SIC

SEAT No._____

No. Printed pages:3

[287]

SARDAR PATEL UNIVERSITY
M.Sc. (SEMESTER-I) EXAMINATION
2017
Wednesday, 1st November
10.00 a.m. to 01.00 p.m.
CHEMISTRY: PS01CCHE01
(INORGANIC CHEMISTRY-I)

Note:-figures to the right indicate full marks. **Total marks: 70**

Q.1. Answer the following: **8**

1. Due to effect of set down operator, eigenvalue of angular momentum operator ($\hat{L}z$) is:
   a. Decrease by ħ b. Increase by ħ
   c. Remain same d. Increase by ħ/2

2. Due to distortion along y-axis, energy of the state E_{221} is decrease by:
   a. $-\frac{h^2}{ML^2}$ b. $-\frac{h^2}{ML^3}$ c. $-\frac{h^2}{4ML^2}$ d. $-\frac{h^2}{4ML^3}$

3. The boundary condition for the rotational motion of particle are:
   a. 0 to L b. 0 to π c. 0 to 2π d. - L/2 to + L/2

4. The value of associated Laguerre polynomials for n =1 and l = 0 system is:
   a. 6 b. 1 c. - 6 d. - 1

5. The expression for the fourth order perturbation energy is:
   a. $< \Psi^1 | \hat{V} | \Psi^2 >$
   b. $< \Psi^2 | \hat{V} | \Psi^2 >$
   c. $< \Psi^0 | \hat{V} | \Psi^3 >$
   d. $< \Psi^0 | \hat{V} | \Psi^4 >$

6. The value of ionization energy of helium atom in presence of repulsion energy term is:
   a. -2.75 a.u.
   b. -4.00 a.u.
   c. 2.00 a.u.
   d. 0.75 a.u

7. Which of the following symbol is used for the overlap integral?
   a. H_{AB}
   b. S_{AB}
   c. S_{AA}
   d. H_{AA}

2..

8. The value of spin multiplicity for F_2^+ molecule is:
   a. Four
   b. One
   c. Two
   d. Three

Q.2. Attempt any **SEVEN** of the following: **14**

1. What are the application of quantum mechanical tunneling?
2. Evaluate the commutator $[Z, \frac{\partial}{\partial z}]$.
3. Explain the total wave function for hydrogen like atom.
4. Derive the kinetic energy of harmonic oscillator.
5. Derive the first order perturbation energy equation.
6. Calculate the total energy of helium atom in presence and absence of repulsion energy term.(Given: 1 a.u. = 0.435×10^{-17} Js. and 1J = 6.24×10^{18} eV)
7. Explain the bonding in LiH on the basis of valence bond treatment.
8. The $\pi_u 2Px$ orbital is higher in energy than $\sigma_g 2Pz$ for the F_2 system. Explain.
9. Explain the eigenvalue equation.

Q.3.A. Show that square of angular momentum operator ($\hat{L}^2$) commute with component of angular momentum operator ($\hat{L}x$) and shift operator ($\hat{L}_+$), while component of angular momentum operator ($\hat{L}x$) does not commute with component of angular momentum operator ($\hat{L}y$) and ladder operator ($\hat{L}_+$). **6**

B. Explain the utility of particle in box model and calculate the following parameters for the butadiene molecule: **6**
1. Lowest absorption frequency in cm^{-1}.
2. Wave length of light absorbed in nm.
3. Total ground state energy in cm^{-1}.

[Given: h=6.626×10^{-34} Js., 1J = 6.24×10^{18} eV and 1 eV = 8.06×10^3 cm^{-1}. The length of the butadiene is equal to the length of carbon chain plus half the C-C bond length on either side and average C-C bond length is 0.14×10^{-7} cm^{-1}]

OR

B. Answer the following:

1. Derive the equations for Hamiltonian and angular momentum operators.
2. Derive the wave function and energy equation for a translational motion of a free particle.

Q.4.A. Answer the following: **6**
1. Derive the value of normalization factor (N) of the radial eiganfunction for n = 1, l = 0 and n = 3, l = 1 systems.
2. Derive the third degree of Hermite's polynomial.

3...

B. Answer the following: 6

1. Derive the Schrödinger equation for the vibrational motion of a particle in a one dimensional harmonic oscillator.
2. Derive the normalization factor and the characteristic of eiganfunction of a one dimensional harmonic oscillator.

OR

B. Answer the following:

1. Derive the recursion formula for the Hermite's differential equation.
2. Explain the rotational motion of particle on a sphere.

Q.5.A. Explain the Dirac notation and discuss the time independent perturbation theory for non-degenerate case. 6

B. Explain the spin-orbit interaction Derive the term symbols arising out of the coupling between an electron in d-orbital and an electron in f-orbital. 6

OR

B. Answer the following:

1. Discuss the Hatree-self consistent field methods.
2. Derive the equation for the first order correction to wave function.

Q.6.A. Discuss the Born- Oppenheimer approximation for the solution of Schrödinger equation. 6

B. Explain the MO theory of bonding for hydrogen molecule. 6

OR

B. Answer the following:

1. Explain the electronic state and term symbols for diatomic molecule. Determine the term symbols for the Be_2, N_2^+ and O_2^+ molecules.
2. Explain the bonding in HeH and He_2 molecules

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SEAT No._____

[23FA-5]

No of Printed Pages: 03

SARDAR PATEL UNIVERSITY

M.Sc. (CHEMISTRY), Semester – I, Examination

Friday, 3rd November 2017

PS01CCHE02 - ORGANIC CHEMISTRY – I

Time: 10:00 A. M. To 01:00 P. M. **Maximum Marks – 70**

Q.1 Select the correct answer from the option given below for each of the following questions. [08]
Write **ONLY ANSWERS** in the provided answer book. **[e.g. Q.1 (1)-(D)]**

(1) Which of the following alkene addition reactions occur(s) specifically in *syn* fashion?

A) dihydroxylation using OsO_4, H_2O_2 C) hydroboration

B) addition of H_2 D) A, B and C.

(2) The Markovnikoff's product, resulting from an addition reaction to an unsymmetrical alkene, is formed because:

A) the product is statistically favored. C) steric hindrance favors its formation.

