# Quiz 2 for CH 101

Instructions:
1) Read the question carefully and provide your answer by selecting given correct option/options.
2) Your Exam will automatically start at 8 AM on 21/01/21 and you have to submit the answers on or before 8:55 PM on 21/01/21, after this given time you will NOT BE ABLE TO SUBMIT YOUR ANSWERS.
3) Failing to upload your response on time will be considered as Absent.
4) The result of quiz -2 will be accessible through the same link on 25/01/21 from 12 noon to 4 PM.
5) Total Marks: 30, Duration of Quiz-2: 55 minutes
ALL THE BEST !

...

Points: 28/30

1

Question
(2/2 Points)

For a two-electron system when the spatial part of the wavefunction is $\Psi_+ = [\frac{1}{\sqrt{2}}\{\Psi_a(r_1)\Psi_b(r_2) + \Psi_b(r_1)\Psi_a(r_2)\}]$, the spin-part of the wavefunction can then be written as

(A) $\frac{1}{\sqrt{2}}\{\alpha(1)\beta(2) - \beta(1)\alpha(2)\}$

(B) $\frac{1}{\sqrt{2}}\alpha(1)\beta(2)$

(C) $\frac{1}{\sqrt{2}}\{\alpha(1)\beta(2) + \beta(1)\alpha(2)\}$

(D) $\frac{1}{\sqrt{2}}\beta(1)\alpha(2)$

- A ✓
- B
- C
- D

2

2

(2/2 Points)

Determine whether TRUE (T) or False (F) and tick the correct combination

a. Octahedral neutral complexes containing $d^2$ metals with σ–only ligands
HOMO = $t_{2g}$ (non-bonding): LUMO = $e_g^*$

b. Octahedral neutral complexes containing $d^5$ metals with π–donor ligands
HOMO = $e_g^*$: LUMO = $a_{1g}^*$

c. Octahedral neutral complexes containing $d^7$ metals with π–accepting ligands
HOMO = $e_g^*$: LUMO = $a_{1g}^*$

Options:

1. FTF
2. FFT
3. TTT
4. TFT

- 1
- 2
- 3 ✓
- 4

3

Question
(1/1 Point)

In which of the option each of the organic solvents will show only ONE peak in their $^1$HNMR.

(1) Chloroform, dichloromethane, ethylacetate, benzene

(2) Dichloromethane, acetone, benzene, methanol

(3) Chloroform, dichloromethane, acetone, benzene

(4) Deuterated chloroform, dichloromethane, acetone, benzene

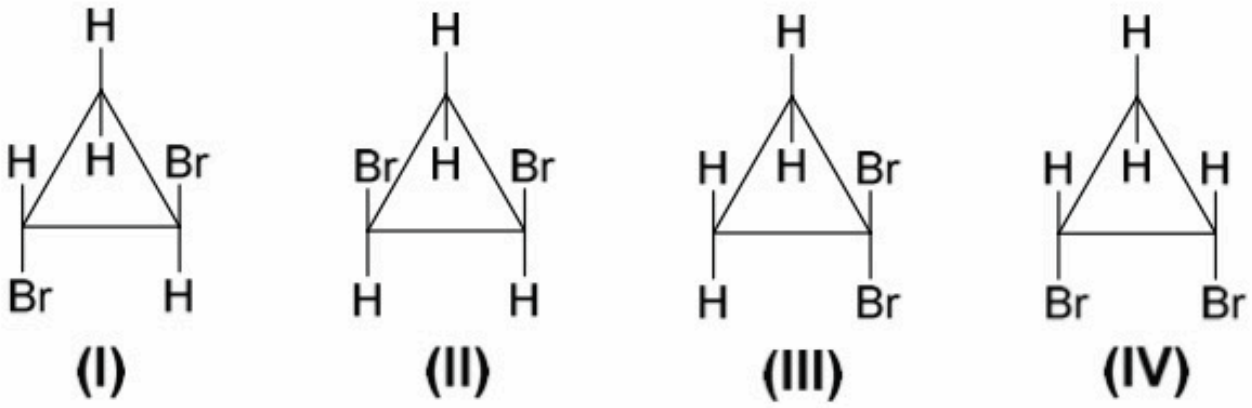
- 1
- 2
- 3 ✓
- 4

4

Question
(1/1 Point)

