

Al Azhar university

Instrumental Analysis

Faculty of Pharmacy

Time allotted :- 2 hrs.

Pharmaceutical Chem. Dept.

12/5/2019

Final Exam

Student's Name

Student's No

I pledge my honor that I have neither given nor received aid on this examination

Q1] MCQ

1		7		13		19	
2		8		14		20	
3		9		15			
4		10	.	16			
5		11		17			
6		12		18			

Q2] True and False

1		4		7		10	
2		5		8		11	
3		6		9		12	

Q1] In each of the following ; choose the most correct answer

1. The odd term of the following is

- a. Bathochromic
- b. Green shift
- c. LOMO
- d. both "b and c"

2. Mass spectrometers are used to determine which of the following?

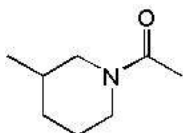
- a. composition in sample
- b. Concentration of elements in sample.
- c. Relative mass of atom.
- d. Properties of sample

3. absorption of what type of electromagnetic radiation results in transitions among allowed nuclear magnetic spin states is.....

- a. ultraviolet light
- b. radio waves
- c. infrared light
- d. microwaves

4. How many absorption bands will appear in the ^{13}C NMR spectrum for the following compound?

- a. 4
- b. 6
- c. 7
- d. 8



5. Absorption of what type of electromagnetic radiation results in transitions among allowed rotational motions?

- a. Microwave
- b. infrared light
- c. ultraviolet light
- d. none of the above

6. The EASIEST method to distinguish between phenoxide and anilinium is

- a. UV
- b. MS
- c. H-NMR
- d. IR

7. The frequency of the stretching vibration of a bond in IR spectroscopy depends on what two quantities?

- a. the electronegativity of the atoms and the nuclear charges of the atoms
- b. the masses of the atoms and the stiffness of the bond
- c. the stiffness of the bond and the electronegativity of the atoms
- d. the electronegativity of the atoms and the masses of the atoms

8. Which of the following compounds has the MOST deshielded protons?

- a. CH_3Cl
- b. CH_3I
- c. CH_3Br
- d. CH_3F

9. In mass spectrometer, the sample that has to be analysed is bombarded with which of the following?

- a. Protons
- b. Electrons
- c. Neutrons
- d. Alpha particles

10. Which molecule below would exhibit m/z peaks at 43,57,87,101 and 116

- a. Propylchloride
- b. Isopropylbromide
- c. 1-butanol
- d. Sec-Butyl isopropyl ether.

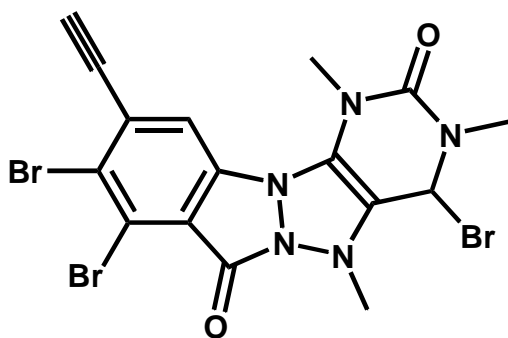
- 11. When a high energy electron impacts molecule M in the ionization chamber, what type of species is initially produced?**
- Cation
 - Radical
 - radical cation
 - radical anion
- 12. The procedure for IR spectroscopy starts with which of the following processes?**
- The sample is bombarded by electron beam
 - The ions are separated by passing them into electric and magnetic field
 - The sample is converted into gaseous state
 - The ions are detected
- 13. Which of the following statements is wrong?**
- UV absorption is attributable to electronic transitions.
 - UV spectra provide information about valence electrons.
 - IR absorption is attributable to transitions between rotational energy levels of whole molecules.
 - NMR spectrometers use radiofrequency electromagnetic radiation.
- 14. The disadvantages of Electron Impact Ionization are:-**
- Stable molecules are broken and fragmented for very small ions difficult to be interpreted
 - The molecular ion might not been seen because of its construction from the beginning.
 - complete evacuating leads to the appearance of sort of overlapping peaks.
 - None of the above.
- 15. Which molecule below would exhibit m/z peaks at 43,57,87,101 and 116**
- Propylchloride
 - Isopropylbromide
 - 1-butano
 - Sec-Butyl isopropyl ether.
- 16. A substance with ($\lambda_{\max} = 469 \text{ nm}$). What color of light does the substance absorb?**
- Red
 - Blue
 - Green
 - None of the above
- 17. The molecule HOCH₂CH₂OH will have an nmr spectrum consisting of...**
- two singlets
 - singlet and doublet
 - triplet and singlet
 - triplet and triplet
- 18. The correct order for the basic features of a mass spectrometer is...**
- acceleration, deflection, detection, ionization
 - acceleration, ionisation, deflection, detection
 - ionisation, acceleration, deflection, detection
 - acceleration, deflection, ionisation, detection
- 19. What does the notation $\sigma^* \leftarrow n$ mean?**
- Emission; transition from a non-bonding MO to σ^* MO.
 - Emission; transition from a quantum level n to σ^* MO
 - Absorption; transition from a quantum level n to σ^* MO.
 - Absorption; transition from a non-bonding MO to σ^* MO.
- 20. Which method would be best for finding the identity of an organic compound?**
- finding the m/z value
 - its proton nmr spectrum
 - comparing its infra red spectrum with known example
 - measuring its melting point