B) the reaction proceeds via the more/most stable carbocation. D) the reaction forms the more/most stable product.

(3) Benzene when treated with HCl gives _____

A) p-chlorobenzene C) o-chlorobenzene

B) π-complex D) σ-complex

(4) Assertion A: Tartaric acid has two chiral carbon atoms.
Reason B: Total stereo isomers of tartaric acid = 4.

A) Both A and B are true; B is the correct explanation. C) A is true and B is false.

D) A is false and B is true.

B) Both A and B are true; B is not the correct explanation.

(5) Transition state of Cope Elimination reaction is _____.

A) less flexible and more rigid. C) flexible and more rigid.

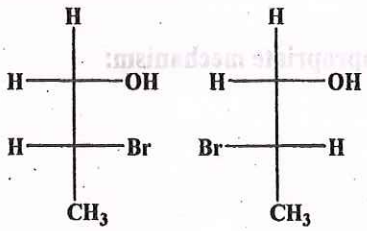
B) less flexible and less rigid. D) flexible and less rigid.

(6) Which of the following rearrangement involves carbanionic intermidates?

A) Favorskii rearrangement C) Lossen rearrangement

B) Backmann rearrangement D) All the above

(7) The molecules shown are:



A) constitutional isomers. C) diastereomers.

B) enantiomers. D) identical.

(8) Which of the following is not suitable for semi pinacol-pinacolon rearrangement?

A) β-amino alcohol C) epoxy compound

B) 1,2-diol D) allyl alcohol

Q.2 Answer **ANY SEVEN** of the following **[14]**

(a) "Orientation of addition reaction is governed by markonikoff's rule" Justify.

(b) Darzen glycidic ester condensation is chain extension reaction, explain.

(c) Discuss the importance of primary kinetic isotope effect for the mechanism of nitration of benzene.

(d) Why 2,2-dimethyl propanaldehyde cannot undergoes benzoin condensation?

(e) Explain: Apolar biprotic solvent is favorable for bimolecular elimination.

(f) Define the terms with suitable example: (1) prostereogenic center
(2) valance bond isomer

(g) Hypohalous acid is used for the halogenation of aromatic compound explain.

(h) Discuss Gatterman-Koch reaction.

(i) Draw fischer projection for 2R,3R-dichlorobutane and convert it into newmann projection via sawhorse formula.

Q.3

(a) Explain the followings:

(i) 2,3,4-trihydroxypentane exist in four different stereoisomer. **[03]**

(ii) Enantiotopic and diastereotopic ligands can co-exist. **[03]**

(b) Explain the following:

(i) Stereogenicity and chirogenisity are different properties. **[03]**

(ii) Limitation of fischer projection formula with suitable example. **[03]**

OR

(b) Answer the following as directed:

(i) Chirality descriptor in compounds with chiral axis is independent on the viewer's side. **[03]**

(ii) What is prochiral center? Assign the prochirality descriptor to the methylene hydrogen atoms in propanoic acid. **[03]**

Q.4

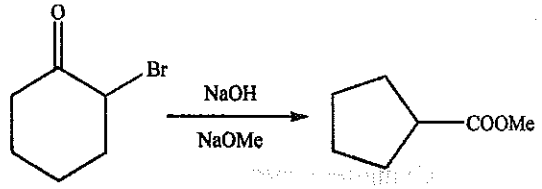
(a) Explain the following statements:

(i) Sommelete Hauser rearrangement involves 2,3-sigmatropic shift. **[03]**

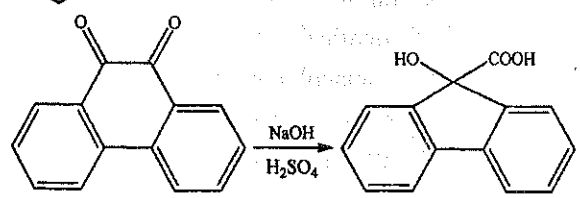
(ii) Wagner meerwein rearrangement involving hydride migration does not change the molecular skeleton. **[03]**

(b) Explain the following transformation with appropriate mechanism: **[06]**

(i)



(ii)



OR

(b)

(i) Explain: Hunsdiecker reaction is a decarboxylative halogenation reaction. [03]

(ii) Justify "Schmidt reaction is preferred for conversion of ketones to anilides over backmann reaction" [03]

Q.5

(a) Justify the following:

(i) Any crowding, irrespective of its origin, large size of base and leaving group favors Hoffman elimination. [03]

(ii) Ozonolysis of alkene involves molozonide as an intermediate. [03]

(b) Answer the followings:

(i) Give the synthesis of dimedone using 4-methyl-3-penten-2-one and diethyl malonate. [03]

(ii) Discuss the factor favoring E1 mechanism. [03]

OR

(b) Explain the followings:

(i) Shows that hydroxylation of alkene using per acid is a stereo-specific reaction. [03]

(ii) Rate of dehalogenation can be determined by the steric effect experienced in the transition state. [03]

Q.6

(a) Answer the following as directed:

(i) *Ortho-* and *para-* product will be the product of kinetic control; upon electrophilic attack on phenol. [03]

(ii) Why diazonium salt is taken in slightly acidic medium while phenol is in alkaline medium? [03]

(b) Explain the followings:

(i) Pyridine hardly undergoes electrophilic attack at position 3. [03]

