

國 立 清 華 大 學 命 題 紙

九十一學年度 原子科學 系 甲 組碩士班研究生招生考試

科目 近代物理 科號 3201 共 1 頁第 1 頁 *請在試卷【答案卷】內作答

1. (30%) Consider two parallel line charge distributions with linear charge density λ , suppose that the distance between these two line charge distributions are d and they are moving with the same velocity v , along the direction of the line charge distributions. Please prove that the Lorentz force of a point charge on one line charge distributions due to the other line charge distributions is proportional to $1/\gamma^2$ where $\gamma = [1 - (v/c)^2]^{-1/2}$, $v = |v|$ and c is the velocity of light. Please drive the complete results.
2. (40%) Please describe the development (A.D. 1900-1925) of the quantum physics. In your description, it should include at least four important experiments or observations, which lead the development of the quantum physics. We should also describe why they are important and what kind of inspiration they brought to the physicists at that time.
3. (20%)
 - (1) (10 %) Please describe what is *fluorescence*. How dose it produced?
 - (2) (10%) In the emission spectrum and the excitation spectrum of fluorescence, in most case, there is mirror symmetry between them. Why is that? (Hint: transition probability)
4. (10%) Please describe the basic principle of Laser. In you description, it should include the spontaneous emission and stimulated emission and what are they.