Index no:.....

UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES

DEPARTMENT OF PHARMACY

THIRD BPHARM PART I EXAMINATION – JULY 2018

PH 3113 ANALYTICAL CHEMISTRY (SEQ)

TIME: TWO HOURS

INSTRUCTIONS

- There are **four** (04) questions in parts **A, B** and **C** of the paper.
- Answer each part in a separate booklet provided.
- Do not use any correction fluid.
- Marks will be deducted for illegible hand writing.
- Use of calculators is allowed.

PART A

01 Answer all parts.

1.1. What is the ISO definition of "Quality"? ***(15 marks)***

1.2. Briefly explain the importance of "quality" in pharmacy/pharmaceutical industries. ***(15 marks)***

1.3. List **five** important characteristics of quality assessment of pharmaceuticals. ***(10 marks)***

1.4. Uniformity is one of the most important characteristic of pharmaceutical quality. Explain how it is determined in different dosage forms. ***(15 marks)***

1.5. State what is meant by "method validation". ***(15 marks)***

1.6. List **ten** parameters of method validation. ***(20 marks)***

1.7. Give **five** sources of impurities in pharmaceuticals. ***(10 marks)***

PART B

02. Answer all parts.

2.1 Give the definitions of the terms ***molarity*** and ***molality.*** ***(08 marks)***

2.2 A 500.00 cm^3 of 0.0020 N H_2SO_4 acid is mixed with 0.0200 g of NaOH. Calculate the concentration of the resulting solution ***in ppm.*** (*Relative molar mass of H_2SO_4 acid and NaOH are 98 and 40 respectively*). ***(10 marks)***

2.3 What is a buffer solution? ***(04 marks)***

2.4 What are the **two** factors that affect the pH of a buffer? ***(04 marks)***

2.5 A 250.00 cm^3 of a buffer solution **A** was prepared by dissolving 4.32 g of acetic acid and 1.50 g of sodium acetate. (*The dissociation constant of acetic acid is 1.8×10^{-5} at 25 °C and the molecular weights of acetic acid and sodium acetate are 60 and 82 g/mol respectively*).

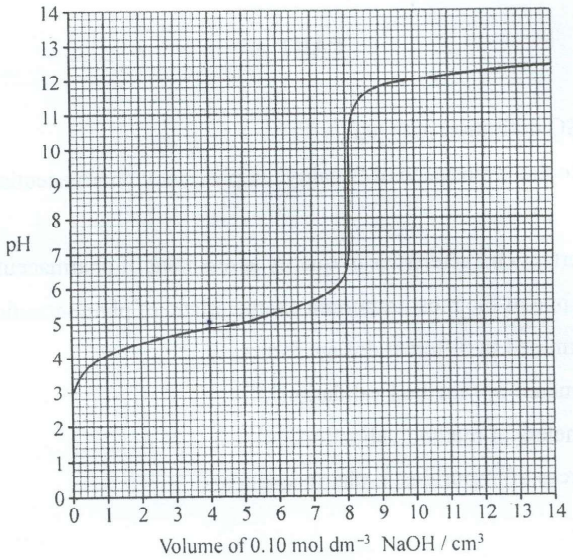
2.5.1 Calculate the pH of the buffer solution **A**. ***(10 marks)***

2.5.2 A new buffer solution **B** was prepared by adding 4.30 g of NaOH into solution **A** and diluting it up to 1.00 dm^3 with distilled water. Calculate the pH change that you expect in solution **B.** ***(10 marks)***

2.5.3 Which one of the above two buffers (A or B) would be the best buffer? Give reasons. ***(04 marks)***

PART C

2.6 The following graph shows how the pH changes during the titration of 10.00 cm^3 of a solution of a weak acid (HA) with 0.1000 mol dm^{-3} NaOH.



2.6.1 What is the pH at the equivalence point and explain why the pH changes rapidly in this region. ***(10 marks)***

2.6.2 Calculate the initial concentration of the acid (HA). ***(20 marks)***

2.6.3 Calculate the $[H^+]$ of the acid before any sodium hydroxide is added. Use this value to determine the K_a value and the pK_a value of the acid. ***(20 marks)***

03. Answer all parts.

3.1 Suppose that you need to determine the concentrations of Mg^{2+} and Zn^{2+} in a mixture.

3.1.1 Calculate the conditional formation constants for MgY^{2-} and ZnY^{2-} at pH 4 and 10 and show how pH control provides some selectivity for EDTA titrations. Log K_f of MgY and ZnY are 8.69 and 16.5 respectively and α_{Y4-} of EDTA is 3.61 x 10^{-9} (at pH 4.00) and 0.35 (at pH 10.00). ***(40 marks)***

3.1.2 A 25.00 cm^3 aliquot of a mixture containing Mg^{2+} and Zn^{2+} was buffered at pH 10 and titrated with 0.0488 *mol* dm^{-3} EDTA. The endpoint volume is 34.27 cm^3. A second 25.00 cm^3 aliquot of the above Mg/Zn mixture was buffered at pH 4 and titrated with the same EDTA solution. This time the endpoint volume is 22.56 cm^3. Calculate the molar concentrations of Mg^{2+} and Zn^{2+}. ***(30 marks)***

3.2 A solid sample (0.2661 g) contains only with NaCl and KBr was dissolved in water and required 2.00 L of 0.00150 *mol* dm^{-3} $AgNO_3$ to precipitate all Cl^- and Br^-. The molecular weights of NaCl and KBr are 58.4 and 119.0, respectively. Calculate how many moles of KBr are contained in the solid sample. ***(30 marks)***

04. Answer <u>all</u> parts

4.1 Define the following types of solvents:

4.1.1 amphioprotic ***(10 marks)***

4.1.2 nonionizable with basic properties ***(10 marks)***

4.1.3 inert ***(10 marks)***

4.2 Categorize the following solvents into three general types.

Acetic acid, carbon tetrachloride, dimethyl ether, dioxane, methanol, pyridine, petroleum ether. ***(15 marks)***

4.3 Give the reasons for using mercuric acetate in certain non aqueous titrations. ***(15 marks)***

4.4 Calculate the electrode potential for the titration of 50.00 cm^3 of 0.1000 *mol* dm^{-3} V^{2+} with 0.0500 *mol* dm^{-3} Sn^{4+} at the 50.00 cm^3 volume of titrant. The relevant half reactions are:

$$V^{3+} + e \rightarrow V^{2+} \qquad E^o = -0.256$$

$$Sn^{4+} + 2e \rightarrow Sn^{2+} \qquad E^o = 0.154$$

(40 marks)

@@@@@@@@@@