



**KENYATTA UNIVERSITY**  
**EXAMINATION FOR THE DEGREE OF BACHELOR OF PHARMACY**  
**(BPHEM. LEVEL III)**  
**PPC 330: PHARMACEUTICAL CHEMISTRY III**

**3<sup>RD</sup> SEMESTER 2020/2021**

**TIME: 3 Hours**

**INSTRUCTIONS:**

1. The paper consists of three sections: A, B and C
2. Attempt ALL questions
3. Answer each section in a separate booklet

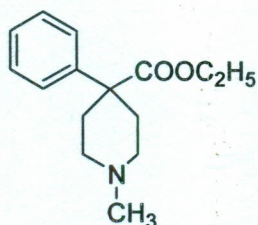
**SECTION A: RADIOPHARMACY**

1. (a) Define the following terms as used in radiopharmacy
  - (i). Radiolysis (1 mark)
  - (ii). Isomer (1 mark)
  - (iii). Radiopharmaceutical (1 mark)
  - (iv). Scintillation counter (1 mark)
- (b) Write equations for the following nuclear processes
  - (i). Formation of tritium ( $^3\text{H}$ ) from lithium-6 by neutron bombardment (2 marks)
  - (ii). Transmutation of sulphur ( $Z=16$ ,  $A=32$ ) to phosphorous ( $Z=15$ ,  $A=32$ ) (2 marks)
  - (iii). Positron decay by  $^{52}\text{Fe}$  (2 marks)
  - (iv). Electron capture by  $^7\text{Be}$  (2 marks)
2. Explain the principle of radionuclide production in;
  - (a). Nuclear reactors (4 marks)
  - (b). Particle accelerators (4 marks)
3. (a) Outline six characteristics of an ideal radiopharmaceutical (3 marks)
- (b) Describe six factors influencing the design of new radiopharmaceuticals (6 marks)

4. (a) Describe the principle of iodination as used in the radiolabeling of radiopharmaceuticals (6 marks)
- (b) Explain two properties of Technetium-99m that makes it favourable for use in radiopharmacy. (5 marks)

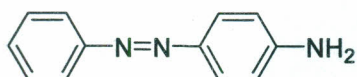
### **SECTION B: DRUG METABOLISM**

1. Explain the significance of drug metabolism in drug design and development (5 marks)
2. Identify two biological factors that could influence drug metabolism and explain their effects on drug's activity. (6 marks)
3. With the aid of relevant drug examples, describe four characteristics of an ideal carrier prodrug. (8 marks)
4. a). Using relevant chemical structures, outline the phase II metabolic pathway of acetaminophen which results into toxic metabolite. (5 marks)
- b). Explain the mechanism of the hepato and nephrotoxicity of acetaminophen (6 marks)
5. Using chemical equations, outline two possible metabolic pathways of each of the following compounds. Draw the respective metabolites in each case:  
  
(a) Pethidine (5 marks)



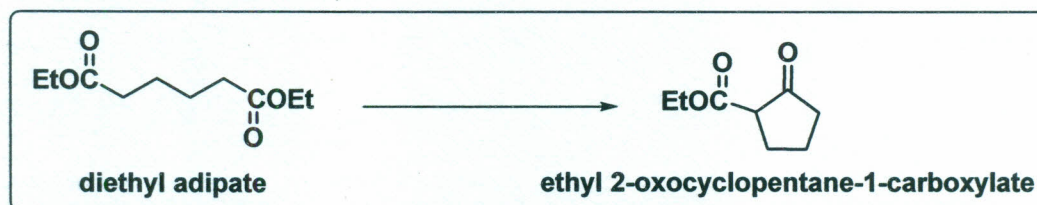
(b) 4-aminoazobenzene.

(5 marks)



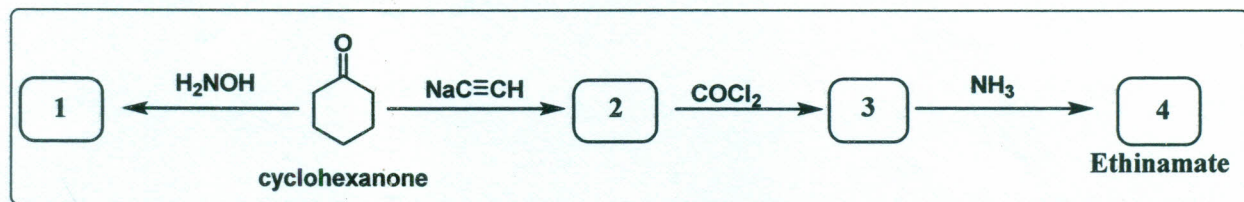
### SECTION C: SYNTHETIC METHODS IN PHARMACY

