



**KENYATTA UNIVERSITY**  
**EXAMINATION FOR THE DEGREE OF BACHELOR OF PHARMACY**

**PPC 320: PHARMACEUTICAL CHEMISTRY II**

**2<sup>ND</sup> SEMESTER 2022/2023**

**TIME: 2 Hours**

**INSTRUCTIONS:**

1. The paper consists of three sections; A, B and C
2. Answer all questions
3. Answer sections A, B and C in separate booklets

**SECTION A: INTRODUCTORY PHARMACEUTICAL ANALYSIS**

**Part 1: Multiple Choice Questions**

(10 marks)

1. What is the molarity of a solution of barium hydroxide, if 35 mL of 0.1 M HCl is used in the titration of 25 mL of the barium hydroxide solution?
  - A. 0.35
  - B. 0.07
  - C. 0.28
  - D. 0.14
  - E. 0.7
2. EDTA is a:
  - A. Tetradentate ligand
  - B. Hexadentate ligand
  - C. Octadentate ligand
  - D. Pentadentate ligand
  - E. Unidentate ligand



3. In which method is ferric ammonium sulphate used as an indicator?
- A. Fajan's method
  - B. Mohr's method
  - C. Volhard's method
  - D. Karl Fischer Titration
  - E. None of the above
4. Which of the following potentiometric titrations will have the equivalence point at a pH more than 8?
- A. HCl and  $\text{NH}_3$
  - B.  $\text{CH}_3\text{COOH}$  and  $\text{NH}_3$
  - C. HCl and NaOH
  - D.  $\text{CH}_3\text{COOH}$  and NaOH
  - E. Salicylic acid and  $\text{NH}_3$
5. Calculate the pH of the solution resulting from the addition of 20.0 mL of 0.100 M NaOH to 30.0 mL of 0.100 M  $\text{HNO}_3$ .
- A. 1.35
  - B. 1.70
  - C. 1.95
  - D. 3.40
  - E. 3.00
6. Example of aprotic solvent is:
- A. Bromine trifluoride
  - B. Liquid sulfur dioxide
  - C. Dinitrogen tetroxide
  - D. A & C
  - E. A, B & C
7. The oxidation state of Mn in  $\text{KMnO}_4$  is
- A. 3
  - B. 2
  - C. 5
  - D. 7
  - E. 1
8. In the titration of weakly acidic drugs, which of the following is the best standard solution?
- A. Sodium perchlorate
  - B. Sodium hydroxide
  - C. Lithium methoxide
  - D. Ammonium hydroxide
  - E. Acetic acid

9. The best temperature for formation of diazonium salt is:
- A. 308-313 K
  - B. <273 K
  - C. 298 K
  - D. 283-288 K
  - E. 288-298 K
10. The following combination of reagents can be used as a combined Karl Fischer reagent:
- A. Iodine, nitrogen dioxide, pyridine and methanol
  - B. Chlorine, pyridine, sulfur dioxide and methanol
  - C. Imidazole, Iodine, sulfur dioxide and methanol
  - D. A & C
  - E. None of the above

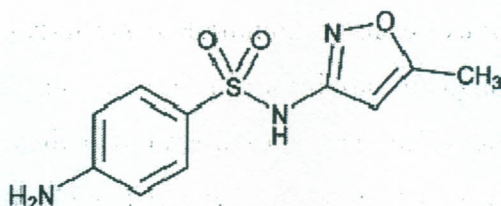
**Part 2: Short Answer Questions**

1. For each of the following primary standards, give an example of a volumetric titrant solution that it is used to standardise. (4 marks)
- (a). Potassium hydrogen phthalate
  - (b). Zinc metal
  - (c). Sulfanilamide
  - (d). Arsenic trioxide
2. Using chemical equations, explain the assay of sulfur ointment by iodometric titration. (4 marks)
3. Calculate the ideal volume of 0.06 M sodium sulfide solution required to completely and quantitatively precipitate 20 mL of 0.14 M silver nitrate solution during gravimetric analysis. (3 marks)
4. Outline the procedure and chemistry involved in the assay of aluminium in compound magnesium trisilicate suspension. (4 marks)
5. 0.1592 g of benzoic acid (molecular weight = 122.12; purity = 98%) was titrated with sodium methoxide (molecular weight = 54.03). The titre was recorded as 8.53 mL. Calculate the concentration of sodium methoxide in %w/v. (5 marks)



### **Part 3: Essay Question**

1. The content of sulfamethoxazole (figure 1; molecular weight = 253.28) in a sample of sulfamethoxazole raw material was determined by diazotization as follows: 0.703 g of the raw material was weighed and dissolved in a mixture of hydrochloric acid and water. The solution was then titrated with a volumetric solution of 0.1 M sodium nitrite (factor = 1.0430) to an external indicator end point. The titre of sodium nitrite was recorded as 24.2 mL.
  - (a). Discuss the principle and chemistry of external indicator end point determination in diazotization. (4 marks)
  - (b). Calculate the percentage content of sulfamethoxazole in the tested raw material and comment on it based on the USP (2022) limits of 98-102%. (6 marks)



**Figure 1:** Chemical structure of sulfamethoxazole

### **SECTION B: INORGANIC SUBSTANCE USED AS DRUGS I**

#### **Part 1: Multiple Choice Questions**

(10 marks)

