KUMARAGURU college of technology
character is life

Register Number:……..…

M.E DEGREE EXAMINATIONS: DEC 2022

(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 analyze 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 and analyze the role of microbial metabolism and techniques in a wastewater treatment plant

CO5: Monitor the impact of the pollution, by identifying the various bioremediation and biodegradation processes

CO6: Analysis the microbial techniques in wastewater treatment

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Sequencing type item CO1 [K_2]

The volume of gases H2, CH4, CO2 and NH3 adsorbed by 1 gm charcoal at 293 K can be given in the order_____

a) $CH_4 > CO_2 > NH_3 > H_2$ b) $CO_2 > NH_3 > H_2 > CH_4$

c) $NH_3 > CO_2 > H_2 > CH_4$ d) $NH_3 > CO_2 > CH_4 > H_2$

2. A solution is prepared by diluting 50 mL of 0.1 M HCl to 1 L. The pH of the final solution is approximately_____ CO1 [K_1]

a) 1.3 b) 2.3

c) 3.3 d) 4.3

3. According to Arrhenius equation, rate constant (k) is proportional to _____ CO2 [K_3]

a) Activation Energy (E) b) e^{E}

c) $e^{1/E}$ d) e^{-E}

4. Matching type item with multiple choice code CO4 [K_4]

List I	List II
1. Microbial degradation	i. Fermentation
2. Acetogenesis	ii. Plate counts, gene probes
3. Dispersion	iii. Batch study
4. Biochemical reactions	iv. Tracer study

a) 1-i, 2-ii, 3-iii, 4-iv
b) 1-ii, 2-iii, 3-iv, 4-i
c) 1-ii, 2-i, 3-iv, 4-iii
d) 1-iii, 2-iv, 3-i, 4-ii

5. Colloidal AgCl in aqueous medium may be positively or negatively charged with adsorbed ions. The ion may be_____ CO3 [K_3]

a) Ag^+
b) Na^+
c) I^-
d) Br^-

6. _____ of the following colloidal system represents a gel. CO3 [K_3]

a) Solid in liquid
b) Solid in gas
c) Liquid in solid
d) Liquid in gas

7. Assertion (A): Bioenergetics is to describe how living organisms acquire and transform energy in order to perform biological work. CO5 [K_5]
Reason (R): Study of Metabolic pathways is essential in bioenergetics.

a) Assertion (A) is true but Reason (R) is false
b) Assertion (A) is false but Reason (R) is true
c) Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation for Assertion (A)
d) Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation for Assertion (A)

8. How many molecule(s) of pyruvate does one molecule of glucose yield after glycolysis? CO5 [K_4]

a) 1
b) 2
c) 3
d) 4

9. Ribosomes are composed of_____ CO4 [K_4]

a) Proteins
b) RNA
c) DNA
d) Lipids

10. _____ of the following enzymes separates the two strands of DNA during replication. CO4 [K_4]

a) Gyrase
b) Topoisomerase
c) Helicase
d) DNA polymerase

PART B (10 x 2 = 20 Marks)

11. Define Salt Hydrolysis. CO1 [K_1]
12. How does NaOH concentration affect the pH of a solution? CO1 [K_1]
13. List the factors affecting Enzyme Activity. CO2 [K_1]
14. Recall the process involved in anaerobic decomposition. CO2 [K_1]
15. Outline Hardy Schulze rule. CO3 [K_1]
16. Define Hydrophilic colloids. CO3 [K_1]
17. Infer the importance of Oxidative phosphorylation. CO4 [K_2]
18. Define Recombinant DNA technology with suitable example. CO4 [K_1]
19. Define Ecotoxicology. CO6 [K_1]
20. List the types of xenobiotics. CO6 [K_1]

PART C (6 x 5 = 30 Marks)

21. If 15 mL of 0.1 M HCl is diluted to 1 L solution. Examine the approximate final pH. CO1 [K_4]

22. A liquid phase reaction is governed by first order kinetics and takes place in a batch reactor. In the reaction A→ Product, 75% of the reactant A dissociates into the product. Calculate the time taken (in seconds) in the reaction to achieve the above condition. Rate constant, k = 5 sec^{-1} CO2 [K_4]

23. Define Colloids and Explain the types of colloids. CO3 [K_2]

24. Classify detergents depending on the electrical charge of the surfactants. CO3 [K_4]

25. Identify the assumptions and importance of Michaelis-Menten equation. CO3 [K_3]

26. Explain the role and name of enzyme which produces ATP in the Electron transport chain. CO4 [K_2]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27.	What is the pH of the buffer solution containing 0.2 M of NH_3 & 0.1 M of NH_4Cl? (Given: pK_b of NH_4OH = 4.74)	CO1	[K_1]
28.	Analyze that in Arrhenius equation, the factor 'A' may be termed as the rate constant at very high temperature and at zero activation energy.	CO2	[K_4]
29.	Explain Faraday Tyndall effect and its applications.	CO3	[K_2]
30.	Examine the formation of end products of tricarboxylic acid with a neat sketch.	CO5	[K_4]
31.	Define Biodegradation. Explain the process and factors affecting of biodegradation rate.	CO6	[K_2]

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