



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PHYSICS
2025_2 EXAMINATIONS

COURSE CODE: PHY406
COURSE TITLE: OPTICS III
CREDIT UNIT: 3
TIME ALLOWED: (3 HRS)
INSTRUCTION: *Answer question 1 and any other three questions*

QUESTION 1

- ai. What is the prerequisite to observe interference fringes? [4marks]
ii. What will happen if the light waves from two slits have a phase relationship which is constant in time? [4marks]
bi. Explain Bohr's assumption on the energy of an atom or a molecule. [4marks]
ii. How is the recording of the amplitude portion of the wave achieved in normal photography? [4marks]
ci. Describe the fashion in which optical fibre transmit light. [4marks]
ii. What is the problem faced during early attempt of communication at optical frequency? [5marks]
(Total: 25 marks)

QUESTION 2

- a. Explain why there is no phase relationship between light wave from two ordinary light sources. [7 marks]
b. Describe the width of the spectral line, and write the expression for the effective path difference of a bright fringe and dark fringe. [8marks]
(Total: 15 marks)

Question 3

- a. Discuss four (4) ways of pumping a laser and achieving the population inversion necessary for stimulated emission to occur. [9 marks]
b. Explain the three (3) main types of laser based on the physical properties of the active medium and the pumping methods employed. [6 marks]
(Total: 15 marks)

QUESTION 4

- a. Elucidate the production of holograms. [6marks]
bi. Describe how holograms are recorded. Use of diagram is necessary. [6 marks]
ii. Explain how interference fringes can be seen [3 marks]
(Total: 15 marks)

QUESTION 5

- a. Discuss the nature of the refractive index in the GRIN fibre. [8 marks]
b. Explain the most elementary application of optical fibre. [7 marks]
(Total: 15 marks)

QUESTION 6

- a. Write the expression of the frequency of the emitted radiation when light emission takes place in an atom. [6 marks]
b. Show that $2d = r\lambda/W$ when $S^1S_2 - S^1S_1 = S_2P = \propto d$, [9 marks]
(Total: 15 marks)