

國立中央大學100學年度碩士班考試入學試題卷

所別：電機工程學系碩士班 固態組(一般生) 科目：近代物理 共 / 頁 第 / 頁

本科考試禁用計算器

*請在試卷答案卷(卡)內作答

1. Explain the Photoelectric effect and its application to the design of a high efficiency solar cell. (15 points)
2. Use one example each to show the wave nature of a particle and the particle nature of a wave. (10 points)
3. Derive the wavefunction and quantized energy for a particle confined in a one-dimensional well with infinite barriers. (10 points) Draw and compare the ground state wavefunctions for the cases of infinite and finite barriers, respectively. (5 points)
4. Explain how a p-n junction diode operates as a rectifier, as a solar cell, as a LED, and as a laser. (15 points)
5. Draw the schematic diagrams of electron diffraction patterns of amorphous and crystalline Si, and explain why? (7 points) Which rule can be used to analyze the diffraction pattern? (3 points)
6. Show that the average kinetic energy of a conduction electron in a metal at 0 K is given by $\bar{E} = (3/5)E_F$. (12 points) How about molecules in an ideal gas at 0 K? (3 points)
7. How is X-ray generated in a typical x-ray diffraction machine and how does X-ray contribute to the correct order of elements in the periodic table? (10 points)
8. Compare the energy scale of rotation, vibration and electronic state of a diatomic molecule and explain how these energy states contribute to its optical spectrum. (10 points)

參考用