Number of $^{1}H$ NMR signals given by isomeric dibromcyclopropane

(I) to (IV) respectively are:




(1) 1, 3, 1 and 3

(2) 2, 3, 1 and 3

(3) 2, 3, 2 and 3

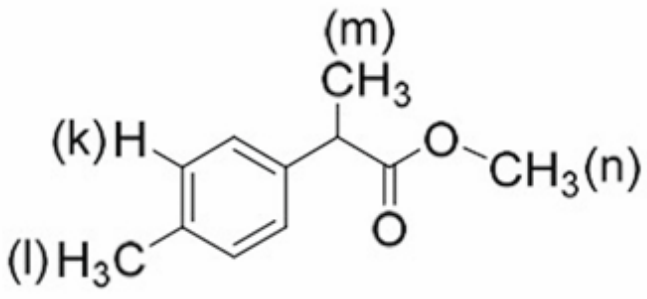
(4) 2, 3, 3 and 1

- 1
- 2 ✓
- 3
- 4

5

Question
(1/1 Point)

For the labelled protons (k, l, m, n) in the given structure, the order of increasing chemical shifts follows the trend:




**Options**

(1) $m < n < l < k$

(2) $l < m < n < k$

(3) $m < l < k < n$

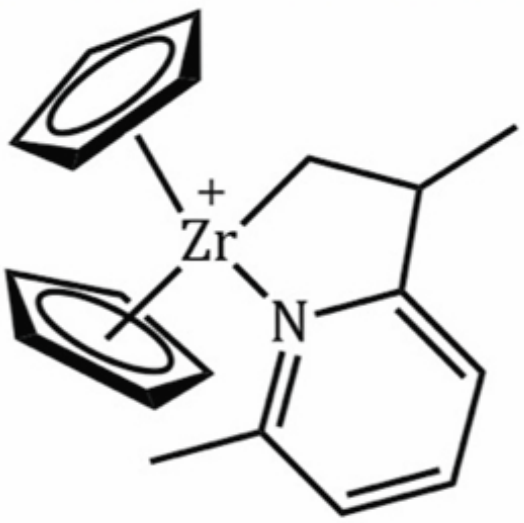
(4) $m < l < n < k$

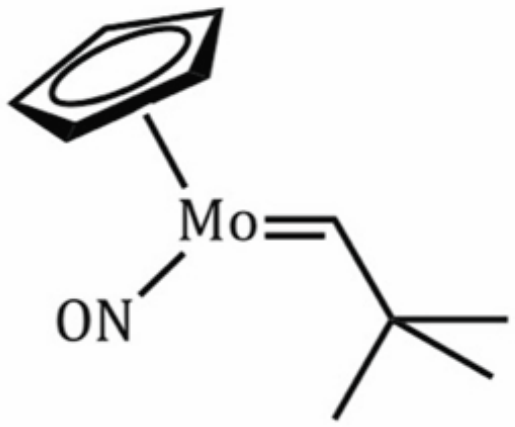
- 1
- 2
- 3
- 4 ✓

6

Question
(4/4 Points)

The correct electron-count of the following complexes are




Options:

1. 16 and 16
2. 12 and 16
3. 18 and 20
4. 18 and 18

- 1 ✓
- 2
- 3
- 4

7

Question
(2/2 Points)