1. Which of following is both acidifying as well as expectorant?
  - A. Ammonium chloride
  - B. Potassium iodide
  - C. Dilute HCl
  - D. Sodium potassium tartrate

2. \_\_\_\_\_ is used as buffer in ophthalmic preparation.
- A. Sodium bicarbonate
  - B. Magnesium carbonate
  - C. Sodium citrate
  - D. Borate salt
3. Which of the following is not a major physiological ion?
- A. Chloride
  - B. Sodium
  - C. iron
  - D. Potassium
4. Ringer's lactate solution does not contain \_\_\_\_\_ ion
- A. Sodium
  - B. Chloride
  - C. Potassium
  - D. Zinc
5. Metabolic alkalosis is treated with \_\_\_\_\_
- A. Sodium bicarbonate
  - B. Sodium acetate
  - C. Sodium citrate
  - D. Ammonium chloride
6. In what formulation is lithium therapy for bipolar disorders?
- A. It is an aqueous solution of  $\text{LiCl}$  or  $\text{Li}_2\text{CO}_3$
  - B. It is a pill with Li silicate as an active ingredient.
  - C. It is an injection of Li-containing phosphate buffer.
  - D. None of the above
7. Hydrogen peroxide is used as
- A. An antiseptic
  - B. Acidifying agent
  - C. Protective agent
  - D. An antioxidant
8. The molecular formula for Kaolin is \_\_\_\_\_
- A.  $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot \text{H}_2\text{O}$
  - B.  $\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2 \cdot \text{H}_2\text{O}$
  - C.  $\text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$
  - D. None of the above



9. Inorganic antimicrobial agents do not act by \_\_\_\_\_

- A. Oxidation
- B. Halogenation
- C. Protein precipitation
- D. Sulphonation

10. Lugol's solution contains \_\_\_\_\_

- A. 5 %w/v I<sub>2</sub> and 10% KI in water
- B. 1.25%w/v I<sub>2</sub> in glycerin
- C. 10 %w/v I<sub>2</sub> and 6 % KI in alcohol
- D. 2.5 %w/v I<sub>2</sub> and 2.5 %KI in alcohol

### **Part 2: Short Answer Questions**

1.

(a). Define the term achlorhydria and give its medicinal application. (2 marks)

(b). Write the molecular formula and two clinical uses of milk of magnesia. (3 marks)

2.

(a). Define the term haematinics. (1 mark)

(b). Using equations, highlight the method of preparation and assay of ferrous sulphate. (3 marks)

(c). List one medicinal use of ferrous sulphate. (1 marks)

3. Discuss the importance of buffer solutions in pharmacy. (5 marks)

4. Explain the role of fluorides in dental caries. (5 marks)

### **Part 3: Essay Question**

1. Using examples, classify inorganic gastrointestinal agents (10 marks)

### **SECTION C: INORGANIC SUBSTANCE USED AS DRUGS II**

1. Ligands which can form two coordinate bonds from each ion or molecule to the transition metal ion are known as \_\_\_\_\_

- A. Ligand ions
- B. Dentate ligands
- C. Monodentate ligands
- D. Bidentate ligands



2. The central atom/ion of a coordination complex is also referred to as
  - A. Lewis acid
  - B. Lewis base
  - C. Bronsted-Lowry acid
  - D. Bronsted-Lowry based
3. The platinum complex, trans-platin has been used in cancer treatment
  - A. True
  - B. False
4. The complexes of which transition metal are commonly used as anti-arthritis drugs?
  - A. Pt.
  - B. Fe
  - C. Au
  - D. Mo
5. On which two metallic elements are imaging agents most commonly based?
  - A. Gadolinium and technetium
  - B. Iron and gallium
  - C. Germanium and thallium
  - D. Platinum and gold
6. The complexes of \_\_\_\_\_ element are getting importance in anti-cancer therapy.
  - A. Zr
  - B. Ru
  - C. Pd
  - D. Zn
7. Which of the following is a benefit to chelation therapy?
  - A. Removing heavy metals from the body to prevent further toxicity
  - B. Reversing all cognitive damage done by heavy metals
  - C. Removing excess calcium for proper bone development
  - D. Increasing blood calcium levels to ensure proper cardiac function
8. The number of dative bonds to the central metal ion is its \_\_\_\_\_.
  - A. Oxidation number
  - B. Coordination number
  - C. Dative number
  - D. Compound number
9. Which one of the following is a characteristic of an ideal chelating agent?
  - A. Coordination complexes formed are relatively non-toxic

- B. Can traverse cell membranes
- C. Able to form complexes metal ions at different pH conditions in the body
- D. All of the above

10. Which of the following statements is not true?

- A. Gold (I) and gold (III) complexes are anti-tumor agents.
- B. Gold (I) complexes act as both anti-rheumatic agents and anti-tumor agents.
- C. Selenium compounds show antioxidant, antineoplastic, anti-allergic and antiviral potential.
- D. Vanadium compounds exhibit anti-inflammatory activity

### **Part 2: Short Answer Questions**

1. Draw two drug structures of platinum II complexes. (5 marks)
2. Explain four properties of zinc that make it suitable for topical use on skin. (5 marks)
3. Explain how gadolinium (III) ion is used in MRI. (5 marks)
4. Identify two metal complexes used as antimicrobial agents and discuss their chemistry. (5 marks)

### **Part 3: Essay Question**

1. Using examples, describe four shapes formed by complex metal ions. (10 marks)