


Name:			
Enrolment No:			
UPES End Semester Examination, May 2024			
Course: Chem of s- & p- Block Elements, States Of Matter & Chemical Kinetics Program: B.Sc. (Hons.) Math+Geo+Phy Course Code: CHEM1010G		Semester: IV Time : 03 hrs. Max. Marks: 100	
Instructions: Read all the instructions below carefully and follow them strictly.			
<ol style="list-style-type: none"> 1) Mention Roll No. at the top of the question paper. 2) Internal choice is given in Q. no. 9 and 10. 3) ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY. 			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	Explain the following: (i) Diamond is non-conductor while graphite is a good conductor of electricity. (ii) Pb^{4+} compounds are oxidizing in nature.	4	CO2
Q 2	What are clathrate compounds of noble gases? Discuss their formation with the help of an example.	4	CO1
Q 3	Find the interplanar distance in a crystal in which a series of planes produce a first order reflection from a copper X-ray tube ($\lambda = 1.539 \text{ \AA}$) at an angle of 22.5° .	4	CO3
Q 4	Mention the effect of temperature on viscosity and surface tension.	4	CO2
Q 5	Elaborate the critical constants of a gas.	4	CO3
SECTION B (4Qx10M= 40 Marks)			
Q 6	(A) What are <i>Lewis acids</i> ? Arrange the following in the order of increasing acid strength with proper reasoning: (i) BCl_3 , BF_3 , BBr_3 ; (ii) $SnCl_2$, $SnCl_4$. (B) What are <i>Lewis bases</i> ? Arrange the following in the order of decreasing base strength: (i) NH_3 , NCl_3 , NF_3 ; (ii) NH_3 , PH_3 , AsH_3 .	5+5	CO3
Q 7	(A). Give at least two examples to show that water can behave both as an acid and a base under suitable conditions. (B) Differentiate between the following with appropriate examples: (i) Minerals and ores (ii) Calcination and roasting	4+6	CO3

Q 8	With a neat sketch elaborate the stalagmometer method for determining surface tension.	10	CO2
Q 9	What is the activation energy of a chemical reaction? Calculate the energy of activation of a reaction for which rate constant becomes doubled by increase of 10 K temperature from 298 K. OR (A). Derive the integrated rate constant expression for a chemical reaction with rate law equation, Rate = $k[A]^3$. (B). What is half-life of a chemical reaction? How is it useful in calculating order of a reaction?	10 5+5	CO1
SECTION-C (2Qx20M=40 Marks)			
Q 10	(A) Elaborate Boyle's, Charles's and Graham diffusion law. (B) Mention the postulates for Kinetic theory of gases. OR Define: (i) Collision Number (ii) Collision Frequency (iii) Mean free path (iv) Root mean Square velocity (v) Collision diameter (vi) Viscosity (vii) Surface tension (viii).Bravais Lattice	10+10 2.5x8	CO1
Q 11	(A). Determine the value of the rate constant for the elementary reaction: $I_2(g)+H_2(g)\rightarrow 2HI(aq)$, given that when $[I_2]$ is 0.15 M and $[H_2]$ is 0.2M, the rate of reaction is 0.005 M s^{-1} at 298 K. (B). Briefly discuss the factors affecting rate of a chemical reaction. (C). List out the differences between order and molecularity of a reaction.	7+7+6	CO2