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**BACHELOR OF PHARMACY HONOURS - LEVEL 3 - 2019/20**  
**BSU3340- PHARMACEUTICAL CHEMISTRY I**  
**FINAL EXAMINATION**

INDEX NO: .....

**Part B – 06 Essay Questions**

*(80 marks)*

**Write answers in booklets provided.**

1. a) How Gibb's free energy change ( $\Delta G$ ) is related to entropy change ( $\Delta S$ ) and enthalpy change ( $\Delta H$ ) at given temperature T. (Provide the equation). (02 marks)
- b) Explain why endothermic dissolution favours at high temperature? (05 marks)
- c) Calculate the dissolution enthalpy of AgCl in water using the data provided below. (06 marks)  
  
Lattice energy of AgCl -916 kJ/mol, Solvation energy (Hydration energy) -851 kJ/mol.
- d) Determine whether the dissolution process of AgCl is endothermic or exothermic. (02 marks)
2. a) Explain why non-aqueous solvents are very useful in pharmacology. (04 marks)
- b) List major features of an ideal precipitate of a gravimetric analysis. (04 marks)
3. Consider a weak acid, HA.
  - a) Write the chemical equation for the ionization of HA in an aqueous solution. (02 marks)
  - b) Derive the Henderson-Hasselbalch equation for HA. (08 marks)
  - c) When 50.0 g of a monoprotic weak acid is dissolved in 1000 mL of water, ionization percentage of acid is recorded as 2.2. If the acid dissociation constant ( $K_a$ ) is  $6.5 \times 10^{-5}$ , calculate the formula weight of the acid. (10 marks)



4. At a given temperature T, the distribution constant of a drug (AX) between  $\text{CHCl}_3$  and Water is 85. If the drug is dissolved in 100.0 mL of water and extracted once with 50.0 mL of  $\text{CHCl}_3$ , calculate the remaining AX percentage in the aqueous phase at temperature T. (07 marks)
5. During an experiment, a student observed that the formal (S) of a metal hydroxide  $\text{M}(\text{OH})_2$  is reduced by a factor of 12 in a 0.0200 M solution of  $\text{MCl}_2$  ( $\text{MCl}_2$  is a soluble salt).
- a) Calculate the formal solubility (S) of the metal hydroxide. (09 marks)
- b) Calculate the solubility product  $K_{sp}$  of the hydroxide. (02 marks)
- c) Calculate the solubility of the metal hydroxide (in ppm) in the presence of 0.0200 M  $\text{MCl}_2$  solution. Atomic weight of M is 40. (04 marks)
6. A student performed an experiment to find out the molarity of a commercial hydrogen peroxide solution by performing a titration against  $\text{KMnO}_4$  solution. A 25.00 mL volume of the hydrogen peroxide solution was diluted to 250.0 mL in a volumetric flask. Then 25.00 mL of the diluted solution was mixed with 50 mL of water and 10 mL of 4 M  $\text{H}_2\text{SO}_4$  and titrated with 0.020 M  $\text{KMnO}_4$ .
- a) Identify the reducing agent and the oxidizing agent (02 marks)
- b) Write the balanced redox reaction between permanganate ion and  $\text{H}_2\text{O}_2$  in the acidic medium. (07 marks)
- c) If the end-point of the titration was observed with 28.50 mL of titrant, calculate the molarity of the commercial  $\text{H}_2\text{O}_2$ . (06 marks)

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