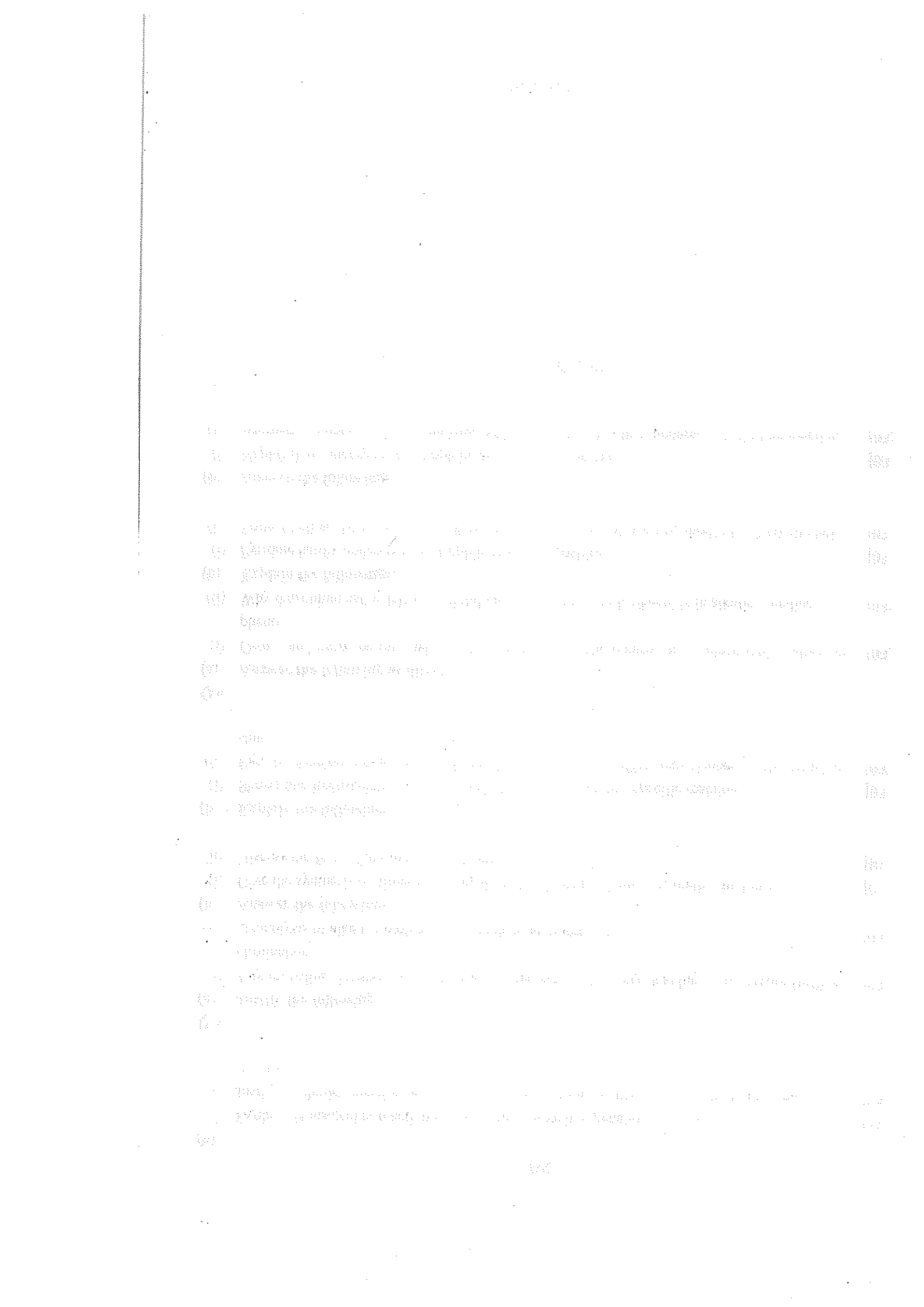
(ii) Fridel Craft acylation is more preferred for the alkylation of benzene than Fridel Craft alkylation [03]

OR

(b) Answer the followings:

(i) Naphthalene undergoes electrophilic attack at position one. [03]

(ii) Aromatic compounds do not undergo addition reaction but they undergo substitution reaction. [03]



5.2

SEAT NO._____

No of Printed Pages: 02

[829A25]

SARDAR PATEL UNIVERSITY

M.Sc.- Chemistry, (First Semester)

Sub: Physical Chemistry-I, PS01CCHE03

Tuesday, 7th November, 2017

Time: 10:00A.M. To 1: 00 P.M.

Total Marks: 70

Que. 1		**Choose appropriate answer of the followings**	**08**
1		At low pressure, the value of PV for any gas is a linear function of its, (a) Pressure (b) Volume (c) Temperature (d) None of theses	
2		The energy of an ideal gas depends only on its (a) Temperature (b) Pressure (c) Volume (d) none of these	
3		If the reaction condition is such that $J_a > k$ then (a) reaction will not occur (b) reaction is spontaneous (c) ΔF is negative (d) both (b) and (c)	
4		In chemical equilibrium (a) temperature is same throughout the system (b) composition does not change with time (c) pressure is same through the system (d) All	
5		Freezing point and melting point, both depend on (a) molar volume (b) external pressure (c) latent heat constant (d) temperature	
6		Which one of the following is not an intensive property? (a) Temperature (b) Density (c) Specific volume (d) Enthalpy	
7		The ionic molality of sodium ion in 0.5 m NaHCO3 is (a) 1.0 (b) 0.25 (c) 0.5 (d) 0.75	
8		Which of the following have minimum freezing point. (a) 1 molal NaCl (b) 1 molal KCl (c) 1 molal $CaCl_2$ (d) 1 molal urea	
Que.2		Attempt any **SEVEN**	**14**
1		Explain fugacity of solids and liquids?	
2		Explain any one conformation of third law of thermodynamics?	
3		Define the terms: Fugacity and Pressure	
4		Write thermodynamic significances of partial molar properties?	
5		Show difference between partial molar property and apparent molar property.	
6		State applications of free energy function.	
7		Show that mixing of two liquids which yield a system exhibiting positive deviation from Raoult's law there is absorption of heat?	
8		Derive an expression for mean ionic activity coefficient.	
9		State ideal form of Henry's law.	
Que. 3	**(A)**	Discuss in detail about the graphical method for determination of fugacity of real gases.	**06**
	(B)	Discuss the Lewis Randall rule for determination of fugacity of a gas in gaseous mixture.	**06**

OR

(1)

(P.T.O.)

