UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Basic Analytical Chemistry   Semester   : IV
Program: B.Sc. Chemistry (H)   Time   : 03 hrs
Course Code: CHEM 2011   Max. Marks: 100

Instructions:
- **Attempt all the questions.**
- **Internal Choices are given for question number 9 & 11**

	SECTION A		
S. No.		Marks	CO
Q 1	Describe the different types of instrumental errors in chemistry.	4	CO1
Q 2	Write a brief note on precision and accuracy.	4	CO1
Q 3	Write a short note on composition of soil.	4	CO3
Q 4	Describe the below mentioned terms. (i) Spraying agent (ii) Stationary Phase	4	CO2
Q 5	Discuss the working principle of paper chromatography in brief.	4	CO2
	SECTION B **Attempt all questions. Internal Choices are given for Q 9.**		
Q 6	Discuss the method for determination of Calcium in the soil sample by complexometric titration.	10	CO3
Q 7	(a) Standard HNO_3 solution was prepared for preparation of calibration graph. A 25 % (v/V) stock HNO_3 solution was used for the preparation of standard solution having pH= 4.5. Find out the amount of HNO_3 (in mL), should be used, to prepare 8000 liter of the above solution. (b) A sample containing 750 mg of $CaCO_3$ and 1250 mg of $MgCl_2$ was dissolved in acid and made to 500 mL. It was titrated with EDTA of unknown strength, and volume used was found to be 50 ml for a 25 ml of above water sample solution. Find out the hardness of water (in ppm) and molarity of EDTA (in mole/liter).	5+5	CO3
Q 8	Describe the below mentioned techniques in detail. (i) Thin layer chromatography	10	CO2

	(ii) Column chromatography		
Q 9	(i) A 5 ml of a sample of water when titrated with required 10 ml of N/15 HCl using methyl orange indicator gives color change, but did not give any color with phenolphthalein. Determine the type and extent of alkalinity (in mg/liter) is present, in the sample. OR Calculate the pH value of a solution obtained by mixing 225 ml of 0.2 N HCl with 50 ml of 0.1 N NaOH. (ii) Hardness of 11,000 liter of a water sample was completely removed by passing it through a Zeolite softener. The softener required 200 liter of NaCl solution (35 g/liter of NaCl) for regeneration. Calculate the hardness of water sample. OR A 50 mL sample of domestic water was titrated against 0.01 M EDTA and the end point occurred at 28.0 ml. Find out the hardness of water in ppm of $CaCO_3$ equivalent.	4+6	CO3

SECTION-C
Attempt all questions. Internal Choices are given for Q 11.

Q 10	(i) Discuss the procedure for separation of cobalt and nickel metal ions from their mixture by a paper chromatography technique. (ii) Describe the process for determination of Caffeine in sample	10+10	CO2
Q 11	(i) Determination of ion exchange capacity of anion/cation exchange resins is key procedure in the industry. Discuss in detail the above process for an anion exchange resin, giving suitable examples, diagram and concept. OR Write the process of spectrophotometric determination of Iron in dietary food supplements. (ii) A standard solution of hydrated oxalic acid [$(COOH)_2. 2H_2O$] was prepared dissolving 63 gm in 10 liter of solution, for calibration of NaOH. The standard NaOH was used to determine the ion exchange capacity of a polymeric resin. Based on the data given below find out the Normality of oxalic acid, NaOH, along with ion exchange capacity of the resin. • Mass of resin = 1.88 gm • Volume of NaOH take= 25.0 mL • Volume of oxalic acid used= 35.5 mL OR Describe in detail about the Flame Photometric Determination of Potassium in tap water.	14+6	CO2