

TABLE OF CONTENTS

Preface	7
Part 1. CHEMISTRY	9
1.1. Safety rules	9
1.2. Basics	10
1.2.1. Standard solution	10
1.2.2. Concentrations	11
1.2.3. Molar concentration	11
1.2.4. Normal concentration	12
1.2.5. Percent concentration	13
1.2.6. Density	14
1.3. Alkacymetry	14
1.4. Argentometry	17
1.5. Complexometry	20
1.6. Manganometry	23
1.7. Iodometry	25
1.8. Colorimetry	28
1.8.1. Colorimetric phosphate(V) determination	31
1.8.2. Colorimetric colloidal silica titration	32
1.9. Spectrometry	32
1.10. Ion exchange	33
1.11. Adsorption	38
1.12. Example of Report	43
Part 2. ENVIRONMENTAL CHEMISTRY	46
2.1. Water analysis	46
2.1.1. pH	46
2.1.2. Conductivity	47
2.1.3. Smell (odour)	47
2.1.4. Colour	48
2.1.5. Turbidity	49
2.1.6. Manganese	49
2.1.7. Iron	51
2.1.8. Alkalinity	51
2.1.9. Total hardness	52

2.1.10. Carbon dioxide: free and aggressive	53
2.1.11. Determination of oxygen	56
2.1.12. Permanganate index	57
2.1.13. Chlorides Cl^-	59
2.1.14. Sulfates SO_4^{2-}	59
2.1.15. Nitrates NO_3^-	60
2.1.16. Nitrites NO_2^-	61
2.1.17. Ammonium NH_4^+	62
2.1.18. Phosphates and total phosphorous	63
2.2. Wastewater analysis	65
2.2.1. Total suspended solids	65
2.2.2. Dry residue	65
2.2.3. Chemical oxidation demand	66
2.2.4. Total nitrogen	68
2.2.5. Biological Oxidation Demand	69
2.2.6. Phenol index	70
2.2.7. Determination of surfactants	71
Part 3. ENVIRONMENTAL CHEMISTRY II	73
3.1. Organic pollutants determination in soil using Gas Chromatography coupled with Mass Spectrometry (GC-MS)	73
3.1.1. Solid sample extraction with Soxhlet apparatus	76
3.1.2. Liquid sample extraction	78
3.2. Determination of heavy metals using Atomic Absorption Spectroscopy (AAS)	79
3.2.1. Total heavy metal content determination in bottom sediments	83
3.2.2. EDTA speciation of heavy metals in bottom sediments (bio-available and not available fraction)	83
3.2.3. Tessier's speciation of heavy metals in bottom sediments	84
3.3. Industrial wastewater treatment with Coagulation/Sedimentation (C/S) and Coagulation/Dissolved Air Flotation (C/DAF) processes	85
3.3.1. Coagulation/Sedimentation (C/S)	88
3.3.2. Coagulation/Dissolved Air Flotation (C/DAF)	89
3.4. Industrial wastewater treatment with Advanced Oxidation Process (AOPs)	90
3.4.1. Phenol removal from industrial wastewater	92
3.5. Photochemical Fe (III) reduction	93
3.5.1. Trivalent Iron photochemical reduction	95
3.6. Self-purification of water	97
3.6.1. Preparation of sample for natural water self-purification ability determination	98
3.7. Carbonate balance disruption – softening water	102
3.7.1. Thermal method for softening water	103
3.8. Fluorides determination	104
3.8.1. Fluorides determination with ion selective electrode	105
Bibliography	156