KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF BCH

COURSE CODE: SCH 413

COURSE TITLE: BIO – INORGANIC CHEMISTRY

DURATION: 2 HOURS

DATE: 6/8/ 2018 **TIME:** 2– 4PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of **3** printed pages. Please Turn Over

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QUESTION ONE. (COMPULSORY QUESTION)

1) (a) Draw the structure of a heme complex in a haemoglobin showing clearly the following structures;
   (i) The central metal atom..... (2mks)
   (ii) The nature of the ligand present..... (2mks)
   (iii) The globin .....(2mks)
   (iv) The functional groups attached to the ring ..... (2mks)

   (b) Describe the mechanism of poisoning by carbon monoxide ..... (3mks)

   (c) (i) Explain using examples the process of nitrogen fixation .....(4)

   (ii) Why are plants able to fix nitrogen under ambient conditions .....(4)

   (d) Identify three important rings in bio inorganic chemistry .....(3)

   (e) What are essential elements? Explain how an essential element can become toxic .....(3)

   (f) Using structures, describe two amino acids that are likely to bind metals .....(5)

2) (a) Explain the iron binding by transferrin..... (7)

(b)Why does CO bind more tightly to iron(II) porphyrins? Explain in one or two sentences; comment on the vCO infrared frequency in this complex. Compare this frequency to that of free CO.....(5)

(c) In what way would CO binding change the reduction potential of an iron(III) porphyrin?...(5)

(d) In what way would cyanide alter the Fe(III)/Fe(II) reduction potential of an iron porphyrin complex? ....(3)

3)(a) Graphically compare the O_2 affinity of hemoglobin and myoglobin.....(8)

(b) List the common forms of O_2 and oxygen bearing species in relation to ROS.....(8)

(c)Show with a picturesque presentation the role of distal imidazole heterocycle for trapping of O_2 by heoxy-Hb..... (4)

4)(a) Explain transport, formation and degradation of hydrogencarbonate in our body.....(7)

(b) Briefly present the aqueous iron chemistry in relation to the mineralization.....(7)

(c) How mobilization of Fe^{3+} is done by siderophores.....(6)

5) (a) Explain the pathways for inactivation of hemoglobin..... (6)

(b) Explain O_2 binding in hemerythrin .....(6)

(c) Explain the different oxygen binding behavior of the Co(II) prophyrin……..(4)

(d) Ferrochelatase is an enzyme which inserts iron into protoporphrrin IX; the iron complex is then taken up by hemoglobin. Some people are deficient in this enzyme and have some iron free protoporphyrin IX. Such individuals develop dark lesions on their skin when they are in the sun. Explain the underlying cause of this disease. Do you expect this disease to be congenital?....(4)