P. P. SAVANI UNIVERSITY

Fifth Semester of B.Sc. Examination

December-2021

SSES3010–Advanced Wastewater Treatment Technologies I

07.12.2021, Tuesday **Time: 12:30 p.m. to 03:00 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

Section-I (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a ____ Treatment is required to remove remaining constituents from the biological treatment.

- **A** Preliminary
- **B** Primary
- **C** Secondary
- **D** Advanced

1.1b ___ may increase chlorine demand.

- **A** Colloidal matter
- **B** Organic matter
- **C** Ammonia
- **D** Surfactants

1.1c ___ Compounds are carcinogenic in nature.

- **A** Colloidal matter
- **B** Organic matter
- **C** Volatile organic compounds
- **D** Surfactants

1.1d ___ constituent if present in wastewater may shield bacteria during disinfection

- **A** Colloidal matter
- **B** Organic matter
- **C** Refractory organics
- **D** VOC

1.1e TKN = ____+____

- **A** NH4+ Organic-N
- **B** NH4+NO2
- **C** NO2+Organic-N
- **D** NO2+NO3

1.1f Nitrosomonas converts ____ to ____

- **A** Nitrite, Nitrate
- **B** Nitrate, Nitrite
- **C** Ammonia, Nitrite

D Ammonia, Nitrate

1.1g ____ is the suitable pH range for nitrifying bacteria.

A 6.5-7
B 4-5.5
C 7.5-8
D 8-9

1.1h ___ form of phosphorous is a basic constituent of detergents and water softeners.

A Particulate Poly-phosphate
B Organic Phosphate
C Inorganic Orthophosphate
D Orthophosphate

1.1i Which of the below is an example of PAO?

A Acinetobacter
B Pseudomonas
C Rhizobacteria
D Nitrosomonas

1.1j ___ is uptake by PAO in EBPR process.

A PHB
B VFA
C Orthophosphorous
D Particulate Poly-phosphate

1.2 Answer the Following **[05]**

1.2a Full form of MBTE.

1.2b Give any one example of advanced wastewater treatment.

1.2c Give any one example of denitrifying bacteria.

1.2d In denitrification, heterotrophic bacteria consume oxygen from ___

1.2e Full form of PHB.

Q.2 Short Notes (Attempt any two) **[06]**

A Write a note on need for advanced wastewater treatment.

B Write a note on SNDn.

C Explain Direct precipitation used in Chemical phosphorous removal.

Q.3 Explain in detail (Attempt any two) **[14]**

A Write a note on typical residual constituents found in wastewater and their impacts.

B Write a note on types of process included in denitrification.

C Write a note on EBPR.

Section-II (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a Which of the following is not an adsorbent?

A Carbon
B Silica
C Polymer
D Dry sponge

1.1b Pore size Nano-filtration membrane ranges from _____

A 0.1- 5μm
B 0.1- 0.01μm
C 0.001- 0.01μm
D 0.0001- 0.001μm

1.1c The concentrate, the retained liquid is called _____

A Permeate
B Retentate
C Concentration factor
D Diafiltration

1.1d What is the typical separation mechanism in Electrodialysis?

A Sieve
B Solution + Diffusion
C Diffusion
D Ion exchange with selective membrane

1.1e The rate at which permeate flows through membrane is known as ___

A Flux
B Brine
C Scaling
D Permeate

1.1f Pore size Micro-filtration membrane ranges from _____

A 0.08- 2μm
B 0.1- 0.01μm
C 0.001- 0.01μm
D 0.0001- 0.001μm

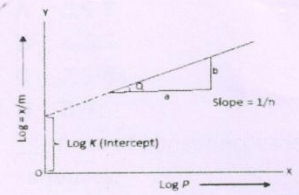
1.1g Calculate the adsorption of a dye on activated carbon at 25°C, where k = 10, n = 0.5 and C = 0.04. Based on the Freundlich isotherm.

A 1.599
B 2.135
C 2.678
D 4.234

1.1h Which of the following is characteristic of Langmuir isotherm?

A It is reversible
B It is specific
C It is multilayer phenomenon
D Heat of adsorption is about 400kj

1.1i Which type of isotherm is given from the figure, Choose from the following options?



A Langmuir
B BET
C Freundlich
D Kisluik

1.1j Scaling can occur in membrane due to presence of ___ compound.

A Calcium Sulfate
B Acid
C Base
D Free Oxygen

1.2 **Answer the Following (Fill in the blanks/Definition/True or False)** **[05]**

1.2a Full form of GAC.

1.2b Define Adsorption.

1.2c _____ separation mechanism is used Micro filtration membrane filter to remove particulate material from water.

1.2d Define term scaling.

1.2e Define term Brine.

Q.2 **Short Notes (Attempt any two)** **[06]**

A Explain Freundlich and Langmuir Isotherm.

B Write a short note on Carbon regeneration and Reactivation.

C Write a short note on Tubular and Hollow Fiber membrane configuration with neat sketch.

Q.3 **Explain in detail (Attempt any two)** **[14]**

A Mention advantages, disadvantages and application of MF & UF.

B Explain Membrane Fouling.

C Write down the general characteristics of membrane processes