Determine whether TRUE (T) or False (F) and tick the correct combination

a. In comparison with tetrahedral complexes, octahedral complexes will have absorptions at longer wavelengths and a lower molar extinction coefficient (Ɛ)
b. Transitions in both $[Mn(H_2O)_6]^{2+}$ and $[Ni(H_2O)_6]^{2+}$ cannot occur without violating "Laporte Selection rule" and the "Spin Selection Rule"
c. Molar extinction coefficient follows the trend;
   $[Mn(H_2O)_6]^{2+} < [Co(H_2O)_6]^{2+} < [CoCl_4]^{2-} < [MnO_4]^-$
d. The transitions $t_{2g} \rightarrow t_{1u}^*$ and $t_{1u} \rightarrow t_{2g}$ are Laporte Forbidden

Options:

1. FFTT
2. TTFT
3. FFTF
4. TFTF

- 1
- 2
- 3 ✓
- 4

8

Question
(1/1 Point)

In which of the following all the nuclei are NMR active?

(1) $^{2}H$, $^{10}B$, $^{15}N$, $^{19}F$, $^{31}P$

(2) $^{1}H$, $^{11}B$, $^{14}N$, $^{12}C$, $^{31}P$

(3) $^{3}H$, $^{11}B$, $^{16}O$, $^{19}F$, $^{31}P$

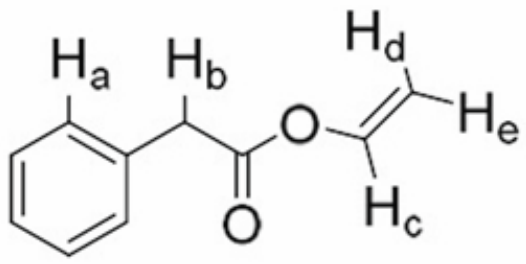
(4) $^{2}H$, $^{13}C$, $^{14}N$, $^{16}O$, $^{17}O$

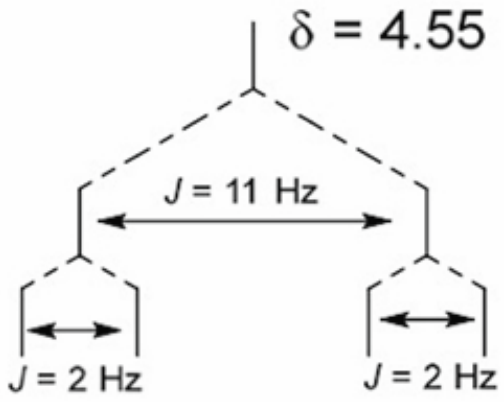
- 1 ✓
- 2
- 3
- 4

9

Question
(1/1 Point)

From the splitting tree (shown below) identify the proton in the given structure:




## Options

(1) $H_d$ proton

(2) $H_b$ proton

(3) $H_e$ proton

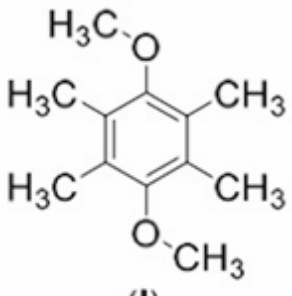
(4) $H_a$ proton

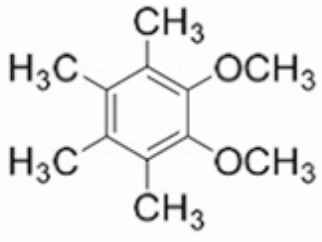
- 1
- 2
- 3 ✓
- 4

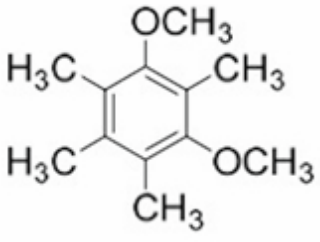
10

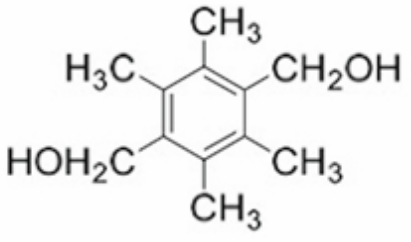
Question
(1/1 Point)

