



**MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY
(MMUST)
Main CAMPUS
UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

MASTERS STUDENTS FIRST YEAR MAIN EXAMINATION

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN CHEMISTRY

COURSE CODE: SCH 850: Advanced Environmental Chemistry

DATE: 17/4/2023

TIME: 2.00-5.00 PM

INSTRUCTIONS TO CANDIDATES

Answer all the Questions

TIME: 2 HOURS

MMUST observes ZERO tolerance to examination cheating

Question one (17 Marks)

1 (a). Explain what is meant by a sink, when describing pollutant fate. (3 marks)

(b) You are provided with some sinks in the environment. Discuss them in relation to pollutants of concern.

- i. CaCO_3
- ii. Human fat cells
- iii. Organic humus in the soil

(b) You are provided with the following question,



- i. What property of $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$ attracts its use in water purification as a coagulant?
- ii. Why should we monitor the alkalinity that is caused by $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$ when used as a coagulant?
- iii. What advantage will $\text{Fe}_2(\text{SO}_4)_3$ have over $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$ in water purification?

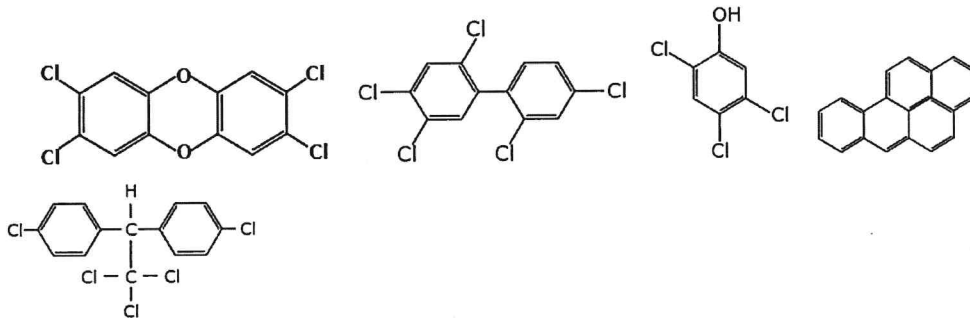
Question Two (15 marks)

4 (a) Describe the four main regions of the atmosphere in terms of their altitude ranges, general chemical composition, temperature profile, and penetration of solar radiation. Illustrate your answer using a labelled diagram. (10 marks)

(b) Giving Examples, describe green house effect. (5 marks)

Question Three (15 marks)

3 (a). In what category of pollutants do these shown pollutants fall under? (5 marks)



(b) Sketch the structure of 2,3,7,8-tetrachloro-dibenzofuran (3 marks)

(c). Briefly explain how you will dispose of 1000kg of perfluoro hexanesulfonate stockpile, without using thermal treatment methods. (5 marks)

(d) How will you treat or remediate soils that are contaminated PCBs? (2 marks)

Question Four (15marks)

4 (a) Provide the advantage and disadvantages of the following technologies that are used in removal of chemical pollutants from wastewater (6 marks)

- i. Use of adsorbents
- ii. Fenton processes
- iii. Biodegradation

(b) Briefly discuss the following advanced wastewater treatment technologies. Use suitable examples. (9 Marks)

- i. Enhanced Biological Treatment:
- ii. Advanced oxidation processes (AOPs)
- iii. Ultrafiltration and membrane technology

.....60 Marks.....