46

RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. Honours in Chemistry
Fourth year Semester I Examination – January / February 2021

CHE 4308 – ADVANCED ENVIRONMENTAL CHEMISTRY

Time: Three (03) hours

Answer **all** questions

1.
a) The Constitution of Sri Lanka ensures environment protection. Comment.
b) State the occurrence of major costal environmental pollutants of Sri Lanka.
c) Discuss the current status of ambient air quality in Sri Lanka.
d) State the pathways of priority inorganic pollutants of Sri Lankan potable water.

(100 marks)

2.
a) Define the following terms
i. Sorbtion ii. Ion exchange iii. permanent surface charge
iv. Surface complexes

b) State the differences between the inner sphere and outer sphere surface complexes.

c) The CO_2 sorption onto activated carbon is shown below. Prove that the data is following the Langmuir model. State all assumptions made in the formulation of the Langmuir model.

p-CO2 mm Hg	Γ_{CO2} g/g
0	0
25	0.0669
50	0.0924
200	0.114
400	0.127

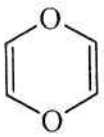
d) How is the electrical double layer formed? Discuss its impoorant in charged particulate removal in water.

(100 marks)

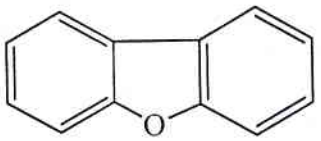
3.

a) What are persistant organic pollutants (POP)? How the government of Sri Lanka interventions for their mitigation.

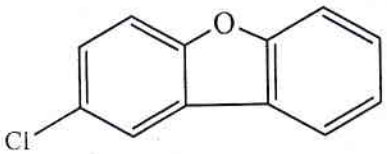
b) Write conversion pathways of following pollutants



1,4-dioxin

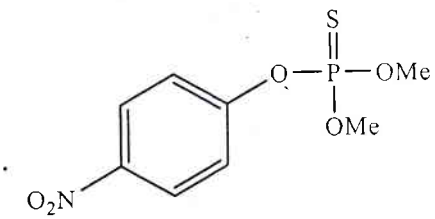


dibenzofuran



2-chlorodibenzofuran

c) Postulate the hydrolysis pathways of methyl parathion



d) A certain soil has a bulk density of 1.28 g cm^{-3} and an organic carbon content of 1%. The porosity of the soil is 30%, of which 50% is occupied by water and 50% by air. Benzene is disposed into the environment. Find the percentages of benzene contained within the solid, liquid and gas phases.

$K_H = 0.22$ $K_{OW} = 134.90$ $K_d = 0.6\ f_{oc}K_{OW}$ (100 marks)

4. Conventional water treatment is recognized as a solid liquid separation process. Hence, it is based on the removal of suspended solid and then disinfection

a) How do you correlate suspended solid (SS) and turbidity?
b) Explain the importance of using Al^{+3} or Fe^{+3} over other metal ions in coagulation process.
c) Explain coagulation and flocculation processes using the double layer theory.
d) Briefly discuss about the jar test and use of it in water treatment.

5. Disinfection with chlorination is considered as a compulsory treatment in municipal water treatment as it provides residual chlorine within distribution system. (100 marks)

a) What is chlorination?
b) What are the other similar methods used in disinfection?
c) What does it mean by 'CT value'?
d) Discuss about disinfection by-products with examples.
e) Explain about the need of having a properly designed coagulation and flocculation process before ensuring an effective disinfection process to happen 4 marks).

(100 marks)

— END —