

Quiz 3 for CH 101 IV

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 25/02/21 and you have to submit the answers on or before 8:55 PM on 25/02/21, 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 -3 will be accessible through the same link on 26/02/21 from 11 AM to 2 PM.
 - 5) Total Marks: 30, Duration of Quiz-3: 55 minutes
- ALL THE BEST !

...

Points: 22.5/28

1

Question
(2.5/2.5 Points)

For a molecule at room temperature ($T = 300\text{ K}$), the typical rotational transition frequency is 20 GHz and $\delta\nu/\nu = 2.5 \times 10^{-6}$; where $\delta\nu = \frac{2\nu}{c} \left(\frac{2kT \ln 2}{m} \right)^{1/2}$. The linewidth would be about

(A) 400 Hz (B) 60 GHz; (C) 50 kHz; (D) 20 MHz

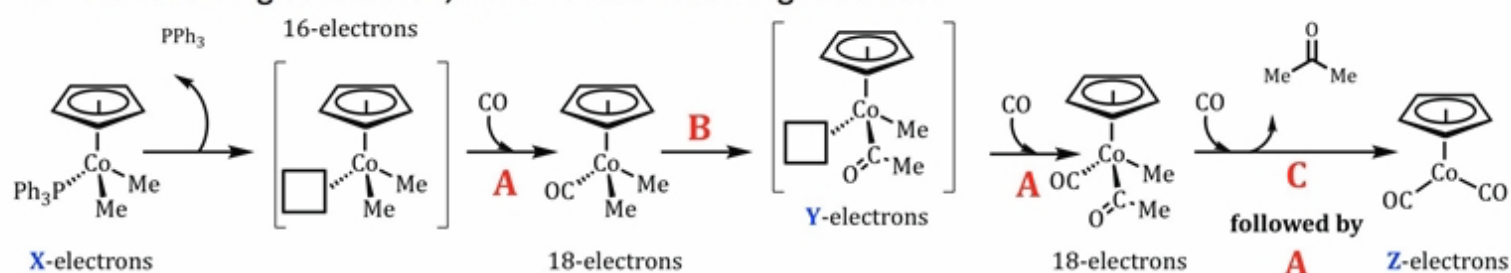
- ☐ A
- ☐ B
- ☒ C
- ☐ D

✓

2

Question
(2/2 Points)

For the following conversion, which of the following is correct



Options:

1. A = Addition, B = Reductive Elimination, C = Migratory insertion; X = Z = 18 and Y = 16
2. A = Addition, B = Migratory insertion, C = Reductive Elimination; X = 18, Y = 16 and Z = 16

3. **A** = Addition, **B** = Migratory insertion, **C** = Reductive Elimination; **X** = **Z** = 18 and **Y** = 16

4. **A** = Addition, **B** = Reductive Elimination, **C** = Migratory insertion; **X** = 18, **Y** = 16 and **Z** = 16