A compound having a molecular formula $C_{12}H_{18}O_2$ shows two singlets at 3.75 and 2.15 ppm in the ratio of 1:2 the correct structure of the compound is:


(I)


(II)


(III)


(IV)

- I ✓
- II
- III
- IV

11

Question
(4/4 Points)

The angle between the two hybridized orbitals $\Psi_1 = 0.45\Psi_{2s} + 0.71\Psi_{2p_y} + 0.55\Psi_{2p_z}$ and

$\Psi_1 = 0.45\Psi_{2s} - 0.71\Psi_{2p_y} + 0.55\Psi_{2p_z}$ is,

(A) $180^0$; (B) $120^0$; (C) $109^0$ or (D) $104.5^0$

- A
- B
- C
- D ✓

12

Question
(4/4 Points)

The C-H bond (harmonic oscillator) vibrational frequency is $1.44 \times 10^{13}$ Hz. The force required to stretch the C-H bond (harmonic oscillator) by 0.2 Å is:

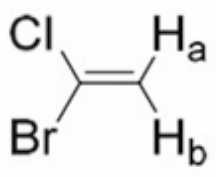
(A) 250 pN ; (B) 500 pN; (C) 250 nN or (D) 500 nN

- A ✓
- B
- C
- D

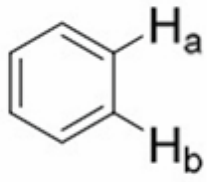
13

Question
(1/1 Point)

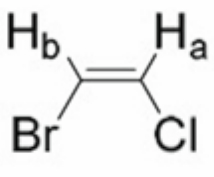
For the given protons ($H_a$ and $H_b$) the correct order of their coupling constant follows the order



