



M.E. DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

First Semester

ENVIRONMENTAL ENGINEERING

P18EEI1201: Environmental Chemistry and Microbiology

COURSE OUTCOMES

- CO1:** Apply basic chemical concepts to analyze chemical processes involved in different environmental problems.
- CO2:** Solve and analyse the chemical kinetics involved in the water and waste treatment processes.
- CO3:** Use the appropriate degradation technology based on the surface chemistry of the fluids .
- CO4:** Identify the role microbial metabolism in a wastewater treatment plant.
- CO5:** Monitor the impact of the pollution, by identifying the various bioremediation and biodegradation processes.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Sequence below mentioned components in a combined electrode from the inner most one. CO1 [K₂]
1. Glass membrane 2. Reference Electrode 3. Membrane Electrolyte 4. Porous junction
a) 2-1-3-4 b) 2-3-1-4
c) 1-2-3-4 d) 2-4-3-1
2. The percentage ionization of 0.01 M H₂CO₃ solution at 25°C for a given K_a as 4.45 x 10⁻⁷ is CO1 [K₃]
a) 0.2 b) 2.0
c) 20 d) 0.02
3. Which among the following is not a first order reaction? CO2 [K₂]
1. Adsorption 2. Disinfection 3. Drug decomposition 4. Microbial kinetics
a) 1 only b) 1, 2 & 4
c) 3 only d) 3 & 4

4. Which of the following are not B vitamins? CO2 [K₂]
 B1, B2, B3, B4, B5, B6, B7, B8, B9, B10
- a) B4, B8 b) B3, B7
 c) B2, B6 d) B1, B9

5. Matching type – I list of Colloidal dispersion phase with the type – II list of relevant colloidal names with multiple choice code CO3 [K₂]

List I	List II
A. Solid – Liquid	i. Smokes
B. Liquid - Gas	ii. Sols
C. Solid – Gas	iii. Foams
D. Gas - Liquid	iv. Fogs

- a) A – ii B – i C- iii D – iv b) A – iii B – iv C- i D – ii
 c) A – ii B – iv C- i D – iii d) A – iii B – i C- ii D – iv
6. **Assertion (A):** The surface to volume ratio of a given particle shape is inversely proportional to the length of the principal axis. CO4 [K₂]

Reason (R): The surfaces of colloids are of maximum importance since the interaction of the particles with each other and the principal phase is of primary concern.

- a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A
 c) A is true but R is false d) A is false but R is true

7. Matching type – I list of Enzymes with the type – II list of respective functions in DNA replication with multiple choice code: CO4 [K₂]

List I	List II
A. Ligase	i. Opens the DNA helix
B. Helicase	ii. Matches with new nucleotide
C. Polymerase	iii. Forms RNA primer
D. Primase	iv. Joins the fragment strands

- a) A – iv B – i C- iii D – ii b) A – iii B – iv C- i D – ii
 c) A – ii B – iv C- i D – iii d) A – iv B – i C- ii D – iii

23. Explain in detail the dietary source and functions of fat soluble vitamins. CO2 [K₂]
24. State the properties of colloids. CO3 [K₂]
25. Explain in detail the various steps involved in Recombinant DNA technology. CO4 [K₂]
26. Explain in detail the fate and mechanism of xenobiotics in a body system. CO5 [K₃]

Answer any FOUR Questions

PART D (4 x 10 = 40 Marks)

27. Calculate the pH, degree of dissociation and concentration of various species in a solution of 0.1 M acetic acid which also contains 0.1 M sodium acetate (K_a for acetic acid = $1.85 \times 10^{-5} \text{ mol dm}^{-3}$). CO1 [K₃]
28. Derive an expression for Michaelis Menten equation and state the significance of MM constants in wastewater treatment process. CO2 [K₃]
29. Elaborately discuss on the application of different types of surfactants. CO3 [K₂]
30. Illustrate and explain aerobic cellular respiration through Glycolysis. CO4 [K₃]
31. Explain the various steps and mechanism involved in detoxification during xenobiotic biotransformation. CO5 [K₂]
