

Name:
Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, January 2021

Program : M.Sc. Chemistry
Course : Principles of Analytical Chemistry
Course Code: CHEM 7004

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

Section A

Instructions:

1. Each Question will carry 5 Marks
2. Complete the statement /select the correct answer(s)
3. Answer should be short, fill in blank, true or false.

S. No.	Question	CO
Q 1	(a) A 100 mL sample of well water was titrated against 0.015 M EDTA. The end point was reached at 39.50 mL. Find out the hardness of water in mg/liter of CaCO ₃ equivalent. (b) Absolute formation constant (K_{MY}) for MgY^{-2} is 5.0×10^{10} and α_4 at pH 10.5 is 0.35. A 20 mL of 0.01 M Mg^{+2} solution buffered at pH 10.5 and titrate with 0.01M EDTA solution. After addition of 20.0 mL of titrant EDTA, the pMg will be. (2+3 marks)	CO4
Q 2	A 720.0 mg sample containing KCl and NaCl gave 1520.4 mg of AgCl. Find out the percentage of the KCl and NaCl in the sample. (NaCl=58.5, KCl=74.5 and AgCl=143.5 gm/mol)	CO3
Q 3	(a) Find the pH of 0.001 N HCN solution if it is 1.8 % ionized in a given solution. (b) 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. (3+2 marks)	CO2
Q 4	(a) If we begin with 8 mL of a glucose solution with a concentration of 0.55 mol L ⁻¹ and dilute it to a volume of 0.4 L, what is the concentration of the final, diluted solution (in mol L ⁻¹)? (b) How much water must we add to a 25 mL sample of NaCl with a concentration of 0.3 mol L ⁻¹ to bring about a ten-fold dilution? (3+2 marks)	CO3
Q 5	Calculate the pH of the following solutions, till 4 significant figures (a) 1.0×10^{-8} M HCl & (b) 1.0×10^{-8} M NaOH. (2+3 marks)	CO2
Q 6	In an experiment, an average of 37.0 ml of 0.48 mol/L magnesium hydroxide is required to titrate 60.0 ml of the acid in order to reach the endpoint. The neutralization reaction is- $2CH_3COOH_{(aq)} + Mg(OH)_{2(aq)} \rightarrow Mg(CH_3COO)_{2(aq)} + 2H_2O(l)$ Find out the concentration of acetic acid.	CO3

Section B

Instructions:

1. Each question will carry 10 marks
2. Write short/brief notes of 1-2 page answer.
3. Question 11 has internal choices, and hence you have to attempt only one out of two questions.
4. Draw the neat diagram, to justify your answer.

Q 1	(a) Discuss Hammett equation and give its significance? (b) Discuss Bronsted and Lewis theories for acids and give their limitations.	CO2
Q 2	(a) Write about the Principles of Chromatography and write about its applications in qualitative and quantitative analysis. (b) What do you mean by R _f value in chromatography and discuss the parameters, which affect R _f values.	CO1
Q 3	Discuss the below mentioned titrations methods involving EDTA citing suitable diagram and reactions. (a) Back and (b) Indirect	CO4
Q 4	The application of standard solutions is the key factor in analytical chemistry. Write a short note on primary and secondary standards citing some examples along with their importance.	CO3
Q 5	Find out the electrode potential for a potentiometric titration of 0.05 N Ce (IV) (60 mL) with 0.10 N Fe (III) if both solutions were prepared in one molar H ₂ SO ₄ . Given that $E^0_{Fe^{+2}/Fe^{+3}} = 0.68 V$ and $E^0_{Ce^{+3}/Ce^{+4}} = 1.44 V$ (i) At the start of the titration. Assume $\frac{[Ce^{+4}]}{[Ce^{+3}]} = 1000$ (ii) After the addition of 15 mL of Fe solution. (iii) At equivalent point. (iv) After the addition of 35 mL of Fe solution. OR Describe the concept, chemical used and procedure for water determination by Karl Fischer reagent.	CO4

Section C

Instructions:

1. Question is of 20 marks

2. Draw the neat diagram, to justify your answer.

3. Internal choices is there for 12(a) and 12(b), and hence you have to attempt both 12 (a) and 12(b)

Q 1	<p>(a) Discuss the principles of solid-phase extraction and its limitations</p> <p style="text-align: center;">OR</p> <p>Discuss the various devices used for solid phase micro extraction with illustrations.</p> <p>(b) Discuss the factors affecting the SPME, and advantages of the SPME.</p> <p style="text-align: center;">OR</p> <p>Discuss the various methods used in LPME and compare their advantages and disadvantages</p>	CO1
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