

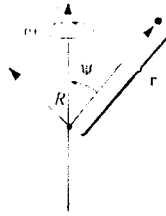
國立中央大學八十八學年度轉學生入學試題卷

物理學系 三年級

科目：電磁學

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1. Assume that an atomic nucleus is a uniformly charged sphere of total Charge Q and radius R . Find the electrostatic energy of the α -particle. (20%)
2. Given an electrostatic dipole with dipole moment p . Find the electrostatic potential and the electric field of this dipole. (Choose your own preferred coordinates) (20%)
3. Given that the vector potential as $\mathbf{A}(\mathbf{r}) = (\mu_0/4\pi) \int [\mathbf{J}(\mathbf{r}') / r'] d\tau'$, Find the vector potential at point \mathbf{r} of a spinning spherical shell of radius R carrying a uniform surface charge σ . Assume it spins at angular velocity ω . (20%)



4. Write down the Maxwell's equations in matter. Please explain each term in more detail. For example, $\nabla \times \mathbf{H} = \mathbf{J}_f + \partial \mathbf{D} / \partial t$. This equation means, where \mathbf{H} is, $\nabla \times \mathbf{H}$ is, \mathbf{J}_f is, $\partial \mathbf{D} / \partial t$ is, \mathbf{D} is, you should concentrate on the physical meaning in each term. (20%)
5. The general solution of potential for a spherical charge distribution is $V(r, \theta) = \sum_{l=0}^{\infty} (A_l r^l + B_l / r^{l+1}) P_l(\cos \theta)$. Find the potential inside and outside a sphere if the potential $V_0(\theta)$ is specified on the surface of this hollow sphere of radius R . (20%)

參考用