(b) Describe the cooperative effect in hemoglobin. Is this effect present in myoglobin? Explain.

(c) Inability to synthesize transferrin may result in anemia as well as an overload of iron. Do you agree? Justify your answer. (5,5,5)

5. (a) Name the reagent used to distinguish the II A group from the II B group in qualitative analysis. Explain its role. How will you identify copper in the presence of cadmium in qualitative analysis?

(b) Both group II and group IV cations precipitate out as their sulphides, but some cations are placed in group II and others in group IV. Explain.

(c) When both NO_3^- and Cl^- are present, sometimes no brown vapours are evolved. Explain. How will you confirm when these two ions are present together? (5,5,5)

6. (a) Discuss the health effects caused by the excess and deficiency of any two trace metals in the human body.

(b) How will you identify sulphite and carbonate ions when present together? Write down the chemical reactions involved in it.

(c) Why is it necessary to test Group V ions in the order: Ba^{2+}, Sr^{2+}, Ca^{2+}? (5,5,5)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5506 **J**

Unique Paper Code : 2172013601

Name of the Paper : DSC: Principles in Qualitative Analysis & Bioinorganic Chemistry

Name of the Course : **B.Sc. (H) Chemistry**

Semester : VI

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. Attempt **FOUR QUESTIONS** in all.
3. All Questions carry **equal** marks.

1. (a) Elements such as Silicon, Aluminium, and Titanium are abundant in the Earth's crust but play only a marginal role in biological systems. Explain why.

(b) How is the unequal concentration of Na^+ and K^+ ions in extracellular and intracellular fluids regulated in the human body? Provide a diagrammatic representation of the process and explain the mechanism involved.

(c) Explain the working mechanism of the calcium pump using ATP. What would happen if the calcium pump stops functioning in muscle cells? (5,5,5)

2. (a) A mixture of salts, when heated with ethanol and concentrated H_2SO_4, gives a gas (A), which burns with a green-edged flame when ignited. The mixture also gives a red gas (B) when heated with potassium dichromate and concentrated H_2SO_4. The pungent gas evolves on heating the mixture with NaOH solution, gives a brown precipitate (C) with potassium tetraiodomercurate (II). The residue left after boiling the mixture with dilute HCl is soluble in hot water. The hot solution gives a white precipitate (D) with dilute sulphuric acid and a yellow precipitate (E) with potassium chromate solution. Identify (A)-(E) and name the ions present.

(b) A test tube contains an aqueous solution of Fe^{3+}, Al^{3+}, and Cr^{3+}. Suggest the reagents used to

separate the three cations from each other. Discuss one confirmatory test of each cation with a chemical reaction.

(c) Identify the ion for which the following reagents are used. Write down the chemical reaction between the ion and the reagent.

(i) Sodium nitroprusside

(ii) Zirconyl nitrate

(iii) Ammonium thiocyanate

(iv) Sodium bismuthate (5,5,5)

3. (a) Explain the mechanism of action of carbonic anhydrase in converting carbon dioxide to bicarbonate. Draw a diagram of its active site.

(b) What are the toxic effects of lead? Give the reasons for its toxicity. How can it be treated?

(c) Draw and label the dose-response curves for an essential element and a toxic element. (5,5,5)

4. (a) How does cytochrome c oxidase contribute to ATP synthesis? Discuss its role in oxidative phosphorylation.