

國立中央大學八十四學年度碩士班研究生入學試題卷

所別：物理研究所

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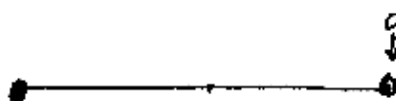
科目：物理

共 1 頁 第 1 頁

1. (50%) Following are some terms concerning the development of the concept of energy. Explain them as clearly as you can. — What are the observed phenomena? What are the important equations? How do they extend the concept of energy?

- a. Work–Energy Theorem.
- b. Potential Energy.
- c. Heat.
- d. Electromagnetic Radiation.
- e. Mass–Energy equivalence.

2. (20%) Two 2.0 kg masses are attached to the end of a thin rod of negligible mass 5.0 cm long. The rod is free to rotate without friction about a horizontal axis through its center. Initially, the rod and the masses are at rest. A 50 gm putty wad drops onto one of the masses with a speed of 3.0 meters/sec. and sticks to it. See the figure. (a) What is the angular speed of the system after the collision? (b) Find the ratio of the kinetic energy of the system after the collision to that just before the collision.



3. (30%) A disc of conductivity σ and thickness d rotates with angular speed ω about an axis passing through its center and normal to the surface of the disc. A uniform magnetic field \vec{B} is applied perpendicular to the plane of the disc over a small area a^2 located a distance ρ from the axis (assume $\rho \gg a$). See the Figure. Find the torque (its magnitude and direction) on the disc. Explain every step of your calculation briefly.

