



**NATIONAL OPEN UNIVERSITY OF NIGERIA PLOT 91, CADASTRAL ZONE,  
NNAMDI AZIKIWE EXPRESSWAY, JABI – ABUJA  
FACULTY OF SCIENCES  
DEPARTMENT OF CHEMISTRY  
2025\_1 EXAMINATION**

**COURSE CODE: CHM 416**

**COURSE TITLE: ORGANIC SYNTHESIS**

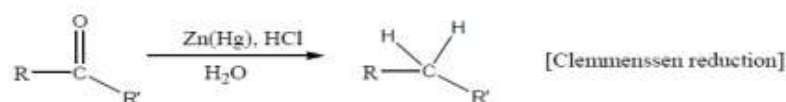
**COURSE UNIT: 2**

**INSTRUCTION: Answer question one (1) and any other two questions**

**Time: 2 Hours**

**QUESTION 1**

- 1a) With the aid of chemical equation only, how can you prepare perbenzoic acid **(5 marks)**  
b) What are the structures and names of products of the ozonolysis of hept-3-ene? **(10 marks)**  
c) Show a detailed mechanism of Clemmensen reduction below **(10 marks)**



- d) With the aid of equation only, show Castro-Steven coupling reaction **(5 marks)**

**QUESTION 2**

- a) b) Explain the following terms:  
i. Hydroxylation **(3.5 marks)**  
ii. Epoxidation of alkenes **(3.5 marks)**  
b) List four metals commonly used in reduction reaction **(8 marks)**  
c) What is Perkin Reaction? **(5 marks)**

**QUESTION 3**

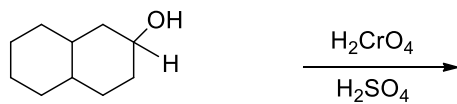
- a) List five (5) reagents that are common oxidizing agents **(10 marks)**  
b) Give the product(s) of the reaction below;



- c) Give the equation for the conversion of an alkene to an epoxide by a peroxyacid **(5 marks)**

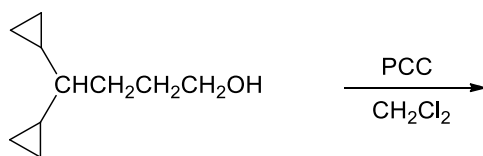
**QUESTION 4**

- 4a) Copy and complete the reaction below



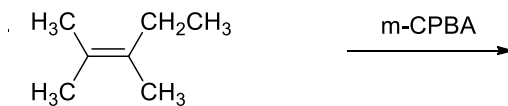
(7.5 marks)

b) Write the product(s) of the reaction below



(5 marks)

c) Complete the reaction below



(7.5 marks)

### QUESTION 5

5a) Using equation only, show the synthesis of pyridinium chlorochromate

(10 marks)

b) Itemize four (4) reagents that are common oxidizing agents

(4 marks)

c) Based on the reduction efficiency, distinguish between  $\text{LiAlH}_4$  and  $\text{NaBH}_4$

(6 marks)