



الإجابة النموذجية لامتحان الكيمياء العضوية الطيفية

317 ك

(نصف ورقة امتحانية)

الفرقة : الثالثة

الشعبة : الكيمياء و الجيولوجيا, الكيمياء و الحيوان, الكيمياء و النبات, الكيمياء التطبيقية , الكيمياء و الحشرات

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الممتحن : د/ محمد عبد الرحمن موسى ابو ريا

قسم : الكيمياء

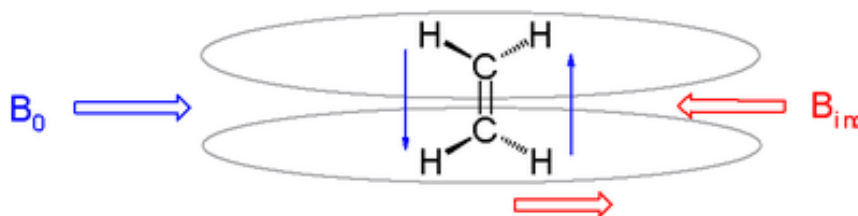
كلية : العلوم

### 3 b) Illustrate the anisotropic effect on the chemical shift.

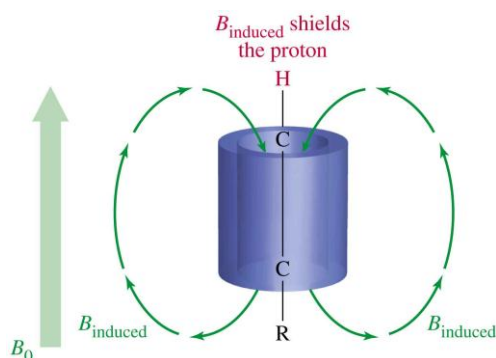
#### • Magnetic Anisotropy Effects

All groups in a molecule with  $\pi$  electrons will have an effect on the local magnetic field due to the induced circulation of these  $\pi$  electrons. (Secondary field)

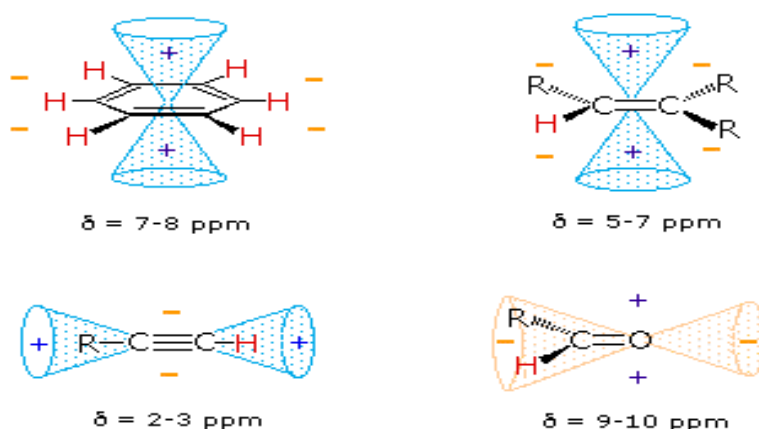
(Diamagnetic field-Paramagnetic field)



For Double bond the protons in the region with applied field so it will be more deshielded.



For acetylenic protons the electrons is located at shielding region.



3 c) A signal has been reported to occur at 600 Hz downfield from TMS in an NMR spectrometer operating at 400 MHz . (3 Marks)

- What is the chemical shift of the signal?
- What would its chemical shift be in an instrument operating at 300 MHz?
- How many hertz downfield from TMS would the signal be in a 100-MHz spectrometer?

i.

$$\text{Chemical shift} = \delta = \frac{\text{shift in Hz}}{\text{spectrometer frequency in MHz}} = \text{ppm}$$

$$\delta = 600 \text{ Hz} / 400 \text{ MHz} = 1.5 \text{ ppm}$$

ii. The chemical shift doesn't get affected by the change in spectrometer operating frequency so it will be at 1.5 ppm.

iii. For a 100 MHz the frequency will be  $100 * 600 / 400 = 150 \text{ Hz}$

$$\text{Or } 1.5 \text{ ppm} * 100 \text{ MHz} = 150 \text{ Hz}$$

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4.

1- b) 2

2- b) 2

3- c) radio

4- b) 2

5- a) 1

6- b) ethyne,  $\text{HC}\equiv\text{CH}$

7- b) higher

8- d) a, b

9- a) ethyl group

10- b) Acetic Acid

11- d) 2,3-dibromobutane

12- a)  $(\text{CH}_3)_2\text{CHCN}$

**5 a) -** An organic compound with the molar mass 106.5 g/mol has the composition 56.34 % C, 10.33 % H, 33.33 % Cl, has a strong IR absorption at  $2970\text{ cm}^{-1}$ . Its  $^1\text{H}$  NMR spectra shows signals at  $\delta$  1 (6H, triplet), 1.8 (4H, pentet), 3.9 (1H, pentet). What is the structure of the compound?

**Answer**

First we should indicate the molecular weight from the **mass spectroscopy** and elemental analysis as following :

$$\text{O}\% = 100 - (56.34 + 10.33 + 33.33) = 0\%$$

	C	H	Cl	
	56.34/ 12	10.33/1	33.33/35.5	
The	4.695/0.939	10.33/0.939	0.939/0.939	Empirical formula
is $\text{C}_5\text{H}_{11}\text{Cl}$	5	11	1	with Formula

weight = 106.5 is equal to molecular formula so the empirical formula is the molecular formula.

**From  $^1\text{H}$ NMR spectra**

	a	b	c
$\delta$	1	1.8	3.9
Multiplicity	triplet	pentet	pentet
Numbe of hydrogen atoms	6 H	4 H	1 H
Groups	2 ( $\text{CH}_3$ )	2 ( $\text{CH}_2$ )	CH

**From**

**IR spectra it shows that: there is no function groups except the Aliphatic -CH**

**The suggested structure is**



5 b. The correct structure is

c)

