

Contents

<i>Chapter</i>	<i>Page</i>
Preface	v
Crystallization	1
Thermal analysis	2
Partial arrest of cooling curves	3
Heating curves	3
Quantitative and qualitative interpretation of phase diagrams	4
The course of a crystallization in a binary system	6
Ternary phase diagrams	7
Isothermal crystallization in ternary systems	8
The variation of a three-component phase system with temperature	11
Crystallization by cooling in a ternary system	12
PROBLEMS	13
Further reading	31
2 Precipitation	32
Introduction	32
Solubility product	32
The effect of temperature on solubility	33
The effect of salt concentration	34
The effect of solvent on solubility	36
Graphical method for finding the solvent mixture composition for maximum precipitation	37
The effect of pH on the solubility of a precipitate	38
Homogeneous precipitation	39
PROBLEMS	39
Further reading	44
Reference	44

<i>Chapter</i>	<i>Page</i>
3 Centrifugal practice	45
Calculations based on the centrifugal effect	45
The effective weight	46
Pressure on centrifuge basket walls	46
PROBLEMS	47
Further reading	50
4 Filtration	51
Rate of filtration	51
Filtration at constant pressure	52
Particle size range	53
Discharge time and optimum cake thickness	54
Rotary vacuum filters	55
Constant rate filtration	56
PROBLEMS	56
Further reading	64
5 Distillation	65
Raoult's law and ideal systems	65
The effect of temperature on vapour pressure	66
Duhring's rule	67
Fractional distillation of a binary system <i>AB</i>	69
Calculation of the degree of separation in a distillation	69
The graphical method of McCabe and Thiele	71
The effect of reflux ratio	72
The effect of feed conditions	74
Enthalpy–composition phase diagrams	74
The determination of the number of theoretical plates by the Ponchon and Savarit method	75
Ternary mixtures	77
The determination of the number of theoretical plates for an ideal ternary system	78
Distillation of an azeotrope	80
Molecular distillation	80
PROBLEMS	81
Further reading	95
References	95

<i>Chapter</i>	<i>Page</i>
6 Extraction	96
Distribution	96
Solid-liquid extraction	97
Liquid-liquid extraction	100
PROBLEMS	103
Further reading	107
References	107
7 Gas treatment and sorption	108
Equation of state	108
Van der Waals' equation	108
Sorption isotherms	110
Ion exchange	
Gas-liquid equilibria	112
PROBLEMS	115
Further reading	123
8 Chemical kinetics	124
Order and rate constant	124
Rate equations	125
Determination of order and rate constants	126
The effect of temperature on specific reaction rate	128
Catalysis	128
Reactor characteristics	129
PROBLEMS	130
Further reading	130
9 Chemical thermodynamics	139
First law of thermodynamics	139
Hess's law	140
The effect of temperature on heats of reaction	141
Second law of thermodynamics	142
Reactions at constant temperature	144
Variation of equilibrium constant with temperature	145
Clapeyron-Clausius equation	146
Third law of thermodynamics	147
Determination of reaction temperature conditions—	
Ellingham diagrams	147
PROBLEMS	149
Further reading	161

<i>Chapter</i>	<i>Page</i>
10 Electrochemistry	162
Conductivity	162
Electrochemical cells	163
Concentration cells	165
Thermodynamics of cells	166
Determination of pH	167
Electrolysis	168
PROBLEMS	170
Further reading	176
11 Composite problems	177
11.1. A modified Dow process for phenol manufacture	177
11.2. The extraction of pentanes from shale	181
11.3. A pilot scale process for the manufacture of polyethyleneterephthalate (terylene)	184
DATA SECTION	189
Answers	196
Appendix A	229
Physical constants and conversion factors	229
Appendix B	230
Logarithms	230
Antilogarithms	232
Index	235