

NUCLEAR AND PARTICLE PHYSICS
PHY 422/622

ASSIGNMENT IV

- (1) Draw the relevant Feynman diagram and write the invariant matrix element for the Beta decay process.
- (2) Write the terms in the Bethe-Weizsäcker formula. Motivate and explain each term in a few lines.
- (3) Consider the series of nuclear decays,

$$1 \rightarrow 2 \rightarrow \dots \rightarrow k \rightarrow \dots \rightarrow N$$

with decay constants $\lambda_1, \lambda_2 \dots \lambda_{N-1}$. Assume, one initially starts with just N_0 nuclei of type '1'. Derive an expression for the activity of the k-th member in the chain. These are called the *Bateman equations*. [Hint : Look at a few special cases before trying to generalise.]