

- **Chapter 1 Introduction to Cells** (p. 1)
- **Panel 1-1 Light and electron microscopy** (p. 8)
- **Panel 1-2 Cells: the principal features of animal, plant, and bacterial cells** (p. 25)
- **How We Know: Life's common mechanisms** (p. 30)
- **Chapter 2 Chemical Components of Cells** (p. 39)
- **How We Know: What are macromolecules?** (p. 60)
- **Panel 2-1 Chemical bonds and groups** (p. 66)
- **Panel 2-2 The chemical properties of water** (p. 68)
- **Panel 2-3 An outline of some of the types of sugars** (p. 70)
- **Panel 2-4 Fatty acids and other lipids** (p. 72)
- **Panel 2-5 The 20 amino acids found in proteins** (p. 74)
- **Panel 2-6 A survey of the nucleotides** (p. 76)
- **Panel 2-7 The principal types of weak noncovalent bonds** (p. 78)
- **Chapter 3 Energy, Catalysis, and Biosynthesis** (p. 83)
- **Panel 3-1 Free energy and biological reactions** (p. 96)
- **How We Know: Using kinetics to model and manipulate metabolic pathways** (p. 103)
- **Chapter 4 Protein Structure and Function** (p. 119)
- **Panel 4-1 A few examples of some general protein functions** (p. 120)
- **How We Know: Probing protein structure** (p. 129)
- **Panel 4-2 Four different ways of depicting a small protein** (p. 132)
- **Panel 4-3 Cell breakage and initial fractionation of cell extracts** (p. 160)
- **Panel 4-4 Protein separation by chromatography** (p. 162)
- **Panel 4-5 Protein separation by electrophoresis** (p. 163)
- **Panel 4-6 Making and using antibodies** (p. 164)
- **Chapter 5 DNA and Chromosomes** (p. 169)
- **How We Know: Genes are made of DNA** (p. 172)
- **Chapter 6 DNA Replication, Repair, and Recombination** (p. 195)
- **How We Know: Finding replication origins** (p. 198)
- **Chapter 7 From DNA to Protein: How Cells Read the Genome** (p. 229)
- **How We Know: Cracking the genetic code** (p. 246)
- **Chapter 8 Control of Gene Expression** (p. 267)
- **How We Know: Gene regulation--the story of eve** (p. 282)
- **Chapter 9 How Genes and Genomes Evolve** (p. 293)
- **How We Know: Counting genes** (p. 314)
- **Chapter 10 Manipulating Genes and Cells** (p. 323)
- **How We Know: Sequencing the human genome** (p. 334)
- **Chapter 11 Membrane Structure** (p. 365)
- **How We Know: Measuring membrane flow** (p. 384)
- **Chapter 12 Membrane Transport** (p. 389)
- **How We Know: Squid reveal secrets of membrane excitability** (p. 414)
- **Chapter 13 How Cells Obtain Energy from Food** (p. 427)
- **Panel 13-1 Details of the 10 steps of glycolysis** (p. 432)
- **How We Know: Unraveling the citric acid cycle** (p. 442)
- **Panel 13-2 The complete citric acid cycle** (p. 450)
- **Chapter 14 Energy Generation in Mitochondria and Chloroplasts** (p. 453)

- **How We Know: How chemiosmotic coupling drives ATP synthesis** (p. 460)
- **Panel 14-1 Redox potentials** (p. 471)
- **Chapter 15 Intracellular Compartments and Transport** (p. 497)
- **How We Know: Tracking protein and vesicle transport** (p. 520)
- **Chapter 16 Cell Communication** (p. 533)
- **How We Know: Untangling cell signaling pathways** (p. 561)
- **Chapter 17 Cytoskeleton** (p. 573)
- **How We Know: Pursuing motor proteins** (p. 586)
- **Chapter 18 Cell-Cycle Control and Cell Death** (p. 611)
- **How We Know: Discovery of cyclins and Cdks** (p. 618)
- **Chapter 19 Cell Division** (p. 637)
- **Panel 19-1 The principal stages of M phase in an animal cell** (p. 642)
- **How We Know: Building the mitotic spindle** (p. 646)
- **Chapter 20 Genetics, Meiosis, and the Molecular Basis of Heredity** (p. 659)
- **How We Know: Reading genetic linkage maps** (p. 682)
- **How We Know: Making sense of the genes that are critical for cancer** (p. 734)
- **Panel 20-1 Some essentials of classical genetics** (p. 685)
- **Chapter 21 Tissues and Cancer** (p. 697)
- **Panel 21-1 The cell types and tissues from which higher plants are constructed** (p. 700)
- **Answers to Questions** (p. A:1)
- **Glossary** (p. G:1)
- **Index** (p. I:1)