NAVRACHANA UNIVERSITY
a UGC recognized University

School:	School of Science
Program/s:	M.Sc. (Chemistry)
Year: 1st	**Semester:** 2nd
Examination:	End Semester Examination
Examination year:	December - 2022

Course Code: PCH101   **Course Name:** **Physical Chemistry**
Date: 08/12/2022
Time: 11:30 am to 1.30pm

Total Marks: 40
Total Pages: 2

Instructions:
➔ *Write each answer on a new page.*
➔ *Use of a calculator is permitted.*

QN	Questions	Marks	COs	BTL
Q1	**Chose the most appropriate option or Do as directed**			

1) Match the Following

Group A	Group B
1.Enzymatic Reactions	A. Chain Reaction
2. Free radical reaction	B. Reaction Cross Section
3.σ	C. No relative orientation leads to a chemical reaction
4. P=0	D. Intermediate Compound Formation Theory
	E. Adsorption Theory

Marks: **2**

2) Which one of the following statements is **INCORRECT**?   **1**
(a) Frenkel defect is a cation vacancy and a cation interstitial
(b) Frenkel defect is an anion vacancy and cation interstitial
(c) Density of solid remains unchanged in case of Frenkel defects
(d) Density of a solid decreases in case of Schottky defects.

3) Arrangement of Sulphur in zinc blende and Wurtzite structures respectively are   **1**
(a) hexagonal close packing and cubic close packing
(b) cubic close packing and hexagonal close packing
(d) simple cubic packing in both the structures
(d) hexagonal close packing in both the structures

5) The distance between two successive (110) planes in a simple cubic lattice with lattice parameter "a" is   **1**

$(a)\sqrt{2}.a$ $(b)\sqrt{3}.a$ $(c)2\sqrt{2}.a$ $(d)\dfrac{a}{\sqrt{2}}$

6) A sphere of radius r cm is packed in a box of cubical shape. What should be the minimum volume (in cm^3) of the box that can enclose the sphere? (**Show all calculations**).   **2**

COs column: CO1, CO3, CO4, CO5, CO6, CO7

BTL column: BT1, BT2, BT3, BT4, BT5

(a) $\frac{r^3}{8}$ (b) r^3 (c) $2r^3$ (d) $8r^3$

Q.2   Answer any <u>four</u> questions in detail.

A.   Discuss the activated complex (transition state) theory of chemical reactions. Derive an expression relating rate constant with standard enthalpy of activation and standard entropy of activation.

B.   i.) What do you understand by a complex reaction? State and explain in brief different types of complex reactions. ii) Explain Harpoon Mechanism in brief.

C.   State and explain theories of Enzyme Catalysis. Derive Michaelis-Menten equation to explain kinetics of an enzyme catalyzed reaction. Discuss the effect of substrate concentration on Enzyme catalyzed reaction.

D.   Define Phase transfer catalyst. State Examples of Phase Transfer Catalysts. Explain the mechanism of phase transfer catalysis for organic synthesis citing a suitable reaction as an example. State different applications of phase transfer catalysis.

E.   Draw a schematic diagram to illustrate powder crystal method.
Explain in detail the working of powder crystal method and its applications.

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CO1	BT1
CO2	BT2
CO3	BT3
CO4	BT4
CO5	
CO6	
CO7	

Q.3.   Answer the following in brief

A)   Explain the significance of Air to Fuel Ratio and Lambda sensors with respect to functioning of a three-way catalytic converter.

B)   Explain the process of Raney Nickel catalyzed Hydrogenation of Alkene on the basis of Adsorption theory.

C)   Write a detailed note on different types of Crystal defects.

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CO4	BT1
CO5	BT2
CO6	BT3
CO7	BT4
	BT5

************End of Question Paper************