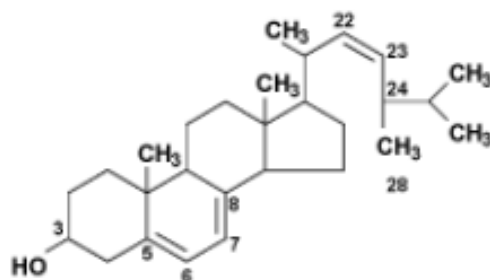




Houston Community College

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SAMPLE EXAM # 1A
Organic Chemistry I
2425



Egosterol

Egosterol — Ergosterol is a component of fungal cell membranes, serving the same function that cholesterol serves in animal cells. The presence of ergosterol in fungal cell membranes coupled with its absence in animal cell membranes makes it a useful target for antifungal drugs. Ergosterol is also present in the cell membranes of some protists, such as trypanosomes.^[2] This is the basis for the use of some antifungals against West African sleeping sickness.

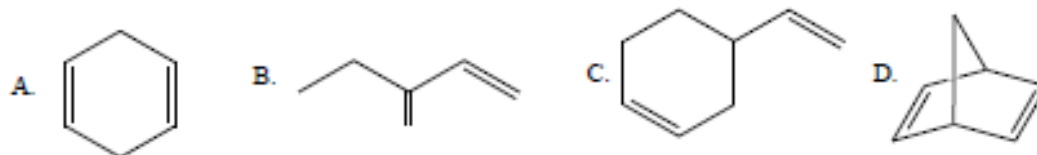
CHEM 2425 - Sample Exam #1A (Chapters 13, 14, and 15)

Part I. Multiple choice questions. Please write your answer in the space provided.

____ 1. How many sets of equivalent protons are there for $\text{CH}_2\text{Cl}-\text{CH}_2-\text{CH}_2\text{Cl}$

- A. 1 B. 2 C. 4 D. 6

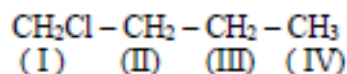
____ 2. Which of the following is an example of a conjugated dienes?



____ 3. Which of the following is the most likely fragment ion formed at 57?

- A. CH_3CH_2^+ B. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2^+$ C. $\text{CH}_3\text{CH}_2\text{CH}_2^+$ D. $\text{CH}=\text{CH}_2^+$

____ 4. In the proton NMR spectrum for 1-chlorobutane, which of the proton has the lowest field resonance (lowest chemical shift)?



- A. I B. II C. III D. IV

____ 5. What is the structure for a compound, $\text{C}_4\text{H}_9\text{Br}_2$, which has the following proton NMR spectrum?

Doublet δ 1.7 (6 H) and Quartet δ 4.4 (2 H)

- A. 1,1-dibromobutane B. 1,2-dibromobutane
C. 1,3-dibromobutane D. 2,3-dibromobutane

____ 6. What kind of compound has a sharp IR absorption band in the region of 1710 cm^{-1} and a broad band at 3300 cm^{-1} ?

- A. Ethanol B. Acetic Acid C. Acetone D. Diethyl ether

____ 7. Examining the Proton NMR spectrum of a compound allows us to:

- A. Determine the types of functional groups present in the compound.
B. Determine the C-H framework of the compound.
C. Determine the molecular weight of the compound.
D. Determine the nature of the conjugated pi electrons system in the compound.

___ 8. Given $M^+ = 156$, the possible formula of compound which include only one oxygen is;

- A. $C_{13}H_{14}O$ B. $C_{11}H_8O$ C. $C_{12}H_{10}O$ D. $C_{10}H_4O$

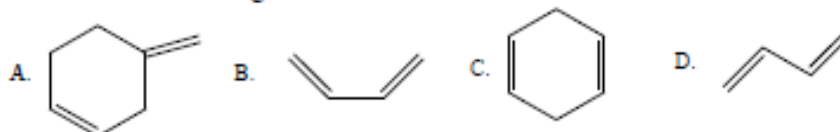
___ 9. An organic compound is composed of C, H, and N. It shows a molecular ion at $m/z = 112$ amu in the mass spectrum. What is the plausible molecular formula for this compound ?

