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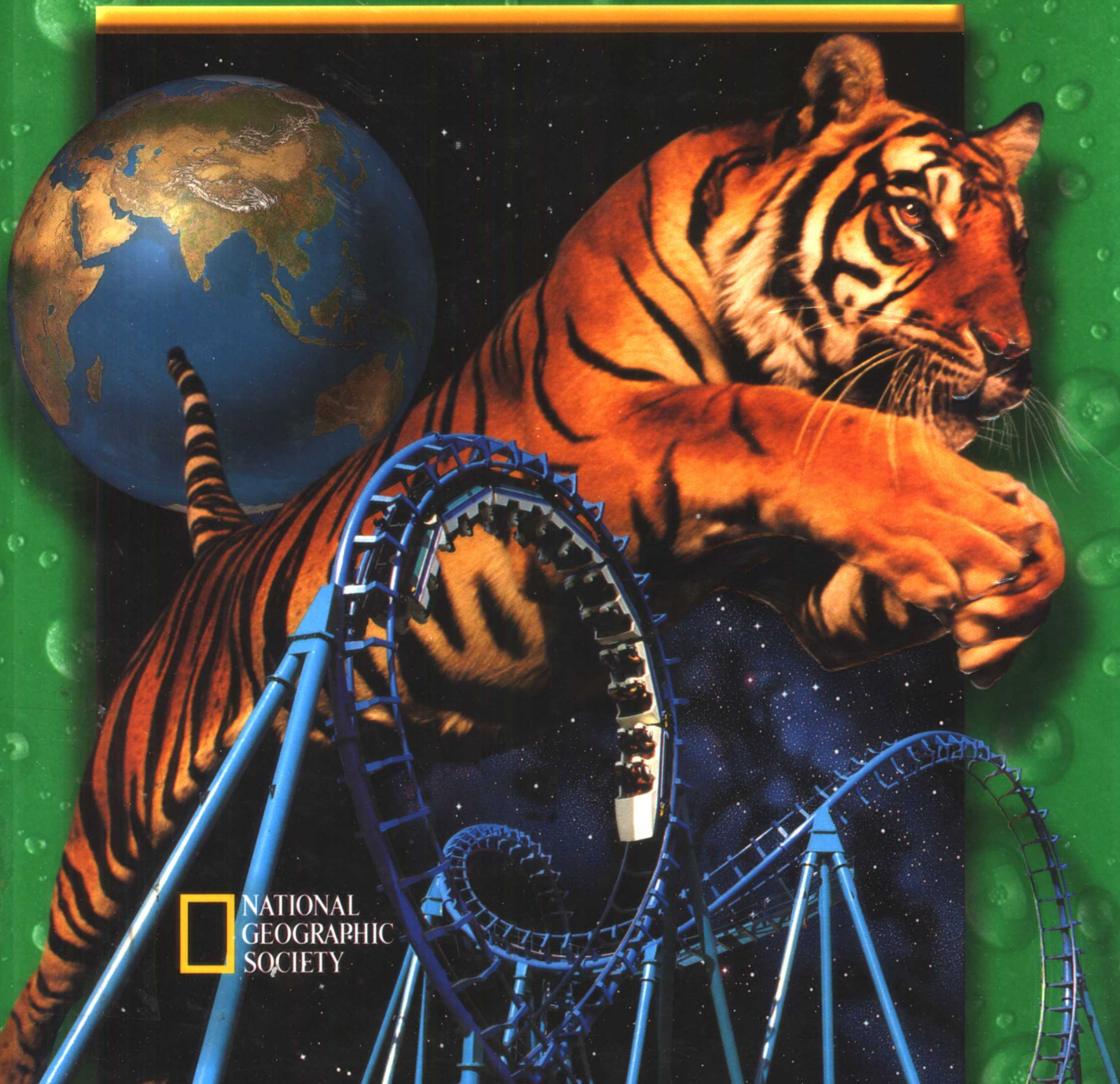
# SCIENCE VOYAGES