	(B)	The fugacity of NH_3 gas at 200^0C & 100 atm is 82.2 atm. Find out fugacity for NH_3 gas at 225^0C & 100 atm pressures. (Given ΔH= 621 cal/mole)	06
Que.4	(A)	Derive the equation for the partition function for a chemical reaction.	06
	(B)	What is meant by metathetic reaction? Derive the value of equilibrium constant for such a reaction.	06
		OR	
	(B)	Derive an expression for the standard free energy of formation of 1 mole of ammonia as a function of temperature and evaluate value of ΔF^0 at 25^0C. ΔH_0^0 = -9130 cal., I' = 12.07	06
Que.5	(A)	Determine activity of solvent in a solution from osmotic pressure method.	06
	(B)	Derive the precise and approximate forms of Duhem-Margules equation. How are they differ from each other and write its applications.	06
		OR	
	(B)	Determine activity of solvent in a solution from freezing point method.	06
Que.6	(A)	Explain relation between apparent molar property and partial molar property for the case of infinitely dilute solution?	06
	(B)	Write note on: Isopiestic method	06
		OR	
	(B)	Derive fundamental equations of partial molar properties.	06

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SEAT No._____

[297]

No. Printed pages:3

SARDAR PATEL UNIVERSITY
M.Sc. (SEMESTER-I) EXAMINATION
2017
Wednesday, 1st November
10.00 a.m. to 01.00 p.m.
CHEMISTRY: PS01CCHE21
(Electronic spectroscopy and Magneto chemistry)

Note:-figures to the right indicate full marks. **Total marks: 70**

Q.1. Answer the following: **[8]**

1. For $M_L = 2$ and $M_S = 1$ system, the ground state term is:
   a. $^3D_1$
   b. $^3F_2$
   c. $^3F_1$
   d. $^3D_2$
2. According to molecular orbital diagram, the number of non-bonding electrons in $[Co(F)_6]^{3-}$ complex is:
   a. Two
   b. Zero
   c. Four
   d. Three
3. The ground state of $[Cr(CN)_6]^{4-}$ complex is:
   a. $^3T_{2g}$
   b. ^3E_g
   c. $^3A_{1g}$
   d. $^3T_{1g}$
4. Arrange the following term in decreasing order of the energy:

   (i). ^4F
   (ii). ^4G
   (iii). ^3I
   (iv). ^2H
   a. (iv) > (iii) > (ii) > (i)
   b. (iii) > (i) > (iv) > (ii)
   c. (ii) > (iv) > (i) > (iii)
   d. (ii) > (i) > (iii) > (iv)
5. Which of the following compounds exhibits highest magnetic property?
   a. Paramagnetic
   b. Antiferromagnetic
   c. Ferromagnetic
   d. Ferrimagnetic

6. The canting angle is:
   a 0 to 15^0
   b. 0 to 60^0
   c. 0 to 90^0
   d. 0 to 180^0

2....

7. The correct order of effective magnetic moment value of the following coordination compounds is :
(i) $[Co(CN)_6]^{4-}$ (ii) $[Co(NH_3)_6]^{3+}$ (iii) $[Co(H_2O)_6]^{3+}$ (iv) $[V(NH_3)_6]^{3+}$

a. i < ii < iii < iv
b. iv < iii < ii < i
c. ii < iv < i < iii
d. iii< iv < i < ii

8. The CFSE for $[Mn(CN)_6]^{3-}$ is:
a. zero Dq
b. 20 Dq+ 2p
c. 16 Dq
d. 16 Dq +p

Q.2. Attempt any **SEVEN** of the following: **[14]**

1. Define the microstate and calculate the number of microstate for $K_4[Fe(NCS)_6]$ complex.
2. The term symbols for $K_4[Fe(SCN)_6]$ and $K_3[Mn(SCN)_6]$ are ^5D. Explain.
3. Give the crystal field terms for ^3P, ^1F, ^3I and ^3G.
4. Determine the M_L, M_S and term symbols of the $(3^+,3^+)$ and $(2^-,2^-)$ microstates.
5. Explain the structure of copper acetate monohydrate.
6. Explain that $K_4(Ru_2OCl_{10})$ is diamagnetic.
7. Calculate the electron exchange energy for high-spin d^4 to d^7- configurations.
8. Calculate the number of pair of parallel spin for low-spin d^4 to d^7 -configurations.
9. Calculate the 'g' value for Dy(III)(Z= 66) and Cf(III)(Z = 98).

Q.3.A. Answer the following: **[6]**

1. Explain the splitting of d-orbitals in $[Pt(NH_3)_2(Cl)_2]$ complex.
2. Differentiate the splitting of d-orbitals in octahedral field and tetrahedral field.

B. Answer the following: **[6]**

1. Differentiate spectrochemical series and Nephelauxetic series.
2. Explain the structure of $[Cr(CN)_6]^{4-}$ and $[Cr(H_2O)_6]^{2+}$ complexes.

OR

B. Derive the terms arising out of f^2-configuration and indicate the order of increasing energy of these terms.

3...

Q.4.A. Answer the following: **[6]**

1. Draw and explain the Orgel for $[Co(NH_3)_6]\cdot Cl_2$ complex.
2. Draw and explain the TS-diagram for $[Fe(NH_3)_6]^{2+}$ complex.

B. Draw and explain the correlation diagram for $[V(edta)]^-$ complex. **[6]**

OR

B. Explain the Laporte and spin selection rules giving suitable examples. Calculate Nephelauxetic ratio, Racah parameter, covalent character, ionic character and crystal field splitting energy for the $[V(NH_3)_6]^{3+}$ complex. Given: ν_1 = 17,200 cm^{-1} and ν_2 = 25,600 cm^{-1} and B_0 for V(III) = 860 cm^{-1}.

Q.5.A. Derive the equation for diamagnetic susceptibility. **[6]**

B. Answer the following: **[6]**

1. Find out the diamagnetic correction for 1,10-phenanthroline and ethylenediaminetetraacetic acid. Given: $\chi_A \rightarrow C = -6.0 \times 10^{-6}$ cgs units, $H = -2.93\times10^{-6}$ cgs units, $O = -4.61\times10^{-6}$ cgs units, $O_2 = -7.95\times10^{-6}$ cgs units, $N_{(Open\ chain)} = -5.57 \times 10^{-6}$ cgs units and $N_{(ring)} = -4.61 \times 10^{-6}$ cgs units. $\lambda \rightarrow C = -0.24\times10^{-6}$ cgs units and $C{=}N = +8.15\times10^{-6}$ cgs units.
2. Derive the equation for the multiplate width comparable to thermal energy.