- A. $C_7H_{14}N_2$ B. $C_6H_{12}N_2$ C. $C_6H_{10}N_2$ D. $C_7H_{12}N_2$

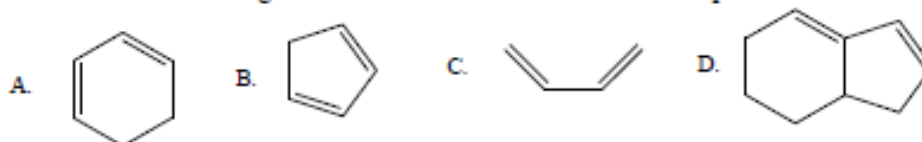
___ 10. Which of the following statements is true about the molecular ion?

- A. a compound that lost a pair of electrons
B. a compound that gained one electron
C. a compound that lost one electron
D. a compound that carries a free radical and a negative charge

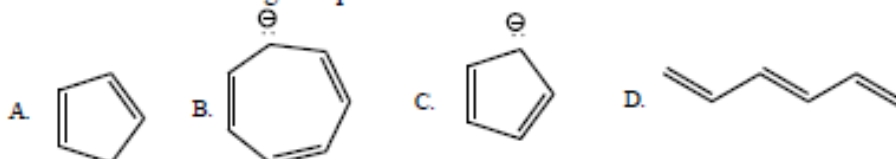
___ 11. Which of the following dienes is most stable?



___ 12. Which of the following dienes cannot be used as the diene component in Diels Alder Reaction?



___ 13. Which of the following is expected to be aromatic?



___ 14. Which of the following is a correct description of benzene?

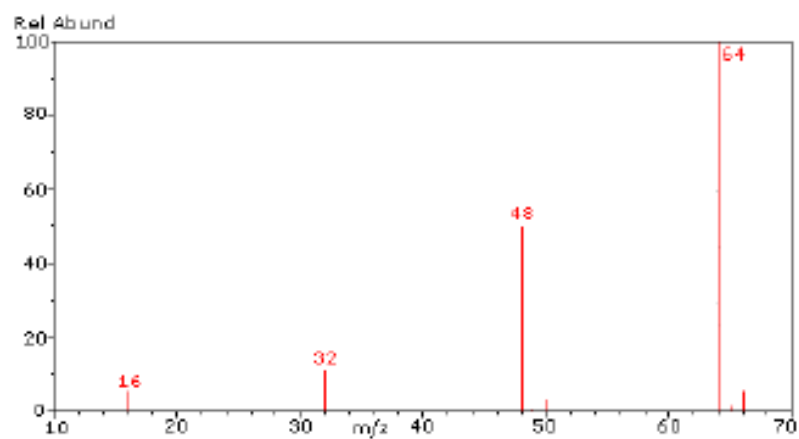
- A. The molecule is planar.
B. The molecule is aromatic.
C. The CCC bond angles are all 120° and each carbon is sp^2 hybridized.
D. All of the above

___ 15. Which is not a required for aromaticity?

- A. The structure must be bicyclic.
B. Each atom in the ring must have an unhybridized p orbital.
C. The π network must contain $4n+2$ pi electrons, where n is a whole number.
D. The structure must be planar.

