Total energy: $$E_{tot} = \frac{1}{2} m_e v^2 + \frac{q_1 q_2}{4\pi\varepsilon_0 r}$$

Quantized angular momentum: $$L = m_e v r = n\frac{h}{2\pi}$$ Solve for *v*: $$v = \frac{nh}{2\pi m_e r}$$

Coulomb force law: $$\left|F_{coulomb}\right| = \left|\frac{q_1 q_2}{4\pi\varepsilon_0 r^2}\right| = \left|m_e a\right|$$ Rearrange: $$\left|\frac{q_1 q_2}{4\pi\varepsilon_0 r^2}\right| = \left|\frac{m_e v^2}{r}\right|$$

Insert *v*, solve for *r*: $$r_n = \frac{\varepsilon_0 n^2 h^2}{\pi m_e q_1 q_2} = \frac{\varepsilon_0 n^2 h^2}{\pi m_e Z e^2}$$

Plug r_n into *v*, solve for v_n: $$v_n = \frac{Ze^2}{2\varepsilon_0 nh}$$

Plug r_n and v_n into E_{tot}, solve for E_n: $$E_n \frac{-Z^2 e^4 m_e}{8\varepsilon_0^2 n^2 h^2}$$