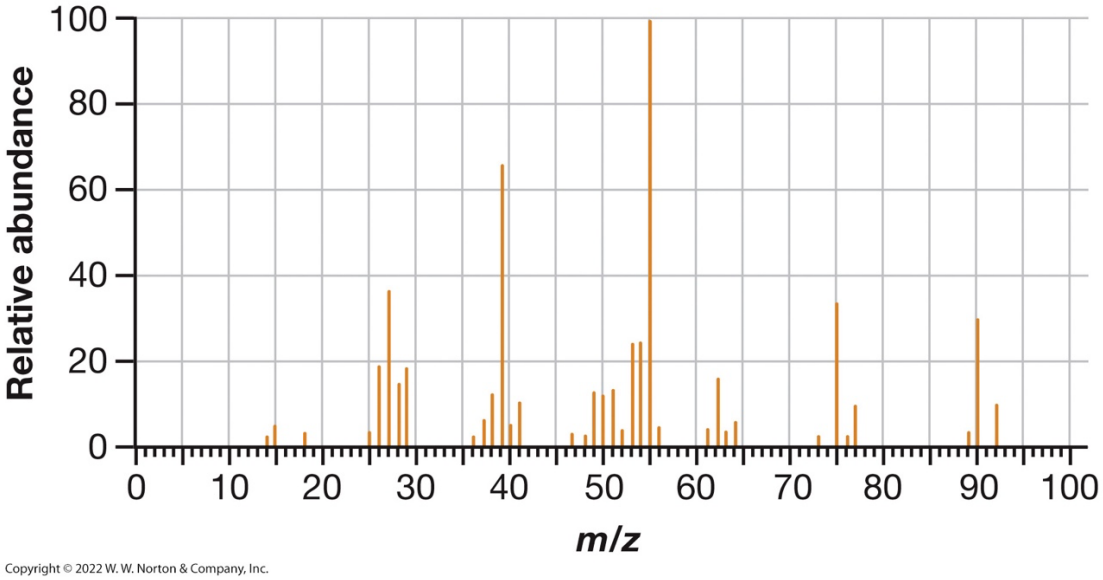


(a) **Propose a structure** for a molecule with **6 carbons** and the following mass spectrum.



Formula: _____

(b) **Propose the molecular formula** and **structure** for a molecule with **4 carbons** and the **mass spectrum** below. Note the peak intensities (height) of the **M^+ peak = 92** and **M+2 peak = 94.**



Molecular Formula _____

Propose TWO structures that fit this data