



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE PILANI
Pilani Campus, Chemistry Department
Inorganic Chemistry -III, CHEM F343, Semester II, 2017 - 18

Mid Semester Test, 05 Mar 2018

Maximum Marks: 90

Duration: 90 minutes

CLOSED BOOK

NOTE

1. There are TWO pages in the question paper with SIX questions.
2. Start answer each question from a new page, all subsections together
3. Use PEN only for both answering and drawing. NO PENCIL USE

Q1. (a) What is best possible way to transport the ions of quite a low charge density and N_2 across the membrane? [1+1]

(b) (i) What are the binding sites of iron when attached to hemoglobin? **(ii)** What is the oxidation state of iron when it is attached to oxygen in heme unit? Why?

(iii) How is the heme- O_2 complex stabilized?

(iv) What is the defence mechanism existing against the CO binding? [2+2+3+2]

(c) Keeping the heme unit same, for the process of oxygen carrying, should Ca or Zn be a better choice than Fe? Explain. [1+3]

Q2. (a) What are differences between hemerythrin and hemoglobin though both of them are oxygen carrier? How is the mode of binding of oxygen to hemerythrin proved? [2+4]

(b) (i) Mention the usual metals with their corresponding oxidation states present in acid and alkaline phosphate. **(ii)** Among these phosphates which one is coloured and why?

(iii) What is burst kinetics and why does the reaction involving alkaline phosphate follow burst kinetics? [2+4+3]

Q3. (a) Plastocyanin, cytochrome b, cytochrome c, flavodoxin, ferredoxin are all important proteins.

(i) What is the common activity all these proteins have?

(ii) Identity the cofactors of any **three** proteins so that these are active.

(iii) Among all these proteins, one is distinctly different. Identify that and mention the reason why it is different. [1+3+2]

(b) Name the assimilatory and dissimilatory nitrate metabolism end products. [2]

(c) (i) Is Calvin cycle in light-independent reaction the source of ATP generation or ATP consumption?

(ii) Write down the reaction steps involved in Calvin cycle.

(iii) How many cycles are required to synthesize a molecule of glucose? [1+5+1]

Q4. (a) (i) Write down the structure of ATP. **(ii)** Mention a reaction site where ATP is generated via substrate-level phosphorylation. [3+1]

(b) (i) What is the role electron transport chain in cellular respiration? **(ii)** In that context, write down the reactions happened in complex-III and mention clearly the components present in complex-III. [2 +5]

(c) (i) What is the magnetic property of type III copper protein? **(ii)** How can the magnetic property of type III be proved? [1+3]

Q5. (a) How does photosynthesis for green plants and bacteria differ from each other? [3]

NO SCRIBBLING ON QUESTION PAPER



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(b) Glyceraldehyde 3-phosphate and 3-phosphoglycerate also get generated in steps of a very important biological process other than Calvin cycle. (i) Identify the process. (ii) How does Glyceraldehyde 3-phosphate get converted to 3-phosphoglycerate in presence of NAD^+ , inorganic phosphates(Pi) and ADP?

[1+5]

(c) Nitrogenase M cofactor also known as FeMo cofactor contains an Fe_4S_3 cluster bridged with a MoFe_3S_3 cluster by three S^{2-} ligands (nonprotein). (i) Draw the structure of the cofactor. (ii) What are geometry/geometries observed around all the Fe atoms.

[3+3]

Q6. (a) For detoxification of Hg^{2+} name a ligand and justify for your choice.

[2]

(b) (i) Explain the mechanism of nitrite reductase. (ii) Why are two iron centers required for the process of reduction.

[5+2]

(c) (i) What is Goldman's equation? (ii) What is Donnan potential? (iii) Why is the Goldman's equation not exactly application for Donnan potential?

[2+2+2]

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