

TABLE OF CONTENTS

Acknowledgment.....	i
Abstract.....	ii
المخلص.....	iii
Table of contents	iv
List of Figures.....	vi
List of Tables	vii
1. Introduction.....	1
2. Properties of nucleons and nuclear interaction	7
2.1. Properties of nucleons	7
2.2. Nucleon-nucleon interaction	9
2.2.1. The deuteron	9
2.2.2. Properties of the nucleon-nucleon interaction.....	13
2.2.3. Nucleon-nucleon potentials	17
2.3. Effective nucleon-nucleon interaction inside nuclear matter	22
2.4. The Skyrme interaction.....	23
3. The nuclear shell model.....	26
3.1. Evidence and basic assumptions of the nuclear shell model.....	26
3.2. Center-of-mass spurious states in the nuclear shell model	28
3.3. Harmonic oscillator nuclear shell model	29

3.4. ^3He calculations using harmonic oscillator nuclear shell model	34
3.5. Binding energy of ^3He using harmonic oscillator nuclear shell model ..	37
4. Medium dependence of the binding energy	44
4.1. Wave function of ^3He -neutron system	44
4.2. Binding energy of ^3He -neutron system	48
5. Ideal Fermi gas statistics	68
5.1. Ideal Fermi gas.....	68
5.2. Nuclear statistical equilibrium (NSE) model	71
5.3. Ensemble average over all values of $\vec{K}$ and $\vec{k}$ at $T > 0$	72
5.4. Ensemble average over all values of $\vec{K}$ and $\vec{k}$ at $T = 0$	81
6. Results and conclusions	90
6.1. Binding energy dependence on density and temperature	90
References	99