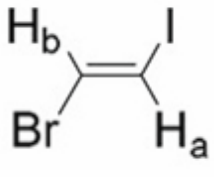

I




II




III




IV

**Options**

(1) I < II < III < IV

(2) II < I < III < IV

(3) II < I < IV < III

(4) I < II < IV < III

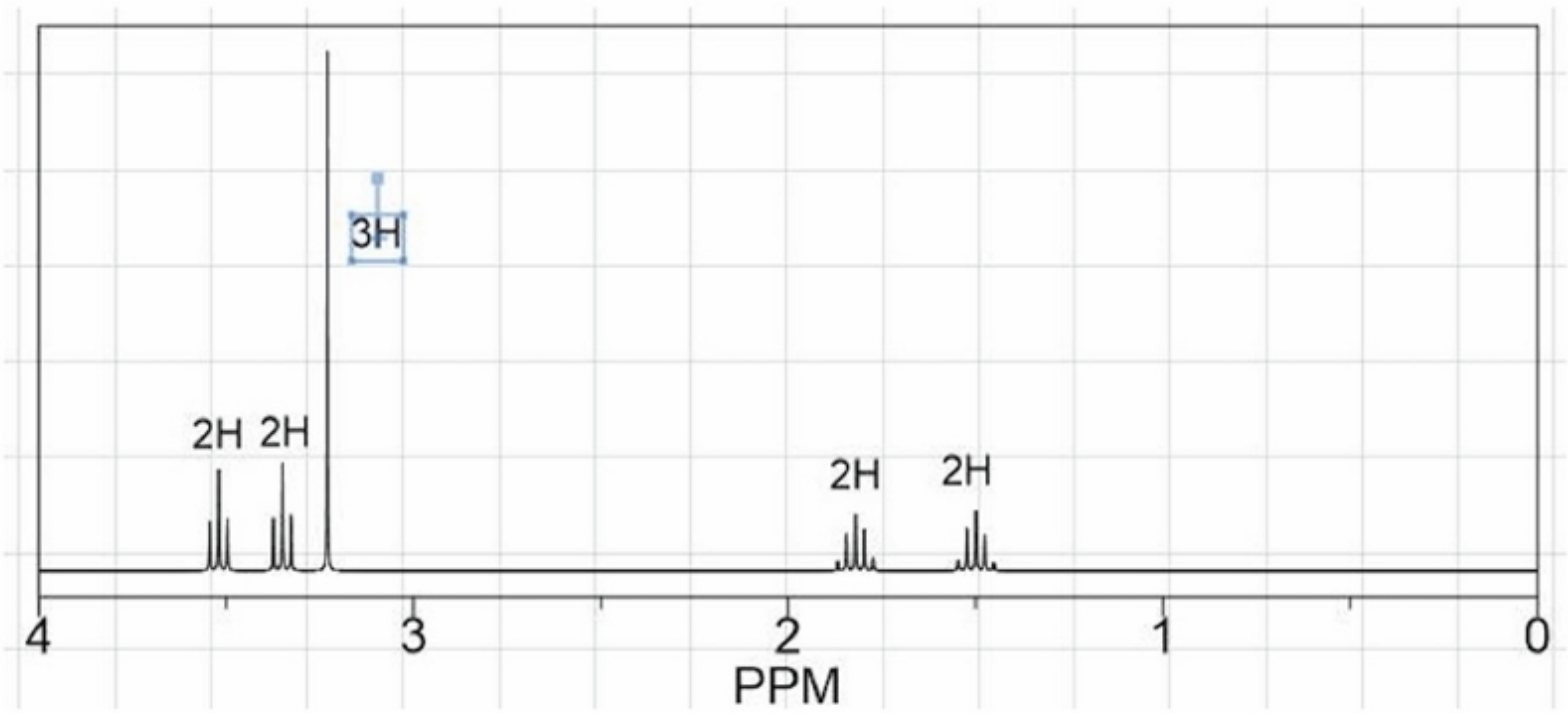
- 1 ✓
- 2
- 3
- 4

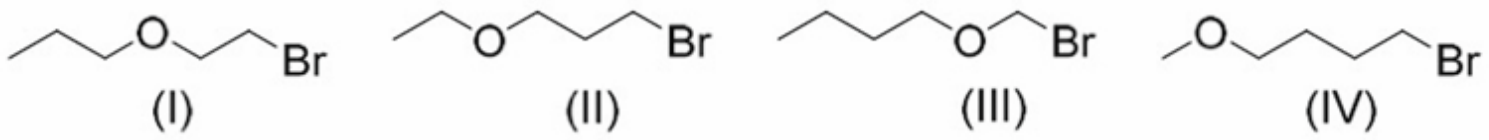
14

Question

(1/1 Point)

From the $^1$HNMR given below having a molecular formula $C_5H_{11}BrO$ the correct structure of the compound is:




- I
- II
- III
- IV ✓

15

Question

(1/1 Point)

Which of the following statements are TRUE.

(i) ΔE Depends on the operating frequency of the spectrophotometer.

(ii) $^{1}H$ and $^{2}H$ have same gyromagnetic ratio (γ).

(iii) Trimethylsilane (TMS) shows signal at δ = 0 ppm in all NMR machine.

(iv) At room temperature axial and equatorial protons shows two signals.

(v) Benzene gives a single peak in its $^{1}H$ NMR at 2.5 ppm.

