p489 3, 7, 8, 11, 12, 14, 15, 16, 20, 21

(3) $W = qV = (1.6\times10^{-19}\,C)(23\,000\,V) = \underline{3.68\times10^{-15}\,J}$
$= \underline{23\,000\,eV}$

(7) $E = \frac{V}{x}$

$x = \frac{V}{E} = \frac{45\,V}{1500\,Vm^{-1}} = \underline{0.03\,m}$

(8) $V = \frac{W}{q} = \frac{(65.0\times10^{3}\,eV)(\cancel{1.6\times10^{-19}}\,JeV^{-1})}{2(\cancel{1.6\times10^{-19}}\,C)} = \underline{32\,500\,V}$

(11) (a) $E_k = \frac{1}{2}mv^2$

$v = \sqrt{\frac{2E_k}{m}} = \sqrt{\frac{2(750\,eV)(1.6\times10^{-19}\,JeV^{-1})}{(9.11\times10^{-31}\,kg)}} = \underline{1.6\times10^{7}\,ms^{-1}}$

(b) $v = \sqrt{\frac{2E_k}{m}} = \sqrt{\frac{2(3.2\times10^{3}\,eV)(1.6\times10^{-19}\,JeV^{-1})}{9.11\times10^{-31}\,kg}} = \underline{3.4\times10^{7}\,ms^{-1}}$

(12) $E_k = \frac{1}{2}mv^2$

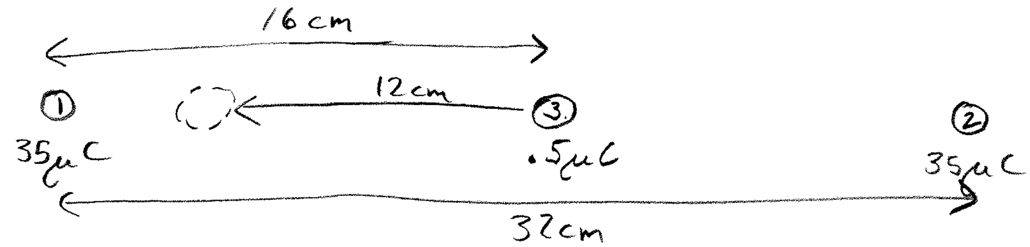
$v = \sqrt{\frac{2E_k}{m}} = \sqrt{\frac{2(3.2\times10^{3}\,eV)(1.6\times10^{-19}\,JeV^{-1})}{1.67\times10^{-27}\,kg}} = \underline{7.8\times10^{5}\,ms^{-1}}$

(14) $V = \frac{kq}{r} = \frac{(8.99\times10^{9}\,Nm^2C^{-2})(4\times10^{-6}\,C)}{(.15\,m)} = \underline{2.4\times10^{-5}\,V}$

(15) $V = \frac{kq}{r}$

$q = \frac{Vr}{k} = \frac{(125\,V)(.15\,m)}{(8.99\times10^{9}\,Nm^2C^{-2})} = \underline{2.1\times10^{-9}\,C}$

(16)



$$W_{13} = q_3 V = q_3\left(\frac{kq_1}{r_{13}'} - \frac{kq_1}{r_{13}}\right)$$

$$W_{23} = q_3 V = q_3\left(\frac{kq_2}{r_{23}'} - \frac{kq_2}{r_{23}}\right)$$

$$W_{net} = W_{13} + W_{23}$$

$$= q_3\left(\frac{kq_1}{r_{13}'} - \frac{kq_1}{r_{13}}\right) + q_3\left(\frac{kq_2}{r_{23}'} - \frac{kq_2}{r_{23}}\right)$$

$$= q_3 k q\left(\frac{1}{r_{13}'} - \frac{1}{r_{13}} + \frac{1}{r_{23}'} - \frac{1}{r_{23}}\right) \qquad q = q_1 = q_2$$

$$= (0.5\times10^{-6}\,C)(8.99\times10^{9}\,Nm^2C^{-2})(35\times10^{-6}\,C)\left(\frac{1}{.04m} - \frac{1}{.16m} + \frac{1}{.28m} - \frac{1}{.16m}\right)$$

$$= \underline{2.5\ J}$$

(20) $W = qV$

$$\frac{1}{2}mv^2 = q\left(\frac{kq_e}{r_2} - \frac{kq_e}{r_1}\right) \qquad r_2 = \infty$$

$$v = \sqrt{\frac{2q}{m}\left(\frac{kq_e}{r_1}\right)} = \sqrt{\frac{2(0.125\times10^{-6}\,C)}{9.11\times10^{-31}\,kg}\left(\frac{(8.99\times10^{9}\,Nm^2C^{-2})(1.6\times10^{-19}C)}{0.325\,m}\right)}$$

$$\underline{v = 3.49\times10^{7}\,ms^{-1}}$$

21 $W = qV$

$$\frac{1}{2}mv^2 = q_1\left(\frac{kq_2}{r_{12}'} - \frac{kq_2}{r_{12}}\right) \qquad r_{12}' = \infty$$

$$v = \sqrt{\frac{2q_1}{m}\left(\frac{kq_2}{r_{12}}\right)} = \sqrt{\frac{2(9.5\times10^{-6}\,C)(8.99\times10^{9}\,Nm^2C^{-2})(9.5\times10^{-6}\,C)}{(1\times10^{-6}\,kg)\;(0.035\,m)}}$$

$$v = \underline{6.8\times10^{3}\ ms^{-1}}$$