

1. Starting from $\mathcal{L} = -\frac{1}{4}F_{\mu\nu}F^{\mu\nu}$,
 - a. derive the equations of motion.
 - b. Show that one can reproduce the Maxwell's equation of motion .

2. For $SU(2)_L \times U(1)_Y \rightarrow U(1)_{em}$, explicitly show the calculation for $W^\pm, Z$ gauge boson mass.

3. For the Standard Model, $SU(2)_L \times U(1)_Y \rightarrow U(1)_{em}$, calculate the Higgs boson mass.

4. Draw the Feynman diagram for $\nu_e e^- \rightarrow \nu_e e^-$.
 - a. Calculate the Matrix element for this process and
 - b. the cross-section for this process