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UNIVERSITY OF RUHUNA – FACULTY OF MEDICINE

ALLIED HEALTH SCIENCES DEGREE PROGRAMME

THIRD BPHARM PART I EXAMINATION - JANUARY 2017

PH 3113 ANALYTICAL CHEMISTRY (SEQ)

TIME: TWO HOURS

INSTRUCTIONS

- Answer **all** questions in the given booklets.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Use illustrations where necessary.

01. Answer **all** parts.

1.1 Define the term "GMP". (***20 marks***)

1.2 Explain briefly why GMP is important in pharmaceutical industry. (***25 marks***)

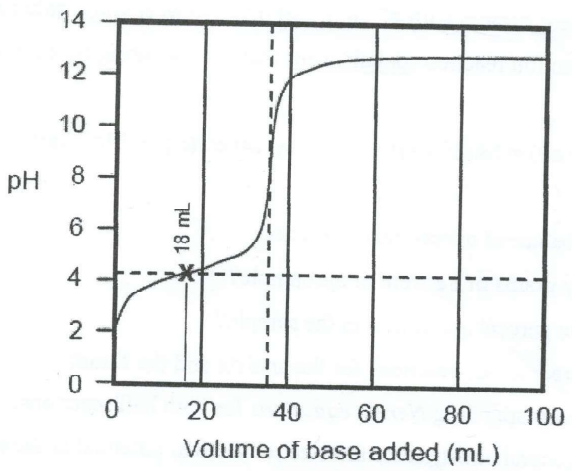
1.3 What are the basic requirements for GMP? (***15 marks***)

1.4 What is "Total Quality Management"? (***20 marks***)

1.5 Name **five** parameters of how quality vary in pharmaceuticals? (***20 marks***)

02. Answer **all** parts.

2.1 A 0.446 g sample of an unknown monoprotic acid is titrated with 0.1050 *mol* dm^{-3} KOH. The resulting titration curve is shown below. Determine the molar mass and p*K*a of the acid.



(***50 marks***)

2.2

2.2.1 What is the simplest definition of a buffer solution? (***05 marks***)

2.2.2 What are the **two** factors that affect on pH of a buffer? (***05 marks***)

2.3

2.3.1 Derive the Henderson Hasselbalch equation considering the dissociation of a weak acid, HA, with a dissociation constant K_a. **(*05 marks*)**

2.3.2 A buffer solution was prepared by mixing of a weak acid (pK_a = 4.755) and its conjugated base with the same concentrations. Calculate the change of pH on the addition of 0.01 *mol* of H_3O^+ into 1.0 dm^3 buffer solution, when the concentrations of the weak acid and its conjugated base are;

(I) 2.500 $mol\ dm^{-3}$

(II) 0.025 $mol\ dm^{-3}$

(III) Comment on the results obtained in above (I) and (II).

(*15 marks*)

2.4 Calculate the acid dissociation constant (K_a) of a weak monoprotic acid, if the measured pH of its 0.02 $mol\ dm^{-3}$ solution is 4.70. **(*20 marks*)**

03. Answer **all** parts.

3.1 A 10.00 mL solution of $FeSO_4$ was added to 50.00 mL of 0.05 $mol\ dm^{-3}$ Na_2H_2Y. The H^+ released required 18.03 mL of 0.080 $mol\ dm^{-3}$ NaOH for titration. What was the molar concentration of the $FeSO_4$ solution? **(*40 marks*)**

3.2 What are the factors affecting the sharpness of the break, at equivalence point, in the titration curve of a complexometric titration? **(*10 marks*)**

3.3 A 0.8890 g sample of iron ore was dissolved in acid, and the iron was converted to Fe^{2+}. The sample was them titrated with 47.20 mL of 0.02240 M $KMnO_4$ solution.
The oxidation-reduction reaction (unbalanced) that occurs during titration is as follows:

$$Fe^{2+}(aq) + MnO^{4-}(aq) + H_3O^+(aq) \rightleftharpoons Fe^{3+}(aq) + Mn^{2+}(aq) + H_2O(l)$$

3.3.1 Write the balanced overall redox reaction.

3.3.2 How many grams of Fe were in the sample?

3.3.3 What is the percentage of iron in the sample?

3.3.4 Write the redox half-reactions for the analyte and the titrant.

3.3.5 Give the corresponding ***Nernst equations*** for both half reactions.

3.3.6 Derive a general equation for the electrochemical potential at the equivalence point for the titration.

(*50 marks*)

4. Answer **all** parts.

4.1

4.1.1 What are the **two** distinct events of a precipitate formation?

4.1.2 By defining a solute's relative super saturation, explain how it would affects the above two events.

(***40 marks***)

4.2 Explain briefly, Volhard's method with the help of equations, and the precautions involved in this method.

(***20 marks***)

4.3

4.3.1 What is the **diazotization** reaction?

4.3.2 Explain the use of diazotization reaction in assay of drugs.

(***20 marks***)

4.4

4.4.1 What is the importance of non-aqueous titrations in pharmaceutical analysis?

(***10 marks***)

4.4.2 State the reasons with an appropriate example to use '**Mercuric Acetate**' in the assay of halogen acid salts of bases. (***10 marks***)

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