OR

B. Derive the equation for the multiplate width larger than thermal energy.

Q.6.A. Which of the following complexes exhibit orbital contribution? Why? **[6]**
1. $[Cr(CN)_6]^{4-}$, 2. $[Co(NH_3)_6]^{3+}$, 3. $[Co(NH_3)_6]^{2+}$,
4. $[Ni(Ox)_3]^{4-}$, 5. $[Ti(SCN)_6]^{4-}$, 6. $[MnF_6]^{4-}$.

B. Answer the following: **[6]**

1. Explain the spin- orbit coupling on A and E-terms.
2. Discuss the role of shift reagent in NMR spectroscopy giving suitable examples.

OR

B. Answer the following:

1. Derive the **L, S, J, g,** μ_J and term symbols for Nd(III)(Z= 60), Eu(III)(Z= 63), Tb(III)(Z= 65), Am(III)(Z= 95), Bk(III)(Z= 97) and Ac(III)(Z= 89).
2. Discuss the spin paring in non-octahedral complexes.

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SEAT No._____ [24]

No of Printed Pages: 04

SARDAR PATEL UNIVERSITY

M.Sc. (CHEMISTRY), Semester – I, Examination

Friday, 3rd November 2017

PS01CCHE22 - ORGANIC CHEMISTRY–I

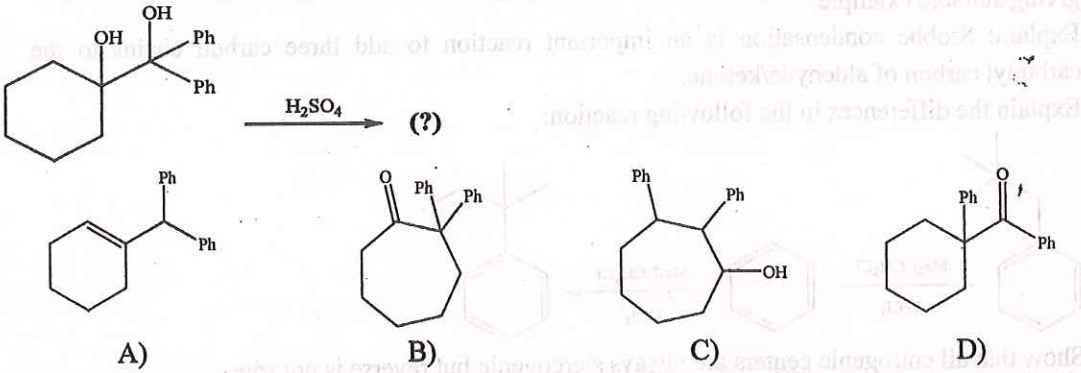
Time: 10:00 A.M. To 01:00 P.M. **Maximum Marks–70**

Q.1 Select the correct answer from the option given below for each of the following questions. **[08]**
Write **ONLY ANSWERS** in the provided answer book. **[e.g. Q.1 (1)-(D)]**

(1) **Assertion A:** Hypo-halous acid in presence of acid is used as a reagent for halogenation in benzene and derivatives.
Reason B: This is an example of electrophilic aromatic substitution.
A) Both A and B are true; B is the correct explanation.
B) Both A and B are true; B is not the correct explanation.
C) A is true and B is false.
D) A is false and B is true.

(2) Which of the following statements applies to the E2 mechanism?
A) It is occurs with the inversion of stereochemistry.
B) It proceeds through the more stable carbocation intermediate.
C) The C-H and C-Y bonds that break must be anti.
D) Use of bulky base gives the more highly substituted alkene product.

(3)



A) B) C) D)

(4) Which of the following compound is least reactive towards nucleophilic substitution reaction?
A) 1-chloro-2,4-dinitrobenzene
B) 1-chloro-2,4-dimethoxybenzene
C) 1-chloro-2,4-dimethylbenzene
D) 1,4-dichlorobenzene

(5) The regioselectivity and stereospecificity in the hydroboration-oxidation of an alkene is best described as:
A) Anti-Markovnikov orientation with anti-addition.
B) Anti-Markovnikov orientation with syn-addition.
C) Markovnikov orientation with anti-addition.
D) Markovnikov orientation with both syn- and anti-addition.

(6) Phenol ester is converted into ortho- or para-acylphenol in presence of lewis acid using _____.
A) Fries rearrangement
B) Wolff rearrangement
C) Lossen rearrangement
D) Steven rearrangement

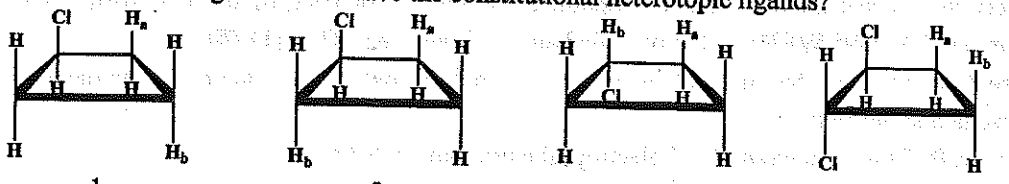
(7) The correct statements about the compound $H_3C(OH)HC\text{-}CH{=}CH\text{-}CH_3$ (X) are
1) The total number of stereoisomer possible for X is 4.
2) Total number of diastereomers possible for X is 3.

3) If the stereochemistry about the double bond in X is *trance*, the number of enantiomers possible for X is 4.

4) If the stereochemistry about the double bond in X is *cis*, the number of enantiomers possible for X is 2.

Option: A) 1 & 2 B) 2 & 3 C) 3 & 4 D) 1 & 4

(8) Which of the following molecules have the constitutional heterotopic ligands?



1 2 3 4

Option: (A) 1 & 2 (B) 3 & 4 (C) 2 & 4 (D) 1 & 3

Q.2 Answer **ANY SEVEN** of the following **[14]**

(a) Explain: Hydrobromination of ethene is faster than bromoethene.

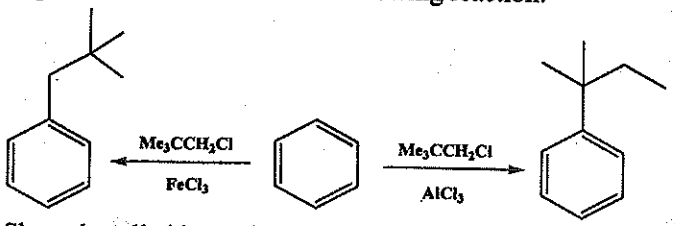
(b) Why formaldehyde does not give the product of knoevenagel condensation with diethylmalonate or diethylamine?

