AHMEDABAD UNIVERSITY
School of Engineering and Applied Science
2025-2026 Monsoon

CHE318: Physical and Chemical Treatment Processes
Mid-Term Examination
Monday 23 February 2026. 11:00 – 13:00

Name:	Roll no.	A	U	2							Marks

/35

Write your answers on this sheet and on the answer book. Attach this sheet to the answer book and then submit it. Answer all questions. Access to net is not allowed.

Part-A (Answer in Brief) **8 x 2 = 16 Marks**

1. Is water a polar or non-polar molecule? Substantiate your answer with the molecular structure of water.
2. For each of the following molecules, determine whether the bond type is (a) polar covalent, (b) pure covalent/non-polar covalent, or (c) ionic.
   (i) CO_2
   (ii) HF
   (iii) NaCl
   (iv) H_2O

3. For any given water sample, is BOD greater than, lesser than, or equal to COD? Substantiate your answer with appropriate explanation.

4. Which of these treatment options would you choose for the removal of suspended solids in a water treatment plant? Mention the reason for your choice.
   a. Sedimentation tank
   a. UV-treatment
   a. Softening
   a. Chlorination
   a. Both (c) and (d)

5. Mention the risks associated with turbidity in drinking waters.

6. Draw the electric double layer formed around a negatively charged colloid in water.

7. State two differences between electrolysis and electro-peroxone. Also, mention the order in terms of the oxidation potential (from lowest to highest) of the following oxidants: Chlorine, Ozone, Hydrogen peroxoide, oxygen and hydroxyl radicals.

8. Mention the four mechanisms to achieve particle destabilization using coagulation.

Part-B

9. If you were to design a water treatment plant, what treatment train (series of units) would you choose to treat a typical
   a. Groundwater
   a. Surface water

Please draw a flow chart to show the series of treatment units. Clearly indicate which unit contributes towards the removal of which kind of contaminants.
(4 Marks)

10. You are an environmental engineer, and you have been given the assignment to evaluate the sewage-influent sample of a local wastewater treatment plant. To understand the oxygen demand of the sample, you estimated the ultimate BOD and found it to be 1500 mg/L and $k_1 = 0.1 d^{-1}$ (coefficient is for calculations to the base 10).

Based on the ultimate BOD, you are asked to compute the BOD on days 10 and 20.
(3 Marks)

11. For the rectangular horizontal-flow sedimentation basin following discrete sedimentation, compute the particle removal efficiency for the influent particle-settling characteristics given below.
(7 Marks)

Parameter	A
Flow rate, m^3/d	7,570
Length, m	30
Width, m	5

Settling Velocity, m/h	Number of Particles, #/mL
0–0.4	511
0.4–0.8	657
0.8–1.2	876
1.2–1.6	1168
1.6–2.0	1460
2.0–2.4	1314
2.4–2.8	657
2.8–3.2	438
3.2–3.6	292
3.6–4.0	292

12. Calculate the terminal settling velocity for sand in water at 10°C having particle diameter of 75μm and a density of 2650 kg/m³. The density and viscosity of water at 10°C are $\mu = 1.30 \times 10^{-3}$ N·s/m² (or kg/m·s) and $\rho_w = 999.7$ kg/m³.
(5 Marks)