[This question paper contains 5 printed pages.]

Sr. No. of Question Paper : 1536 **E** **Your Roll No.....**

Unique Paper Code : 217461

Name of the Course : **B.Sc. (Programme) Physical Science/Life Science**

Name of the Paper : Paper 13-CHPT 404: Inorganic and Physical Chemistry

Chemistry of a & P block elements, states of matter and phase Equilibrium

Semester : IV

Duration : 3 Hours Maximum Marks : 75

Instructions for candidates:

1. ***Write your Roll No. on the top immediately on receipt of this question paper.***
2. ***Use of Scientific Calculator and log tables are permitted.***

SECTION-A (37½)

(INORGANIC CHEMISTRY)

Attempt any three questions

Question No.1 is compulsory.

1. Explain the following :

   a) Why fluorine has lower value of electron affinity than chlorine.

   b) In group I, elements have 2^{nd} ionisation energy is much higher than 1^{st} ionisation energy.

c) LiOH breaks down to oxide on strong heating but NaOH has no reaction.

d) Basicity of the oxides and hydroxides of alkaline earth metals increases as we go down the group.

e) Among alkali metals halides lattice enrgy for LiF is greatest and smallest for CsI. (1½, 3, 3, 3, 3)

2. Write short notes on :

a) Ellingam diagram

b) Inert pair effect

c) Mullikens scale for measurement of electronegativity

d) Van Arkle's process (3,3,3,3)

3. a) Discuss the nature of bonding of Hydrogen bridges in diborane. (2)

b) What are the differences between : (i) Calcination and Roasting (ii) Slag and Flux (iii) Gangue and Ore (6)

c) Write briefly the structure of allotropes of sulphur. (2)

d) Discuss the structure of N_2H_4. (2)

4. a) Complete the following :

i) $2NH_3 + 3I_2 \rightarrow$ .....

ii) $CH_4 + NH_3 \xrightarrow[1300°C]{Pt}$ .....

iii) $4NH_3 + 3F_2 \rightarrow .....$

iv) $SO_2Cl_2 + 2NH_3 \xrightarrow{C_6H_6} .....$ (1,1,1,1)

b) Name and draw the structures of the following anions:

$S_2O_3^{-2}$, $S_2O_6^{-2}$, $S_2O_7^{-2}$, $S_2O_8^{-2}$ (2,2,2,2)

SECTION-B (37½)

(PHYSICAL CHEMISTRY)

Attempt any four questions

Question No.1 is compulsory.

(Log tables to be provided)

1. Answer the following:

a) What is the excluded volume? How is it related to actual volume? (2)

b) Why do gases fail to obey ideal gas equation at high pressure and low temperature? (2½)

c) Explain the terms unit cell and space lattice. (2)

d) What do you mean by temperature co-efficient of reaction rates? (2)

e) A drop of a liquid is spherical in shape. Explain. (2)

2. a) Derive the Vander Waal's equation for 1 mole of a gas. (3)

b) Write the mathematical equation giving Maxwell's distribution of molecular velocities. Explain with the help of graphs, how molecular velocities change with increase in temperature. (3)

c) Calculate the root mean square velocity of CO_2 gas at 27°C. (3)

3. a) Define the surface tension and viscosity of a liquid. Explain the effect of temperature on them. (4)

b) The time of flow of water through an Ostwald Viscometer at 20°C is 1.52 minutes. For the same volume of an organic liquid of density 0.800 g/cc, time is 2.25 minutes. Calculate the absolute viscosity of organic liquid if viscosity and density of water at 20°C are 1.002 centipoise and 0.998 g/cc respectively. (3)

c) What is the physical significance of n in Bragg's equation $2d\sin\theta=n\lambda$? (2)

4) a) Derive the integrated rate equation for the first order reaction and from it derive the expression for half-life period. (3)

b) 50% of a first order reaction is completed in 23 minutes. Calculate the time required to complete 90% of the reaction. (3)

c) When a certain crystal was studied by Bragg's method using x-rays of wavelength 229 pm, an x-ray reflection was observed at an angle of 23°20'. What is the corresponding inter planer spacing? (sin 23°20' =0.396) (3)

5. Write short notes on any three of the following :

a) Symmetry elements of a simple cubic lattice

b) Critical constants of a gas

c) Weiss and Miller Indices

d) Collision theory of bimolecular reactions (3x3)