# EARTH & PHYSICAL SCIENCES



NATIONAL GEOGRAPHIC SOCIETY

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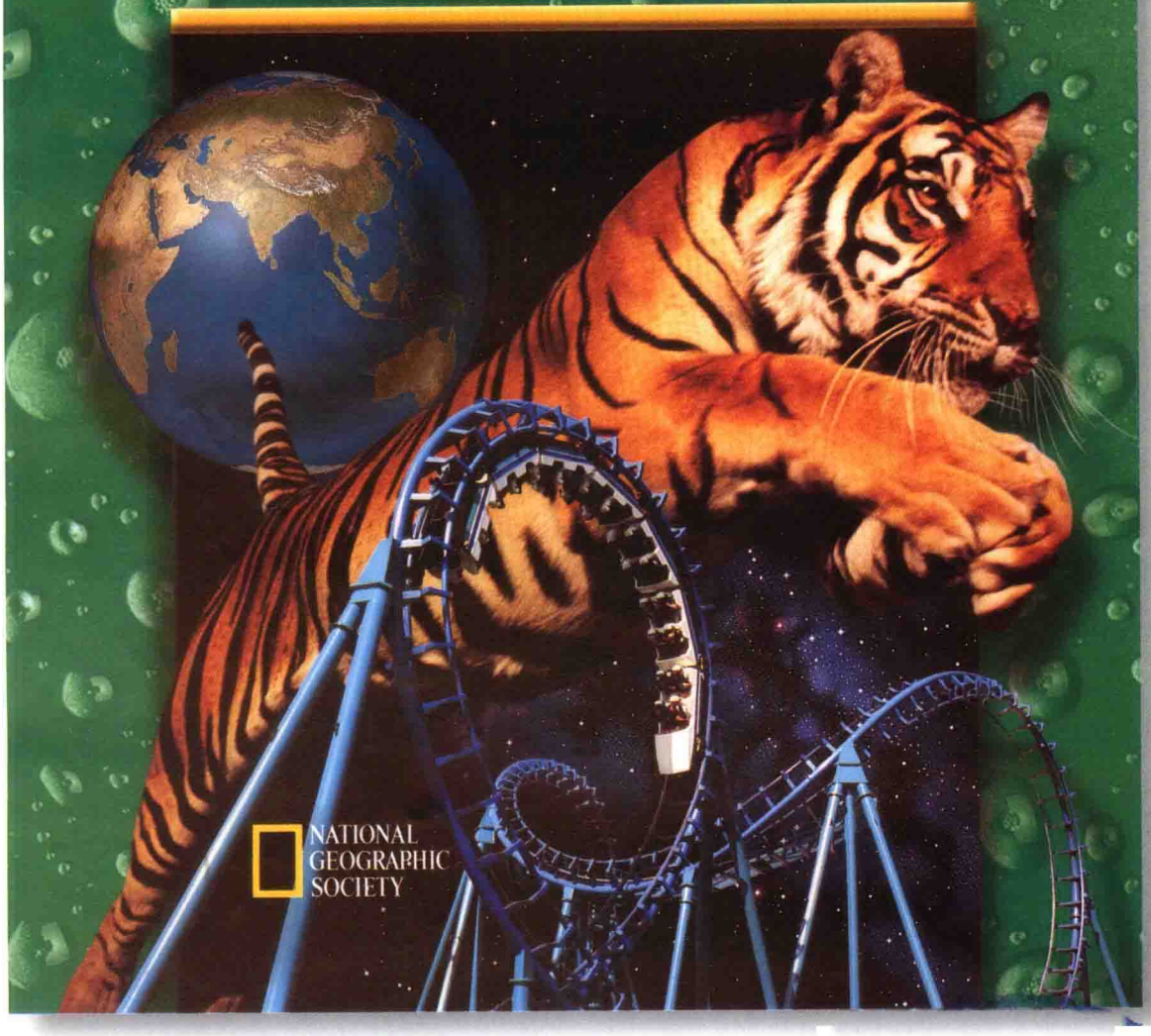




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State of California Science Content Standards

# GRADE SEVEN: FOCUS ON LIFE SCIENCE

What are science content standards and why does California have them? Standards are guidelines for schools, students, and parents that describe the essential science concepts and skills for understanding the world in which we live. In 1999, The California State Board of Education established science content standards, and these standards will be the basis for state assessments that measure student achievement in science.

