

## 國立清華大學 102 學年度碩士班考試入學試題

系所班組別：生命科學院碩士班丙組(0506)

考試科目（代碼）：近代物理(0602)

共\_\_1\_\_頁，第\_\_1\_\_頁 \*請在【答案卷】作答

1. (10%) A particle with mass  $m$  is confined in one-dimensional box between  $x=0$  and  $x=L$ . Apply the Heisenberg's uncertainty relation to determine the ground state energy  $E$  as a function of  $m$ ,  $L$ , and the Planck's constant  $h$ .
2. (10%) Two spaceships, A and B, travel from the earth to outer space. An observer on earth observes that A and B travel in opposite directions with same speed  $0.5c$  ( $c$ =speed of light). What is the speed of A relative to B?
3. (15%) A photon hits an electron at rest, producing an electron-positron pair. Calculate the minimum energy of the incident photon: ( photon + electron ) changes to (2 electrons + 1 positron). The rest energy of electron is 0.5 MeV.
4. (10%) The binding energy of a hydrogen atom in the Bohr model is 13.6 eV. An electron and a positron can form a bound state called positronium. Calculate the binding energy of positronium.
5. (10%) What are the two basic postulates in the theory of special relativity?
6. (45%) Explain (a) Franck-Hertz experiment, (b) Pauli's exclusion principle, (c) Mossbauer effect, (d) Meissner effect, (e) Parity violation, (f) Zeeman effect, (g) de Broglie wavelength, (h) Josephson effect, (i) Higgs particle.