

國立中央大學八十八學年度轉學生入學試題卷

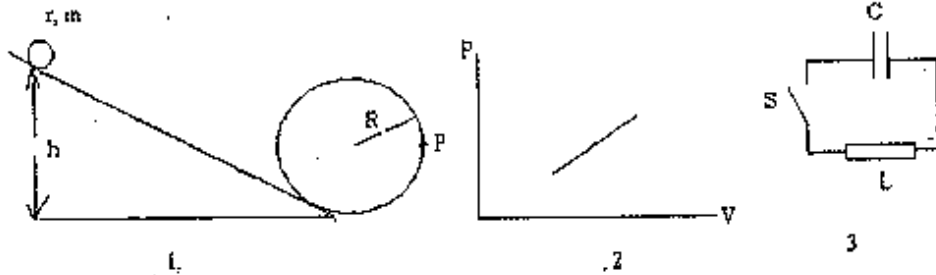
全校 二年級

科目：普通物理

共 / 頁 第 / 頁

1. A solid sphere of mass m and radius r rolls without slipping along the track shown in the figure below. It starts from rest with the lowest point of the sphere at height h above the bottom of the loop of radius R . (a) what is the minimum value of h (in terms of r and R) such that the sphere completes the loop? (b) What is the velocity of r at the point P (height= R) if $h=3R$. (20%)

Figures for problems 1-3.



2. An ideal gas of n moles initially has a temperature T_0 . The ideal gas expanded along a straight line as shown in the figure 2 with the final pressure and volume doubled the initial values. In terms of n , R , and T_0 , what is (a) the work done by the gas W (b) the change in internal energy ΔU (c) the heat absorbed Q . (15%)

3. A LC oscillator consists of a capacitor C with charge Q and an inductor L . Initially, C has a charge Q_0 at $t=0$ when the switch S is closed to connect L . (a) Write down the differential equation describing the variation of charge with time in C and show that the charge oscillates with a frequency $\omega = 1/(LC)^{1/2}$ (b) if the circuit has a resistance R , describing the variation of charge and the oscillation frequency. (15%)

4. An electron of mass 9.1×10^{-31} kg has an initial velocity $v_0 = 10^6$ i m/s. It enters a region in which it experiences a force $F = 8 \times 10^{-17}$ j for a period of 10^{-8} s. What is its velocity as it emerges from the region? (15%)

5. Three point charges, $q_1 = 1 \mu C$, $q_2 = -2 \mu C$, and $q_3 = 3 \mu C$ are fixed at the positions shown in Fig.4. (a) What is the potential at point P at the corner of the rectangle? (b) How much work would be needed to bring a charge $q_4 = 2.5 \mu C$ from infinity and place it at P? (c) What is the total potential energy of q_1 , q_2 , and q_3 ? (20%)

6. A converging lens has surface with radii 2 cm and 3 cm as shown in Fig. 5. What is its focal length? The refractive index of the glass is 1.5. (15%)

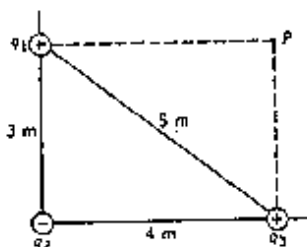


Fig. 4.

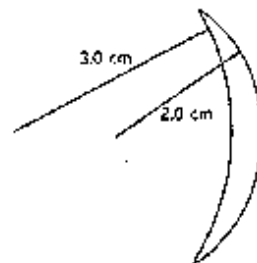


Fig. 5.

卷二第