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SARDAR PATEL UNIVERSITY
M. Sc. SECOND SEMESTER Examination - 2015
Saturday, 25th April 2015,
2.30 p.m. to 5.30 p.m.
Course – PS02CCHE03, Physical Chemistry – II, Selected Topics
N.B. Figures to the right of each of the question indicate marks

1. **Write the correct answer** 08

   (i) The plane which is perpendicular to principal axis is

      a) σ_v b) σ_h c) σ_d d) None

   (ii) The backbone of the DNA helix consists of:

      a) Sugar and base   b) Sugar and phosphate

      c) Phosphate and base   d) Sugar and Nucleotide

   (iii) Electrokinetic effects leads to:

      a) Electrophoresis   b) Electroosmosis

      c) Streaming potential   d) All

   (iv) ξ-potential of a surface characterizes:

      a) Electric charge   b) Electric potential

      c) Electrical energy   d) Electric work

   (v) Which of the following is an example of consecutive reactions?

      a) Polymerization   b) Thermal cracking

      c) Chlorination of hydrocarbons   d) All

   (vi) Which of the following is correct ?

      a) $O + O_2 \rightarrow O_3$ b) $O_2 + M \rightarrow MO + O$

      c) $O + O_2 + M \rightarrow O_3 + M$ d) $O + MO_2 \rightarrow O_3 + M$

   (vii) α - helix form of a protein represents:

      a) Tertiary structure   b) Secondary structure

      c) Primary structure   d) Quaternary structure

   (viii) O-dichlorobenzene belongs to:

      a) C_{4v} b) C_{3v}

      c) C_{2v} d) C_{3h}

2. Attempt any SEVEN 14

(i) Show that for NH_3 : $\sigma_v'\sigma_v\sigma_v' = \sigma_v''$

(ii) Enlist two differences between parallel and consecutive reactions.

(iii) Whys some reactions have zero activation energy ?

(iv) Zeta potential varies with the pH of the medium – explain .

(v) Show that $C_4^3 \cdot C_4 \cdot C_4^- = EC_4^-$

(vi) What are Lipids ?

(vii) How do simple and conjugate proteins differ from each other?

(viii) Explain how an electrical double layer is constructed ?

(ix) What is electro osmosis ?

3. (a) Consider the character table: 06

	E	$2C_5$	$2C_5^2$	$5\sigma v$
Γ_1	1	1	1	1
Γ_2	1	1	1	-1
Γ_3	2	2cos 72°	2cos 144°	0
Γ_4	2	2cos 144°	2cos 72°	0

i) Which point group it belongs ? give an example.
ii) How many symmetry elements it has ?
iii) Show each class through neat sketch
iv) What are Γ_i ?
v) Show that Γ_1 and Γ_2 are orthogonal.

(b) (i) Give and explain the rules for constructing a character table. 03

(ii) Draw the neat sketch of ethylene and show that it belongs to D_{2h} point group. 03

OR

(b) Explain different symmetry elements present in C_{3v} point group with neat sketch and work out the characters of this point group. 06

4. (a) For the reaction of type, $A \rightarrow B \rightarrow C$, derive the relations for the concentrations of A, B and C considering that each of the reactions is of first order. **06**

(b) How does the rate constant of ionic reaction changes with ionic strength of the medium. **06**

<div align="center">OR</div>

(b) Give the mechanism involved in a typical chain reaction of type, $H_2 + Br_2 \rightarrow 2\,HBr$ and show that over all rate is equal to $k\,[H_2][Br_2]^{1/2} / 1 + j\,[HBr]/[Br_2]$ **06**

5. (a) What is electrical double layer ? give its importance and how Guoy - Chapman and Stern models describe it ? **06**

(b) Write a note on: (i) Electrophoresis, (ii) Streaming potential **06**

<div align="center">OR</div>

(b) (i) What are electrocapillary curves ? Why the interfacial tension values for KI aqueous solutions are lower than KCl solution under lower field potential? **03**

(ii) Give an account of biological membranes and how passive transport occurs across them ? **03**

6. (a) (i) How a DNA and RNA molecule differ from each other? Give types of RNA along with their functions. **03**

(ii) For a general reaction: $cS_1 + dS_2 \rightarrow aP_1 + bP_2$ – define free energy change, ΔG & K_{eq} and show that $\Delta G^0 = -\,1364 \log K_{eq}$ at $25\,^0C$. **03**

(b) Calculate the standard state ΔG values at (i) pH 0 and (ii) pH 5 for the dissociation of acetic acid: $HOAc \rightleftharpoons OAc^- + H^+$, $K_a = 1.75 \times 10^{-5}$ (iii) Calculate ΔG_{ion} at pH 5.0. **06**

<div align="center">OR</div>

(b) (i) Write a brief note on coupled reactions. **03**

(ii) What is acyl phosphate ? and give its importance. **03**

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