



Indian Association for the Cultivation of Science
(Deemed to be University under *de novo* Category)
Integrated Bachelor's-Master's Program
End-Semester (Sem-II) Examination-Spring 2021

Subject: Know Your Environment
Full Marks: 50

Subject Code(s): AEC 1201
Time Allotted: 3 h

[There are SIX questions in this paper. Answer any FIVE.]

1. (a) During municipal water treatment, air is often mixed intimately with the water (aeration). What kinds of undesirable contaminants would this procedure remove from water? [3]

(b) Why might hard water be desirable as a medium if phosphorus is to be removed by an activated sludge plant operated under conditions of high aeration? [3]

(c) Under what conditions does the reaction, [2]
 $\text{Fe}_2\text{O}_3 \rightarrow \text{Fe}^{2+} + \text{H}_2\text{O}$
occur in soil? Name two detrimental effects that can result from these reactions.

(d) For what kind of treatment process is activated carbon used? [2]

2. (a) Analysis of a compound shows it to contain 26.49% potassium, 35.58% Cr, and 37.93% O. What is the expected formula of the compound? [3]

(b) The combustion of tetraethyllead, $\text{Pb}(\text{C}_2\text{H}_5)_4$, formerly used as a gasoline octane booster, that burns in the presence of O_2 . What are the products that are formed in the combustion process? Comment on the environmental impact of the products. [3]

(c) Explain how Fe^{3+} ion dissolved in water can be viewed as an acidic hydrated ion. [2]

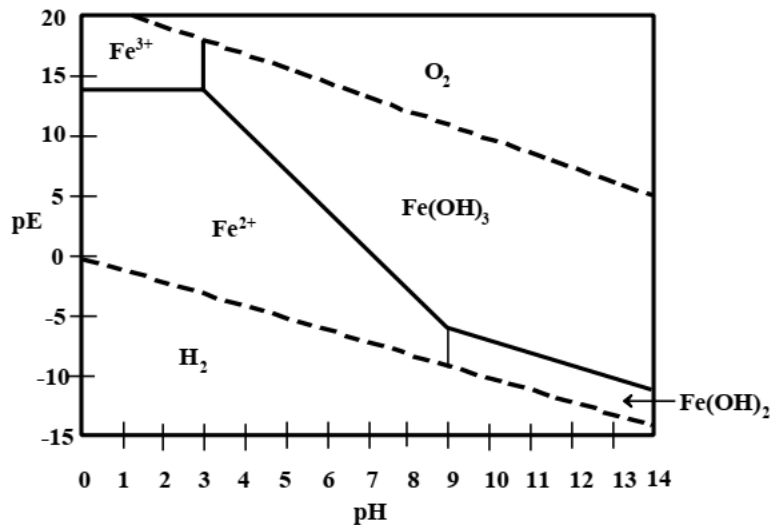
(h) Organophosphate insecticides are environmentally more superior to the organohalide insecticides. Why? [2]

3. (a) Ferrate has been proposed as a multipurpose wastewater chemical for coagulation, and disinfection. How it serves for both the purpose? [3]

(b) Hazardous wastes are often incinerated. What is this process? What are the advantages and disadvantages of incineration? [4]

(c) Why is cation exchange normally used without anion exchange for softening water? [3]

4. (a) From the following predominance diagram of iron:



(i) Explain the presence of soluble iron in anaerobic groundwater at pH 7. [2]

(ii) Explain what might happen, and why a precipitate might be observed, as acid mine water is raised to the surface and exposed to air. [2]

(b) A wastewater contains dissolved cyanide ion. What process would you prefer to remove the contaminant and why? [3]

(c) Why coagulation is used with filtration? [3]

5. (a) Both activated-sludge waste treatment and natural processes in streams and bodies of water remove degradable material by biodegradation. Explain why activated-sludge treatment is so much more effective. [3]

(b) The photogeneration process of hydroxyl radical from H₂O₂ in the degradation of toxic organic pollutants has certain disadvantages. Yet the process is often used. Why? [2]

(c) Write a short note highlighting your idea of solving the problem of pollution from stubble burning. [5]

6. (a) What are super soakers materials? How they work for removal of toxic metal ion in water? [3]

(b) Explain the process of reverse osmosis. [3]

(c) In secondary wastewater treatment, how trickling filter work? Compare its efficacy with respect to activated sludge process. [4]