**Options**

(1) (i), (ii) and (iii) only

(2) (ii), (iv) and (v) only

(3) (i) and (iii) only

(4) (i), (iii) and (v) only

1

2

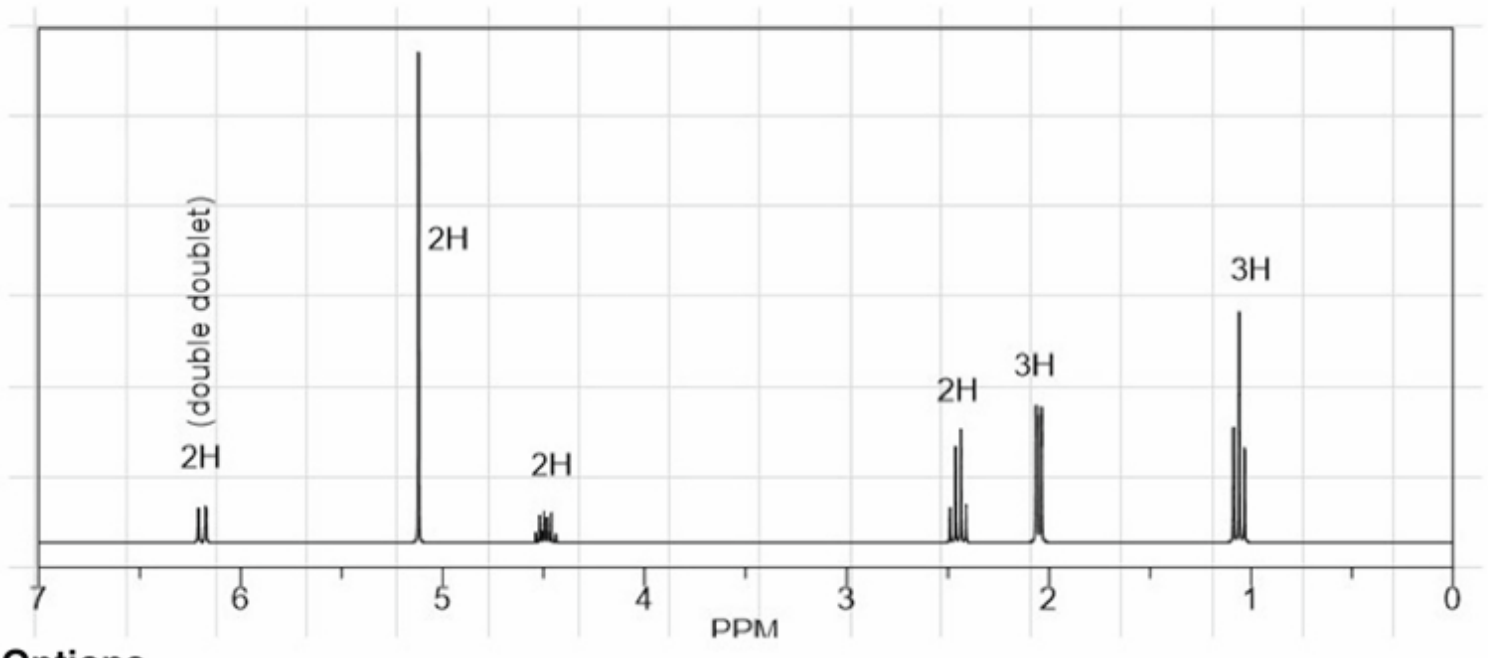
3 ✓

4

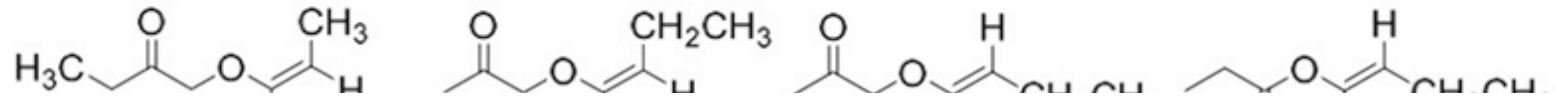
16

Question
(1/1 Point)

The $^{1}H$ NMR spectra of a compound having a molecular formula $C_7H_{12}O_2$ is given below. The correct structure of the compound is:




**Options**




- I ✓
- II
- III
- IV

17

Question
(0/2 Points)

Indicate the correct trend in the strength of *J-T* distortion

Options:

1. $d^3 = d^5$ (high-spin) $< d^7$ (high-spin) $< d^9$
2. $d^3 = d^5$ (high-spin) $>> d^7$ (high-spin) $< d^9$
3. $d^7$ (high-spin) $< d^9 < d^3 = d^5$ (high-spin)
4. $d^7$ (high-spin) $> d^9 < d^3 = d^5$ (high-spin)

- 1 ✓
- 2
- 3
- 4