

# Contents

## Part One: Calculations

### **Unit 1**

|                             |   |
|-----------------------------|---|
| 1 Electromagnetic Radiation | 3 |
|-----------------------------|---|

### **Unit 2**

|   |     |
|---|-----|
| 2 Volumetric Analysis                                       | 8   |
| 3 Redox Titrations  | 14  |
| 4 Empirical Formulae  | 22  |
| 5 Gravimetric Analysis                                      | 27  |
| 6 Equilibrium Constant and Partition Coefficient            | 35  |
| 7 pH of Solutions and the Ionic Product of Water            | 44  |
| 8 Dissociation Constants and the pH of Weak Acids           | 48  |
| 9 Buffer Solutions  | 53  |
| 10 Using Bond Enthalpies                                    | 57  |
| 11 Enthalpy Diagrams (Born-Haber Cycles)                    | 64  |
| 12 $\Delta H^\circ$ , $\Delta S^\circ$ and $\Delta G^\circ$ | 81  |
| 13 Electrochemical Cells                                    | 91  |
| 14 Rate Equations   | 104 |

## Part Two: Prescribed Practical Activities

### **Unit 1**

|  |     |
|--|-----|
| PPA 1 Preparation of Potassium Trisoxalatoferate(III)  | 115 |
| PPA 2 Colorimetric Determination of Manganese in Steel | 117 |

### **Unit 2**

|  |     |
|--|-----|
| PPA 3 Complexometric Determination of Nickel using EDTA              | 120 |
| PPA 4 Gravimetric Determination of Water in Hydrated Barium Chloride | 121 |
| PPA 5 Determination of a Partition Coefficient                       | 122 |
| PPA 6 Verification of a Thermodynamic Prediction                     | 123 |
| PPA 7 Kinetics of the Acid-Catalysed Propanone/Iodine Reaction       | 126 |

### **Unit 3**

|  |     |
|--|-----|
| PPA 8 Preparation of Cyclohexene                                   | 129 |
| PPA 9 Identification by Derivative Formation                       | 130 |
| PPA 10 Preparation of Benzoic Acid by Hydrolysis of Ethyl Benzoate | 132 |
| PPA 11 Preparation of Aspirin                                      | 135 |
| PPA 12 Aspirin Determination                                       | 137 |