42. (a) We note that the symbol "e" stands for the elementary charge in the manipulations below. From

$$-e = \int_0^\infty \rho(r) 4\pi r^2 dr = \int_0^\infty A \exp\left(-2r/a_0\right) 4\pi r^2 \, dr = \pi a_0^3 A$$

we get $A = -e/\pi a_0^3$.

(b) The magnitude of the field is

$$\begin{aligned} E &= \frac{q_{\text{encl}}}{4\pi\varepsilon_0 a_0^2} = \frac{1}{4\pi\varepsilon_0 a_0^2}\left(e + \int_0^{a_0} \rho(r) 4\pi r^2 dr\right) \\ &= \frac{e}{4\pi\varepsilon_0 a_0^2}\left(1 - \frac{4}{a_0^3}\int_0^{a_0} \exp(-2r/a_0)\, r^2 \, dr\right) \\ &= \frac{5\, e\, \exp(-2)}{4\pi\varepsilon_0 \, a_0^2} \; . \end{aligned}$$

We note that $\vec{E}$ points radially outward.