Sem-I CBSGS 27.03.15

Sub:- P.O.C.

QP Code : 13454

Total Marks : 70 Duration : 3Hrs

N.B.: 1. All questions are compulsory

2. Figures to right indicate full marks

Q. No.1. [A] Explain the following terms (Any five): (5)

i) Polar covalent bond.
ii) Turnover number.
iii) Equilibrium kinetics.
iv) Correlation.
v) Charge transfer complex
vi) Closed shell repulsion

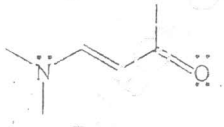
[B] Fill in the blanks (Any five): (5)

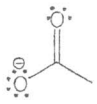
i) Ground state electronic configuration of Carbon is _____
ii) Lewis structure for nitric acid in which the central atom is bonded to all three oxygens is _____.
iii) The d_z^2 orbital has _____ symmetry along the z-axis.
iv) The rate constant of a first order reaction whose half life is 3.25 hr is _____.
v) Charge transfer complex formation usually _____ the entropy.
vi) Number of bonds between two atoms is called _____.

[C] Match the following: (5)

A	B
i) Symmetry elements in water molecule	a) Tetrahedral
ii) Valence electrons of Fe (At. No. 26)	b) π symmetry
iii) Shape of molecule with 2 bonding pairs and 2 lone pairs of electrons as per VSEPR	c) Organic charge transfer complex
iv) d_{xy} orbital	d) C_2 axis, σ_v plane of symmetry
v) Benzene-tetracyanoethene	e) $3d^6$, $4s^2$

Q. No.2. [A] Draw resonating structure for the following- (2)

i) 

ii) 

[B] Explain second order perturbation with the help of a suitable example. (3)

[C] Explain secondary isotope effect with an example. (3)

[D] Enlist different methods of catalysis. Give suitable example for each. (3)

Q. No.3. [A] Mention the symmetry operations for MH_3 system. Indicate similarity and differences between molecular orbitals of CH_3, BH_3 and NH_3 (molecular orbital diagram is not expected). (3)

[B] Justify on the basis of MOT: In an isolated water molecule in the gas phase, the lone pairs are not identical. (3)

[C] Write a note on determination of activation parameters using Eyring's plot. (3)

[D] What is half life of a reaction? Derive equation for half life of a first order reaction (2)

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WG-Con. 209-15.

Q. No.4. [A] What are similarities and differences between MOT and VBT? (3)

[B] State any three rules of QMOT. (3)

[C] Differentiate between first order and second order kinetics. (3)

[D] Discuss phase transfer catalysis with an example. (2)

Q. No.5. [A] Give reasons for the following: (3)

i) The bond angle in H_2O molecule is smaller than tetrahedral bond angles.

ii) As more chlorine atoms are attached to methane, molecular dipole decreases.

iii) C-I bonds are more reactive than C-Cl bonds in reactions like S_N2 and E2.

[B] Explain the concept of hyperconjugation using a suitable example. (3)

[C] The activation energy of a reaction is 40 KJ/mol. At 50 °C rate constant is 0.145 sec^{-1}. At what temperature will this reaction go twice as fast? (2)

[D] Give the classification of charge transfer complexes with suitable examples. (3)

Q. No.6. [A] Complete the following table on the basis of hybridization concept: (3)

Molecule	Hybridization state of the underlined atom	Molecular shape
i) $\underline{Be}Cl_2$		
ii) $\underline{C}H_4$		
iii) $\underline{Si}Br_4$		

[B] Write a note on general base catalysis. (4)

[C] Draw a reaction co-ordinate diagram for a chemical reaction with following characteristics: (2)

i) Two step exothermic reaction.

ii) Transition state of first step is more stable than transition state of second step.

[D] Explain reactivity versus selectivity principle. (2)