

# Contents

---

	Preface	<i>page viii</i>
1.	Introduction	1
1.1	The concept of buffer action	1
1.2	Why are buffers needed?	2
1.3	Some naturally occurring buffers	3
2.	The Theory of Buffer Action	4
2.1	Equilibrium aspects	4
2.2	Activity effects	6
2.3	Effect of dilution	7
2.4	Salt effects	8
2.5	Ampholytes and zwitterions	10
2.6	Buffer capacity	10
2.6.1	<i>Buffer capacity of a polybasic acid</i>	12
2.7	Pseudo buffers	15
2.8	Self buffers	15
2.9	Mixtures of buffers	17
2.10	Temperature dependence	18
2.11	Effect of pressure on buffers	18
2.12	Further reading	19
3.	Applications of pH Buffers	24
3.1	Factors governing the choice of a buffer	24
3.2	Measurement of pH	25
3.3	Biochemistry and biology	27
3.4	Spectroscopy	32
3.5	Buffers for special applications	33
3.5.1	<i>Volatile buffers</i>	33
3.5.2	<i>Buffers for electrophoresis</i>	34
3.5.3	<i>Buffers for complexometric titrations</i>	34
3.5.4	<i>Buffers for chromatography</i>	35

3.5.5	<i>Buffers for polarography</i>	35
3.5.6	<i>Buffers for proton magnetic resonance studies</i>	36
3.5.7	<i>Buffers for solvent extraction</i>	36
3.5.8	<i>Isotonic pharmaceutical buffers</i>	37
3.5.9	<i>Miscellaneous</i>	38
4.	<b>Practical Limitations in the Use of Buffers</b>	55
4.1	Chemical problems	55
4.2	Biological effects	58
4.3	Influence on chemical reactions	60
5.	<b>New pH-Buffer Tables and Systems</b>	62
5.1	On calculating buffer composition tables	62
5.1.1	<i>Buffers of constant ionic strength. No added electrolyte</i>	62
5.1.2	<i>Constant ionic strength buffers with added electrolyte</i>	64
5.1.2.1	<i>Preparation of amine buffers of constant ionic strength</i>	65
5.1.3	<i>Buffers by direct titration of weak bases or acids with strong acids or bases</i>	65
5.2	On designing a new pH-buffer system	69
6.	<b>Buffers for use in Partially Aqueous and Non-Aqueous Solvents and Heavy Water</b>	77
6.1	pH* Scales	78
6.2	pH* Buffers	78
6.3	The measurement of pH*	79
6.4	A universal pH scale	80
6.5	The pD scale and the measurement of pD	81
6.6	The use of pH* and pD buffers	82
6.6.1	<i>The determination of dissociation constants of acids</i>	82
6.6.2	<i>Rate studies in heavy water</i>	82
6.7	Surfactants	83
7.	<b>Metal-ion Buffers</b>	94
7.1	The concept of pM	94
7.2	Uses of metal-ion buffers	95
7.3	Calculation of pM	96
7.4	pH-Independent metal-ion buffers	99
7.5	Effects of pH buffer substances on pM	101
7.6	Anion buffers	102
7.7	Redox buffering	103
8.	<b>Purification of Substances Used in Buffers</b>	109
9.	<b>Preparation of Buffer Solutions</b>	117

<b>10. Appendices</b>	123
<b>Appendix I. Tables for constructing buffer tables</b>	123
<b>Appendix II. Composition-pH tables of some commonly used buffers</b>	128
<b>Appendix III. Thermodynamic acid dissociation constants of prospective buffer substances</b>	157
<b>Appendix IV. The Henderson-Hasselbalch equation</b>	164
<b>References</b>	167
<b>Index</b>	173