

Vasavi College of Engineering, (A)

DEPARTMENT OF PHYSICS

Practice Assignment

Class: B.E (2021-22) Sem.-I

Faculty: Dr. Vanita Thakur

Branch/Sec: CSE/A

Last Date of Submission: 5th Feb. 2022

Subject: Semiconductor Physics and Optoelectronic Devices

Note: Please use A4 size papers for the assignment and write on both sides of the paper.

1. Draw the following planes in a cubic cell: (110) and (101).
2. Visible Light cannot be used to study crystal structures. Why?
3. What are the necessary conditions of physically acceptable wave function?
4. What are Miller indices? Explain with proper example how to determine Miller Indices.
5. Describe with suitable diagram the powder method used for the determination of crystal structure.
6. Show that no. of Frenkel defects in equilibrium at a given temperature is proportional to $(NN_i)^{1/2}$ where N be the no. of atoms, N_i be the no. of interstitial sites.
7. Derive the eigen values and eigen functions for a particle in 1-dimensional box. Draw the energy eigenvalues upto first four states.
8. Derive time dependent Schrodinger wave equation for a free particle.
9. A crystal with primitives 1.2 Å, 1.8 Å and 2 Å has a plane (231) which cuts an intercept 1.2 Å along x-axis. Calculate the intercepts along y and z axes.
10. Density of Schottky defect in NaCl is $5 \times 10^{11}/\text{m}^3$ at 25 °C. If interionic distance is 2.82 Å, what is the energy required to create one Schottky defect?
11. The wavelength of X- Rays is to be determined using a simple cubic crystal. The Bragg's angle for the first order reflection from (110) plane is 20°. What is the wavelength of X-Rays? The lattice parameter of the crystal is 3.14 Å.
12. An electron is trapped in a 1-D box of length 0.1 nm. Calculate the energy required to excite the electron from its ground state to the fourth excited state.