Progressive Education Society's
Modern College of Arts, Science and Commerce, Ganeshkhind, Pune-411016

B.Sc. Blended Program

(A degree of Savitribai Phule Pune University equivalent to the degree of University of Melbourne)

End Semester Examination: March/April 2025

Program: B.Sc. Blended **Program (Specific):** B.Sc. Blended(Chemistry) **Set: A**

Class: T.Y. B.Sc. Blended **Semester: VI**
Course code: CHM-602
Course name: Bioinorganic and coordination chemistry
Credits: 3 **Time: 2½ hours** **Maximum marks: 50**

Instructions to the candidate:

- All questions are compulsory.
- Figures to the right indicate marks.
- Draw diagrams wherever necessary.
- Use of scientific calculator is allowed.
- Ask for graph paper if needed.

Q.1] **Choose the correct option (Solve <u>ANY 10</u> out of 12)** **[1 x 10 =10M]**

1. The metalloprotein which function as transport of oxygen is……
   a. Hemoglobin
   b. Transferrin
   c. Ferritin
   d. Ferrodoxin

2. Which of the following system is most stable?
   a. d^1
   b. d^2
   c. d^3
   d. d^{10}

3.For low spin complexes ……
   a. P = 10Dq
   b. P > 10 Dq
   c. P < 10Dq
   d. P^2 = 10 Dq

4. The isomer pair [$Cr(H_2O)_5Cl$] Cl_2H_2O and[$Cr(H_2O)_4Cl_2$] $Cl. 2H_2O$ is an example of
   a. hydrate or solvent
   b. ionisation
   c. co-ordination
   d. linkage or ambidentate

5. The number of possible geometrical isomers for [Ma_2b_2] type are……..
   a. 0
   b. 1
   c. 2
   d. 5

6. Identify X in the reaction [$Pt(NH_3)_4$]$^{2+}$ + 2 HCl → X
   a. cis [$PtCl_2(NH_3)_2$]
   b. trans[$PtCl_2(NH_3)_2$]
   c. [$PtCl(NH_3)_3$]$^{+}$
   d. [$PtCl_3(NH_3)_3$]$^{-}$

7. The number of ionisable chlorine in $[Co(NH_3)_5Cl]Cl_2$ is…….
   a.zero
   b one
   c.two
   d. three

8. Fac-mer isomerism is shown by …….type.
   a.Ma_4b_2
   b.Ma_5b
   c.Ma_3b_3
   d. Ma_4bc

9. According to CFT,the natrure of bonding in complexes is ……..
   a. 25% ionic
   b. 50% ionic
   c. 75% ionic
   d. purely electrostatic

10. The d orbital having lobes along x and y axis is …….
   a. dxy
   b. dyz
   c. dxz
   d. d x^2-y^2

11. The number of unpaired electrons in $[Fe(CN)_6]^{2-}$ is ……..
    a. 0
    b. 1
    c. 2
    d.3
12. Which one of the following do not show geometrical isomerism ……..
    a. Ma_4
    b. Ma_2b_2
    c. Ma_2bc
    d. Mabcd

Q.2] Answer the following in short (<u>ANY 10</u> out of 12) [2 x 10 = 20M]

1. Write the name of one oxygen transporting and storage protein with an example.
2. What are the drawbacks or limitations of V.B. theory applied to complexes.
3. Draw diagrams of eg set of d orbitals.
4. What is weak field complex.
5. Explain any one evidence for CFSE.
6. Draw d orbital splitting diagram for tetrahedral ligand field.
7. Explain formula for calculation of CFSE in octahedral complexes. .
8. Comment on the optical isomerism in tetrahedral complexes..
9. What is trans effect?
10. Explain geometrical isomerism in $[Co(NH_3)_3Cl_3]$.
11. Write definition of isomerism .
12. Explain briefly oxygen evolving complex or centre(OEC).

Q.3. Answer in brief (<u>ANY 4</u> out of 6) [4 x 5 = 20M]

1. Explain Jahn-Teller distortion.
2. Explain number of unpaired electrons for high spin complexes with reference to $d^4$and d^7 octahedral system.
3. State and explain which complex has a larger value of 10Dq.
   i) $[Co(CN)_6]^{3-}$ and $[Co(NH_3)_6]^{3+}$
4. Explain the different types of isomerism shown by $[Co(en)_2(Cl)_2]$.
5. Explain shapes of d orbitals.
6. Explain principle of EPR spectroscopy.

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