## ADDITIONAL CONTENT STANDARDS FOR GRADE 7

- California Science Standards and Case Studies, found at the back of the book
- California Science Content Standards Assessment Practice booklets
- Chapter Assessments at the end of each chapter
- Science Voyages Website at www.glencoe.com/sec/science/ca

## Cell Biology

1. All living organisms are composed of cells, from just one to many trillions, whose details usually are viible only through a microscope.. As the basis for understanding this concept, students know:
   - **a.** cells function similarly in all living organisms
     Sections 2-1, 2-2, 3-1, 3-2, 3-3, 4-1, 4.-2, page 628
   - **b.** the characteristics that distinguish plant cells from animal cells, chloroplasts and cell walls.
     Sections 2.2, 4-1, page 629
   - **c.** the nucleus is the repository for genetic information in plant and animal cells.
     Sections 4-1, 4-3, page 630
   - **d.** mitochondria liberate energy for the work that cells do, and chloroplasts capture sunlight energy for photosynthesis.
     Sections 2-2, 3-3, page 631, 632
   - **e.** cells divide to increase their numbers through a process of mitosis, which results in two daughte5r cells with identical sets of chromosomes.
     Sections 4-1, 5-1, page 632
   - **f.** as multicellular organisms develop, their cells differentiate.
     Sections 2-2, 21-2, page 633

## Genetics

2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As the basis for understanding this concept, students know:
   - **a.** the differences between the life cycles and reproduction of sexual and asexual organisms.
     Sections 4-1, 4-2, page 634
   - **b.** sexual reproduction produces offspring that inherit half their genes from each parent.
     Sections 4-1, 4-2, 5-1, 6-1, page 634
   - **c.** an inherited trait can be determined by one or more genes.
     Sections 4-3, 6-1, 6-2, 6-3, pages 634
   - **d.** plant and animal cells contain many thousands of different genes, and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominating in determining the phenotype while the other is recessive.
     Sections 6-2, 6-2, 6-3, page 635
   - **e.** DNA is the genetic material of living organisms, and is located in the chromosomes of each cell.
     Sections 2-2, 4-3, 6-1, 6-2, page 635

## Evolution

3. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept, students know:
   - **a.** both genetic variation and environmental factors are causes of evolution and diversity of organisms.
     Sections 7-1, 30-1, 30-2, 30.3, page 638
   - **b.** the reasoning used by Darwin in making his conclusion that natural selectin is the mechanism of evolution.
     Sections 7-1, page 639
   - **c.** how independent lines of evidence from geology, fossils, and comparative anatomy provide a basis for the theory of evolution.
     Sections 7-1, 7-2, 7-3, 29-1, 29-2, 30-1, 30-2, 30-3, page 639
   - **d.** how to construct a simple branching diagram to classify living groups of organisms by shared derived characteristics, and expand the diagram to include fossil organisms.
     Sections 7-1, 7-3, page 640
   - **e.** extinction of a species occurs when the enviromnent changes and the adaptive characteristics of a species are insufficient for its survival.
     Sections 30-1, 30-2, 30-3, page 640

## Earth and Life History (Earth Science)

4. Evidence from rocks allows us to understand the evolution of life on Earth. As a basis for understanding this concept, students know:
   - **a.** Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time.
     Sections 27-1, 27-2, 27-3, 27-4, 29-3, page 643
   - **b.** the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impact of an asteroid.
     Sections 29-2, pages 643, 646
   - **c.** the rock cycle includes the formation of new sediment and rocks. Rocks are often found in layers with the oldest generally on the bottom.
     Sections 7-2, 27-1, 27-2, 27-3, 27-4, 29-2, pages 643 - 644
   - **d.** evidence from geologic layers and radioactive dating indicate the

Earth is approximately 4.6 billion years old, and that life has existed for more than 3 billion years.
Sections 7-2, 29-3, page 634

**e.** fossils provide evidence of how life and environmental conditions have changed.
Sections 7-2, 29-1, 29-2, 30-1, 30-2 30-3 , page 634

**f.** how movements of the Earth's continental and oceanic plates through time, with associated changes in climate and geographical connections, have affected the past and present dirtribution of organisms.
Sections 30-1, 30-2, 30-3, page 645

**g.** how to explain significant developments and extinctions of plant and animal life on the geologic time scale.
Sections 30-1, 30-2, 30-3, page 645