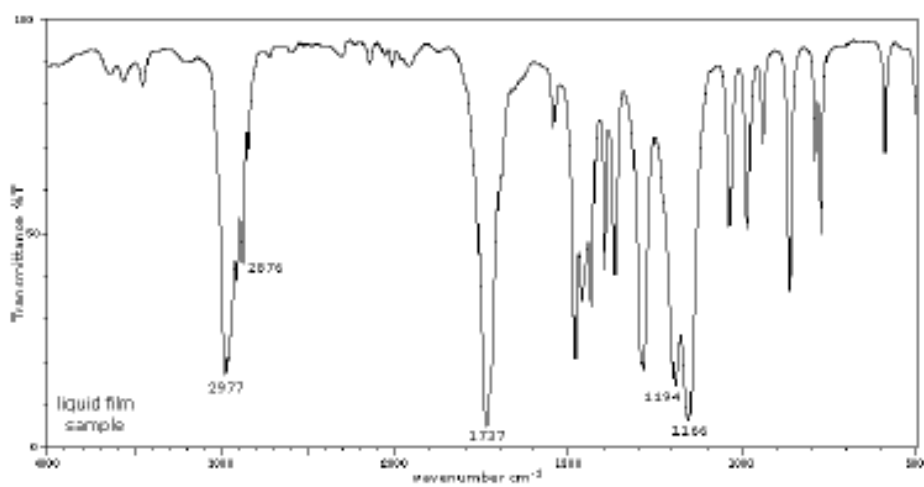
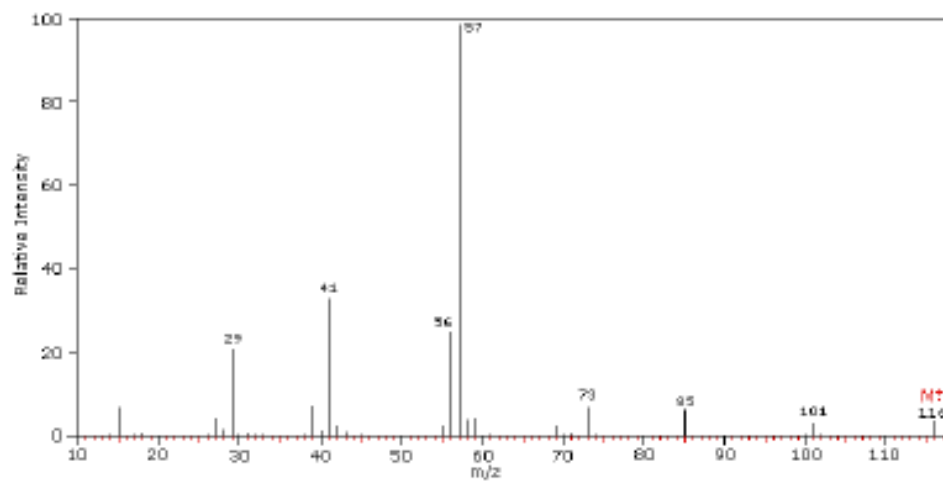
Part II. Show all your work for complete credit.