Q2] TRUE AND FALSE (T or F)

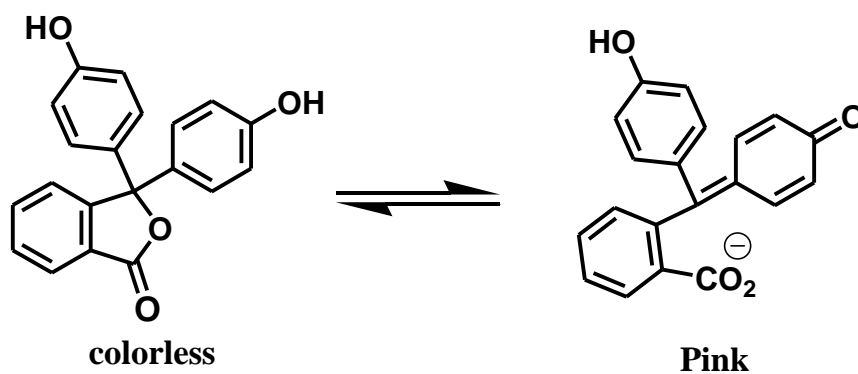
- () Aprotic solvent causes red-shift effect in the value of $n \rightarrow \pi^*$ λ_{\max} .
- () In ^{13}C -NMR; $B_{\text{effective}} = B_{\text{applied}} - B_{\text{local}}$
- () Ions in spectrometer are absorbed by metal plate in the mass spectrometer
- () In mass spectroscopy; free radical or cationic fragments are detected, they are visible.
- () λ_{\max} is the maximum absorption that occurred in the ir spectroscopy
- () Knocking out one electron from a molecule forming molecular ion is known as fragmentation
- () The condition for H-NMR if all protons absorbed at the same frequency
- () Samples in microgram scale must be converted into the vapor state using high temperature in spectrometer
- () Signals in UV are more broad than the signal in IR because of atomic vibration and rotation.
- () IR spectra show up as multiple bands due to the interference of electronic, rotational and vibrational motions.
- () Nitrogen rule is a well-known method to identify how many nitrogen atoms does a compound have?
- () In mass spectroscopy; a substance is exposed to magnitude of energy that is much greater than the case of UV.

Q3]

a. By Inspection and calculation; provide the Degree of Unsaturation "DoU" for the following compound

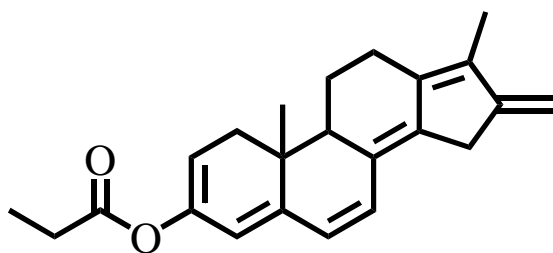


b. Regarding to the acid-base titration; the indicator Phenolphthalein creates a pink color upon changing the PH from 8 to ≥ 13 . Explain showing what is going ?

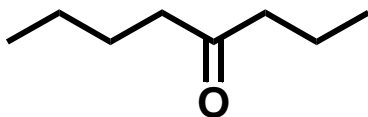


Q4]

a. Using Woodward-Fieser rule to Calculate λ_{max} for the following compound and its color



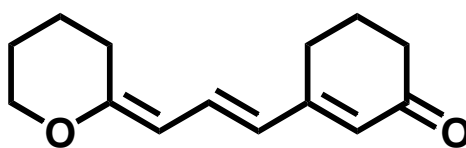
b. Use drawing and bond cleavage to show Mclafferty rearrangement for the following ketone.