☐ 1

☐ 2

☒ 3

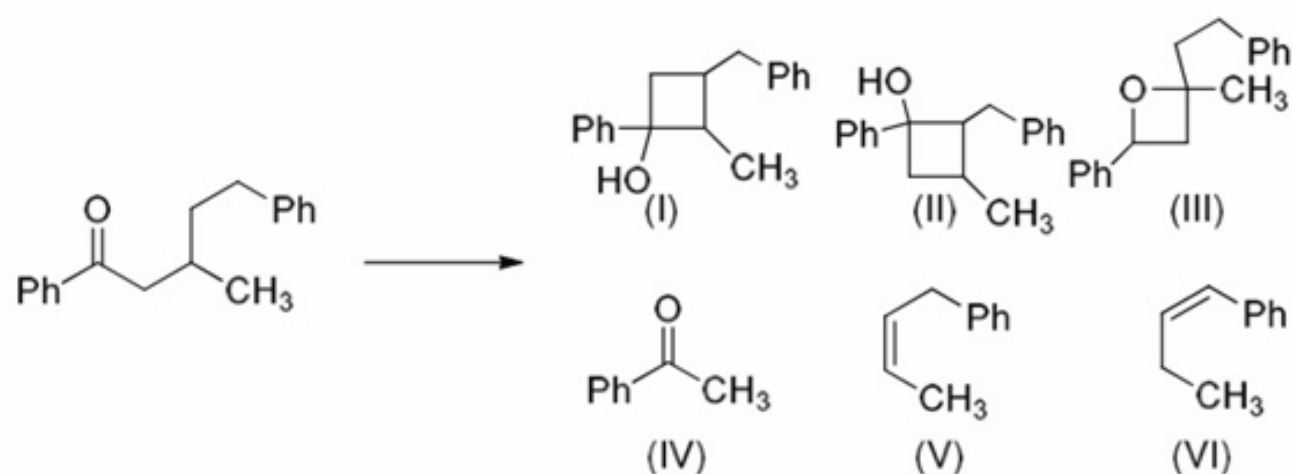
☐ 4



3

Question
(1/1 Point)

Which of the following products will be obtained via Norrish type II path



(A) (i), (iv) and (vi)

(B) (ii), (iv), and (vi)

(C) (ii), (iv) and (v)

(D) (ii), (iv) and (vi)

☐ A

☐ B

☒ C

☐ D

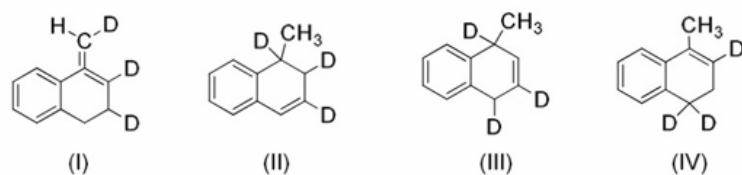


4

Question
(1/1 Point)

In the reaction given below which of the product will be obtained (Hint: not more than two Sigmatropic rearrangements).





(A) (i) and (iii)

(B) (ii) and (iii)

(C) (ii) and (iv)

(D) (i) and (iii)

☐ A

☒ B

☐ C

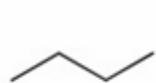
☐ D



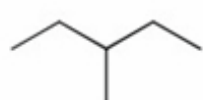
5

Question
(0/1 Point)

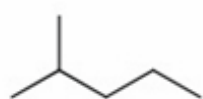
Which of the following alkanes/alkene will NOT be obtained via Norrish type I photolysis of 4-methylhexane-3-one



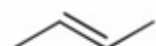
(a)



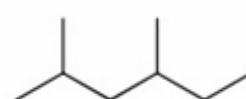
(b)



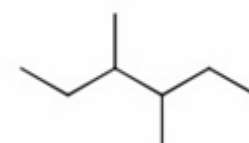
(c)



(d)



(e)



(f)

(A) (a), (c), (d) and (f)

(B) (c) and (e)

(C) (b), (c) and (e)

(D) (c), (d), (e) and (f)

☐ A

☐ B

☐ C

☐ D



6

Question
(2.5/2.5 Points)

The minimum number of energy states of the active system required for laser action and that for fluorescence are

- (A) 4(laser) and 4(fluorescence) (B) 3(laser) and 3(fluorescence)
(C) 3(laser) and 2(fluorescence) and (D) 2(laser) and 2(fluorescence)

- ☐ A
☐ B
☒ C
☐ D



7

Question
(2/2 Points)

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

- $[\text{Co}(\text{PPh}_3)_3\text{H}_2\text{Cl}]$ is less reactive than $[\text{Ir}(\text{PPh}_3)_3\text{H}_2\text{Cl}]$ towards reductive elimination of H_2
- The C—O bond in $[\text{Ag}(\text{CO})]^+$ is stronger than that in $\text{Ni}(\text{CO})_4$
- In the case of “non-electrophilic oxidative addition”, two mono anionic ligands are generated starting from a neutral ligand are *trans* to each other.
- In $[\text{Fe}(\text{CO})_4(\text{C}_3\text{H}_7)]^-$, the Fe—CO bond is very weak in comparison to Fe— C_3H_7 bond.

