

# Contents

Preface to the Third Edition	v
<b>1 Introduction</b>	<b>1</b>
1.1 The liquid state	1
<b>2 The thermodynamic properties</b>	<b>11</b>
2.1 Summary of thermodynamic relations	11
2.2 Vapour pressure	19
2.3 Mechanical properties	24
2.4 Heat capacities	29
2.5 Adiabatic properties	32
2.6 Residual and configurational properties	47
2.7 van der Waals's equation	51
<b>3 The critical state</b>	<b>59</b>
3.1 Thermodynamics of the critical point	59
3.2 Inequalities at the critical point	65
3.3 The measurement of critical constants	70
3.4 Experimental values of the critical exponents	75
3.5 Scaling the free energy	77
<b>4 The thermodynamics of liquid mixtures</b>	<b>86</b>
4.1 Introduction	86
4.2 Partial molar quantities	87
4.3 The ideal mixture	92
4.4 Thermodynamics of non-ideal mixtures	98
4.5 Tests for consistency	101
4.6 Azeotropy	104
4.7 Fields and densities	110
4.8 Thermodynamics of partially miscible liquids	115
4.9 Exponents at the critical point of a binary mixture	119
4.10 Tricritical points	122
<b>5 Excess thermodynamic functions</b>	<b>132</b>
5.1 Introduction	132

5.2	The experimental determination of excess functions	133
5.3	Mixtures of condensed gases	140
5.4	Liquefied natural-gas mixtures	145
5.5	Mixtures of the higher hydrocarbons	149
5.6	Mixtures containing halides	154
5.7	Mixtures containing fluorocarbons	158
5.8	Mixtures containing polar liquids	162
5.9	Aqueous mixtures	174
5.10	Mixtures of quantum liquids	179
<b>6</b>	<b>Fluid mixtures at high pressures</b>	<b>191</b>
6.1	Introduction	191
6.2	Gas-liquid critical states of binary mixtures	195
6.3	High-pressure phase equilibria: type I mixtures	203
6.4	High-pressure phase equilibria: type II and type VI mixtures	207
6.5	High-pressure phase equilibria: type III mixtures	213
6.6	High-pressure phase equilibria: type IV and type V mixtures	221
<b>7</b>	<b>The statistical thermodynamics of fluids</b>	<b>230</b>
7.1	Intermolecular forces	230
7.2	Molecular distribution functions	232
7.3	Molecular correlation functions	237
7.4	The measurement and calculation of correlation functions	243
7.5	The principle of corresponding states	261
7.6	Perturbation theories: spherical molecules	266
7.7	Perturbation theories: non-spherical molecules	270
<b>8</b>	<b>The statistical thermodynamics of mixtures</b>	<b>279</b>
8.1	Introduction	279
8.2	Ideal and random mixtures	279
8.3	Mixtures of spheres	284
8.4	The van der Waals approximation	286
8.5	Perturbation theories of mixtures of spherical molecules	288
8.6	Excess functions of simple mixtures	291
8.7	Mixtures of alkanes	298
8.8	Perturbation theories of mixtures of non-spherical molecules	300
8.9	Phase equilibria at high pressures	303
8.10	Conclusions	312
	<b>General index</b>	<b>317</b>
	<b>Index of systems</b>	<b>323</b>