

注意：考試開始鈴響前，不得翻閱試題，
並不得書寫、畫記、作答。

國立清華大學 112 學年度碩士班考試入學試題


系所班組別：生命科學暨醫學院

丙組(計算生物與人工智慧組)

科目代碼：0602

考試科目：近代物理

—作答注意事項—

1. 請核對答案卷(卡)上之准考證號、科目名稱是否正確。
2. 考試開始後，請於作答前先翻閱整份試題，是否有污損或試題印刷不清，得舉手請監試人員處理，但不得要求解釋題意。
3. 考生限在答案卷上標記「由此開始作答」區內作答，且不可書寫姓名、准考證號或與作答無關之其他文字或符號。
4. 答案卷用盡不得要求加頁。
5. 答案卷可用任何書寫工具作答，惟為方便閱卷辨識，請儘量使用藍色或黑色書寫；答案卡限用 2B 鉛筆畫記；如畫記不清(含未依範例畫記)致光學閱讀機無法辨識答案者，其後果一律由考生自行負責。
6. 其他應考規則、違規處理及扣分方式，請自行詳閱准考證明上「國立清華大學試場規則及違規處理辦法」，無法因本試題封面作答注意事項中未列明而稱未知悉。

國立清華大學 112 學年度碩士班考試入學試題

系所班組別：生命科學暨醫學院丙組

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. The James Webb Space Telescope (JWST) was launched on December 25, 2021, and began to operate in mid-2022. JWST is primarily designed for observing near-infrared light, and this design has several advantages over the old Hubble Space Telescope, which mainly observes visible light. One of the advantages is that observing infrared light allows JWST to see more distal and older objects formed in the early universe. Please explain why (hint: redshift). The more detailed your answer is, the better score you get. You can answer this question in English or Chinese. (20 points)
2. One of the major achievements in physics this year is the breakthrough in nuclear fusion experiments. The scientists at Lawrence Livermore National Lab in the U.S. have successfully demonstrated that they can pump out more energy from the reactor than they put in. Please explain A. What is nuclear fusion? (20 points) B. Why is nuclear fusion considered a much cleaner energy technology than nuclear fission used in current nuclear power plants? (20 points) You can answer this question in English or Chinese.
3. Many technologies in life science research rely on the knowledge of modern physics. Just name a few: electron microscopy, scanning tunneling microscopy, atomic force microscopy, nuclear magnetic resonance spectroscopy, magnetic resonance imaging, light-sheet microscopy, etc. Please pick at least two technologies and explain the physics principles behind them. You can also explain the technologies not listed above as long as they are used in studying biological systems. You can answer this question in English or Chinese. (40 points)