

國立中央大學 108 學年度碩士班考試入學試題

所別： 物理學系生物物理 碩士班 不分組(一般生)

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科目： 普通物理

本科考試禁用計算器

計算問答題(需有詳細計算過程與說明)

1. (10 points) Typical rod-shape bacterial cell is about $2\ \mu\text{m}$ long and $1\ \mu\text{m}$ in width. Please estimate (a) the volume of a bacterial cell and (b) how many atoms within it.
2. (10 points) Please write down the SI units of following physical quantities. (a) mass, (b) length, (c) temperature, (d) energy, and (e) magnetic field
3. (9 points) A 60.0 kg marathon runner runs up the stairs to Taipei 101's observation deck (91st floor, 390 m tall). To lift himself to this floor in 15 minutes, what must be his average power output?
4. (15 points) Find the moment of inertia of a solid sphere (radius R) of uniform mass density ρ about an axis through its center.
5. (15 points) Weighing Astronauts. This procedure has been used to "weigh" astronauts in space. A 42.5 kg chair is attached to a spring and allowed to oscillate. When it is empty, the chair takes 1.3 s to make one complete vibration. But with an astronaut sitting in it, with her feet off the floor, the chair takes 2.54 s for one cycle. What is the mass of the astronaut?
6. (15 points) (a) If two sounds differ by 15.0 dB, find the ratio of the intensity of the louder sound to that of the softer one. (b) If one sound is 190 times as intense as another, by how much do they differ in sound intensity level (in decibels)? (c) If you increase the volume of your stereo so that the intensity double, by how much does the sound intensity level increase?
7. (16 points) Please write down Maxwell's equations (4 equations) and explain their physical meanings.
8. (10 points) What is the de Broglie wavelength of (a) electron accelerated from rest by a potential of 54 V, and (b) a 10 g bullet moving at 400 m/s?

參考用