Quiz 1

1) As we discussed in class, using dimensional analysis we can extract a length and time scale. Use kinematic viscosity ν $[L^2T^{-1}]$ and energy dissipation rate per unit mass ϵ $[L^2T^{-3}]$ and extract a length scale η and time scale τ_η.
   a) $\eta = \left(\frac{\nu}{\epsilon^3}\right)$; $\tau_\eta = \left(\frac{\nu^3}{\epsilon}\right)$
   b) $\eta = \left(\frac{\nu^3}{\epsilon}\right)^{\frac{1}{4}}$; $\tau_\eta = \left(\frac{\nu^3}{\epsilon}\right)^{\frac{1}{2}}$
   c) $\eta = \left(\frac{\nu^3}{\epsilon}\right)^{\frac{1}{4}}$; $\tau_\eta = \left(\frac{\nu}{\epsilon}\right)^{\frac{1}{2}}$
   d) $\eta = \left(\frac{\nu}{\epsilon^3}\right)^{\frac{1}{2}}$; $\tau_\eta = \left(\frac{\nu^3}{\epsilon}\right)^{\frac{1}{4}}$

2) Newton's third law of motion suggest that the total linear momentum ($\boldsymbol{p_1} + \boldsymbol{p_2} = m_1\boldsymbol{v_1} + m_2\boldsymbol{v_2}$) of a pair of mutually interacting particles is conserved. It breaks when:
   a) Both particles are not charged and moving.
   b) Both particles are charged and moving.
   c) Both particles are charged and at rest.
   d) Both particles are not charged and at rest.