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[11/A-6]

**SARDAR PATEL UNIVERSITY**

M. Sc. SECOND SEMESTER Examination 2016

Thursday, 27<sup>th</sup> October 2016, 10.00 a.m. to 1.00 p.m.

Course – PS02CCHE03, Physical Chemistry – II, Selected Topics

N.B. Figures to the right of each of the question indicate marks.

1. Choose appropriate answer of the followings

[08]

- (i) Trimolecular reactions are characterized by  
(a) Positive  $E_a$  (b) Zero  $E_a$   
(c) Negative  $E_a$  (d) Both Positive and Negative  $E_a$
- (ii) What is the unit of the rate constant for 3/2 – order reaction?  
(a)  $(\text{dm}^3)^{-1/2} \text{mol}^{1/2} \text{s}^{-1}$  (b)  $(\text{dm}^3)^{1/2} \text{mol}^{-1/2} \text{s}^{-1}$   
(c)  $\text{dm}^{-3/2} \text{mol}^{3/2} \text{s}^{-1}$  (d)  $\text{s}^{-1}$
- (iii) Which one of the following molecule shows square pyramidal geometry?  
(a)  $\text{SF}_6$  (b)  $\text{XeF}_4$  (c)  $\text{NH}_3$  (d)  $\text{BrF}_5$
- (iv)  $\text{O}_2$  molecule has:  
(a)  $4C_2$  axis (b)  $\alpha C_2$  axis (c)  $3C_2$  axis (d)  $2C_2$  axis
- (v) Secondary structure of protein have :  
(a)  $\alpha$ - form (b) Helix form (c)  $\beta$  – form (d) Coil form
- (vi) In RNA Pyrimidines, the base element is \_\_\_\_\_  
(a) Guanine (b) Adenine (c) Thymine (d) Uracil
- (vii) The product formed under thermodynamic control have \_\_\_\_\_ rate with \_\_\_\_\_ amount of product at infinite time.  
(a) slower, major (b) faster, major  
(c) slower, minor (d) faster, minor
- (viii) Glycoprotein hydrolyze to give :  
(a) Protein & Phosphates (b) Protein & Carbohydrates  
(c) Protein & Nucleic Acid (d) Protein & Lipid

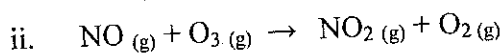
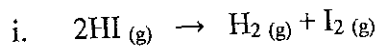
[14]

2.

Attempt any SEVEN

(i) What is meant by a fast reaction? List out techniques for monitoring fast reactions.

(ii) Write rate equation and order of reaction for the following:



(iii) How the order of reaction and molecularity differs from each other?

(iv) Discuss the principle of detail balancing.

(v) Define the term 'Point Group'. Explain roto-reflection axis with suitable example.

(vi) Give the conformational forms in a peptide bond.

(vii) Explain the term ribosomes.

(viii) Enlist two differences between  $D_{2h}$  and  $C_{2h}$  point groups.

(ix) Electrophoresis and Electroosmosis are based on electrokinetic phenomena but they differ – Explain.

3.

(a) Define Plane of symmetry with suitable example. Derive the transformation matrix for  $\sigma_v$ ,  $\sigma_v'$  and  $\sigma_v''$  planes. [06]

(b) There are 8 symmetry elements for  $C_{4v}$  point group. The character table of this point group is shown below. Deduce the values of a, b, c and d. [06]

	E	$2C_4$	$C_2$	$2\sigma_v$	$2\sigma_d$
$\Gamma_1$	1	1	1	1	1
$\Gamma_2$	1	1	1	-1	-1
$\Gamma_3$	1	-1	1	1	-1
$\Gamma_4$	1	-1	1	-1	1
$\Gamma_5$	2	a	b	c	d
		?	?	?	?

OR

(b) i. Define the term symmetry operation and enlist the symmetry elements along with point group for p-Dichlorobenzene and Phenol molecules. [03]

ii. Show that under orthogonal transformation, the length of the vector remains constant. [03]

4. (a) Discuss the kinetic relations for a chain reaction. [06]  
 (b) What is Relaxation time? Considering following reaction [06]  

$$2A \xrightleftharpoons[k_{-1}]{k_1} B$$
, derive an equation for relaxation time.

OR

- (b) Discuss the plug flow method for determining rate of fast reaction and [06]  
 derive the equation  $C_f = C_i e^{-kt}$ .  
 5. (a) Show the effect of pH and different types of electrolytes on  $\zeta$ - potential [06]  
 of charged surface.  
 (b) Describe various models for electrical double layer. [06]

OR

- (b) Give the differences between: [06]  
 i. Fibrous and Globular Proteins  
 ii. Plate like and helix forms of a protein  
 6. (a) Explain the mechanism of DNA replication considering the role of [06]  
 different types of enzymes.  
 (b) (i) The  $pK_a$  of the newly formed ionizable group on ADP obtained from [06]  
 the hydrolysis of ATP is 6.68 at  $25^\circ\text{C}$  ( $K_a = 2.09 \times 10^{-7}$ ). Of the total  $\Delta G'$   
 of  $-7700$  cal/mol for the ATP hydrolysis, how much can be attributed to  
 the ionization of ADP?  
 (ii) The terminal phosphate of ATP has  $pK_a$  values of 6.95 and 2.3. The  
 inorganic phosphate derived from the terminated phosphate, has  $pK_a$   
 values of 12.5, 6.82 and 2.3. Does the ionization of inorganic phosphate  
 groups contribute to the total  $\Delta G'$ ?

OR

- (b) Discuss the enzyme regulation and types of regulatory enzymes. [06]

\_\_\_\_\_ X \_\_\_\_\_ X \_\_\_\_\_

