

UPES SAP ID No.: _____



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

Examination, July 2020

Programme:
Course Name:
Course Code:
No. of page/s:

Semester :
Max. Marks : 40
Attempt Duration : 24 Hrs.

Note:

1. **PART B** should be attempted after **PART A**
 2. There are total of five questions attempt all carry equal marks
 3. **PART B** consist of long answer based questions and has the total weightage of 40%. (Whereas **PART A** it is 60%)
 4. **PART B** to be submitted within 24 hrs from the scheduled time. i. e the examination starts on 8th July 2020 at 10:00 AM, the answers must be submitted by 09:59:59 AM next day (9th July 2020). No submission of **PART B** shall be entertained after 24 Hrs.
 5. **The PART B** responses(Answers) should be attempted in blank white sheets (hand written) with all the details like programme, semester, course name, course code, name of the student, SAP ID at the top (as in the format) and signature at the bottom (right hand side bottom corner)
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PART – B (Attempt all the questions)
(5 × 8 = 40 marks)

1. Explain all types of corrosion and explain prevention control methods.
2. a) A Zn rod is placed in 0.1M solution of ZnSO₄ at 25°C. Assuming that the salt is dissociated to 95% at this dilution, calculate the potential of the electrode at this temperature.

Given: $E^\circ_{(Zn+2/Zn)} = -0.76V$.

- b) From the given molar conductivities at infinite dilution, calculate λ_m^∞ for NH₄OH.
 λ_m^∞ for Ba(OH)₂ = 457.6 ohm⁻¹ cm²mol⁻¹.
 λ_m^∞ for Ba(Cl)₂ = 240.6 ohm⁻¹ cm²mol⁻¹.
 λ_m^∞ for NH₄Cl = 129.8 ohm⁻¹ cm²mol⁻¹.

3. a) Calculate the temporary and total hardness of a water sample containing $\text{Mg}(\text{HCO}_3)_2 = 73\text{mg/L}$, $\text{Ca}(\text{HCO}_3)_2 = 162\text{mg/L}$, $\text{MgCl}_2 = 95\text{mg/L}$, $\text{CaSO}_4 = 136\text{mg/L}$

b) Write a short note on Ion-exchange process. And solve below numerical

Explain with chemical equations and calculate the amount of lime and soda required for softening of 1,00,000l of water containing the following:

$\text{HCl} = 7.3\text{ mg/L}$, $\text{Al}_2(\text{SO}_4)_3 = 34.2\text{mg/L}$, $\text{MgCl}_2 = 9.5\text{mg/L}$, $\text{NaCl} = 29.25\text{mg/L}$.

Purity of lime is 90% and that of soda is 98%. 10% of chemicals are to be used in excess in order to complete the reaction quickly.

4. a) 1000 litres of hard H_2O is softened by zeolite process. The zeolite was regenerated by passing 10 litres of sodium chloride solution containing 1000 ppm of NaCl . Calculate hardness of H_2O .

b) How many litres of 58.5 mg/L NaCl solution will be required to regenerate an exhausted zeolite bed after softening of 10 litres of hard water of 100 ppm hardness?

5. Describe sol-gel and micro emulsion technique for the synthesis of nanomaterials.

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