## Structure and Function in Living Systems

**5.** The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept, students know:

**a.** plants and animals have levels of organizati9on for structure and function, including cells, tissues, organs, organ systems, and the whole organism.
Sections 2-1, 2-2, 5-1, 17-2, 18-1, 18-2, 18-3, 19-1, 19-2, 20-1, 20-2, 20-3, 21-1, 21-2, 21-3, 22-1, 22-2, 22-3, 27-1, page 648

**b.** organ systems function because of the contributions of individual organs, tissues, and cells, tissues, and cells. The failure of any part can affect the entire system.
Sections 13-2, 13-3, 17-2, 18-1, 18-2, 18-3, 19-1, 19-2, 22-2, 22-3, pages 649, 653

**c.** how bones and muscles work together to provide a structural framework for movement..
Sections 13-1, 13-2, page 649

**d.** how the reproductive organs of the human female and male generate eggs and sperm, and how sexual activity may lead to fertilization and pregnancy.
Sections 21-1, 21-2, page 650

**e.** the number and types of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition.
Sections 21-2, page 651

**f.** the structures and processes by which flowering plants generate pollen and ovules, seeds, and fruit.
Section 5-2, page 650

**g.** how to relate the structures of the eye and ear to their functions.
Section 20-2, page 651

## Physical Principles in Living Systems (Physical Science)

**6.** Physical principles underlie biological structures and functions. As a basis for understanding this concept, students know:

**a.** visible light is a small band within a very broad electromagnetic spectrum.
Section 23-1, page 654

**b.** for an object to be seen, light emitted by or scattered from it must enter the eye.
Sections 23-1, 23-2, page 654

**c.** light travels in straight lines except when the medium it travels through changes.
Sections 20-2, 23-3, page 654

**d.** how simple lenses are used in a magnifying glass, the eye, camera, telescope, and microscope.
Sections 2-1, 23-3, 23-4, pages 654 - 655

**e.** white light is a mixture of many wavelengths (colors), and that retinal cells react differently with different wavelengths.
Sections 20-2, 23-1, page 655

**f.** light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection).
Sections 23-1, 23-2, 23-3, page 655

**g.** the angle of reflection of a light beam is equal to the angle of incidence.
Section 23-2, page 656

**h.** how to compare joints in the body (wrist, shoulder, thigh) with structures used in machines and simple devices (hinge, ball-and-socket, and sliding joints).
Section 13-1, page 656

**i.** how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system.
Sections 13-2, 25-2, page 656

**j.** contractions of the heart generate blood pressure, and heart valves prevent backflow of blood in the circulatory system.
Section 18-1, page 657

## Investigation and Experimentation

**7.** Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:

**a.** select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
Sections 1-1, 1-2, 1-3, 2-1, 2-3, 6-3, 7-1, 13-2, 17-1, 18-2, 19-2, 23-3, 24-3, 25-1, 25-2, pages 628, 638, 655

**b.** utilize a variety of print and electronic resources (including the World Wide Web) to collect information as evidence as part of a research project.
Sections 1-1, 2-3, 3-1, 3-2, 4-1, 4-3, 5-1, 5-2, 6-1, 6-3, 7-1, 7-2, 13-1, 17-1, 18-1, 18-2, 19-1, 19-2, 20-1, 20-3, 21-1, 21-2, 21-3, 22-2, 22-3, 23-4, 24-2, 24-3, 25-2, 26-2, 28-2, 28-3, 29-2, 29-3, 30-1, 30-2, 30-3, pages 630, 634, 637, 638, 639, 642, 644, 645, 649, 653, 655

