## Contents

### Part I  Introduction to Analytical Chemistry

1 **Principles of Analytical Chemistry**

1.1 Explanation of the Slides

1.1.1 Introduction to Part I (1 Slide)

1.1.2 Definitions of Analytical Chemistry (4 Slides)

1.1.3 Aims and Objectives of Analytical Chemistry (3 Slides)

1.1.4 Analytical Chemical References (4 Slides)

1.1.5 (Bio)chemical Information (4 Slides)

1.1.6 Conceptual and Technical Hierarchies (11 Slides)

1.1.7 Classifications (10 Slides)

1.1.8 New Paradigms of Analytical Chemistry (3 Slides)

1.1.9 Research and Transfer in Analytical Chemistry (2 Slides)

1.2 Annotated Suggested Readings

1.3 Questions on the Topic (Answered in Annex 2)

1.3.1 An Abridged Version of the Chapter

2 **Analytical Properties**

2.1 Explanation of the Slides

2.1.1 Introduction (2 Slides)

2.1.2 The Chemical Metrological Hierarchy (3 Slides)

2.1.3 Errors in Analytical Chemistry (5 Slides)

2.1.4 Capital Analytical Properties (5 Slides)

2.1.5 Basic Analytical Properties (1 Slide)

2.1.6 Productivity-Related Analytical Properties (2 Slides)

2.1.7 Relationships Among Analytical Properties (6 Slides)

2.2 Annotated Suggested Readings

2.3 Questions on the Topic (Solved in Annex 2)

2.4 An Abridged Version of the Chapter

3 **Traceability: Reference Materials**

3.1 Explanation of the Slides

3.1.1 Introduction (1 Slide)
3.1.2 The Integral Concept of Traceability (4 Slides) .......... 122
3.1.3 Types of Standards and Their Traceability (4 Slides) ..... 126
3.1.4 Analytical Chemical Standards and Their Integration (10 Slides). ................................................ 129
3.1.5 Specific Meanings of Traceability in Analytical Chemistry and Their Integration (10 Slides) ............ 141
3.1.6 Traceability and Capital Analytical Properties (1 Slide) ... 150
3.2 Annotated Suggested Readings .................................. 151
3.3 Questions on the Topic (Answered in Annex 2) ............... 152
3.4 An Abridged Version of the Chapter ........................... 154

Part II The Analytical Process

4 Generalities of the Analytical Process .......................... 157
  4.1 Explanation of the Slides ................................... 158
    4.1.1 Introduction to Part II (1 Slide) ...................... 160
    4.1.2 Introduction to the Analytical Process (1 Slide) ......... 161
    4.1.3 Definition of Analytical Process (2 Slides) .......... 162
    4.1.4 General Steps of an Analytical Process (2 Slides) ........ 165
    4.1.5 Preliminary Operations of the Analytical Process (23 Slides) ...................................... 167
    4.1.6 Measurement and Transducing of the Analytical Signal (1 Slide) ........................................ 191
    4.1.7 Data Acquisition and Processing (2 Slides) .......... 193
  4.2 Annotated Suggested Readings .................................. 195
  4.3 Questions on the Topic (Answered in Annex 2) ............... 195
  4.4 An Abridged Version of the Chapter ........................... 197

5 Quantitative Analytical Processes ..................................... 199
  5.1 Explanation of the Slides ................................... 200
    5.1.1 Introduction to Quantitative Analysis (4 Slides) ......... 202
    5.1.2 Expressing Quantitative Results (4 Slides) .......... 206
    5.1.3 Quantification Methods (3 Slides) .................... 210
    5.1.4 Calculable Methods (1 Slide) ......................... 213
    5.1.5 Relative Quantification Methods (1 Slide) ............ 226
  5.2 Annotated Suggested Readings .................................. 229
  5.3 Questions on the Topic (Answered in Annex 2) ............... 229
  5.4 An Abridged Version of the Chapter ........................... 232

6 Qualitative Analytical Processes ................................. 233
  6.1 Explanation of the Slides ................................... 234
    6.1.1 Introduction to Qualitative Analysis (2 Slides) ........ 235
    6.1.2 Analytical Screening Systems (3 Slides) .................. 237
    6.1.3 The YES/NO Binary Response (18 Slides) ............. 240
    6.1.4 Types of Qualitative Identification (1 Slide) ............. 254
    6.1.5 Classical Qualitative Analysis (8 Slides) .................. 255
Part III Socio-economic Projection of Analytical Chemistry

7 Analytical Problem-Solving .................................. 275
7.1 Explanation of the Slides ................................ 276
7.1.1 Introduction to Part III (2 Slides) .................... 277
7.1.2 Introduction to the Chapter (2 Slides) ................. 279
7.1.3 The Concept of “Problem” in Analytical Chemistry
(1 Slide) ....................................... 281
7.1.4 An Integral Definition of “Analytical
Problem” (5 Slides). .................................. 282
7.1.5 Elements of an Analytical Problem (1 Slide) ........... 288
7.1.6 Steps of the Analytical Problem-Solving Process
(9 Slides). ....................................... 289
7.1.7 Concluding Remarks (6 Slides). ....................... 298
7.2 Annotated Suggested Readings ............................ 304
7.3 Questions on the Topic (Answered in Annex 2) ............... 305
7.4 An Abridged Version of the Chapter ....................... 307

8 Analytical Chemistry and Quality ............................ 309
8.1 Explanation of the Slides ................................ 310
8.1.1 Introduction (2 Slides) ............................. 311
8.1.2 A General Approach to Quality (5 Slides) .......... 313
8.1.3 Quality in Analytical Chemistry (4 Slides) .......... 318
8.1.4 Quality Systems in Analytical Laboratories (7 Slides) ..... 322
8.1.5 Analytical Quality Control (1 Slide) ............... 329
8.1.6 Assessing Analytical Quality (6 Slides). ............... 331
8.1.7 Supports of Analytical Quality Assurance (1 Slide) ..... 338
8.1.8 Concluding Remarks (2 Slides) ....................... 340
8.2 Annotated Suggested Readings ............................ 342
8.3 Questions on the Topic (Answered in Annex 2) ............... 344
8.4 An Abridged Version of the Chapter ....................... 345

9 Social Responsibility in Analytical Chemistry ................. 347
9.1 Explanation of the Slides ................................. 348
9.1.1 Introduction (2 Slides). ............................. 350
9.1.2 The Concept of “Social Responsibility (9 Slides) ..... 352
9.1.3 Social Responsibility in Science and Technology
(2 Slides). ...................................... 359
9.1.4 Social Responsibility in (Bio)Chemical Information
(36 Slides) .................................................. 361
9.2 Annotated Suggested Readings .................................. 388
9.3 Questions on the Topic (Answered in Annex 2) ............... 389
9.4 An Abridged Version of the Chapter .............................. 390

Annex 1: Glossary of Terms .......................................... 391
Annex 2: Answers to the Questions ................................... 411
Foundations of Analytical Chemistry
A Teaching-Learning Approach
Valcarcel Cases, M.; López Lorente, À.I.; López Jiménez, M.À.
2018, XVII, 487 p. 346 illus., 345 illus. in color. With online files/update., Hardcover
ISBN: 978-3-319-62871-4