

## J00Q.2—Two Interacting Particles

### Problem

Two interacting particles have Hamiltonian  $H = H_0 + H'$ , where

$$\begin{aligned}H_0 &= -\frac{\hbar^2}{2m}(\nabla_1^2 + \nabla_2^2) + V(\vec{r}_1) + V(\vec{r}_2), \\V(\vec{r}) &= \frac{1}{2}k|\vec{r}|^2, \\H' &= \epsilon(x_1x_2 + y_1y_2 - 2z_1z_2).\end{aligned}$$

Find the ground state energy to lowest non-vanishing order in  $\epsilon$ .