

Q. P. Code: 22572**(3 Hours)****Total Marks: 70**

- N.B.:** (1) All questions are compulsory
 (2) Answer all sub questions together
 (3) Figures to right indicate full marks

Q.1 (a) Explain the terms (Any 5)**5**

- | | |
|------------------------------------|--------------------------|
| i) Electrostatic potential surface | ii) Energy of activation |
| iii) Symmetry elements | iv) Specific base |
| v) Activated complex | vi) Field effect |

b) Fill in the blanks**5**

- i) The half life and rate constant for a first order reaction is related as---
- ii) Lewis structure for ozone is-----
- iii) Tetralkyl ammonium bromide is an example of ----- catalyst
- iv) Charge transfer complex example is -----
- v) Ground state electronic configuration for oxygen is-----

c) Match the following**5**

	Column A	Column B
i)	d_{yz}	Electrophilic catalysis
ii)	Co valence electrons (At.No.27)	Phase transfer catalyst
iii)	$AlCl_3$	sp^3 hybridization
iv)	Water	π symmetry
v)	Quaternary ammonium compounds	$3d^7 4s^2$

Q.2 a) Draw resonating structures for :

- i) $CH_2NO_2^-$ ii) CH_3COO^- **2**

b) Define: HOMO and LUMO. Draw molecular orbital diagram for molecule of your choice and show HOMO and LUMO **3**

c) What is an isotope effect? Mention its significance **3**

d) State different catalysis types and explain any one in detail **3**

Q.3 a) Indicate and list out symmetry elements of planar and pyramidal methyl. 3

b) With the help of Walsh diagram explain energies for linear and bent CH_2 **3**

c) State Eyring equation. Explain each term involved in it. **3**

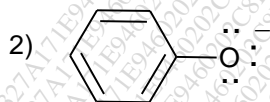
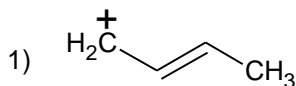
d) Calculate time required for 65% completion of a first order reaction if half life for the same is 35 min. **2**

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QP CODE:

- Q.4) a) Compare Molecular orbital theory and Valence bond theory **3**
 b) State and explain any three rules for QMOT **3**
 c) Elaborate on first order kinetics with suitable examples **3**
 d) Explain electrophilic catalysis in brief **2**

- Q.5) a) Draw the resonating structure for the given molecules **3**



- b) Explain the formation of methyl radical by molecular orbital theory **3**
 c) A plot of $\ln K$ vs $1/T$ is a straight line with a slope -1.34×10^2 . Calculate the energy of activation for the reaction (Given: $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$) **2**
 d) Give the classification of charge transfer complexes with suitable examples **3**

- Q.6a) Complete the following table on the basis of hybridization concept **3**

Molecule	Hybridization state of the underlined atom	Bond angle
<u>S</u> F ₆		
<u>B</u> F ₃		
<u>N</u> H ₃		

- b) Derive an expression for general acid catalysis and show relevant kinetic plots **4**
 c) State and explain principle of kinetic and thermodynamic control on reaction **2**
 d) 'If a reactant is more reactive it is less selective' which is this principle?
 Draw relevant energy profile diagram to explain it **2**