(c) Shows that nitration of phenol involves nitrosation reaction.

(d) What are the symmetry criteria to differentiate homotopic and enantiotopic faces? Explain it by giving suitable example.

(e) Explain: Stobbe condensation is an important reaction to add three carbon chains to the carbonyl carbon of aldehyde/ketone.

(f) Explain the differences in the following reaction:



(g) Show that all chirogenic centers are always stereogenic but reverse is not true.

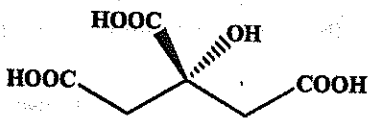
(h) "Stability of carbanionic intermediate is the governing factor for the nucleophilic addition to alkene" Justify.

(i) *Trans*-cyclooctene is chiral explain.

Q.3

(a)

(i) How many prochiral centers existing in the following molecule? Find out the topic relationship between them. **[03]**



(ii) What is psuedoasymmetric center? Draw all possible stereoisomer of 1,2,3,4,5-pentahydroxypentane and assign the chirality descriptor to all. **[03]**

(b) Answer the following:

(i) Justify that diastereotopicity does not depends on the chirality of the molecule. **[03]**

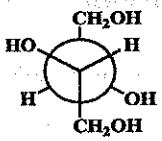
(ii) Give the steps to determine chirality descriptor to the compound having chiral plane by citing suitable example. [03]

OR

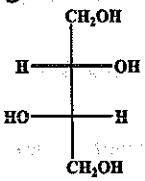
(b) Answer the following as directed:

(i) Discuss Klyne Prelog terminology by citing the example of erythro-3-bromo-2-butanol. [03]

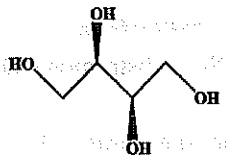
(ii) What is the relationship between following molecules? [03]



[I]



[II]



[III]

Q.4

(a) Answer the followings:

(i) Discuss the effect of base strength on the stereochemical outcome of cross aldol reaction between 2-pentanone and benzaldehyde. [03]

(ii) Give the mechanism for synthesis of 2-phenyl acetaldehyde from benzaldehyde by darzen condensation. [03]

(b) Explain the following statements:

(i) Photochmical wolff rearrangement involves carbene as an intermediate. [03]

(ii) Favorskii rearrangement involves cyclopropane as an intermediate. [03]

OR

(b) Suggest the appropriate mechanism for the following transformation. [06]

(i) Cyclohexanone $\xrightarrow[\text{ii) } H_2SO_4]{\text{i) } NH_2OH}$ Caprolactam

(ii) 2-(aminomethyl)cyclohexanol $\xrightarrow[\text{Room temprature}]{HNO_2}$ cycloheptanone

(iii) cyclohexane-1,2-dione $\xrightarrow{NaOH}$ 1-hydroxycyclopentanecarboxylic acid

Q.5

(a) Answer the following as directed:

(i) How chugaev reaction is useful to prepare 3,3-dimethyl-1-butene from 3,3-dimethyl-2-butanol? [03]

(ii) What is the stereoelectronic requirement for dehydrohalogenation of cyclic halide? Explain it by giving an example of Neo-menthyl chloride and menthyl chloride. [03]

(b) Answer the followings:

(i) Give the evidences for the following facts of halogenation of alkene. [03]

(a) It is a non-concerted and anti-stereoselective process.

(b) It involves the formation of cyclichalonium ion.

(ii) What is cyano-ethylation reaction? Give its importance in organic chemistry. [03]

OR

(b) Answer the followings:

(i) Shows that hydroxylation of alkene by RCO_3H is anti-stereoslective. [03]

(ii) Which isomer would have the faster rate in the following reaction? Why? [03]
Threo & *Erythro*-1-bromo-1,2-diphenylpropane are subjected to base induced dehydrobromination reaction.

Q.6

(a) Give the evidences for the followings:

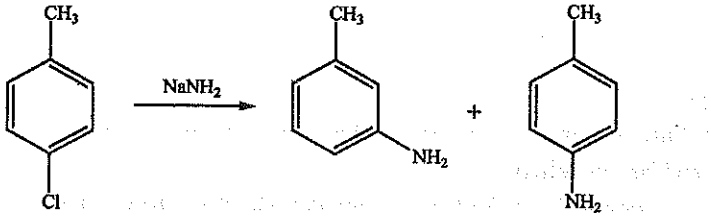
(i) Neucleophlilc aromatic substitution of an activated aryl halide is not a concerted process. [03]

(ii) Diazo-amino compound is converted into amino-azo compound by heating in presence of acid. [03]

(b) Answer the followings:

(i) What is IPSO substitution? Discuss the factors that affect the IPSO substitution with suitable example. [03]

(ii) Suggest the mechanism for the following reaction and explain why unexpected product obtained in a major yield? [03]



(62%)- unexpacted product (38%)-expacted product

OR

(b) Explain the following statement:

(i) Benezene does not give the addition product upon reaction with $HCl/AlCl_3$ but it undergoes substitution reaction. [03]

(ii) Pyridine undergoes electrophilic aromatic substitution at position number 3 [03]

8C

SEAT No._____

[83]

No of Printed Pages: 02

SARDAR PATEL UNIVERSITY

M.Sc.- Chemistry, (First Semester)

Sub: Topics in Physical Chemistry- I, PS01CCHE23

Tuesday, 7th November, 2017

Time: 10:00A.M. To 1: 00 P.M.

