

國立中央大學八十八學年度碩士班研究生入學試題卷

所別： 太空科學研究所 不分組 科目： 普通物理 共 1 頁 第 1 頁

- (25%) 1. A block of mass m is released on a wedge of mass M at a height h above the floor as in Fig.1. All surfaces are frictionless. Show that the speed of the wedge when the block hits the floor is given by

$$\sqrt{\frac{2m^2 gh \cos^2 \theta}{(M+m)(M+m \sin^2 \theta)}}$$

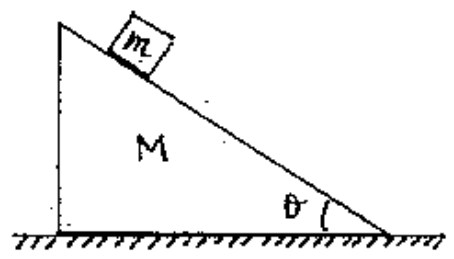


Fig. 1

- (15%) 2. An ideal gas is taken around the cycle ABCA as shown in Fig.2. Find:
 (a) the net work done by the gas in each cycle in terms of P_0 and V_0 ;
 (b) the net heat input in each cycle.

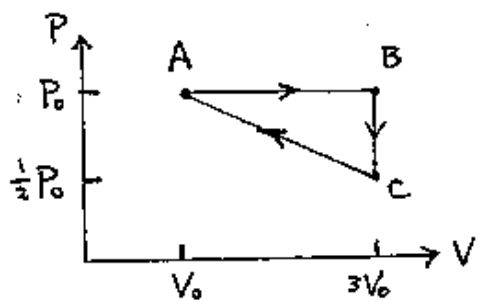


Fig. 2

- (15%) 3. Find the field due to an infinite flat sheet of charge with a uniform areal charge density $\sigma \text{ C/m}^2$.

- (15%) 4. A metal sphere of radius R has a charge Q . Find its potential energy.

- (15%) 5. A particle is subject to a constant force F along the direction of its motion. Starting with the expression $p = \gamma m_0 v$ and $F = dp/dt$, show that its acceleration is $dv/dt = F/\gamma^3 m_0$, where γ is the Lorentz factor.

- (15%) 6. An electron is accelerated from rest by a potential difference of 120 V. What is its de Broglie wavelength?

$(m_e = 9.1 \times 10^{-31} \text{ kg}, e = 1.6 \times 10^{-19} \text{ C}, h = 6.6 \times 10^{-34} \text{ J}\cdot\text{s})$

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