Roll No: ……..

S. No. of Question Paper :

Unique Paper Code : 217461

Name of the Paper : Chemistry-IV (Chemistry of s & p block elements, States of Matter and Phase Equilibrium)

Name of the Course : B.Sc. (Prog.)

Semester : IV

Duration: 2 Hours **Maximum Marks: 75**

Instructions for candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt ***four*** questions in all, ***two*** questions from **SECTION A** and ***two*** questions from **SECTION B.** Question no. 1 and 4 are compulsory.
3. Use separate sheets for section A and section B and indicate the section you are attempting by putting a heading of Section.
4. The questions should be numbered in accordance to the number in the question paper.
5. Use of Scientific Calculator is permitted.

SECTION A (Question no. 1 is compulsory)
(Inorganic Chemistry)

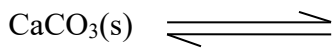
1.		**Explain** the following	
	(a)	Arrange oxoacids of chlorine in the increasing order of acidic strength.	5
	(b)	Arrange hydrides of group 15 in increasing order of bond angle.	5
	(c)	Tl(I) is more stable than Tl (III).	4
	(d)	Arrange HF, HCl, HBr, HI in the increasing order of acidic strength.	3.5
2.	(a)	Give one reaction for the formation of diborane. How does diborane reacts with (i) H_2O (ii) NH_3 (under different conditions)?	5
	(b)	Define Electronegativity. Name different scales of electronegativity along with the formula used.	5
	(c)	Draw structure of the following compounds i) NH_3 ii) $SOCl_2$ iii) H_3PO_4 iv) H_2SO_5 v) PCl_5	5
	(d)	Write short notes on ***any two*** of the following (i) Froth floatation	5

		(ii) Mond's process (iii) Electrolytic refining	
3.	(a)	Discuss various factors which governs the magnitude of Ionization Energy.	5
	(b)	Calculate the electro negativity value of carbon atom using Allred Rochow Scale of eletronegativity by using the following data, Z=6, r =77 Å.	5
	(c)	Arrange methane, ethane and ethyne in the order of increasing acidic character. Explain the trend.	5
	(d)	What are allotropes? Why do some elements show allotropy? Explain the three allotropic forms of Phosphorous.	5

SECTION – B
(Physical Chemistry)

*Question **No. 4** is compulsory.*

($R = 8.314$ J K^{-1} mol^{-1} $k = 1.38 \times 10^{-23}$ J K^{-1} NA $= 6.023 \times 10^{23}$)

4.	Answer the following questions:		
	(*a*)	What are the units of van der Waals constants, *a* and *b*?	2½
	(b)	What is the number of components, phases and degree of freedom the following equilibrium system? 	2½
	(c)	Calculate the temperature at which average speed of H_2 equal to that of SO_2 at 320K.	2½
	(d)	How many symmetry elements are there in a cubic system?	2½
	(e)	What are Miller indices? Calculate miller indices for planes having Weiss indices: (a) 2a, 3b, c (b) 2a, –3b, –3c	2½
	(f)	What is the effect of temperature on surface tension of a liquid? What is SI unit of surface tension of a liquid?	2½
	(g)	Why the viscosity of ethyl alcohol is greater than that of ether.	2½
5.	(a)	Explain the terms Z_1 and λ. Discuss the effects of temperature and pressure on these terms.	5
	(b)	What do you understand by the term viscosity? What are its units? Describe the Ostwald viscometer method for the measurement of viscosity of a liquid giving expression.	5
	(c)	Using Clapeyron equation, draw a labeled phase diagram of water or sulphur.	5
	(d)	A solid crystalizes in body centered cubic lattice. It was studied by using X-ray of wavelength of 0.154 nm. First order of X-ray reflection maximum from set of (200) planes was observed at 16º6′. Calculate inter-planar spacing and the edge length of unit cell.	5
6.	(a)	The coefficients of viscosity of water and acetone at 25 °C are 1.4×10^{-3} kg m^{-1} s^{-1} and 1.6×10^{-3} kg m^{-1} s^{-1} and their densities at same temperature are 8×10^2 kg m^{-3} and 10.2×10^2 kg m^{-3}, respectively. Calculate the time of flow of acetone when water has the time of flow in an Oswald viscometer is 100 seconds.	5
	(b)	Starting from the postulates of kinetics theory of gases, derive the kinetic gas equation, $PV = (1/3)\, mNu^2$	5
	(c)	Define the phase rule and Derive phase rule for a non-reactive system	5
	(d)	What is crystallography? Explain three fundamental laws of crystallography.	5