1. Name one chromatographic technique and explain how you would use it to monitor the progress of chemical reactions in syntheses of organic compounds. (5 marks)
2. List ten critical equipment that must be available in a laboratory where chemical syntheses of novel drugs are carried out. (5 marks)
3. Describe the reaction mechanism involved in condensation of diethyl adipate to ethyl 2-oxocyclopentane-1-carboxylate (figure 1). (5 marks)



**Figure 1:** Condensation reaction

4. Identify the main products/ reagents **1** to **10** as outlined below for the synthesis of ethinamate (figure 2), chlorprothixene (figure 3) and fenopropfen (figure 4). (10 marks)



**Figure 2:** Synthesis of ethinamate

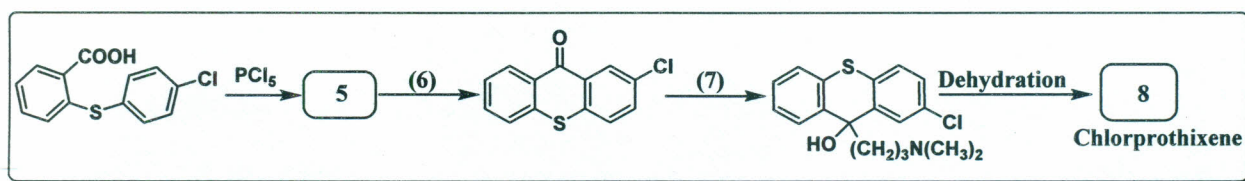


Figure 3: Synthesis of chlorprothixene

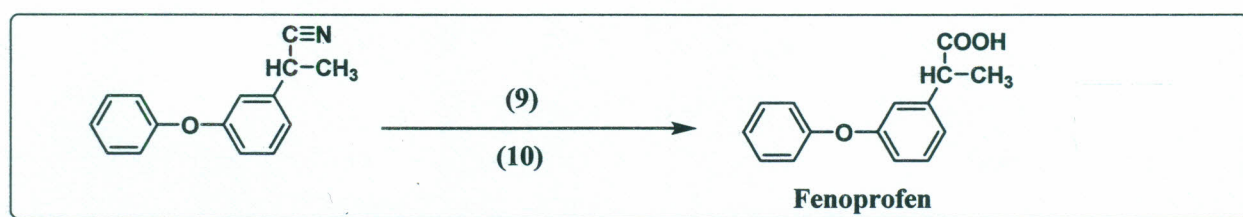


Figure 4: Synthesis of fenopropfen

5. Regarding the chemical synthesis of dapsone as outlined in figure 5:

- Identify the reagents/products A to J. (10 marks)
- Outline the reaction mechanism for the nitration of benzene. (5 marks)

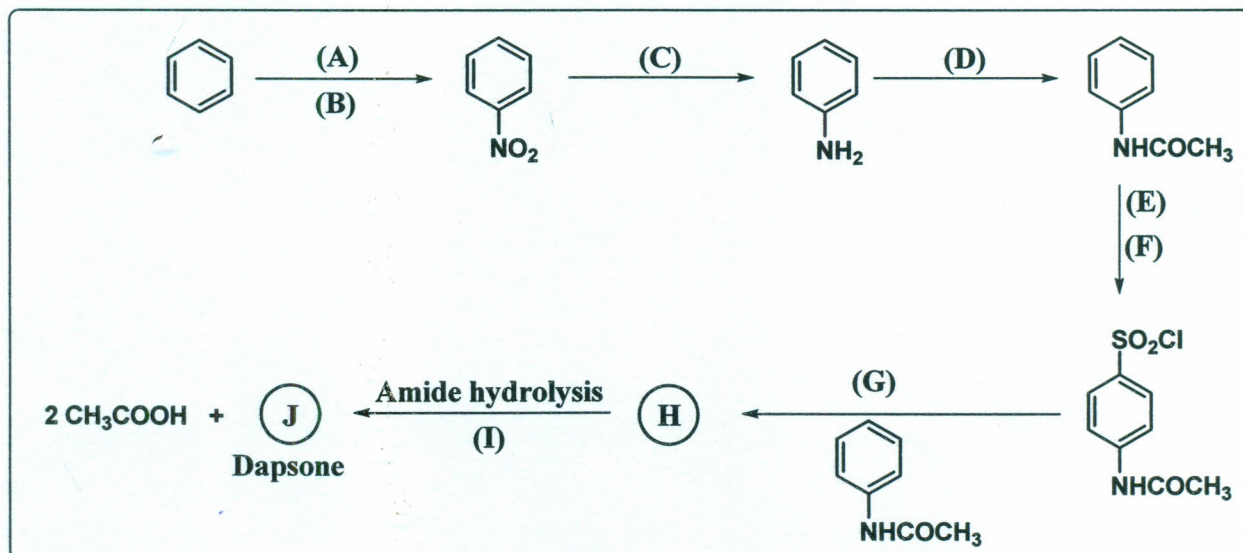


Figure 5: Synthesis of dapsone