TABLE OF CONTENTS

Topic	Page No.
Abstract	i-iii
Preface	iv
Acknowledgement	v
Table of Contents	vi-xiv
List of Tables	xv-xix
List of Figures	xx-xxvii
List of Appendices	xxviii
CHAPTER I: General Introduction	**1-28**
Introduction	1-3
1.1. Solvent Effects	3-7
1.1.1. Solvation	5-6
1.1.2. Preferential Solvation	6-7
1.2. Importance and scope of the Physico-Chemical Parameters	8-10
1.3. Objectives and Application of the Research Work	10-12
1.4. Importance of Solvents and Solvent Mixtures Studied	12-14
1.5. Literature Review	14-22
References	22-28
CHAPTER II: Theoretical Background	**29-82**
2.1 Importance of Mixed Solvent Systems	29-29
2.2 Intermolecular Forces	30-34
2.2.1 Dipole-Dipole Interaction	30-30
2.2.2. Induced Dipole interaction	31-31
2.2.3. Instantaneous Dipole-Induced Dipole interaction	31-32
2.2.4. Hydrogen Bond	32-34

Contd….

Topic	Page No.
2.3. Theory of Mixed Solvents	34-35
2.4 Excess molar Volume	35-36
2.5. Partial molar Volume	36-40
2.6. Viscosity Deviation	40-41
2.7. Thermodynamics for Viscous Flow	42-44
2.7.1 Excess Gibb's Free Energy of Activation of Viscous Flow	42-43
2.7.2. Viscous Entropy and Enthalpy	43-44
2.8. Ultrasonic Speed of Sound	44-49
2.8.1. Isentropic Compressibility	45-46
2.8.2. Excess Isentropic Compressibility	46-46
2.8.3. Intermolecular Free Length	46-47
2.8.4. Specific Acoustic Impedance	47-47
2.8.5. Free Volume	48-48
2.8.6. Internal Pressure	48-49
2.9. Refractive Index	49-51
2.9.1. Deviation in Refractive index	50-50
2.9.2. Molar Refraction and Excess Molar Refraction	51-51
2.10. Predictive Models	51-59
2.10.1. Excess Molar Volume Models	52-59
2.10.1.1. Cubic Equation of State	52-53
2.10.1.2. Peng-Robinson Equation of State	53-55
2.10.1.3. Flory Theory	55-57
2.10.1.4. Prigogine-Flory-Patterson (PFP) Theory	57-59
2.11. Viscosity Models	59-61
2.11.1. Model Based on Eyring Theory Coupled with a Cubic Equation of State	59-60

Contd…

Topic	Page No.
2.11.2. Bloomfield-Dewan Viscosity Model	60-61
2.12. Viscosity Correlative Models	62-64
2.12.1. Grunberg and Nissan Model	62-62
2.12.2 Tamura and Kurata Model	62-63
2.12.3. Hind Model	63-63
2.12.4. Heric-Brewer Model	63-63
2.12.5. McAllister Models	63-64
2.12.6. Katti-Chaudhri Model	64-64
2.12.7. Lobe Model	64-64
2.12.8. Krishnan-Laddha model	64-64
2.13. Other Correlative Models	65-65
2.14. Predictive Symmetric and Asymmetric Models for Ternary and Quaternary Systems	65-68
2.14.1. Symmetrical Models	66-67
2.14.1.1. Köhler Model	66-66
2.14.1.2. Jacob–Fitzner Model	66-66
2.14.1.3. Colinet Model	66-67
2.14.1.4. Rastogi Model	67-67
2.14.2. Asymmetrical Models	67-68
2.14.2.1. Tsao-Smit model	67-67
2.14.2.2. Toop Model	67-67
2.14.2.3. Scatchard Model	67-68
2.14.2.4. Mathieson-Thynne Model	68-68
2.15. Theoritical Estimation of Ultrasonic Speed	68-70
2.15.1. Nomoto Relation (NOM)	68-68

Contd….

