

[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 2nd ionisation energy is much higher than 1st ionisation energy.

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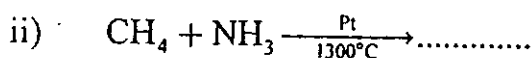
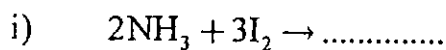
- c) LiOH breaks down to oxide on strong heating but NaOH has no reaction.
- d) Basicity of the oxides and hydroxides of alkaline earth metals increases as we go down the group.
- e) Among alkali metals halides lattice energy for LiF is greatest and smallest for CsI. (1½, 3, 3, 3, 3)

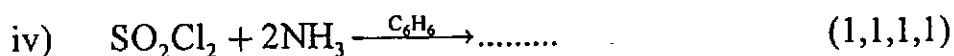
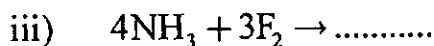
2. Write short notes on :

- a) Ellingham diagram
- b) Inert pair effect
- c) Mullikens scale for measurement of electronegativity
- d) Van Arkle's process (3,3,3,3)

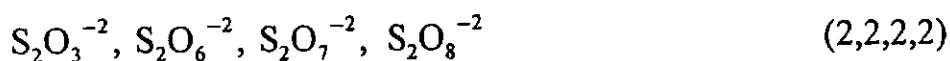
3. a) Discuss the nature of bonding of Hydrogen bridges in diborane. (2)
- b) What are the differences between : (i) Calcination and Roasting (ii) Slag and Flux (iii) Gangue and Ore (6)
- c) Write briefly the structure of allotropes of sulphur. (2)
- d) Discuss the structure of N₂H₄. (2)

4. a) Complete the following :





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

**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)

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- 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 $23^{\circ}20'$. What is the corresponding inter planer spacing? ($\sin 23^{\circ}20' = 0.396$) (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)