

本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

1. Derive the equation for the energy required to assemble a uniform sphere of charge of radius a and volume charge density ρ from the basic concept of electric potential. (15%)
2. The cardiac potential sometime may be modeled as linear electrostatic quadrupole. (a) Draw the configuration of charges along the z -axis for this linear electrostatic quadrupole, and (b) determine the potential V and electric field \mathbf{E} at a distant point $P(R, \theta, \phi)$ in spherical coordinates. (20%)
3. As shown in Fig. 1, determine the potential distributions for the regions: (a) $0 < \phi < \alpha$, and (b) $\alpha < \phi < 2\pi$. (20%)
4. Find the inductance per unit length of a very long solenoid with iron core having N turns uniformly and tightly wound on length L . The cross-sectional area is assumed to be A . (15%)
5. The permittivity of water at optical frequency is $1.75\epsilon_0$. Determine the distance d of an isotropic light under water to yield an illuminated circular area of radius 5 (m) as shown in Fig. 2. (10%)
6. Glass isosceles triangular prisms shown in Fig. 3 are used in optical instruments. Assuming $\epsilon_r = 4$ for glass, calculate the percentage of the incident light power reflected back by the prism. (20%)

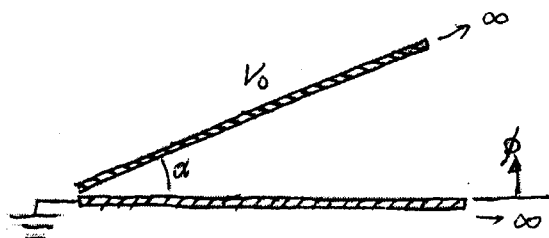


Fig. 1

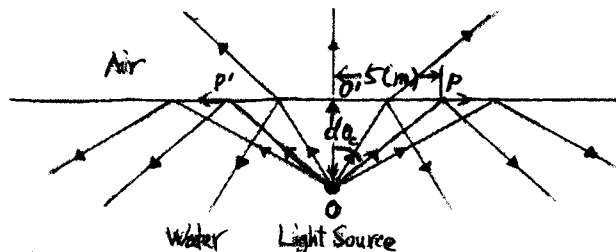


Fig. 2

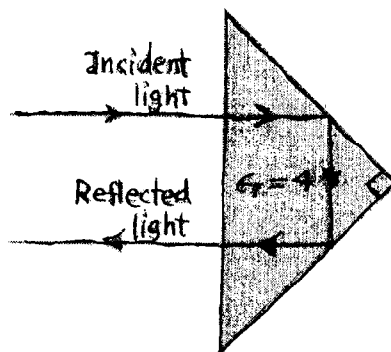


Fig. 3