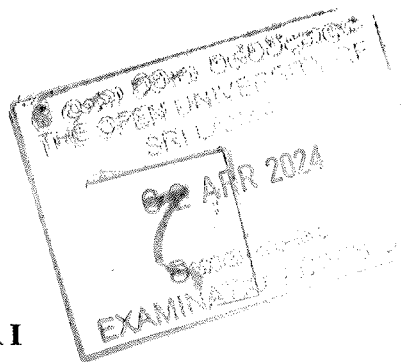**THE OPEN UNIVERSITY OF SRI LANKA**
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BASIC SCIENCES
ACADEMIC YEAR 2023/2024 – SEMESTER I
BACHELOR OF PHARMACY HONOURS
BSU3340-PHARMACEUTICALCHEMISTRY I-LEVEL 03
FINAL EXAMINATION
DURATION: 3 HOURS

DATE: 02nd APRIL 2024   **TIME: 1.30 pm – 4.30 pm**

IMPORTANT INSTRUCTIONS TO CANDIDATES

- This question paper consists of **02** pages containing **05** questions

- Write answers for all questions in booklets provided.

- Clearly state your **Index Number** in your answer script

- Having any unauthorized materials, mobile phones in your possession is a punishable offence

- Calculators are allowed

BACHELOR OF PHARMACY HONOURS - LEVEL 03 - 2023/24
BSU3340- PHARMACEUTICAL CHEMISTRY I
FINAL EXAMINATION
Write answers in booklets provided.

1. a) Propanol (C_3H_8OH) and Ethyl methyl ether ($CH_3CH_2OCH_3$) have the same molar mass. Which one has a higher boiling point? Explain your answer. (04 marks)
   b) List four (04) factors that affect the solubility of an ionic solid. (04 marks)
   c) Calculate the dissolution enthalpy of LiCl in water using the data provided below. (08 marks)
   LiCl Lattice energy: -834 kJ/mol   LiCl Hydration energy: -884 kJ/mol
   d) Determine whether the dissolution process is endothermic or exothermic. (04 marks)

2. a) Explain Arrhenius and Bronsted-Lowry theories regarding acidity of a substance. (04 marks)
   b) Consider a weak acid, HA. Provide the chemical equation for the ionization of HA in an aqueous solution. (02 marks)
   c) Derive the Henderson-Hasselbalch equation for the HA. (06 marks)
   d) An aqueous buffer solution is made of 0.20 moles of formic acid and 0.40 moles of sodium formate ion in 1L of solution. Calculate the pH of the solution. (06 marks)
   e) Explain the term buffer capacity of a buffer solution. (02 marks)

3. a) Determine the relationships between Ka for (NH_4^+) and Kb for CO_3^{2-} in order to have a (NH_4)$_2CO_3$ solution acidic, basic and neutral. Provide necessary ionic equations. (10 marks)
   b) List four (04) types of solvents used in non-aqueous titrations. (04 marks)
   c) Explain why non-aqueous solvents are useful in pharmacology. (06 marks)

4. a) Write the solubility-product constant, Ksp, for Ag_2CrO_4. (04 marks)

b) Solid Ag_2CrO_4 is added to a beaker containing water to prepare a saturated solution of Ag_2CrO_4. At the equilibrium, the concentration of CrO_4^{2-} was found to be 6.5×10^{-5} M. Calculate the Ksp for Ag_2CrO_4. (10 marks)

c) Explain the effect of common ions (eg: adding AgCl) to the solubility and to the Ksp. Of Ag_2CrO_4. (06 marks)

5. a) Alcohol (C_2H_5OH) level in blood can be determined by a redox titration with known concentration of potassium dichromate solution. If the 9.0 mL of 0.05 M $K_2Cr_2O_7$ is required to titrate 10.0 g of blood sample, calculate the alcohol level in the blood sample.

$$C_2H_5OH \ (aq) + 2Cr_2O_7^{2-} \ (aq) + 16H^+ \ (aq) \longrightarrow 2CO_2 \ (g) + 4Cr^{3+} \ (aq) + 11H_2O \ (l)$$

(08 marks)

b) Calcium levels in blood can be determined by adding oxalate ions to precipitate calcium oxalate, CaC_2O_4, followed by dissolving the precipitate in acidic medium, and titrating the resulting oxalic acid, $H_2C_2O_4$ with $KMnO_4$. Calculate how many calcium ions are present in 10.0 mL of blood if 20.0 mL of 0.001M $KMnO_4$ is needed for the titration. ($C_2O_4^{2-}$ will be oxidized to CO_2 in acidic medium). Provide balanced equations and stepwise calculations. (12 marks)

(15 marks)

END