

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

РНҮ 307
SOLID STATE PHYSICS I
2
(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)

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(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)