**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS**

**SCHOOL OF SCIENCE AND TECHNOLOGY**

**JUNE/JULY EXAMINATION**

**COURSE CODE: PHY407**

**COURSE TITLE: Solid State Physics II**

**TIME ALLOWED:3 Hours**

**INSTRUCTION: Answer any five questions.**

PHYSICAL CONSTANTS:

Speed of light ; mass of electro ; Electronic charge ; Avogadro’s number Boltzmann constant ; Plank’s constant ; .

1. (a) (i)Write down the equation for the field of an electric dipole**4 marks**

(b) Two water molecules each having dipole moment Cm point in the same direction along the line joining the centres. Calculate the electric field due to dipole-dipole interaction when the centres are apart. **10 marks**

2. (a) what do you understand by polarization in dielectrics **6 marks**

(b) Obtain the Clausius-Mossotti formula relating microscopic dielectric constant with macroscopic polarization. **8 marks**

3. (a) What do you understand by depolarization field?**4 marks**

(b) Obtain the relation among polarization in solid dielectric the electric field and electric flux density or the electric displacement vector**10 marks**

4. (a)What do you understand by dipole *relaxation time*?**4 marks**

(b) Find the frequency dependence of the electronic polarizability of an electron having the resonance frequency *ω*o, treating the system as a simple harmonic oscillator.**10 marks**

5. (a)Briefly explain what is meant by*paramagnetism*. Give two examples of

paramagnetic material.**4 marks**

(b) Obtain the Langevin function and define all the symbols used in it.**10 marks**

6. (a) What are *ferromagnetic materials?*Give two examples of

Ferromagnetic materials.**4 marks**

(b)Derive the relation of Curie-Weiss law.**10 marks**

7. (a) Mention four of the major defects in crystals.**4 marks**

(b) Write short notes on

(i) Twin boundaries**5 marks**

(ii) Interstcialcy.**5 marks**