16. Refer to the mass spectrum of C_xH_y shown below to answer the following questions.

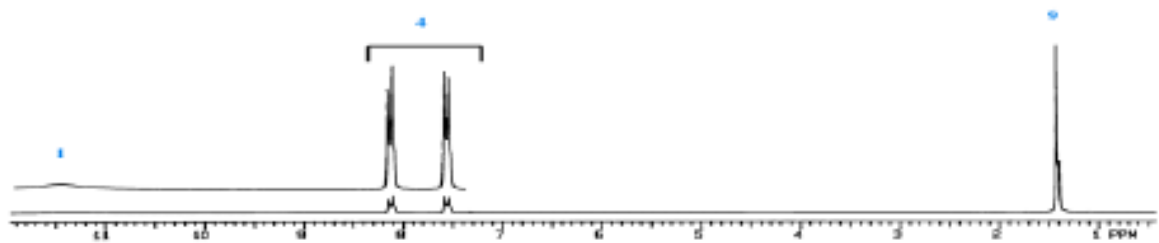
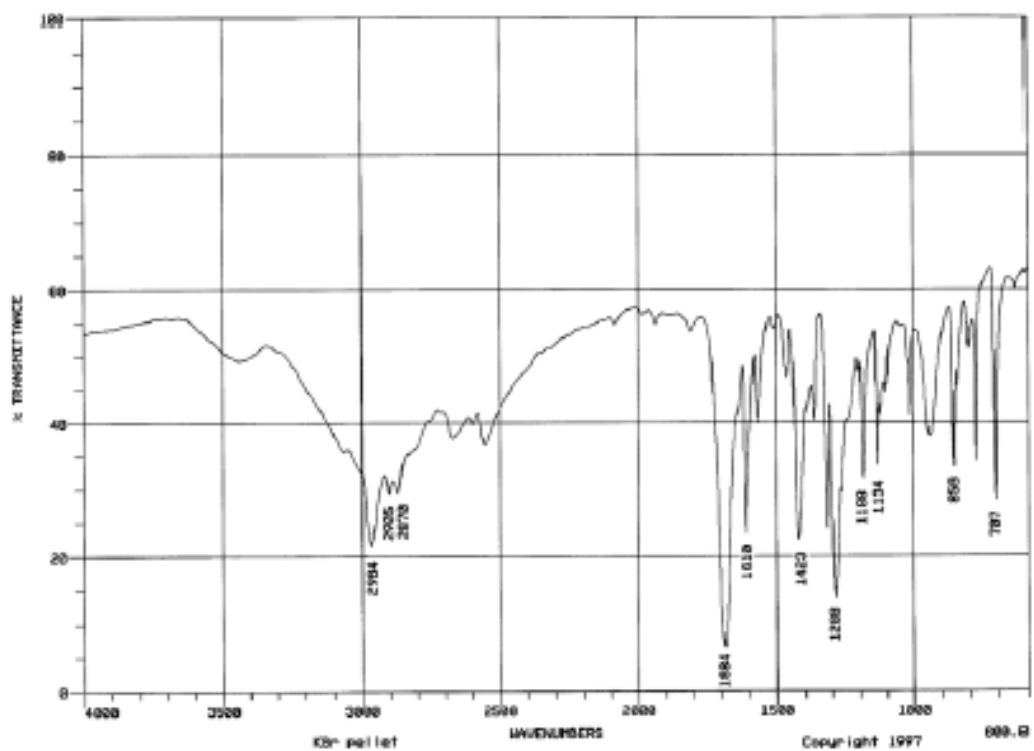


- What peak represents M^{+0} ?
- What peak represents the base peak?
- What peak represents the parent peak?

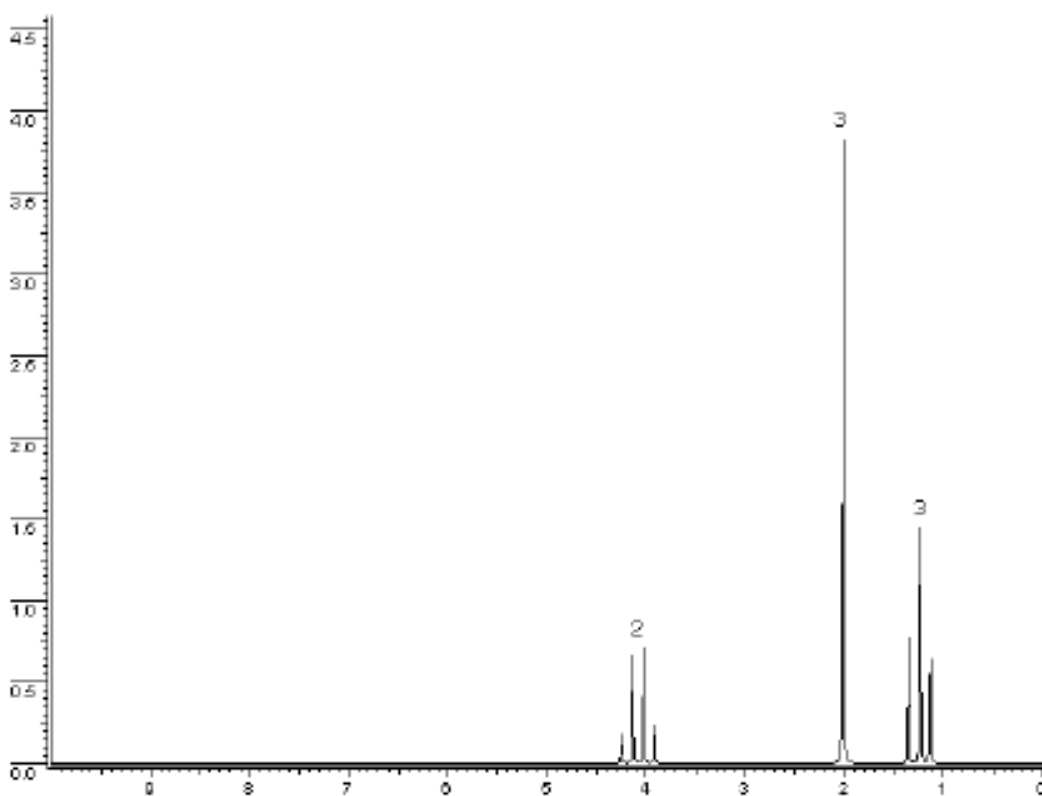
17. Suggest a structure which is consistent with all the spectral data given below for $C_xH_yO_2$.



