PHY102: Assignment 5

1. Suppose the z axis is uniformly charged with a constant charge density λ. Calculate the work done to bring a charge Q from a distance $y = y_2$ to $y = y_1$ along y axis.

2. Find the total electrostatic energy of a uniformly charged sphere of total charge q and radius R.

3. Find the electrostatic energy of a uniformly charged spherical shell of total charge q and radius R.

4. Calculate the capacitance of two concentric spherical metal shells, with radii a and b.

5. Find the capacitance per unit length of two coaxial metal cylindrical tubes of radii a and b.

6. The electric potential of some configuration is given by,

$$\Phi(\vec{r}) = \alpha \frac{e^{-\lambda r}}{r},$$

where α and λ are constants. Find the electric field $\vec{E}(\vec{r})$, the charge density $\rho(\vec{r})$ and the total charge.