e) Selenic acid and telluric acid are differently formulated. Comment.

f) Dithionic acid is not considered as a member of polythionic acid series. Comment.

g) Both NO and NO_2 are odd electron species, yet NO_2 readily dimerises to N_2O_4, whereas NO does not form N_2O_2 except in liquid state. Comment.

4. a) Answer ***any three*** questions : $3 \times 1\frac{1}{2}$

i) PbF_4 and $PbCl_4$ exist but $PbBr_4$ and PbI_4 do not exist. Explain.

ii) Why is HOCl a powerful oxidising agent than $HClO_3$?

iii) F_2 gas can not be prepared by the electrolysis of HF or NaF. Give an explanation in support of your answer.

iv) Give reason why CO_2 is a gas and SiO_2 is a solid.

b) Write two similarities and two dissimilarities between halide ions and pseudohalide ions. 2

c) Explain the structure and bonding of diborane. $1\frac{1}{2}$

d) Write short note on (any ***one***) : 2

i) Inorganic graphite

ii) Silicones

B. Sc. Chemistry Examination, 2023

(4th Semester)

CHEMISTRY (CORE)

Paper: CORE/Chem/TH/08

Time : Two Hours Full Marks : 40

(20 marks for each Unit)

Use a separate answer script for each unit.

UNIT : 4081-I

Answer the following questions.

1. a) Write down the IUPAC names of the following compounds (***any three***) : 3

i) $[Cu(NH_3)_4][PtCl_4]$

ii) $[PtBr_4]^{2-}$

iii) $[Ni(CO)_4]$

iv) $[CoCl(NH_3)_5]SO_4$

b) Predict the geometry of $[Ag(NH_3)_2]^+$ and $[NiCl_4]^{2-}$ 1

c) Name an optically active square planar complex. 1

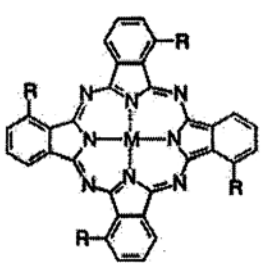
d) Show that $C_2O_4^{2-}$ can act both as a monodentate as well as a bidentate ligand. 1

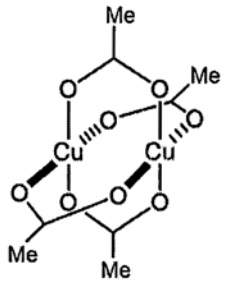
e) What will be the product(s) when both cis- and trans-$[Pt(NH_3)_2Cl_2]$ is treated with thiourea separately? 2

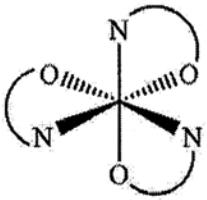
f) Citing suitable example define linkage isomerism. 2

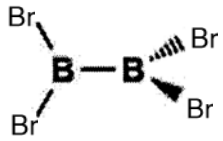
2. Answer thefollowing questions 5×2

a) Determine the **point group** of the following molecules (***any two***) with justification:

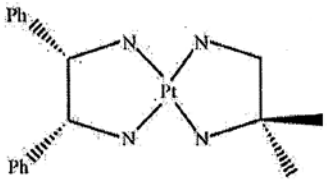


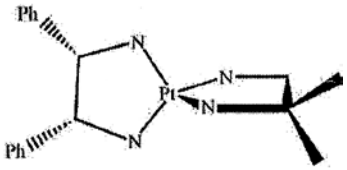






b) Tetra-coordinated complex can adopt either tetrahedral or square planar geometry. Determine the geometry around platinum with illustration in optically active Mills Quibell complex using symmetry criteria.





c) Only one 2p AO of O atom in water can mix with the 2s AO, nonetheless oxygen possesses three orthogonal p AOs. Justify with the aid of symmetry arguments.

d) If a molecule contains $\sigma_h(xz)$ and $\sigma_h(yz)$, then it must have $C_2(z)$. Rationalize the statement using matrix multiplication.

OR

Determine the product $\{\sigma' \otimes \sigma_v'' \otimes \sigma_v'''\}$ with reasoning of a molecule having C_{3v} point group.

e) Construct the Group Multiplication table of D_2 point group.

OR

Two σ planes in C_{2v} symmetry belong to two different classes. Justify.

UNIT : 4082-I

1. Answer ***any five*** questions : 5×2

a) Calculate the pK values of ortho and meta phosphoric acids using Pauling's rule.

b) Write a note on iodine azide test.

c) Bond angle in H_2O is ~105° and in H_2S is 92°. Comment.

d) What happens when $Na_2S_2O_3$ solution is added to $FeCl_3$ solution? Give equation.