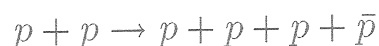


國 立 清 華 大 學 命 題 紙

97 學年度 _____ 生命科學院 _____ 系 (所) _____ 丙 _____ 組碩士班入學考試

科目 _____ 近代物理 _____ 科目代碼 _____ 0402 _____ 共 2 頁第 1 頁 *請在【答案卷】內作答

1. (15%) Calculate the minimum total energy of a proton which hits another proton at rest to produce an anti-proton in the process



The rest energies of proton and anti-proton are 938 MeV but you may use 1 GeV in your calculation. You must use the relativistic forms of momentum and energy.

2. (5%) Give one evidence to support the theory of expanding Universe.
3. (10%) In the Bohr model of hydrogen atom, the binding energy is 13.6 eV. An electron and positron can form a bound state called positronium. What is the binding energy of positronium according to Bohr's theory? You should explain how to derive your result.
4. (10%) A large amount of energy is released in the center of sun, where two light nuclei combine to form a heavier nucleus. Explain why such process of fusion needs extremely high temperature.
5. (15%) Write down the one-dimensional Schrödinger equation for bound states and prove that all solutions are non-degenerate.
6. (10%) In 1957, Lee and Yang won a Nobel Prize for the discovery of parity violation in weak interaction. Explain the meaning of parity violation and weak interaction.
7. (25%) (a) Quark, (b) Half-life, (c) Isospin, (d) Quantum tunneling, (e) holography.

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8. (10%) Compute the de Broglie wavelength of an electron with a kinetic energy of 1 eV. Write your answer accurate to two significant figures. You may use $\sqrt{2 \times 9.1 \times 1.6} = 5.4$.

Planck's constant $h = 6.6 \times 10^{-34} Js$.

Mass of electron = $9.1 \times 10^{-31} kg$.

Charge of electron = $1.6 \times 10^{-19} C$.