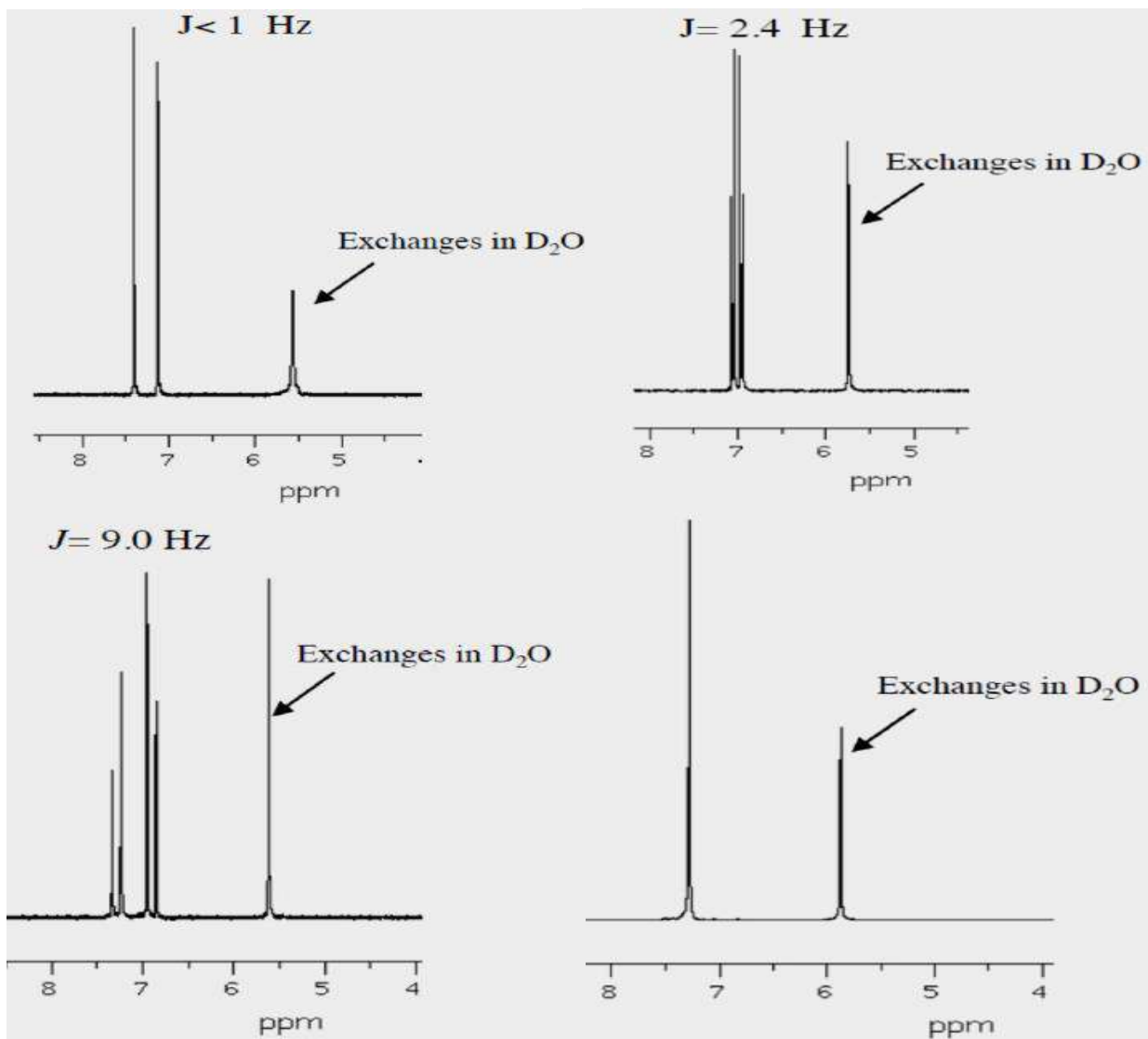
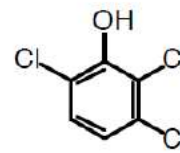
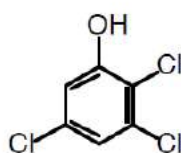
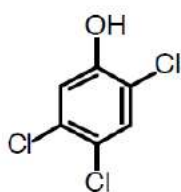
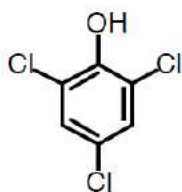
Q5] ***

a. If you are given a non polar compound and asked to figure out its functionality; What you can do?