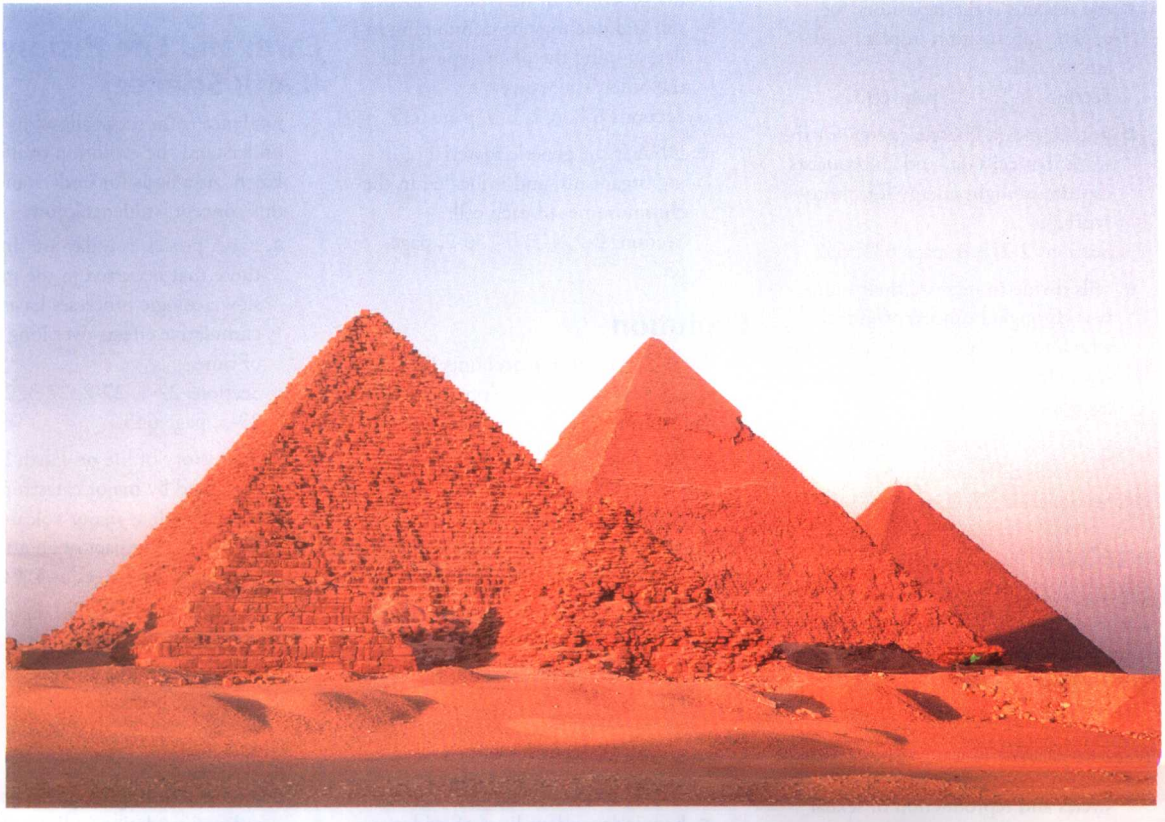
**c.** communicate the logical connection among hypothesis, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.
Sections 1-2, 2-1, 5-2, 7-1, 17-2, 19-1, 20-2, 22-2, 25-2, pages 630, 635, 637, 638, 639, 650, 657

**d.** construct scale models, maps and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).
Sections 1-2, 4-3, 6-1, 6-2, 7-1, 15-1, 15-2, 21-3, 26-2, 30-2, 30-3, pages 630, 631, 635, 638, 639, 643

**e.** communicate the steps and results from an investigation in written reports and verbal presentations.
Sections 2-1, 2-2, 3-2, 5-2, 6-2, 13-2, 17-2, 18-3, 19-1, 21-2, 23-1, 24-2, 25-2, 26-2, 27-1, 29-1, 30-1, pages 69, 95, 121, 463, 519, 571, 628, 633, 635, 647, 651, 656, 785, 817, 847, 907, 971

# Contents in Brief





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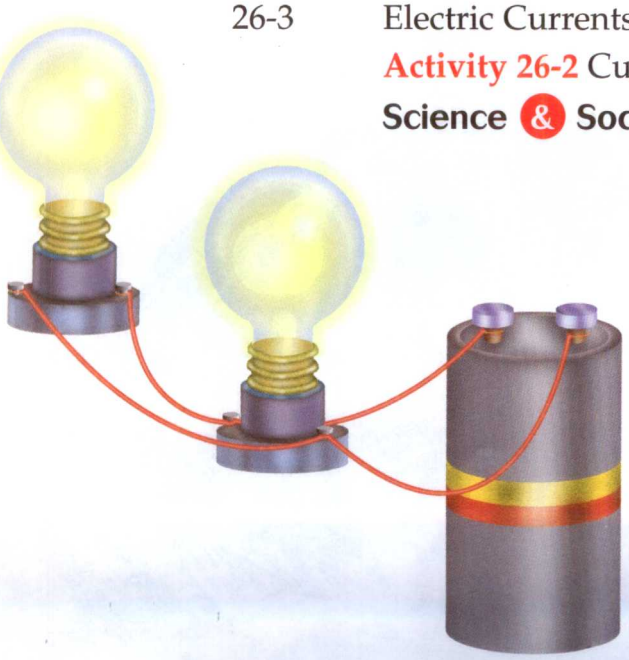

