2421/305
PHARMACEUTICAL CHEMISTRY
Oct./Nov. 2008
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN PHARMACY

PHARMACEUTICAL CHEMISTRY

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

> *Answer booklet*
> *Battery operated scientific calculator*

This paper consists of TWO sections; A and B.
Answer ALL questions in section A and any THREE questions from section B.
Each question in section A carries 4 marks while each question in section B carries 20 marks.
Maximum marks for each part of a question are indicated.

This paper consists of 6 printed pages.

Candidates should check the question paper to ascertain that all
the pages are printed as indicated and no questions are missing.

Turn over

Answer ALL the questions in this section.

1. Differentiate between competitive and non-competitive antagonism in a cholinergic system.

    (4 marks)

2. Explain why amphetamine, drawn below is orally active and exhibit optical isomerism.

    (4 marks)

$$\beta \qquad \alpha$$
$$CH_2 \cdots \cdots CH \cdots NH_2$$
$$\mid$$
$$CH_3$$
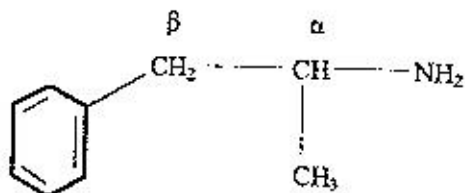
Amphetamine

3. (a) Name **three** naturally occurring estrogens. (3 marks)

    (b) State why the above compounds are not used clinically. (1 mark)

4. (a) Draw the basic structure common in most anti-convulsants.

    (2 marks)

    (b) Identify the above basic structure in barbiturate and benzodiazepine structures.

    (2 marks)

5. The structure below is of histamine neuro-transmitter.

$$N \cdots CH_2\,CH_2 \cdots NH_2$$
$$\|$$
$$N$$
$$\mid$$
$$H$$
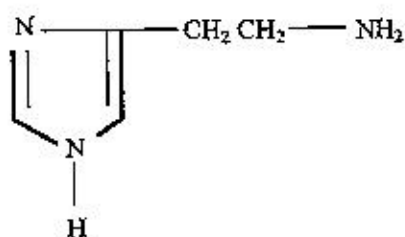
Identify and name the structural features essential for histaminic activity.

(4 marks)

6. 0.5g of drug Z containing Ferrous Sulphate ($FeSo_4$) were dissolved in distilled water to produce $100cm^3$ solution of drug in a volumetric flask. $25cm^3$ of the above solution reacted completely with $15.0cm^3$ of 0.01M standard potassium permanganate in presence of dilute sulphuric acid. Fe = 56.

   (a) Write a balanced ionic equation of the reaction between ferrous ion (Fe^{2+}) and manganate MnO_4^- ions in presence of acid.

   (1 mark)

   (b) Calculate the iron content (Fe^{2+}) in 0.5g of drug Z.

   (3 marks)

7. Outline the steps involved in the laboratory analysis of aspirin content in aspirin tablets B.P.

   (4 marks)

8. With a suitable example in each case, explain the meaning of **direct** and **indirect** acting sympathomimetics.

   (4 marks)

9. Define the following:

   (a) gramme equivalent weight of a dibasic acid;

   (2 marks)

   (b) a normal solution.

   (2 marks)

10. Derive the Henderson-Hasselbalch equation of a weak base, BoH.

   (4 marks)

SECTION B (60 marks)

*Answer any **THREE** questions from this section.*

11. (a) What is a buffer solution? (2 marks)

(b) Benzoic acid is a weak monobasic acid. Explain how a mixture of benzoic acid and sodium benzoate can act as a buffer on addition of small amounts of either hydrochloric acid (HCl) or sodium hydroxide (NaOH) solution.

(4 marks)

(c) 14.4gm of sodium benzoate are dissolved in $1000cm^3$ of 0.01m benzoic acid. Calculate the approximate pH of the resulting solution. (Given that the K_a of benzoic acid = 6.3×10^5 moles per litre).

(4 marks)

(d) Define an acid and a base according to the following:

(i) Arrhenius concept
(ii) Lewis concept

(4 marks)

(e) State six characteristics of an ideal antacid. (6 marks)

12. (a) State **four** ways by which radiation kills micro-organisms when used as a means of sterilization.

(4 marks)

(b) Discuss naturally occurring penicillins under the following sub-headings:

(i) Stereochemistry (2 marks)

(ii) Stability in acid and basic environment. (4 marks)

(c) State **three** short-coming of naturally occurring penicillins. (3 marks)

(d) Below is the structure of chloramphenicol
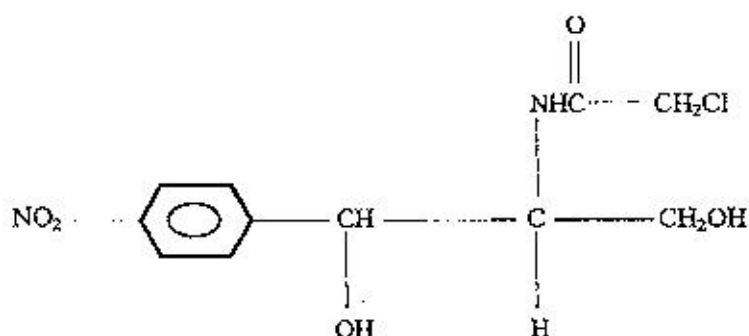
State the structure activity relationship (S.A.R) of the above compound.

(7 marks)

13. The following is the general structure of **phenothiazines**
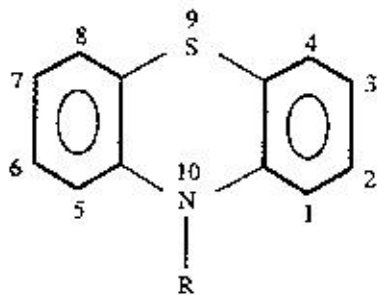
(a) With suitable examples, give the general structure of various **phenothiazines**.

(6 marks)

(b) Explain why **promethazine** has anti-histaminic activity.

(3 marks)

(c) State **two** structural modifications to **phenothiazines** that has resulted in drugs for I.m administration with depot effect.

(2 marks)

(d) State the structural changes to phenothiazine ring to yield compounds with anti-depressant action.

(2 marks)

(e) State the structure activity relationship (S.A.R) of chlorpromazine as an anti-psychotic.

14. The general structure of adrenergic sympathomimetics is given below
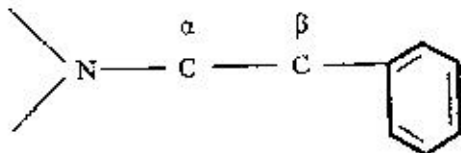
Outline its structure activity relationship (S.A.R).

(20 marks)

15. Define the following terms:

   (a)   (i)   redox titration;
         (ii) gravimetry titration;
         (iii) complexometric titration;
         (iv) argenometry titration;
         (v)   titrant.

                                                          (10 marks)

   (b)   50.0cm3 of 0.16M aqueous potassium permanganate (an excess) were added
         to 25cm^3 of aqueous potassium nitrite (KNO_2) in presence of dilute sulfuric
         acid. The excess manganate Mno_4 ions required 2.50cm^3 of 0.1M ferrous
         (Fe^{2+}) ion for complete reaction in presence of acid.

         (i)   Calculate the concentration in moles per litre (molarity) of potassium
               nitrite solution.

                                                          (7 marks)

         (ii) The concentration in grams per litre of potassium nitrite aqueous.

                                                          (3 marks)