

Appendix: Some mathematical and other details

A.1 Introduction

This appendix contains material which is designed to supplement and extend the discussion in parts of the main text. Generally, the approach taken here will be more mathematical than that in the rest of the book. However, it is very important not to lose sight of the physical meaning of the equations, so we are at pains to point this out and to emphasize the relationship between the equations and the discussion in the main text.

There are four sections:

- **Exponentials and logarithms**

This is a discussion of the exponential function and the closely related natural logarithm. A first-order rate law is used to illustrate how such functions occur in chemistry.

- **Quantum mechanics**

In this section the key ideas in quantum mechanics are introduced and illustrated by showing how wavefunctions can be found by solving the Schrödinger equation.

- **Hydrogen atomic orbitals**

This section describes the mathematical form of the wavefunctions for the hydrogen orbitals. These are then used to understand the origin of radial and angular nodes.

- **Equilibrium constants**

This section explores the origin of the very important relationship between the standard Gibbs energy change for a reaction and the equilibrium constant: $\Delta_r G^\circ = -RT \ln K$.