Que. 1 **Choose an appropriate answer of the followings** **08**

1 The term: $(\partial G/\partial n_i)_{T,P,ni---nj}$, is equal to

(a) Chemical Potential (b) Partial molar free energy

(c) Both (a) and (b) (d) Partial molar volume

2 The energy of an ideal gas depends only on its

(a) Temperature (b) Pressure (c) Volume (d) none of these

3 Which of the following is a first order reaction

(a) $2NO + O_2 \rightarrow 2NO_2$ (b) $2HI \rightarrow H_2 + I_2$

(c) $2NO_2 \rightarrow 2NO + O_2$ (d) $NH_4NO_2 \rightarrow N_2 + 2H_2O$

4 Value of velocity constant for first order reaction is 3.46×10^{-3} min^{-1}, the time for half change is

(a) 200 minutes (b) 400 minutes (c) 100 minutes (d) 346 minutes

5 Which of the following forms a colloidal solution in water

(a) NaCl (b) Starch (c) Glucose (d) Barium nitrate

6 The surface tension of which of the following liquid is maximum

(a) C_6H_6 (b) CH_3OH (c) C_2H_5OH (d) H_2O

7 Corrosion is basically a

(a) Electrochemical Phenomenon

(b) Union between light metal and heavy metal

(c) Interaction (d) Altered reaction in presence of H_2O

8 If the system is a closed one, the statement of the combined first and second laws of thermodynamics is.

(a) $H = E + PV$ (b) $dU = TdS - W$

(c) $\Delta H = \Delta E + P\Delta V$ (d) $S = k\ln W$

Que.2 Attempt any **SEVEN** **14**

1 Explain relation between fugacity and relative fugacity?

2 What is the thermodynamic significance of the partial molar properties?

3 Write factors affecting rate of chemical reaction?

4 Give difference between rate of reaction and rate constant

5 Discuss electro capillary curve versus applied potential.

6 Explain ion-solvent interaction at the electrified interface?

7 Explain electrophoresis?

8 Why water wets the glass surface, explain by using capillary action?

9 Define micelle and critical micelle concentration (CMC).

Que. 3 **(A)** Discuss in details about the Equation of State method for determination of fugacity of a real gases. **06**

(B) Calculate fugacity of 1 mole of methane gas at 50^0C and 400 atmosphere pressure. Given the integral value $\int_0^p (V - RT/p)dp$, **03**

evaluate graphically is -17.27.

	(B)	Explain activity coefficients and ionic strength according to Debye-Huckel theory?	03

OR

	(B)	Determine activity of solvent in a solution from osmotic pressure method.	06
Que.4	(A)	Why unimolecular reaction becomes first order at higher pressure and second order at lower pressure? Explain?	06
	(B)	A reaction follows the first order reaction rate law. The rate constant of the reaction is 8.2×10^{-4} min^{-1} at 45^0C. Calculate the time for (i) the reaction to decrease the concentration reactant from 0.02M to 0.008M. (ii) 75 % reaction (iii) half reaction.	06

OR

	(B)	Derive an integrated rate law for first order reaction by taking suitable example.	03
	(B)	The rate of reaction becomes three fold while increasing the temperature from 27^0C to 37^0C. Calculate the activation energy of reaction in kilocalories.	03
Que.5	(A)	Derive an expression for the fundamental equation of thermodynamics of electrified interface equation.	06
	(B)	Discuss exchange current density and also derive a Tafel equation for anodic and cathodic polarization.	06

OR

	(B)	Discuss the Stern Model for electrified interfaces.	06
Que.6	(A)	What is surfactant? Give classification of surfactant? Give two – two examples of its trade name and structure name.	06
	(B)	Derive the Laplace equation for spherical interface.	06

OR

	(B)	Discuss in detail about capillary action. Why mercury does not wets the glass surface, explain?	06

BEST OF LUCK

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[97/A29]

No. of Printed pages: 03

SARDAR PATEL UNIVERSITY

M.Sc. (Semester-I) (NC) Examination

Thursday, 9th November, 2017

Course No.: PS01ECHE01, Polymer Chemistry-I

10:00 AM to 1:00 PM

Total Marks : 70

Q-1 Answer the following: 08

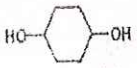
(i) Phenol-Formaldehyde Resin is called as
(a) araldite
(b) nylon
(c) epoxy
(d) bakelite

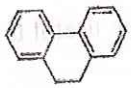
(ii) Number average molecular weight can be measured by
(a) elevation in boiling point
(b) depression in freezing point
(c) end group analysis
(d) all of the above

(iii) The degree of polymerization and kinetic chain length are
(a) Interdependent
(b) Independent
(c) Inversely proportional to each other
(d) proportional to each other

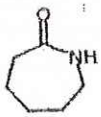
(iv) Coordination polymerization is also known as
(a) polycondesation polymerization
(b) melt condensation polymerization
(c) insertion polymerization
(d) interfacial polymerization

(v) Which of the following molecule undergo ring opening polymerization?

(a) 

(b) 

(c) $CH_2 = CHNH_2$

(d) 

(P.T.O)

(vi) When _____, the copolymer formed will be richer in M_2.
(a) $r_1 > 1, r_2 < 1$
(b) $r_1 < 1, r_2 > 1$
(c) $r_1 = 1, r_2 = 0$
(d) $r_1 = r_2 = 1$

(vii) Why does heat dissipation in bulk polymerization becomes progressively difficult with high conversations?
(a) increase in medium viscosity
(b) precipitation of polymer in the monomer
(c) solubilization of polymer in the monomer
(d) all of the mentioned

(viii) Expandable polystyrene beads are prepared by
(a) solution polymerization technique
(b) bulk polymerization technique
(c) suspension polymerization technique
(d) interfacial polymerization technique

Q-2 Answer the following **(ANY SEVEN):** **14**

(i) Define the terms: Oligomer and Monomer

(ii) What is the molecular weight of high density polyethylene, when its DP is 1000?

(iii) Depression in freezing point method gives only number average molecular weight. Why?

(iv) What may the consequence of the uncontrolled vinyl polymerization with excessive rise in temperature?

(v) List out the salient features of anionic polymerization?

(vi) Why polymer build process is slow in step growth polymerization?

(vii) How will you obtained the values of reactivity ratios, r_1 and r_2 by Fineman Rose method?

(viii) Define and Explain the term Cohesive Energy Density.

(ix) How is the solvent in solution polymerization, more useful to overcome the disadvantages of bulk polymerization?

