

## Physical Chemistry: A Very Short Introduction

By Peter Atkins

### Questions for Thought and Discussion

- What is the evidence for the existence of atoms and molecules?
- What is wrong with the popular conception of an atom as being like a miniature solar system with electrons in orbits around a central nucleus?
- What is an orbital?
- What holds atoms together in molecules? Identify the various kinds of bonds between atoms and suggest reasons why each one forms.
- What is the nature of a physical law? Can physical laws be broken?
- What is energy?
- The natural tendency for change is the dispersal of energy and matter in disorder. So how can structures emerge? Is the emergence of organisms (such as yourself) ruled out by the Second Law?
- Is the Gibbs energy really an energy? If not, what is it? Why, and under what conditions, is a decrease in Gibbs energy the signpost of the direction of spontaneous change?
- What is temperature?
- The Boltzmann distribution plays a special role in physical chemistry. What is its origin, and what is that role?
- Summarize the states of matter by explaining how each one may be recognized and how each one can be interpreted in terms of the behaviour of its molecules.
- Why do molecules attract (and repel) each other? Identify the various types of intermolecular interaction.
- Why is water wet?
- Most chemical reactions go faster the higher the temperature. Why? Does the Boltzmann distribution play a role?
- What is chemical equilibrium? Does the Boltzmann distribution play a role?
- Explain how a chemical reaction can be used to generate an electric current.
- What is a catalyst, and how might it act?
- Computers have transformed the procedures of physical chemistry. Summarize their varied roles.
- What is the contribution of atomic nuclei to chemistry?
- What is the role of electrons in chemistry?

### Other books by Peter Atkins

- *Atkins' Physical Chemistry*, Tenth Edition (Oxford University Press 2014)
- *What is Chemistry?* (Oxford University Press 2013)
- *Reactions: The Private Life of Atoms* (Oxford University Press 2013)
- *On Being: A scientist's exploration of the great questions of existence* (Oxford University Press 2012)
- *Elements of Physical Chemistry*, Sixth edition (Oxford University Press 2012)

## Further Reading

- Please refer to the further reading recommendations in the back of *Physical Chemistry: A Very Short Introduction*.