



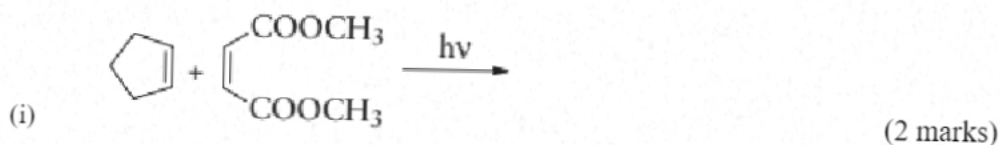
NATIONAL OPEN UNIVERSITY OF NIGERIA
UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE
EXPRESS WAY, JABI - ABUJA.
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2024 1 EXAMINATION

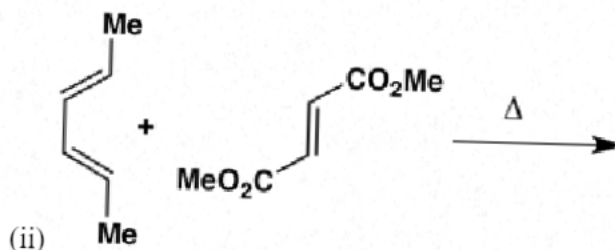
COURSE CODE: CHM 414
COURSE TITLE: PHOTOCHEMISTRY & PERICYCLIC REACTIONS
COURSE UNIT: 2
TIME: 2 HOURS
INSTRUCTION: ANSWER QUESTION NO. ONE (1) AND ANY OTHER TWO (2) QUESTIONS

CCONSTANT: *Speed of light* = $(3 \times 10^8 \text{ ms}^{-1})$

QUESTION ONE

- 1(a)(i) Describe the Angular momentum selection rule. (3 marks)
- (ii) Define the term "Luminescence" in photochemistry (2 marks)
- (iii) State any four (4) areas of application of photochemistry in everyday life (4 marks)
- (iv) Mention any two (2) radiations that are usually absorbed during photochemical reactions (2 marks)
- (b)(i) Two microwave frequencies are authorized for use in microwave ovens: 900 and 2560 MHz. Calculate the wavelength of each. (8 marks)
- (ii) Which frequency would produce smaller hot spots in foods due to interference effects? (2 marks)
- (c)(i) State the Kasha-Vavilove rule (2 marks)
- (ii) Mention any three (3) factors that the configuration of the products in pericyclic reaction depends on (3 marks)
- (d) Predict the cycloaddition product of the reaction





(2 marks)

TOTAL MARK QUESTION 1 = 30 MARKS

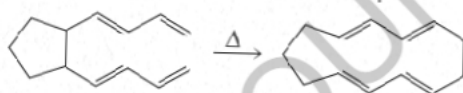
QUESTION TWO

- 2(a)(i) Define the acronym "LASER" (2 marks)
- (ii) Describe briefly the three (3) elements of a laser (10 marks)
- (iii) State the major advantage of lasers over other light sources (2 marks)
- (b) What is used to measure the energy of the monochromatic radiation most accurately? (1 mark)
- (c)(i) Define Dark reactions (2 marks)
- (ii) List any three (3) physical processes that take place when radiant energy interacts with an object (3 marks)

TOTAL MARK QUESTION 2 = 20 MARKS

QUESTION THREE

- 3(a)(i) Write short notes on Sigmatropic rearrangements reactions (4 marks)
- (ii) Indicate the type of sigmatropic rearrangement the reaction below and the mechanism involved in the reaction below



(4 marks)

- (b) What are the different types of electromagnetic radiation? Give the electromagnetic radiation with the shortest wavelength and also the one with longest wavelength. (9 marks)
- (c)(i) State one (1) material whose photo degradation can cause environmental nuisance (1 mark)
- (ii) State the two (2) major field that make up light (2 marks)

TOTAL MARK QUESTION 3 = 20 MARKS

QUESTION FOUR

4(a) Explain the following Stereochemical Notations:

- (i) Suprafacial shifts (2 marks)
- (ii) Antarafacial shifts (2 marks)
- (iii) Conrotatory (2 marks)
- (iv) Disrotatory (2 marks)
- (v) Concerted process (2 marks)

(b) Explain Group transfer pericyclic reaction, giving one example (6 marks)

(c) Classify cycloaddition reactions according to the number of pi electrons that interact in the reaction (4 marks)

TOTAL MARK QUESTION 4 = 20 MARKS

QUESTION FIVE

5(a) Write short notes on photo-oxidation and its applications. (8 marks)

(b) With the aid of a suitable diagram, describe stimulated emission. (12 marks)

TOTAL MARK QUESTION 5 = 20 MARKS