28.9 Since the electrical force supplies the centripetal acceleration,

$$\frac{m_e v_n^2}{r_n} = \frac{k_e e^2}{r_n^2} \text{ or } v_n^2 = \frac{k_e e^2}{m_e r_n}$$

From $L_n = m_e r_n v_n = n\hbar$, we have $r_n = \dfrac{n\hbar}{m_e v_n}$, so

$$v_n^2 = \frac{k_e e^2}{m_e}\left(\frac{m_e v_n}{n\hbar}\right) \text{ which reduces to } \boxed{v_n = \frac{k_e e^2}{n\hbar}}$$

29.19 Recall that the activity of a radioactive sample is directly proportional to the number of radioactive nuclei present, and hence, to the mass of the radioactive material present.

Thus, $\dfrac{R}{R_0} = \dfrac{N}{N_0} = \dfrac{m}{m_0} = \dfrac{0.25 \times 10^{-3}\ \text{g}}{1.0 \times 10^{-3}\ \text{g}} = 0.25$ when $t = 2.0\ \text{h}$

From $R = R_0 e^{-\lambda t}$, we obtain $0.25 = e^{-\lambda(2.0\ \text{h})}$ and $\lambda = -\dfrac{\ln(0.25)}{2.0\ \text{h}} = 0.693\ \text{h}^{-1}$

Then, the half-life is $T_{1/2} = \dfrac{\ln 2}{\lambda} = \dfrac{\ln 2}{0.693\ \text{h}^{-1}} = \boxed{1.0\ \text{h}}$

29.22 Using $R = R_0 e^{-\lambda t}$, with $R/R_0 = 0.125$, gives $\lambda t = -\ln(R/R_0)$

or $$t = -\frac{\ln(R/R_0)}{\lambda} = -T_{1/2}\left[\frac{\ln(R/R_0)}{\ln 2}\right] = -(5\,730 \text{ yr})\left[\frac{\ln(0.125)}{\ln 2}\right] = \boxed{1.72\times 10^4 \text{ yr}}$$

29.39 (a) $\boxed{{}^{21}_{10}\text{Ne}} + {}^{4}_{2}\text{He} \rightarrow {}^{24}_{12}\text{Mn} + {}^{1}_{0}\text{n}$

(b) ${}^{235}_{92}\text{U} + {}^{1}_{0}\text{n} \rightarrow {}^{90}_{38}\text{Sr} + \boxed{{}^{144}_{54}\text{Xe}} + 2\,{}^{1}_{0}\text{n}$

(c) $2\,{}^{1}_{1}\text{H} \rightarrow {}^{2}_{1}\text{H} + \boxed{e^{+}} + \boxed{\nu}$