28.8 (a) With the electrical force supplying the centripetal acceleration,

$$\frac{m_e v_n^2}{r_n} = \frac{k_e e^2}{r_n^2}\text{, giving } v_n = \sqrt{\frac{k_e e^2}{m_e r_n}}$$

where $r_n = n^2 a_0 = n^2\left(0.052\,9 \text{ nm}\right)$

Thus,

$$v_1 = \sqrt{\frac{k_e e^2}{m_e r_1}} = \sqrt{\frac{\left(8.99\times10^9 \text{ N}\cdot\text{m}^2/\text{C}^2\right)\left(1.60\times10^{-19}\text{ C}\right)^2}{\left(9.11\times10^{-31}\text{ kg}\right)\left(0.052\,9\times10^{-9}\text{ m}\right)}} = \boxed{2.19\times10^6 \text{ m/s}}$$

(b) $$KE_1 = \frac{1}{2}m_e v_1^2 = \frac{k_e e^2}{2r_1} = \frac{\left(8.99\times10^9 \text{ N}\cdot\text{m}^2/\text{C}^2\right)\left(1.60\times10^{-19}\text{ C}\right)^2}{2\left(0.052\,9\times10^{-9}\text{ m}\right)}$$

$$= 2.18\times10^{-18}\text{ J} = \boxed{13.6 \text{ eV}}$$

(c) $$PE_1 = \frac{k_e(-e)e}{r_1} = -\frac{\left(8.99\times10^9 \text{ N}\cdot\text{m}^2/\text{C}^2\right)\left(1.60\times10^{-19}\text{ C}\right)^2}{\left(0.052\,9\times10^{-9}\text{ m}\right)}$$

$$= -4.35\times10^{-18}\text{ J} = \boxed{-27.2 \text{ eV}}$$

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

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

28.13 The energy absorbed by the atom is

$$E_\gamma = E_f - E_i = 13.6 \text{ eV}\left(\frac{1}{n_i^2} - \frac{1}{n_f^2}\right)$$

(a) $$E_\gamma = 13.6 \text{ eV}\left(\frac{1}{9} - \frac{1}{25}\right) = \boxed{0.967 \text{ eV}}$$

(b) $$E_\gamma = 13.6 \text{ eV}\left(\frac{1}{25} - \frac{1}{49}\right) = \boxed{0.266 \text{ eV}}$$