1. **Screened Potential**: Consider a particle of mass $\mu$ in the central force potential

$$V(r) = -\frac{e^2}{r} \quad \text{for} \quad 0 < r < R$$

$$= -\frac{e^2}{r} \exp(-\lambda(r - R)) \quad \text{for} \quad R < r < \infty \quad (0.1)$$

This potential differs from the Coulomb potential only in the region $r > R$, where the Coulomb force is screened. The difference becomes negligible when $\lambda \to 0$. Consider this difference as a perturbation and calculate the first-order correction to the energy of the ground state of the hydrogen atom.

2. Problems 17.2.2, 17.2.5 and 17.2.7 in Shankar’s book.