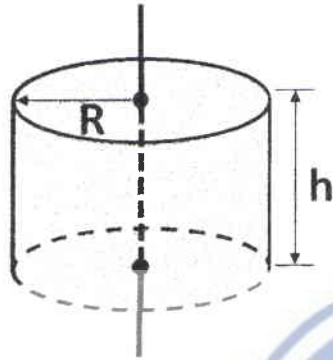
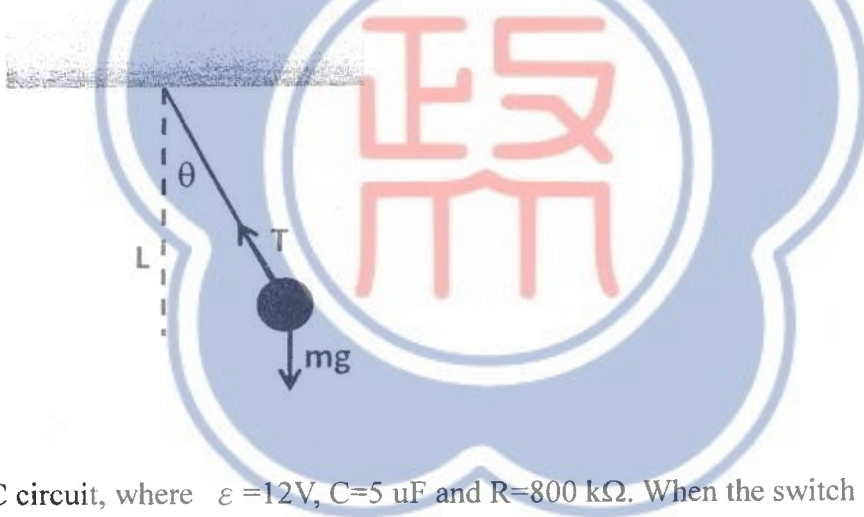


考試科目	普通物理 81321	所別	應用物理研究所	考試時間	2月28日(日) 第一節
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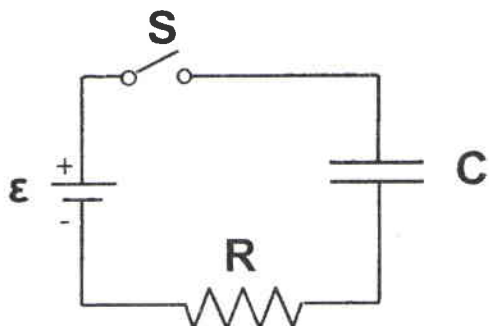
1. (16%) Show that the moment of inertia of a uniform solid cylinder of radius R , mass M and length L is $I = MR^2/2$, if the rotation axis is through the center along the axis of symmetry. (Assume that the density of the cylinder is ρ).



2. (16%) The simple pendulum consists of a particle-like bob of mass m suspended by a light string of length L that is fixed at the upper end. Show that the motion in the vertical plane is very close to that of a simple harmonic motion (SHM), provided the angle θ is small.

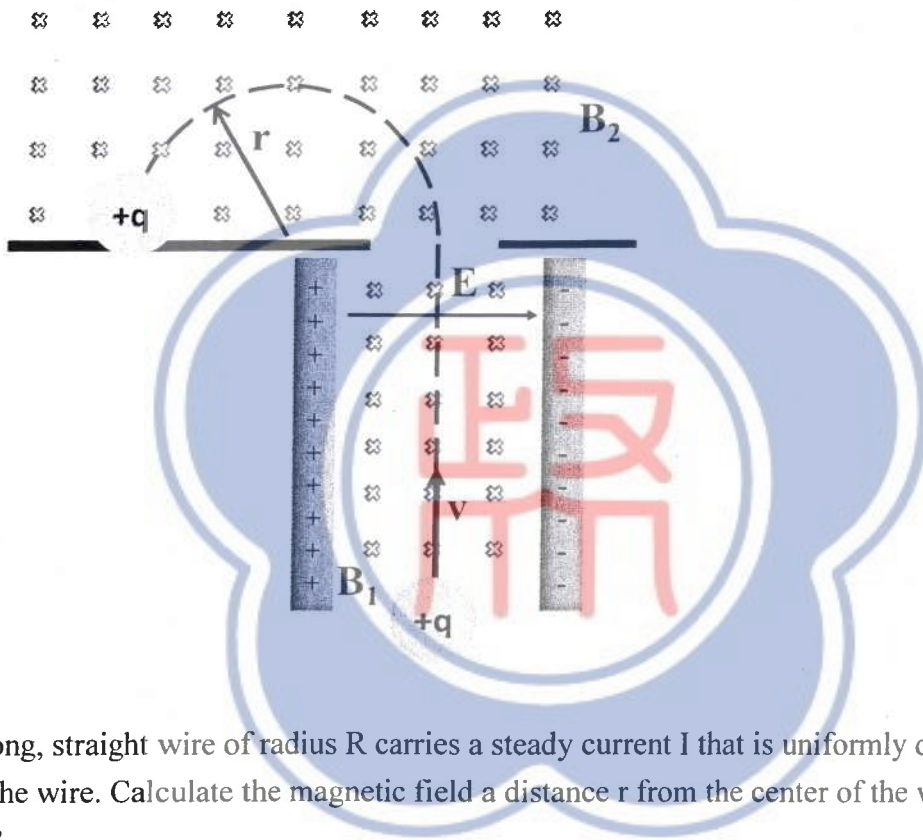


3. (20%) For a RC circuit, where $\epsilon = 12V$, $C = 5 \mu F$ and $R = 800 \text{ k}\Omega$. When the switch is close, (a) Apply the Kirchhoff's loop rule to the circuit and write down the equation in terms of $R, V, C, I(t)$ and $Q_c(t)$. (b) what is the time constant of this circuit. (c) Find the function of $Q_c(t)$. (d) Find the function of $I(t)$.

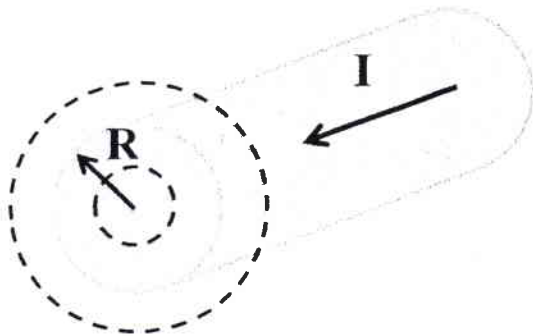


考試科目	普通物理 81621	所別	應用物理研究所	考試時間	2月28日(日) 第一節
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4. (16%) In the isothermal expansion of an idea gas, what is the work done on the gas if the volume expands from V_i to V_f at constant temperature T . ($PV=nRT=\text{constant}$).
5. (16%) For the mass spectrometer shown in the figure. The charge particles first pass through a velocity selector under uniform magnetic field B_1 and electric field E , then enter a second uniform field B_2 . They move in a semicircle of radius r before striking a detector array. (a) Find the velocity of the charge particles that pass un-deflected through the B_1 field. (b) Find the mass-to-charge ratio (m/q).



6. (16%) A long, straight wire of radius R carries a steady current I that is uniformly distributed through the cross section of the wire. Calculate the magnetic field a distance r from the center of the wire in the region (a) $r > R$ and (b) $r < R$.



備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。
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