Topic	Page No.
2.15.2 Schaaff's Collision Factor Theory (CFT)	68-69
2.15.3. Impedance Dependence Relation (IDR)	69-69
2.15.4. Vandeal Vangeal Ideal Mixture Relation (IMR)	69-69
2.15.5. Jacobson's Free Length Theory (FLT)	69-70
2.15.6. Junjie's Equation (JUN)	70-70
2.16. Theoretical Estimation of Refractive Indices of Liquid Mixtures	71-72
2.16.1. Lorentz-Lorenz Relation	71-71
2.16.2. Gladstone-Dale Relation	71-71
2.16.3. Arago-Biot Relation	71-71
2.16.4. Weiner Model Relation	71-71
2.16.5. Eyring-John Relation	72-72
2.16.6. Heller Relation	72-72
2.16.7. Eykman Relation	72-72
2.16.8. Newton Relation	72-72
2.17. Response Surface Model	72-73
2.18. Standard Deviation	73-73
References	73-81
CHAPTER III: Experimental Section	**82-96**
3.1. Source and Purification of the Chemicals Used	82-84
3.1.1. Solvents	82-83
3.1.2. Mixed Solvents	83-84
3.2. Experimental Methods	84-94
3.2.1. Density measurement	84-86
3.2.2. Measurement of Viscosity	86-87
3.2.3. Measurement of Mass	87-87

Contd…

Topic	Page No.
3.2.4. Refractive Index Measurement	88-89
3.2.5. Measurement of Ultrasonic Speed	89-92
3.2.5. Measurement of FT−IR Spectra	93-94
3.2.6. Methodology	94-95
References	95-96
CHAPTER IV: Thermophysical properties of binary mixtures of N, N-dimethylformamide with three cyclic ethers	**97-122**
4.1. Introduction	97-98
4.2. Experimental section	98-99
4.2.1. Materials	98-98
4.2.2. Apparatus and Procedure	98-99
4.3. Results and discussion	100-120
4.3.1. Excess molar volumes	100-105
4.3.2. Excess partial molar volumes	105-108
4.3.3. Prigogine-Flory-Patterson theory (PFP)	108-112
4.3.4. Viscosity Deviation	112-114
4.3.5. Thermodynamics of viscous flow	114-115
4.3.6. Excess Isentropic Compressibilities	116-118
4.3.7. Theoretical prediction of ultrasonic speeds	118-120
4.4. Conclusion	120-120
References	120-122
CHAPTER V: Thermophysical properties of the binary mixtures of 2-ethyl-1-hexanol with 1, 2-disubstituted ethanes at *T* = (298.15- 318.15) K	**123-157**
5.1. Introduction	123-124
5.2. Experimental section	124-125
5.2.1. Material	124-124

Contd…

Topic	Page No.
5.2.2. Apparatus and Procedure	124-125
5.3. Results and discussion	125-154
5.3.1. Excess molar volume	128-131
5.3.2. Excess Partial molar volumes	131-133
5.3.3. Predictions of excess molar volumes	133-137
5.3.4. Viscosity deviations	137-139
5.3.5. Thermodynamics of viscous flow	139-141
5.3.6. Viscosity prediction	141-144
5.3.7. Ultrasonic speed of sound and derived functions	144-149
5.3.8. Prediction of ultrasonic speed of sound	149-149
5.3.9. Excess molar refraction	149-152
5.3.10. IR spectroscopic study	152-154
5.4. Conclusion	154-155
Reference	155-157
CHAPTER VI: Hydrogen bond interactions in the mixtures of 1,4-Dioxane with some 1,2 disubstituted ethanes at *T* = (298.15 -318.15) K	**158-188**
6.1. Introduction	158-160
6.2. Experimental section	160-161
6.2.1. Materials	160-160
6.2.2. Apparatus and Procedure	160-161
6.3. Results and discussion	161-186
6.3.1. Excess molar volumes	161-166
6.3.2. Excess partial molar volumes	166-168
6.3.3. Predictions of excess molar volumes	168-171
6.3.4. Viscosity deviations	171-172

