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SARDAR PATEL UNIVERSITY  
M.Sc. (SEMESTER-IV) EXAMINATION  
2015

Tuesday, 28<sup>th</sup> April  
10.30 a.m. to 1.30 p.m.

INORGANIC CHEMISTRY: PS04ECHE02  
(Reaction mechanism and Bioinorganic chemistry)

Note:-figures to the right indicate full marks.

Total Marks: 70

Q.1. Answer the following:

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- The rate constant of following anation reaction is:  
 $[\text{Co}(\text{NH}_3)_5\text{H}_2\text{O}]^{3+} + \text{Cl}^- \rightarrow [\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+} + \text{H}_2\text{O}$ 
  - $2.1 \text{ M}^{-1}\text{S}^{-1}$
  - $1.3 \text{ M}^{-1}\text{S}^{-1}$
  - $2.0 \text{ M}^{-1}\text{S}^{-1}$
  - $2.5 \text{ M}^{-1}\text{S}^{-1}$
- The value of  $\Delta E_a$  for  $d^4$  strong field TBP intermediate is:
  - 7.02 Dq
  - 7.07 Dq
  - 1.07 Dq
  - Zero Dq
- How many optically active isomer are possible, if complex contains only two optically active groups?
  - Two
  - Six
  - Eight
  - Zero
- Which of the following is an example of complementary electron transfer reaction?
  - $\text{Tl}^{3+} + 2\text{Fe}^{2+} \rightarrow \text{Tl}^+ + 2\text{Fe}^{3+}$
  - $\text{Tl}^{3+} + \text{Sn}^{2+} \rightarrow \text{Tl}^+ + \text{Sn}^{4+}$
  - $\text{Tl}^+ + 2\text{Co}^{3+} \rightarrow \text{Tl}^{3+} + 2\text{Co}^{2+}$
  - $\text{Tl}^+ + 2\text{V}^{4+} \rightarrow \text{Tl}^{3+} + 2\text{V}^{3+}$
- In haemoglobin  $\alpha$ -chain contains \_\_\_\_\_ amino acid residues &  $\beta$ -chain contain \_\_\_\_\_ amino acid residus.
  - 146,141
  - 145,141
  - 141,146
  - 146,149
- In oxy Mb, Fe-O-O bond angle is :
  - $90^\circ$
  - $150^\circ$
  - $115^\circ$
  - $180^\circ$

7. The ferredoxin 4Fe-4S cluster adopt a.....structure with alternating Fe and S atom in the corner.
- (a) Tetrahedral (b) cubane  
(c) Distorted tetrahedral (d) Distorted thiocubane
8. Oxy and deoxy form of hemocynine oxidation states of copper metal is respectively,.....
- (a) Cu<sup>I</sup>, Cu<sup>II</sup> (b) Cu<sup>II</sup>, Cu<sup>II</sup>  
(c) Cu<sup>I</sup>, Cu<sup>I</sup> (d) Cu<sup>II</sup>, Cu<sup>I</sup>

Q.2. Answer any **SEVEN** of the following:

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1. Differentiate labile –inert and stable- unstable complexes.
2. In case of isoelectronic series, lability decreases with increasing charge. Explain.
3. Explain the isomerization reaction in bis(ethylenediamine)diaqua cobalt(III) ion.
4. Explain the stereospecific reaction in M(AA)<sub>3</sub> type complexes.
5. "PTH maintain the plasma Ca<sup>2+</sup> concentration within the required narrow limits?" Explain.
6. What is Bohr effect? Draw oxygen dissociation curves for Mb & Hb at partial pressure of oxygen pO<sub>2</sub>.
7. Explain ionophore antibiotic (Valinomycin).
8. Explain the binding of cis-platin to DNA.
9. Which antibiotics are used in metal in medicine?

Q.3.A. Discuss in detail about the nature of substitution reaction.

6

B. Discuss the theoretical approach to the substitution reactions.

6

**OR**

B. Discuss in detail about the stereochemistry of substitution reactions of octahedral cobalt(III) complexes.

Q.4.A. What do you mean by electron transfer reactions? Explain the bridge inner sphere electron transfer mechanism between complexes of Cr(II) and Co(III) in acidic medium.

6

3...

B. Answer the following:

6

1. Discuss the intramolecular mechanism for the racemization of octahedral complexes.
2. Explain the Pt(II)-catalyzed two electron transfer reaction.

OR

B. Answer the following:

1. Explain the racemization of  $\text{cis}[\text{Co}(\text{en})_2\text{Cl}_2]^+$  complex by intermolecular mechanism.
2. Explain the electron transfer reaction between  $[\text{Co}(\text{NH}_3)_6]^{2+}$  and  $[\text{Co}(\text{NH}_3)_6]^{3+}$  complexes.

Q.5.A. Discuss biological role of elements in living system.

6

B. Give the detail mechanism of working of carbonic anhydrase and carboxypeptidase A.

6

OR

B. Answer the following:

1. Write a note on preventing irreversible oxidation binding of dioxygen by heme irreversible oxidation and auto oxidation.
2. Explain the intracellular  $\text{Ca}^{2+}$  binding proteins.

Q.6.A. Describe in detail the geometry of rubredoxin and ferredoxin (2Fe-2S) proteins.

6

B. Discuss the structural features of cytochrome P450 and explain the mechanism of oxidation of substrate R-H to R-OH.

6

OR

B. Write a note on the Co-enzyme B<sub>12</sub>.

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X