



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 SCIENCES
JULY 2017 EXAMINATION

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

QUESTION ONE

1a) Discuss briefly the effect of Ultraviolet radiation in the very shortest wavelength range (next to X-rays) and middle range of UV. (3 marks)

1b) State the type of interaction encountered when the following regions of the electromagnetic spectrum interact with matter:

- i. Microwave through far infrared
- ii. Near infrared
- iii. Visible
- iv. Ultraviolet
- v. Gamma rays

(5marks)

1c) Give a succinct discussion on photochemical process. (8½ marks)

1d) Explain cheletropic reactions (using the addition of sulphur dioxide to 1, 3- butadiene. (8½ marks)

QUESTION TWO

2a) Explain Frank-Condon Principle. (12 marks)

2b) Give two conditions that are essential for all photochemical reactions. (3marks)

QUESTION THREE

3ai) Describe briefly the Diels-Alder reaction. (3marks)

3aii) Show that the reaction between 1, 3-butadiene and ethene conforms to Diels-Alder reaction. (6marks)

3b) What do you understand by the following terms?

- i. Spontaneous emission
- ii. Stimulated emission (6marks)

QUESTION FOUR

4ai) Write short note on radiative and non-radiative excited state decay pathways. (4 marks)

4aii) Give one example each, of radiative and non-radiative decay pathways. Explain briefly the examples given. (5 marks)

4b) Describe how light amplification by stimulated emission of radiation (LASER) is produced. (6 marks)

QUESTION FIVE

5a) Using relevant chemical equations, discuss the industrial preparation of benzyl chloride by gas-phase photochemical reaction of toluene with chlorine. (11 marks)

5b) Elucidate the relationship between light absorption and energy difference between two energy levels involved in a transition. (4 marks)

