**Mid Semester Test, 10 Mar 2017**

**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)** In heme-O2 complex of iron, what are the roles of two histidine moieties? How does O2 binding change the splitting of the iron d orbitals? What is the expected d-orbital splitting when O2 binding causes the change from tetra-coordination?  **[2+3+2]**

**(b)** In what oxidation state, iron is stored by ferritin? Justify with the reasons. **[1+2]**

**(c)** What are the binding sites present in transferrin to capture iron? How do you prove Fe-transferrin complex formation has pH dependence? **[2+3]**

**Q2. (a)** Namethree bulk metal ions in the biological systems. How are they carried for trans-membrane processes? According to you, why is this mode of transport best? **[2+2]**

**(b)** How is oxygen carried through cell membrane? **[2]**

**(c)** Write down the reaction involving the alkaline phosphate. What is burst kinetics and why does the reaction follow burst kinetics? **[2+3]**

**(d)** Keeping the heme unit same, for the process of oxygen carrying, should Cu be a better choice than Fe? Explain. **[4]**

**Q3. (a)** Nitrite reductase involves 2 iron centers. Can you provide reason for involvement of 2 metal centers? **[2]**

**(b)** Blue copper proteins can exist in three different structures. Draw them. Which analytical techniques can justify the Type-III structure and why? **[2+2]**

**(c)** Following is the oxidised flavin molecule. Write down the reduction reaction of the molecule. **[2]**

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**(d)** In light-independent reaction of photosynthesis, 3-PGA formed from RuBP (Ribulose-1,5 -biphosphate) gets converted to G3P in presence ATP. Write down the structures of RuBP and G3P. Along with 3-PGA and ATP, name the other reagent and mention its role. Where is the absorption CO2 in the RuBP and how is it stabilised?  **[2+2+3]**

**Q4. (a)** Pyruvate is the product of Glocolysis. Write down the reaction involved in glycolysis. What are the all possible fates of pyruvate? **[5]**

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**(b)** Mention the four major steps involved in glucose oxidation. Outcome of all the individual step finally lead to the products of glucose oxidation-Justify. **[2 +8]**

**Q5. (a)** What is role of the complex I, NADH dehyrogenase in the ETC of mitochondria? Mention the reaction of all the steps.  **[5]**

**(b)** Name the metal, ligand and geometry around the metal in chlorophyll-a. Chlorophyll a and carotenoid share similarity on a structural point. What is that? Why does chlorophyll-a molecule at all have it? **[2+1+2]**

**(c)** Chemical apparatus differs for Green plant and bacterial photosynthesis. Justify. **[4]**

**Q6. (a)** Fe3O4 is a very important component of biomineral as it is a magnetic sensor in bacteria and animals. What is the structure of Fe3O4? How do reach to the conclusion? How is it a magnetic sensor?

 **[1+3+3]**

**(b)** What is Donnan potential? How to calculate it across membrane? **[2+2]**

**(c)** What is the role of nitrogenase in nature? Mention the major two components of nitrogenase involving metals. Why does the reaction proceed with energy consumption? **[2+1+2]**

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**NO SCRIBBLING ON QUESTION PAPER**