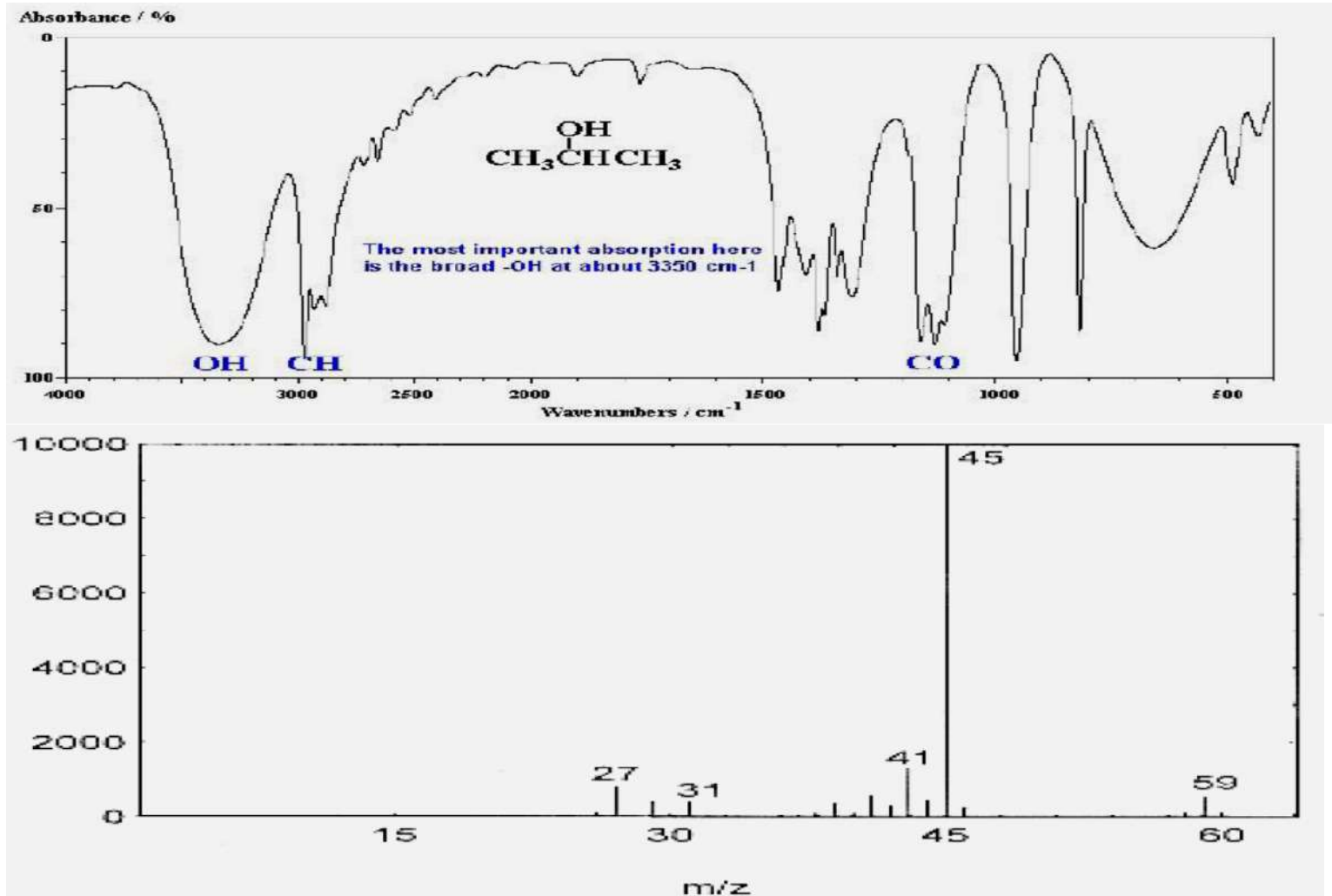
b. What is the effect of adding one drop of an acid on IR and UV analysis to the following compound?



