1-7)

A) Since the net charge of the spherical atom is zero, if we were to isolate one electron, the remaining charge would be +1e. Call this Q.

B) We can make use of Gauss's law for this. Due to the symmetry of the system, the electric field should be the same as for a point charge, so long as we count only the charge within the Gaussian surface. To find the field at a distance r from the center, construct a concentric sphere of radius r. If the remaining charge is uniformly distributed (not unreasonable perhaps for a larger atom), then the charge enclosed should be proportional to the volume enclosed.

$$q_{Enclosed} = \frac{\frac{4\pi}{3} r^3}{\frac{4\pi}{3} R^3} Q = \frac{r^3}{R^3} Q \ .$$

Then, the force on 'our' electron will be

$$F = qE = q \frac{k_e q_{Enclosed}}{r^2} = q \frac{k_e \left(\frac{r^3}{R^3} Q\right)}{r^2} = q \frac{k_e Q}{R^3} r$$
$$= \frac{k_e e^2}{R^3} r \quad \text{toward center of the 'atom.'}$$

C) This force is proportional to the distance from the center and acts to restore the electron back to the center. Do we know of another force that behaves similarly? The spring force is the same. Same force means same motion, so this electron will move through the atom with simple harmonic motion.