18. Suggest a structure, which is consistent with the IR and ^1H NMR spectra shown below.
($\text{C}_{11}\text{H}_{14}\text{O}_2$)



19. Suggest a structure, which is consistent with the ^1H NMR spectra shown below.



20. How many different type of hydrogens (in different environments) are there in the following compounds?

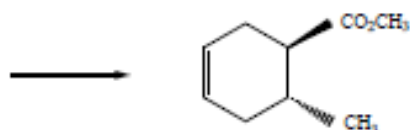
a) cis-1,3-dibromopropene

b) 2-chloropropane

21. Propose structure that fit the following ^1H NMR data:

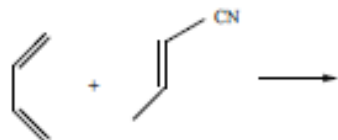
$\text{C}_8\text{H}_9\text{Br}$ 3 H doublet at δ 2.0 , 1 H quartet at δ 5.0 , 5 H singlet at δ 7.3

22. What diene and dienophile would you react to give the product below?

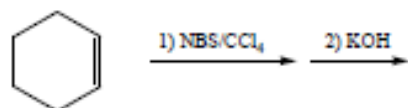


23. Provide the structures of the major product(s) in the following reactions.

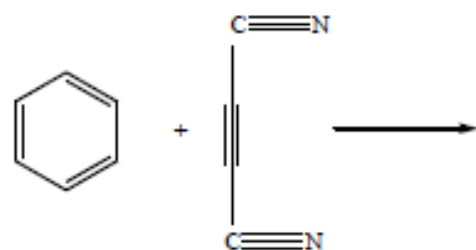
a)



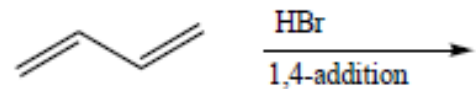
b)



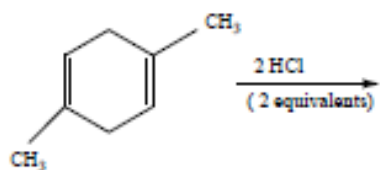
c)



d)

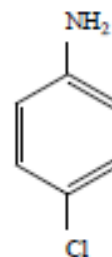
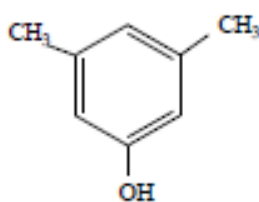
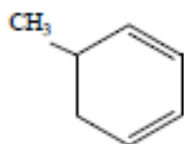


e)



24. Nomenclatures:

I) Give the correct names (IUPAC)



II) Give the correct structures

a) m-nitroaniline



b) 2,4,6-trinitrophenol



c) 3-bromo-(3Z,5E)-octadiene



Bonus question. Provide a detailed stepwise mechanism for the reaction shown below. Please show all your work including electron flow.