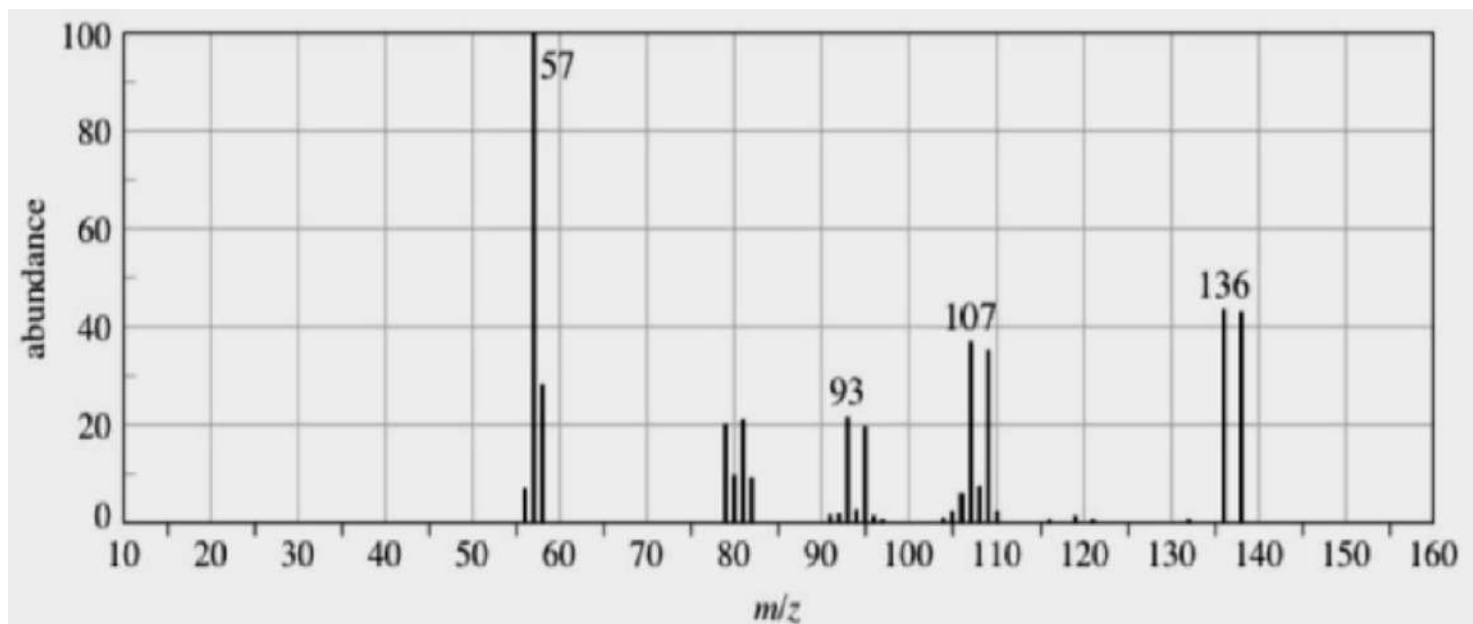
Q6] Match each structure to its corresponding H-NMR spectrum



Q7] Using the below spectral data to identify the structure of the the formula (C₃H₈O)

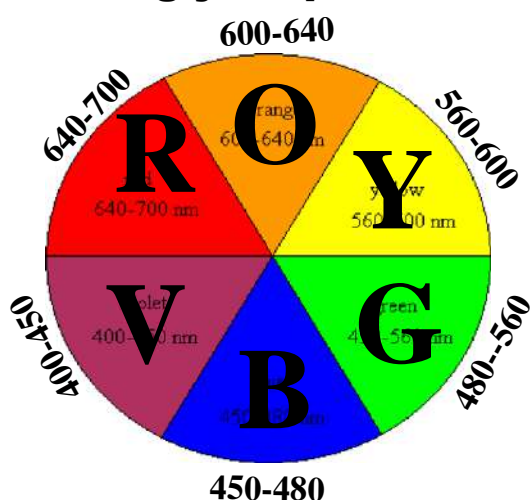


Q8] Regarding to the following MS spectrum; identify the structure and explain its fragments



Data might be useful in solving your problems

1- Color wheel "Disk"



2- Woodward-Fieser Rule

	<i>s-trans</i>	homoannular (cisoid)	heteroannular (transoid)
base values:	217 nm	253 nm	214 nm
Increments:			
	For each additional conjugated double bond		+ 30 nm
	For each exocyclic double bond		+ 5 nm
	For each alkyl group		+ 5 nm
	For each of the following groups:		
	- OR		+ 6 nm
	- O(C=O)R		+ 0 nm
	- Cl		+ 5 nm
	- Br		+ 5 nm
	- SR		+ 30 nm
	- NR ₂		+ 60 nm
	- Ph		+ 60 nm
solvent			