

First Periodical Test, July-December, 2021

Class: **M. Sc. I Semester**

Subject: **Chemistry**

Paper (with code): **Inorganic Chemistry (CHEM 405)**

Max Marks: **10**

No. of Students: **40**

Note: Students are required to attempt any **three** questions. Question No. **1** is **compulsory**.

Q.1 a) Predict the shape of following molecules on the basis of VSEPR theory

- i. $[\text{SbF}_6]^{3-}$
 - ii. $[\text{BrF}_6]^-$,
 - iii. $[\text{SbCl}_6]^{3-}$,
- and explain why they are different. [1]

b) Suggest the structures for PF_4Cl , PF_3Cl_2 , PF_2Cl_3 , PF_4CH_3 , $\text{PF}_4(\text{CH}_3)_2$, and $\text{PF}_4(\text{CH}_3)_3$ and justify your answer. [1]

c) The bond angle PH_3 is approximately equal to 90° . Comment. [0.5]

d) Why NF_3 is more basic than NH_3 [0.5]

e) Explain different hybridization exhibited by the molecules with steric no 5. [1]

Q.2 a) For the molecules or molecular ions given below, give the formula type [3]

(Example: AX_2E), the steric number (SN), indicate the geometry (Example: bent), and give expected bond angles

Compound	Formula Type	SN	Geometry	Bond angle(s)
AlCl_4^{-1}				
XeF_3^{+1}				
PCl_6^{-1}				

OR

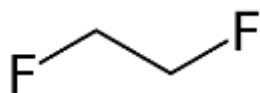
Q. 3 Answer the following questions with justification for each molecule- **[0.5x6=3]**

- (i) MnO_4^- , CrO_3 undergo sd^3 and sd^2 hybridization respectively?
- (ii) XeOF_4 has one double bond and a lone pair but the shape of the molecule is regular.
- (iii) Which molecule has smaller F-X-F bond angle BF_3 or PF_3
- (iv) The molecular shapes, number of bond pairs and lone pairs of electrons of SF_4 , CF_4 and XeF_4 are-

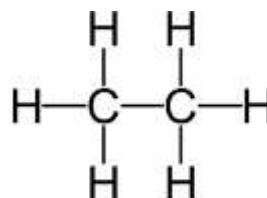
(v) Among the following the pair in which the two species are not isostructural. Explain by applying VSEPR theory to all pairs.

- i. BH_4^- and NH_4^+
- ii. PF_6^- and SF_6
- iii. SiF_4 and SF_4
- iv. IO_3^- and XeO_3

(vi) Why the C-C bond strength in structure A is stronger than in structure B.



Structure-A



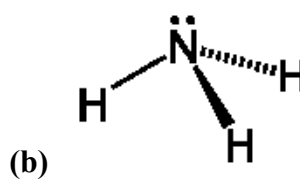
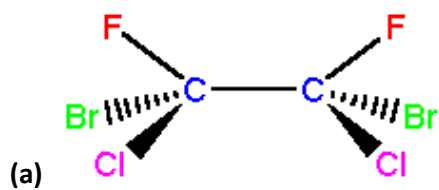
Structure-B

Q.4 Use the flow chart to find point group of the following molecules: [0.5x6=3]

- | | |
|--------------------|----------------------------|
| (a) Allene | (b) H_2S |
| (c) XeF_4 | (d) CF_3Cl |
| (e) CO_2 | (f) PCl_5 |

OR

Q.5 Identify the symmetry elements and apply all the symmetry element present in the following molecules: [1x3=3]



(c) cis and trans platin