



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES

DEPARTMENT OF PHYSICS

2024 1 EXAMINATION

COURSE CODE: PHY 407
COURSE TITLE: SOLID STATE PHYSICS II
CREDIT UNIT: 3
TIME ALLOWED: (3 HRS)

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

QUESTION 1

- (a) Explain the term depolarization (5marks)
(b) state the mathematical relation for the curie-Weiss law and explain its terms (10marks)
(c) Define magnetic polarisation (5marks)
(d) Define a vacancy in a crystal lattice (5marks)

QUESTION 2

- (a) Write the Clausius-Mossotti equation and explain its terms (5marks)
(b) Explain what is meant by loss tangent (3marks)
(c) The dielectric constant of a helium gas at NTP is 1.0000684. Calculate the electron polarizability of helium atoms when the gas contains 2.7×10^{26} atoms/ m^3 and hence calculate the radius of helium molecule $\epsilon_0 = 8.854 \times 10^{-12} Fm^{-1}$ (7marks)

QUESTION 3

- (a) Explain the term magnetic moment (4marks)
(b) Describe the behaviour of conductors in a diamagnetic field (4marks),
(c) A pole of pole strength $80Am$ is placed at a point at a distance $20cm$ on the equatorial line from the centre of a short magnet of magnetic moment $20Am^2$. What is the force experienced (7marks)