



Department of Chemistry

Date: 01 November 2017; 8:00-8.45 a.m.

CH-101

QUIZ 2

Maximum Marks = 15

Name:

Division:

Signature of Invigilator:

Roll No.:

Tutorial Group:

Answer only in this sheet. Only fully correct answers will be accepted. All questions are compulsory. Rough work is mandatory

1. Given the wavefunction an electron in the 1s orbital of H-atom, $\Psi = \frac{1}{(\pi a_0^3)^{1/2}} e^{-r/a_0}$ and the radial probability density, $P(r) = 4\pi r^2 |\Psi|^2$, the most probable radius is: **2.5 Marks**

(Z)	(Y) a_0	(X)	(W)
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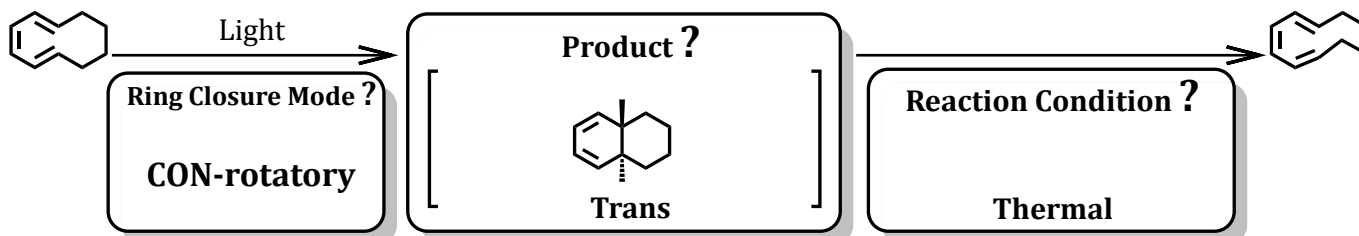
2. The two hybridized orbitals of C-atom (sp^2) are $h_1 = (1/3)^{1/2} \{s - (3/2)^{1/2}p_x - (1/2)^{1/2}p_y\}$, and $h_2 = (1/3)^{1/2} \{s + (3/2)^{1/2}p_x - (1/2)^{1/2}p_y\}$. The expression for the third orbital (h_3) would be: **2.5 Marks**

(H) $(1/3)^{1/2} \{s + 2^{1/2}p_y\}$	(G) $(1/3)^{1/2} \{s - (1/2)^{1/2}p_x - (3/2)^{1/2}p_y\}$
(E) $(1/3)^{1/2} \{s - 2^{1/2}p_x\}$	(F) $(1/3)^{1/2} \{s + (3/2)^{1/2}p_x + (1/2)^{1/2}p_y\}$

3. Identify the types of pericyclic reactions in each of the following steps and name the reaction; If it is a cycloaddition, give (x+y) designation and if it is sigmatropic, give the [i,j] designation. **2 Marks**

Reaction step	Type	Reaction step	Type
(a)	[6+4] cycloaddition	(c)	[7,7] Sigmatropic
(b)	Electrocyclic	(d)	[1,3] Sigmatropic

4. Supply the mode of ring closure, product and the reaction condition for the given transformation **1 Mark**



5. State which of the following statements are true (T) and which are false (F)

2 Marks

		T or F
(a)	A MO is bonding if the number of bonding interactions is greater than the number of nodes	T
(b)	Excited state HOMO of 1,3,5,7-octatetraene is asymmetric.	T
(c)	In an electrocyclic reaction the number of π -bonds in the product is same as that of the reactant.	F
(d)	Two thymine can dimerize only at very high temperature and pressure.	F

6. Indicate the number of valence electron on each metal complex.

(0.5 X 4) Marks

Electron Count	18	17	20	18

7. Indicate if the following exhibit Strong (S), Weak (W) or No (N) Jahn-Teller distortion (0.5 X 4) Marks

	$[\text{Fe}(\text{ox})_3]^{3-}$	$[\text{Ru}(\text{ox})_3]^{3-}$	$[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$	$[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$
Strength of Jahn-Teller distortion	N	W	S	S

8. The frontier orbitals in a simplified MO diagram for an O_h complex with σ -donor ligands is depicted below. Draw the effect of π -bonding of an iodide ligand on **these** σ -only O_h frontier orbitals **1 Mark**

