Nuclear reaction studies are not only important for understanding the underlying reaction mechanism, production of new species but also for understanding nuclear structure and forces as well. Broadly, nuclear reactions are divided into three different categories namely the direct, compound and preequilibrium reactions based on the time of the interaction.

Nuclear reactions take place in a series of stages corresponding to the successive interactions of the incident particle with the nucleons of target nucleus. At each stage, energy may be given to the target nucleons, until ultimately the energy of the projectile is shared statistically among them. The first stage in the process takes place in a time similar to the transit time, generally $10^{-22}$ s. When the incident energy is distributed among the target nucleons, an excited compound system is formed which can subsequently decay by particle emission followed by gamma emission, until it reaches the ground stage. The decay of the compound nucleus takes place over a much longer time scale of about $10^{-15}$ s. For many years, it was considered sufficient to divide the nuclear reaction process into two classes, the direct and the compound nucleus reactions. Many studies have now shown that this division into two classes is inadequate, there is a definite evidence that the particles can be emitted after the first direct interactions but long before the attainment of statistical equilibrium. They are referred to as preequilibrium particles.

Many theories been formulated to understand the excitation functions, energy spectra and angular distributions of the particles emitted during the equilibration of excited nucleus. These models have become very serviceable tools for the analysis and interpretation of nuclear reactions at energies greater than few tens of MeV.
There have been far reaching improvements in the semi-classical or phenomenological models such as Hybrid, Geometry Dependent Hybrid, Exciton and Index models. These are often used for making comparisons with experimental results on account of their simplicity and transparency. Efforts are in progress to give a fully quantum mechanical picture of the pre-equilibrium reactions in the framework of multi-step theories but due to the complexity of the computation of the interaction of complex particles like an alpha particle, the quantum mechanical picture is yet to come.

A survey of literature reveals that presently available experimental information on the exciton functions is generally scanty with a large part of it measured with poor resolution detectors and there are mutual discrepancies among many previous measurements. In some cases, only single measurements are available.

In this scenario, the present investigation is undertaken with two folds aims

1. to study all those reactions for which divergencies were observed, in order to improve the quality of the existing data and to supplement them with new energy point cross-sections wherever not available and

2. to compare the experimental results with pre-equilibrium hybrid model of Blann using codes ALICE and also with the code COMPLET of Ernst for \((\alpha, \alpha x n)\) types of reactions.

The alpha particle induced reactions on the target elements nickel, yttrium, rhodium, terbium and rhenium have been studied up to 50 MeV using the stacked foil activation technique and high resolution HPGe gamma ray spectroscopy. These experimental results and the corresponding theoretical predictions together with conclusions drawn are incorporated in the thesis.