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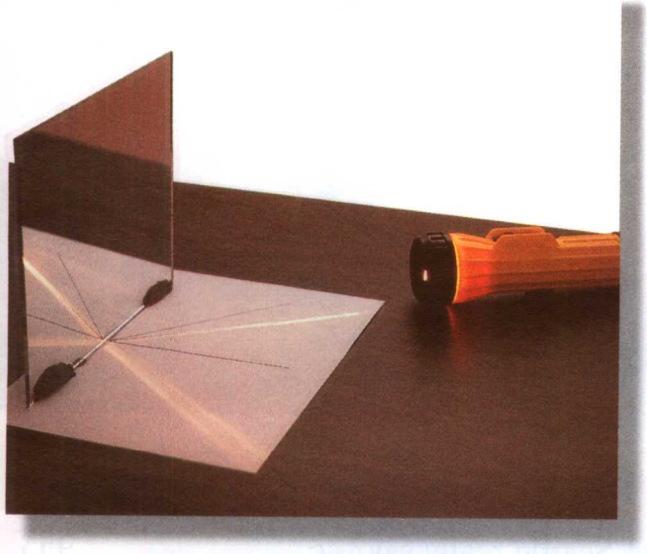


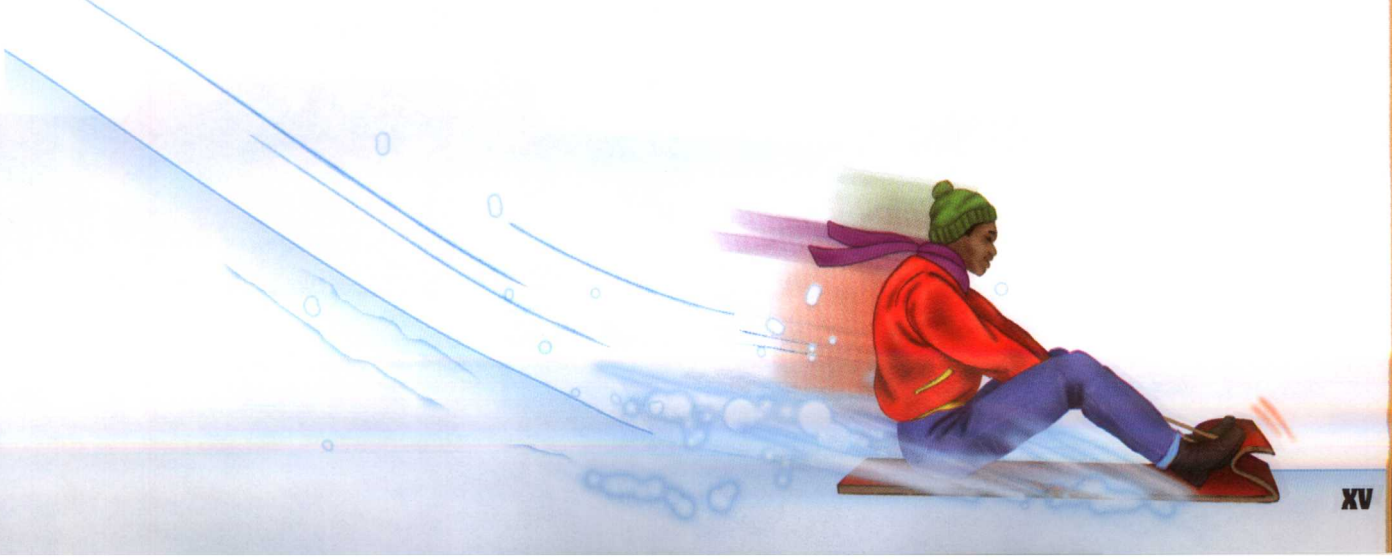


## Mini Lab



## Try at Home Mini Lab





# Explore Activities



# Problem Solving