1. Show that $[b_0^\mu, M^2] = 0$ where b_0^μ is the zero mode oscillator in the Ramond sector and M^2 is the mass operator of the fermionic string.

2. Consider the operator $G = (-1)^F$, where F is the world-sheet fermion number. Write F in terms of oscillator modes in the NS sector. Assuming $G = -1$ for the NS ground state, detemine the G eigenvalue of a generic excited state in the NS sector of the open string, i.e. $\alpha_{-n_1}^{i_1} \cdots \alpha_{-n_N}^{i_N} b_{-r_1}^{j_1} \cdots b_{-r_M}^{j_M} |0>$.

3. The generalized chirality operator in the R sector reads $\Gamma = b_0^1 \cdots b_0^8 (-1)^F$, where $b_0^1 \cdots b_0^8$ is the chirality operator in the eight transverse dimensions. Determine the Γ eigenvalue of a generic state in the R sector assuming $\Gamma|a>= \prod_{i=1}^8 b_0^i |a>= +1|a>$ and $\Gamma|\dot{a}>= -1|\dot{a}>$.

4. Show that $\{(-1)^F, \psi^\mu\} = 0$

5. Construct the massless spectrum of the Type IIA and Type IIB theories

6. Construct the spectrum of the first excited level of the Type IIA and Type IIB theories.