



KENYATTA UNIVERSITY

EXAMINATION FOR THE DEGREE OF BACHELOR OF PHARMACY

PPC 320: PHARMACEUTICAL CHEMISTRY II

1ST SEMESTER 2022/2023

TIME: 3 HOURS

INSTRUCTIONS:

- The paper consists of three sections A, B and C
- Answer all questions
- Answer sections A, B and C in separate booklets

SECTION A: INTRODUCTORY PHARMACEUTICAL ANALYSIS

1. Outline how quantitative acid decomposition of meprobamate (figure 1) to volatile products is applied during its titrimetric assay. (5 marks)

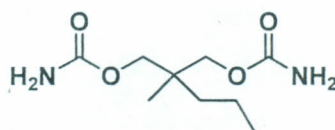


Figure 1: Chemical structure of meprobamate

2. Regarding gravimetric analysis:
- (a). Describe two types of impurities that are usually encountered. (2 marks)
 - (b). Calcium in a 200.0 mL sample of natural water was determined by precipitating the cation as calcium oxalate (CaC_2O_4). The precipitate was filtered, washed and ignited in a crucible with an empty mass of 25.6002 g. The mass of the crucible plus CaO (molecular weight = 56.08) was 25.7134 g. Calculate the concentration of calcium (atomic mass = 40.08) in the water sample in g/100 mL. (4 marks)
3. Regarding potentiometric titration of salicylic acid with sodium hydroxide;
- (a). Plot the expected potentiometric (pH) titration curve. (3 marks)
 - (b). Explain the titration points on the curve before, during and after the end point. (3 marks)
4. Regarding back-titration technique:
- a) Explain three situations which warrant its use. (3 marks)

b) 35.0 mL of 0.055 M disodium edetate (an excess) was added to 20.0 mL of a magnesium chloride solution. The excess disodium edetate was back-titrated with 12.5 mL of 0.048 M zinc chloride. Calculate the molarity of magnesium chloride in the sample solution. (5 marks)

5. A pharmaceutical analyst carried out assay of diphenhydramine hydrochloride by non-aqueous titration as per the following procedure:

- Standardization of dilute anhydrous perchloric acid (HClO_4) volumetric solution was carried out by titrating potassium biphthalate ($\text{C}_8\text{H}_5\text{KO}_4$, molecular weight = 204.22 and purity = 98%) with the perchloric acid. Analysis was done in duplicate and the data obtained during this determination is shown in the table below;

Sample	Weight of potassium biphthalate (mg)	Titre of perchloric acid (mL)
A	235.2	9.9
B	237.3	10.1

- The standardized perchloric acid was used in the titration of a sample of diphenhydramine hydrochloride [$(\text{C}_6\text{H}_5)_2\text{CHOCH}_2\text{CH}_2\text{N}(\text{CH}_3)_2\cdot\text{HCl}$ (MW = 291.8)], weighing 0.620 g dissolved in glacial acetic acid and into which, 15.0 mL of 3.2% mercuric acetate solution had been added. The titre of perchloric acid obtained was 17.5 mL.

Use the information provided above to answer the following questions:

- Name two indicators, which could have been used during the standardization of perchloric acid. (2 marks)
- Explain the role of mercuric acetate during the assay. (3 marks)
- Calculate the mean molarity (M) of perchloric acid. (5 marks)
- Calculate the percent content (%w/v) of diphenhydramine hydrochloride in the sample. (5 marks)

SECTION B: INORGANIC SUBSTANCES USED AS DRUGS I

1. Discuss three water quality parameters under the following headings:

- Physical properties (3 marks)
- Chemical composition (3 marks)
- Biological properties (3 marks)

2. (a). Define a buffer solution and describe the basis of its action. (4 marks)
 (b). Explain the significance of buffers in pharmacy (5 marks)
3. (a). Highlight six characteristics of an ideal antacid (3 marks)
 (b). List six characteristics an anti-microbial agent should possess (3 marks)
4. Outline one method of preparation for each of the following inorganic compounds. (6 marks)
 - (a). Ammonium Chloride
 - (b). Ferric ammonium citrate
 - (c). Lugol's solution
5. (a). Giving one example in each case, classify inorganic gastro-intestinal agents (6 marks)
 (b). Using a chemical structure, identify an example of a transition metal therapeutic agent (4 marks)

SECTION C: INORGANIC SUBSTANCES USED AS DRUGS II

1. Explain why:
 - (a). Gadolinium complexes are good MRI contrast agents. (4 marks)
 - (b). ^{99m}Tc is used in most diagnostic scans (3 marks)
2. Describe the fundamental principle involved in each of the following
 - (a). Magnetic Resonance Imaging. (3 marks)
 - (b). Chelation therapy (3 marks)
3. For each of the following, describe one method of identification and one pharmaceutical use.
 - (a). Boric acid (3 marks)
 - (b). Povidone iodine (3 marks)
 - (c). Zinc oxide (3 marks)
4. Discuss four properties of an ideal antiseptic agent (8 marks)
5. Using appropriate examples, discuss five applications of metal complexes in therapy. (10 marks)