b # 30.

V is constant but since this is a circular motion there is a radial acceleration because $\vec{v}$ is changing direction.

$f = \frac{1}{T}$ T : time for one complete revolution. It is the period.

$T = \frac{2\pi r}{v}$ r: radius of the circular path.

$f = \frac{v}{2\pi r}$

$\vec{F} = \frac{d\vec{p}}{dt} \Rightarrow |\vec{F}| = q v B = \gamma m_o \left|\frac{d\vec{v}}{dt}\right|$

because $\vec{v} \perp \vec{B}$ $a_r = \frac{v^2}{r}$

$\Rightarrow \frac{v}{r} = \frac{qB}{\gamma m_o} \Rightarrow f = \frac{qB}{2\pi \gamma m_o}$; $\gamma = \frac{1}{\sqrt{1 - v^2/c^2}}$

$$\Rightarrow \boxed{f = \frac{qB}{2\pi m_o}\left(1 - \frac{v^2}{c^2}\right)^{1/2}}$$

b # 34.

The rest energy is $E_o = m_o c^2 = 0.511$ MeV

$K = 5 m_o c^2$

The total energy $E = E_o + K = 6 m_o c^2 = 6 \times 0.511$
$\simeq 3.1$ MeV

$E = \gamma m_o c^2 = 6 m_o c^2 \Rightarrow \gamma = 6 = \frac{1}{\sqrt{1 - v^2/c^2}}$

$1 - \frac{v^2}{c^2} = 0.028 \Rightarrow \frac{v^2}{c^2} = 0.97$

$$\Rightarrow \boxed{v = 0.985c}$$