



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESS WAY, JABI - ABUJA.**  
**FACULTY OF SCIENCES**  
**DEPARTMENT OF PURE AND APPLIED SCIENCE**  
**APRIL/MAY, 2019 FIRST SEMESTER EXAMINATION**

**COURSE CODE:** CHM 414  
**COURSE TITLE:** PHOTOCHEMISTRY AND PERICYCLIC REACTIONS  
**COURSE UNIT:** 2  
**TIME:** 2 HOURS  
**INSTRUCTION:** Answer question one and any other three questions.

**QUESTION ONE**

- 1a) State and explain the 1<sup>st</sup> and 2<sup>nd</sup> laws of photochemistry. (8 marks).
- 1bi) Write a short note on photochemistry induced by visible and ultraviolet light. (6 marks)
- 1bii) Elucidate the relationship between light absorption and energy difference between two energy levels involved in a transition. (4 marks)
- 1ci) Explain pericyclic reactions. (3 marks)
- 1cii) What are the characteristics of pericyclic reactions? (4 marks)

**QUESTION TWO**

- 2a. Distinguish between (i) concerted and stepwise processes (ii) synchronous and asynchronous systems. (4 marks)
- 2b. Explain the following Stereochemical Notations:
- i. Suprafacial shifts (1 mark)
  - ii. Antarafacial shifts (1 mark)
  - iii. Conrotatory (1 mark)
  - iv. Disrotatory (1 mark)

2c. The reaction medium is definitely among the most important factors determining chemical reactivity initiated by light. Discuss. (2 marks)

2di. Write short notes on photo-oxidation and its applications. (2 marks)

2dii. Give three applications of photochemistry in everyday life (3 marks)

### QUESTION THREE

3a. Discuss the Frank – Condon principle. (6 marks)

3b. State the criteria that are essential for all photochemical reactions. (2 marks)

3c. Provide list of classification for cycloaddition reactions according to the number of pi electrons that interact in the reaction. (4 marks)

3d. Explain the terms allowed and forbidden reactions. (3 marks)

### QUESTION FOUR

4a. Discuss briefly the processes involved in a photochemical reaction. (6 marks)

4b. With the aid of a suitable diagram, describe stimulated emission. (6 marks)

4c. The reaction medium is definitely among the most important factors determining chemical reactivity initiated by light. Discuss. (2 marks)

4d. State any two selection rules upon which the probability of an electronic transition is predicted. (1 mark)

### QUESTION FIVE

5ai. What is laser? (3 marks)

5aii. Describe how a laser is produced. (6 marks)

5aiii. State one (1) application of laser. (1 mark)

5b. Explain Group transfer pericyclic reaction, giving one example. (5 marks)