Q-3 (a) Discuss about the classification of polymers on the basis of tacticity. **06**

(b) Write a complete note on Ebulliometry. **06**

OR

(b) Following are the vapor phase osmometry data for a standard polystyrene of known molecular weight and an experimental sample of hydroxyl terminated polybutadiene (HTPB) in toluene solutions at 70°C. Calculate the molecular weight of HTPB. **06**

Polymer	Concentration, C (g/L)	Bridge Output, ΔV (μV)
Standard sample (PS) of known mol.wt. ($\overline{M}_n$ = 1800 gm/mol.)	6	107
	9	164
	12	224
	15	287
HTPB of unknown molecular weight	6	85
	9	129
	12	176
	15	225

Q-4 (a) Give the complete account on "Factors determining radical chain polymerization and the properties of the resulting polymer". **06**

(b) Discuss briefly about the ziegler natta polymerization of propylene. **06**

OR

(b) Explain the mechanism of anionic polymerization initiated by sodium-naphthalene complex. **06**

Q-5 (a) Describe the ring opening polymerization of ethylene oxide and ε-caprolactum. **06**

(b) Discuss about the free radical copolymerization and hence derive the copolymer equation which correlates the feed composition with the copolymer composition through two parameters r_1 and r_2. **06**

OR

(b) Write a note on Q-e scheme proposed by Alfrey and Price. **06**

Q-6 (a) Describe the bulk polymerization method. **06**

(b) Give complete account on organometallic polymers. **06**

OR

(b) Write about the following additives. **06**
(i) Particulate fillers
(ii) Colorants

**********BEST OF LUCK**********

(98) SEAT No._____ No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY

M.Sc. Organic chemistry (Semester-1) External Examination

PS01ECHE02-APPLIED AND INDUSTRIAL CHEMISTRY

Date: 9/11/2017, Thursday **Total marks:70**

Time:10.00 a.m. to 01.00 p.m.

Note: Right hand figure indicate marks.

Q.1 **Select the correct answer from the choices given below for each of the following questions:** **[08]**

(i) In nitration of Acetanilide,..... .is the major product.

(a) m-nitro acetanilide **(b)** p-nitro acetanilide

(c) o-nitro acetanilide **(d)** None of above

(ii) A biologically inactive compound that can be metabolized in the body to produce a drug is.....

(a) Prodrug **(b)** Soft drug

(c) Agonist **(d)** Antagonist

(iii) Heat flow mechanism through solid is known as.....

(a) Convection **(b)** Radiation

(c) Conduction **(d)** Reflection

(iv) In medicinal chemistry term "starting material" is called as.....for drug discovery.

(a) Lead compound **(b)** Lead metal

(c) New prescribe **(d)** Starting

(v) Which glass is also known as water glass?

(a) Opal glass **(b)** Sodalime glass

(c) Sodium silicate glass **(d)** Calcium silicate glass

(vi) Venturi meter is a.....meter.

(a) Mano **(b)** Rota

(c) Variable head **(d)** None of the above

(vii) Lindane is also known as .....

(a) DDT **(b)** Gamma HCH

(c) Alum **(d)** None of above

(viii) ..... is the common fundamental constituent of glass.

(a) Lime **(b)** Silica

(c) Gypsum **(d)** Clinker

Q.2 **Answer ANY SEVEN from the following:** **[14]**

(i) Give the difference between drying and evaporation.
(ii) Explain the principle and driving force of filtration.
(iii) What is the difference between sulfonation and sulfation?
(iv) Write the synthesis of phthalic anhydride.
(v) Descibe about the raw material of cement.
(vi) Write a short note on mixing additives to cement.
(vii) Explain the effect of heat on milk.
(viii) Write a short note on oxidizing agents.
(ix) Explain the difference between unit process and unit operation.

(P.T.O.)

Q.3	(A)	Explain the mode of heat transfer with suitable examples.	[06]
	(B)	Write a note on open pan evaporator.	[06]
		OR	
	(B)	What is Reynold's experiment? Explain it in detail.	[06]
Q.4	(A)	Explain the synthesis of Nitro benzene by batch process.	[06]
	(B)	Write a note on "Type of oxidation".	[06]
		OR	
	(B)	Explain the synthesis of Chloro benzene.	[06]
Q.5	(A)	Explain the manufacturing process of cement.	[06]
	(B)	Write a note on special glasses.	[06]
		OR	
	(B)	Explain the manufacturing process of glass.	[06]
Q.6	(A)	Write a note on composition of ghee and cheese.	[06]
	(B)	Define lead compound and explain agonist and antagonist type of drug.	[06]
		OR	
	(B)	Write a note on pasteurization of milk.	[06]

----------END----------

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[99]

3

No. of Printed pages: 03

SARDAR PATEL UNIVERSITY

M.Sc. (Semester-I) Examination

Thursday, 9th November, 2017

Course No.: PS01ECHE22, Polymer Chemistry-I

10:00 AM to 1:00 PM

Total Marks : 70

Q-1 Answer the following: **08**

(i) Phenol-Formaldehyde Resin is called as
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(b) nylon
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(d) bakelite

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(a) elevation in boiling point
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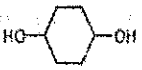
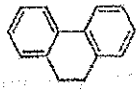
(a) 

(b) 

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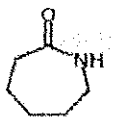
(d) 

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**********BEST OF LUCK**********

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(100) SEAT No._____ No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY

M.Sc. Organic chemistry (Semester-1) External Examination

PS01ECHE23-APPLIED AND INDUSTRIAL CHEMISTRY

Date: 9/11/2017 , Thursday **Total marks:70**

Time:10.00 a.m. to 01.00 p.m.

Note: Right hand figure indicate marks.

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(iii) Heat flow mechanism through solid is known as.....

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(c) Sodium silicate glass (d) Calcium silicate glass

(vi) Venturi meter is a.....meter.

(a) Mano (b) Rota

(c) Variable head (d) None of the above

(vii) Lindane is also known as .....

(a) DDT (b) Gamma HCH

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(viii) ..... is the common fundamental constituent of glass.

(a) Lime (b) Silica

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Q.2 **Answer ANY SEVEN from the following:** **[14]**

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(ii) Explain the principle and driving force of filtration.
(iii) What is the difference between sulfonation and sulfation?
(iv) Write the synthesis of phthalic anhydride.
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(vi) Write a short note on mixing additives to cement.
(vii) Explain the effect of heat on milk.
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		OR	
	(B)	Write a note on pasteurization of milk.	[06]

..... END .....

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