Options:

- FTFF
- FTTF
- TFTF
- TFTT

- ☒ 1
☐ 2
☐ 3
☐ 4

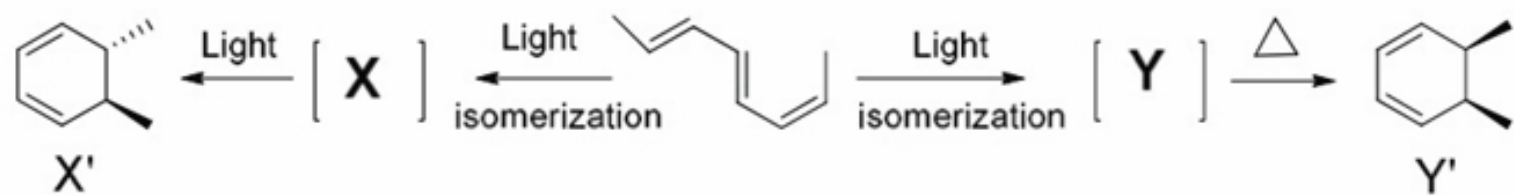


8

Question
(0/1 Point)

The correct structure of photoisomerized triene (X) and (Y) that would

lead to products (X') and (Y') under the given condition respectively are



- (A) and
- (B) and
- (C) and
- (D) and

- ☐ A
- ☒ B
- ☐ C
- ☐ D

✓

9

Question
(2/2 Points)

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

- a. The Fe-C bond of $[\text{Fe}(\text{CO})_3(\text{PPh}_2)]_2$ are weaker than those in $[\text{Fe}(\text{CO})_3(\text{PPh}_2)]_2^{2-}$
- b. The M-C bond strength follows the trend
 $\text{Mo}(\text{CO})_3(\text{PF}_3)_3 < \text{Mo}(\text{CO})_3(\text{PCl}_3)_3 < \text{Mo}(\text{CO})_3(\text{P}(\text{OMe})_3)_3 < \text{Mo}(\text{CO})_3(\text{PPh}_3)_3$
- c. The CO stretching frequency follows the trend;
 $\text{Fe}(\text{CO})_4^{2-} > \text{Ni}(\text{CO})_4 > \text{Co}(\text{CO})_4^-$

Options:

