$$\mathcal{L} = \frac{1}{2} m \vec{v}\cdot\vec{v} + q\,\vec{v}\cdot\vec{A}$$

$$= \frac{1}{2} m \left[\dot\rho^2 + \rho^2\dot\phi^2 + \dot z^2\right] + q\,\frac{\rho\dot\phi\,\mu\rho}{[\rho^2+z^2]^{3/2}} \Rightarrow$$

$$\boxed{\mathcal{L} = \frac{1}{2} m \left[\dot\rho^2 + \rho^2\dot\phi^2 + \dot z^2\right] + \frac{q\mu\rho^2\dot\phi}{[\rho^2+z^2]^{3/2}}}$$

b) $$p_\rho = \frac{\partial \mathcal{L}}{\partial \dot\rho} = m\dot\rho \Rightarrow m\ddot\rho = \frac{\partial \mathcal{L}}{\partial \rho} \Rightarrow$$

$$\boxed{m\ddot\rho = m\rho\dot\phi^2 + q\mu\dot\phi\,\frac{\partial}{\partial\rho}\,\frac{\rho^2}{[\rho^2+z^2]^{3/2}}}$$

$$p_\phi = \frac{\partial \mathcal{L}}{\partial \dot\phi} = m\rho^2\dot\phi + \frac{q\mu\rho^2}{[\rho^2+z^2]^{3/2}} \Rightarrow$$

$$\dot p_\phi = \frac{\partial \mathcal{L}}{\partial \phi} = 0 \Rightarrow \boxed{m\rho^2\dot\phi + \frac{q\mu\rho^2}{[\rho^2+z^2]^{3/2}} = \text{const}}$$

$$p_z = \frac{\partial \mathcal{L}}{\partial \dot z} = m\dot z \Rightarrow m\ddot z = \frac{\partial \mathcal{L}}{\partial z} \Rightarrow$$

$$\boxed{m\ddot z = q\mu\rho^2\dot\phi\,\frac{\partial}{\partial z}\,\frac{1}{[\rho^2+z^2]^{3/2}}}$$