Contd…

Topic	Page No.
6.3.5. Thermodynamics of viscous flow	172-174
6.3.6. Viscosity prediction	174-177
6.3.7. Ultrasonic speed of sound and derived functions	177-182
6.3.8. Molar refractions	182-184
6.3.9. IR spectroscopic study	184-186
6.4. Conclusion	184-186
References	186-188
CHAPTER VII: Thermophysical properties of the binary mixtures of cyclohexane with some esters	**189-220**
7.1. Introduction	189-190
7.2. Experimental section	190-192
7.2.1. Materials	190-190
7.2.2. Apparatus and procedure	190-192
7.3. Results and discussion	192-218
7.3.1. Excess molar volumes	192-197
7.3.2. Excess partial molar volumes	197-198
7.3.3. Predictions of excess molar volumes	198-203
7.3.4. Viscosity deviation	203-204
7.3.5. Thermodynamics of viscous flow	205-207
7.3.6. Viscosity models	207-209
7.3.7. Ultrasonic speed of sound and derived acoustic functions	209-212
7.3.8. Prediction of ultrasonic speed of sound	212-213
7.3.9. Excess molar refractions	213-215
7.3.10. IR spectroscopic study	216-218
7.4. Conclusion	218-218
References	218-220

Contd….

Topic	Page No.
CHAPTER VIII: Thermophysical properties of the binary mixtures of cyclohexanone with some esters	**221-250**
8.1. Introduction	221-222
8.2. Experimental section	222-222
8.2.1. Materials	222-222
8.2.2. Apparatus and procedures	222-222
8.3. Results and discussion	222-248
8.3.1. Excess molar volumes	223-230
8.3.2 Predictions of excess molar volumes	230-233
8.3.3. Viscosity deviation	234-235
8.3.4. Thermodynamics of viscous flow	235-237
8.3.5. Viscosity correlation	238-239
8.3.6. Ultrasonic speed of sound & derived functions	240-243
8.3.7. Prediction of ultrasonic speed of sound	244-244
8.3.8. Excess molar refractions	244-245
8.3.9. IR spectroscopic study	246-248
8.4. Conclusion	248-248
References	248-250
CHAPTER IX: Thermophysical properties of the ternary mixtures of cyclohexane and cyclohexanone with some esters at *T* = (298.15-318.15) K	**251-295**
9.1. Introduction	251-251
9.2. Experimental section	251-252
9.2.1. Material	251-251
9.2.2. Apparatus and procedure	252-252
9.3. Results and discussion	252-293
9.3.1. Excess molar volumes and excess partial molar volumes	252-273

Contd…

Topic	Page No.
9.3.2. Viscosity Deviations	274-278
9.3.3. Excess Isentropic Compressibility	278-284
9.3.4. Excess Molar Refraction	284-290
9.3.5. Empirical and correlative models	291-293
9.4. Conclusion	293-294
References	294-295
CHAPTER X: Thermophysical properties of the quaternary mixtures of cyclohexane and cyclohexanone with some esters at *T* = (298.15-318.15) K	**296-311**
10.1. Introduction	296-296
10.2. Experimental section	296-297
10.2.1. Material	296-297
10.2..2. Measurements	297-297
10.3. Results and discussion	297-310
10.3.1. Excess molar volumes	297-303
10.3.2. Viscosity Deviations	303-304
10.3.3. Excess Isentropic Compressibility	304-306
10.3.4. Excess Molar Refraction	306-307
10.3.5. Empirical and correlative models	307-310
10.4. Conclusion	310-310
References	310-311
CHAPTER XI: Concluding Remarks	312-316
APPENDIX I	317-317
APPENDIX II	318-318
BIBLIOGRAPHY	319-330
INDEX	331-336