1. FFT
2. TTF
3. FFF
4. FTT

- ☐ 1
- ☒ 2
- ☐ 3
- ☐ 4

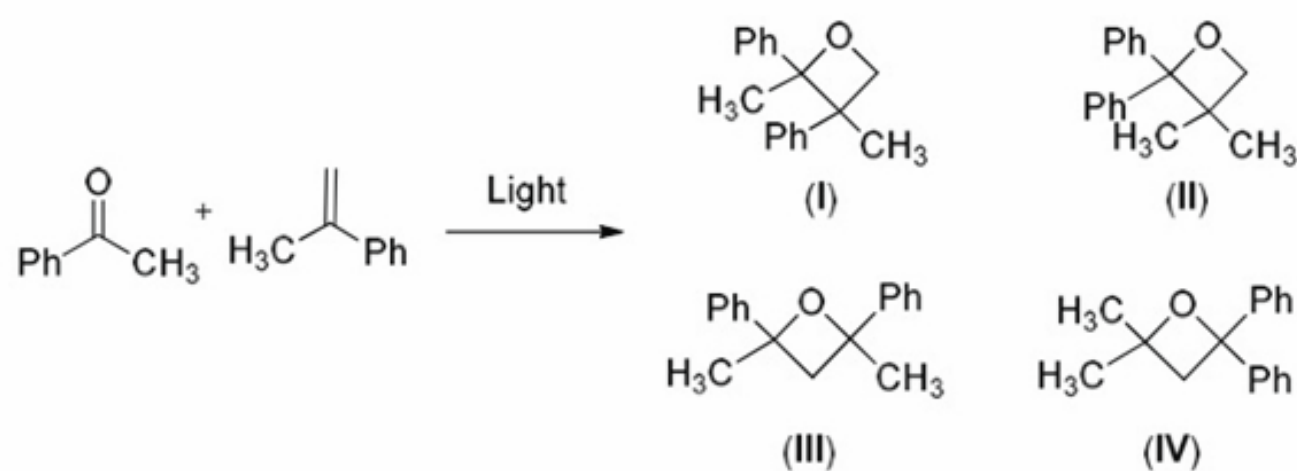
✓



10

Question
(0/1 Point)

The **minor** and **major** product obtained in the following photochemical reaction respectively are:



- (A) (II) and (IV)
- (B) (III) and (II)
- (C) (III) and (I)
- (D) (II) and (III)

- ☐ A
- ☒ B
- ☐ C
- ☐ D



11

Question
(1/1 Point)

The TRUE statements among the following are

- (i) The ground state LUMO and excited state HOMO of butadiene possess same symmetry
- (ii) *E*-azobenzene can be converted to *Z*-azobenzene by heat.
- (iii) Methylacetate will undergo Norrish type –II reaction easily
- (iv) Excited state HOMO of 1,3,5-hexatriene possess three node
- (v) When substituents are pointed in the same direction under conrotatory mode the product is cis
- (vi) S_1 to T_1 transition is called Intersystem crossing

- (A) (i), (ii), and (vi)

- (B) (ii), (iii) and (vi)
 (C) (i), (iv) and (v)
 (D) (i), (iv), (v) and (vi)

- ☐ A
☐ B
☐ C
☒ D



12

Question
 (2.5/2.5 Points)

Planck's radiation law $\rho(\nu)d\nu = \frac{8\pi h \nu^3}{c^3} \frac{1}{e^{\frac{h\nu}{kT}} - 1} d\nu$ and $\frac{N_2}{N_1} = e^{-\Delta E/kT} = e^{-h\nu/kT}$

as the Boltzmann equation. Based on the relationship between Einstein A and B coefficients, the ratio of A/B at 250 nm to that at 750 nm would be:

- (A) 1/27 (B) 27 (C) 9 Or (D) 1/9

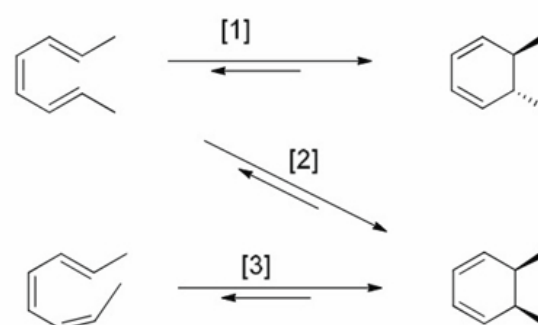
- ☐ A
☒ B
☐ C
☐ D



13

Question
 (1/1 Point)

The appropriate reaction conditions for the interconversion [1], [2] and [3] respectively are:



- (A) Thermal, Thermal, Photochemical
 (B) Photochemical, Thermal, Photochemical
 (C) Thermal, Photochemical, Photochemical
 (D) Thermal, Photochemical, Thermal

