Phys discussion 20

a) $\vec{F} = q\vec{v} \times \vec{B}$ KE = PE $\therefore \frac{1}{2}mv^2 = q\Delta V$

$$v = \sqrt{\frac{2e\Delta V}{m}}$$

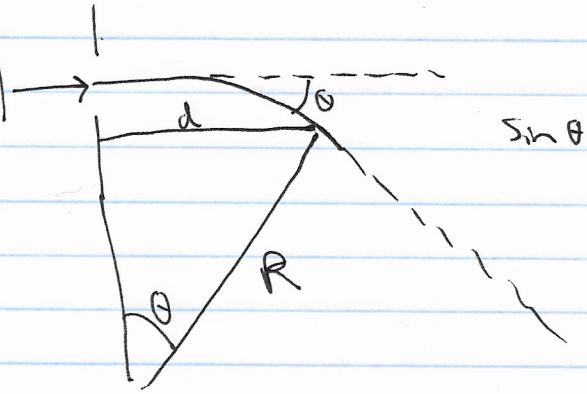
b) $F = q\vec{v} \times \vec{B} = q\sqrt{\frac{2q\Delta V}{m}}B$

c) down — negative charge

d) $F_B = F_c = ma_c = m\frac{v_T^2}{R} = qvB$

$\therefore R = \frac{mv}{qB}$ $= \frac{m\sqrt{\frac{2e\Delta V}{m}}}{qB}$

e)



$\sin\theta = \frac{d}{R}$ $\therefore \theta = \sin^{-1}\left(\frac{d}{R}\right)$

$$\theta = \sin^{-1}\left(\frac{d}{\frac{m\sqrt{\frac{2e\Delta V}{m}}}{qB}}\right)$$

f) No — $\vec{B}$ does No work

g) $R = \frac{d}{2} = \frac{mv_f}{qB} \rightarrow B = \frac{2mv_f}{dq}$ $= \frac{2m\sqrt{\frac{2e\Delta V}{m}}}{dq}$