

國立清華大學 100 學年度碩士班入學考試試題

系所班組別：生命科學院丙組

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. What is the approximate age of the universe?(2%)
2. How many different kinds of quarks?(2%)
3. What are the approximate temperatures on the surface and at the center of our sun?(4%)
4. Why a free neutron can not decay into a proton and an electron?(4%)
5. Some quantum numbers are conserved in all interactions except the weak interaction. Give two examples.(4%)
6. Write down the Schrodinger equation for the hydrogen atom.(8%)
7. Write down the Lorentz transformation in relativity.(8%)
8. Describe the experiment performed by Rutherford in 1911, and explain why he concluded that an atom has a very small nucleus with positive charge.(8%)
9. A particle of mass ( $3m$ ) decays into two identical particles of mass  $m$ . Use the theory of relativity to calculate the final speed.(12%)
10. Explain:
  - (a).Stark effect.(6%)
  - (b).Laser cooling.(6%)
  - (c).Einstein's principle of equivalence.(6%)
  - (d).Red shift in astronomy.(6%)
  - (e).Boltzmann factor in statistical physics.(6%)
  - (f).White dwarf star.(6%)
  - (g).Nuclear magnetic resonance.(6%)
  - (h).Ultraviolet catastrophe in blackbody radiation.(6%)