- ☐ A
☒ B
☐ C

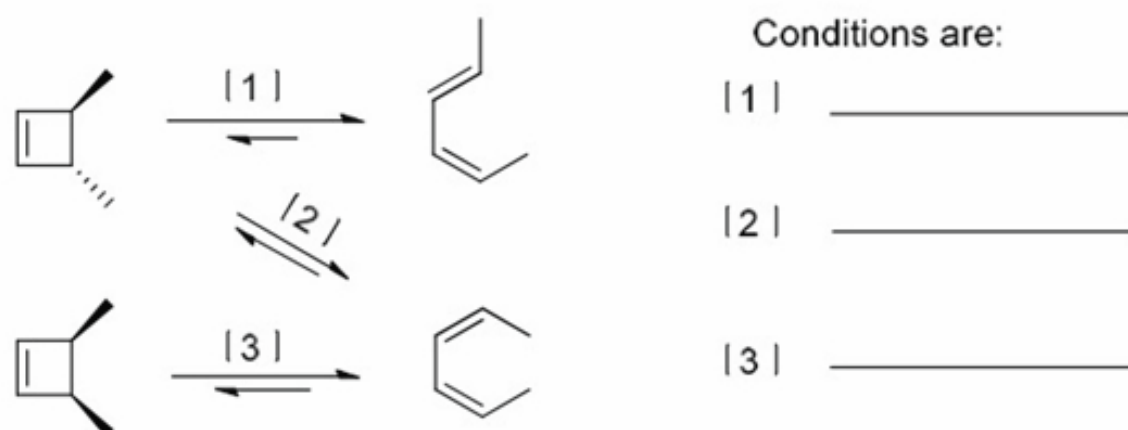


- ☐ C
- ☐ D

14

Question
(1/1 Point)

Suggest appropriate reaction conditions for the following interconversion steps [1], [2] and [3]



- (A) Thermal, Thermal, Photochemical
- (B) Photochemical, Thermal, Photochemical
- (C) Thermal, Photochemical, Thermal
- (D) Photochemical, Photochemical, Thermal

- ☐ A
- ☒ B
- ☐ C
- ☐ D



15

Question
(0/2.5 Points)

Four identical optical cuvettes are placed in parallel to each other. Each cuvette contains a liquid with volume equal to the others and with molar extinction coefficient $1.0 \text{ cm}^{-1}\text{M}^{-1}$ at 500 nm, path length of 1.0 cm and concentration of the solute being 1.0 M. Light of 500 nm wavelength is allowed to enter through the first cuvette. The percentage transmission of light at the end of the fourth cuvette would be

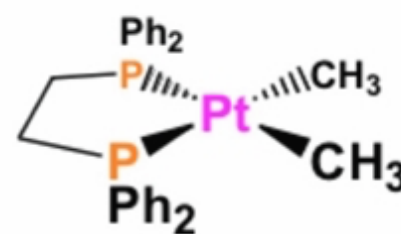
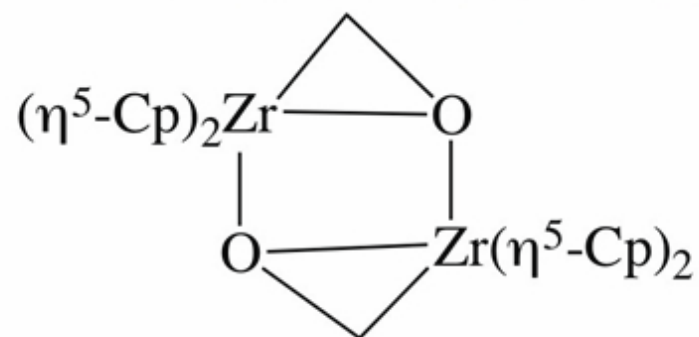
- (A) 0.01; (B) 0.1; (C) 1; (D) 10

- ☐ A
- ☒ B
- ☐ C
- ☐ D

16

Question
(2/2 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 16

- ☐ 1
- ☐ 2
- ☐ 3
- ☒ 4

17

Question
(2/2 Points)

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

- a. The compound $[\text{CpRhCO}]$ has two M–M bonds with two CO ligands bridging the same pair of Rh atoms
- b. While Linear NO is considered as a three-electron donor in the neutral counting method, the Cp^- ligand is considered as a five-electron donor in the ionic counting mode.
- c. The 16-electron rule prevails in d^8 square planar complexes
- d. $[\text{Mn}(\text{CO})_5]^- + \text{XR} \rightarrow [\text{RMn}(\text{CO})_5] + \text{X}^-$

Options:

1. FFTT
2. TTFT
3. FFTF

4. TFTP

- ☒ 1
- ☐ 2
- ☐ 3
- ☐ 4



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