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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCE**

**APRIL/MAY, 2019 EXAMINATIONS**

**COURSE CODE: PHY 307**

**COURSE TITLE: SOLID STATE PHYSICS I**

**CREDIT UNIT 2**

**TIME ALLOWED (2 HRS)**

**INSTRUCTION: *Answer question 1 and any other three questions***

**QUESTION 1**

(a). Explain the cohesion of solid (3 marks)

(b). Define (i).Crystal binding (3 marks)

(ii). Cohesive energy (3 marks)

(c). Briefly explain Vander Waals bonding (5 marks)

(d). What is lattice dynamics (3 marks)

(e). Define lattice vibration (2 marks)

(f). Briefly explain phonons interaction (3 marks)

(g). What is umklapp process (3 marks)

**QUESTION 2**

(a). Write the formula for the (i). Wave number (2 marks)

(ii). Angular frequency (2 marks)

(b). Mention two conditions for the validity of Cauchy relations (3 marks)

(c). State the Cauchy relation (3 marks)

(d). For metallic lattices and alkali halides, state the position of the Cauchy relation (5 marks)

**QUESTION 3**

(a). Briefly explain how to satisfy Bragg’s law for X-ray diffraction (3 marks)

(b). Define experimental crystal structure determination (3 marks)

(c). Briefly explain the Laue method in diffraction (4.5 marks)

(d). Briefly explain the powder method in diffraction (4.5 marks)

**QUESTION 4**

(a). Briefly explain the study of elastic behavior (3 marks)

(b). Define elasticity (3 marks)

(c). What is dilation (3 marks)

(d). (i). Define energy density (3 marks)

(ii).When is a deformation uniform (3 marks)

**QUESTION 5**

(a). Define the free electron model (3 marks)

(b). What is Fermi distribution (3 marks)

(c). (i). Mention the use of Cyclotron resonance (2 marks)

(ii). What is the condition for Cyclotron resonance (2 marks)

(d). What is: (i). Mathiessen rule (2.5 marks)

(ii). Lattice resistivity (2.5 marks)