UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2023

Course: Principles of Analytical Chemistry
Program: B.Sc. Chemistry
Course Code: CHEM 1019

Semester   : II
Time   : 03 hrs
Max. Marks: 100

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

S. No.	SECTION A	Marks	CO
Q 1	0.45 grams of an acid of molecular weight 90 was neutralized by 20 ml of 0.5N caustic soda. What is the basicity of the acid?	**4**	**CO1**
Q 2	List out the ways of locating end point of an acid-base titration	**4**	**CO1**
Q 3	Write a short note on precipitating reagents with examples	**4**	**CO3**
Q 4	Describe the below mentioned terms. (i) Mobile phase (ii) Stationary Phase	**4**	**CO2**
Q 5	Discuss how the purity of a precipitate can be increased.	**4**	**CO2**

SECTION B
Attempt all questions. Internal Choices are given for Q 9.

Q 6	(a) The pH of aqueous solution of 0.05M diethylamine is 12. Calculate its dissociation constant. (b) State and derive distribution law.	**5+5**	**CO3**
Q 7	(a) 50 ml of 0.1 N acetic acid is titrated against 0.1N sodium hydroxide. Calculate pH after addition of (i) 0 ml (ii) 40 ml and (iii) 60 ml of sodium hydroxide. (b) Discuss in brief, the methods of conducting complexometric titrations and their applications in industry.	**5+5**	**CO3**
Q 8	Describe the below mentioned techniques in detail. (i) liquid-liquid microextraction (ii) Thin layer chromatography	**5+5**	**CO2**
Q 9	(i) Discuss the action of phenolphthalein in an acid-base titration. Also give structure and pH range of phenolphthalein. OR	**4+6**	**CO3**

	Calculate the pH value of a solution obtained by mixing 50 ml of 0.2 N HCl with 50 ml of 0.1 N NaOH. (ii) A 15 mL of a chloride sample was treated with 15 mL of 0.15 M $AgNO_3$. The excess silver was titrated with 0.10 M SCN^- requiring 3.5 mL to reach the red $Fe(SCN)^{2+}$ end point. Find the amount of chloride (At Wt = 35.5) in g/L. OR A 0.238 g sample contained only NaCl and KBr. It was dissolved in water and required 48.40 mL of 0.048 M $AgNO_3$ for complete titration of both halides [giving AgCl(s) and AgBr(s)]. Calculate the weight percent of Cl in the solid sample		
<div align="center" colspan="3">**SECTION-C** **Attempt all questions. Internal Choices are given for Q 11.**</div>			
Q 10	(i) In the distribution of succinic acid between benzene and water at 15°C, 20 ml of ethereal layer contains 0.092 g of the acid. Find the weight of the acid present in equilibrium with it if the distribution coefficient for succinic acid between water and ether is 5.2. (ii) Discuss the requirement of primary standard solution and secondary standard solution with few examples (iii) Discuss the important applications of buffer solutions including physiological buffers. (iv) Briefly describe the various steps involved in gravimetry.	**6+5+5+4**	**CO2**
Q 11	(i) An aqueous solution of acid at 15°C, containing 0.07 g in 10 ml is in equilibrium with an ethereal solution which has 0.013 g in 10 ml. the acid has its normal molecular weight in both the solvents. Find out the concentration of the ethereal solution which is in equilibrium with an aqueous solution containing 0.024 g in 10 ml? OR Elaborate the role of redox indicators in redox titrations with few examples (ii) Find the pCl in a 20 mL of a 0.10 M Cl^- solution after addition of 0, 10, 20, and 30 mL of 0.10 M $AgNO_3$. K_{sp} = $1.0x10^{-10}$. OR Describe in detail any one redox titrations and give their application.	**12+8**	**CO2**