



AMERICAN SOCIETY OF PLANT BIOLOGISTS (ASPB)

12 Principles of Plant Biology

Concepts for Science Education

The American Society of Plant Biologists has developed the *Principles of Plant Biology* to provide basic plant biology concepts for science education at the K-12 levels and to help students gain a better understanding of plant biology:

1. Plants contain the same biological processes and biochemistry as microbes and animals. However, plants are unique in that they have the ability to use energy from sunlight along with other chemical elements for growth. This process of photosynthesis provides the world's supply of food and energy.
2. Plants require certain inorganic elements for growth and play an essential role in the circulation of these nutrients within the biosphere.
3. Land plants evolved from ocean-dwelling, agal-like ancestors, and plants have played a role in the evolution of life, including the addition of oxygen and ozone to the atmosphere.
4. Reproduction in flowering plants takes place sexually, resulting in the production of a seed. Reproduction can also occur via asexual propagation.
5. Plants, like animals and many microbes, respire and utilize energy to grow and reproduce.
6. Cell walls provide structural support for the plant and also provide fibers and building materials for humans, insects, birds, and many other organisms.
7. Plants exhibit diversity in size and shape ranging from single cells to gigantic trees.
8. Plants are a primary source of fiber, medicines, and countless other important products in everyday use.
9. Plants, like animals, are subject to injury and death due to infectious diseases caused by microorganisms. Plants have unique ways to defend themselves against pests and diseases.
10. Water is the major molecule present in plant cells and organs. In addition to an essential role in plant structure, development, and growth, water can be important for the internal circulation of organic molecules and salts.
11. Plant growth and development is under the control of hormones and can be affected by external signals such as light, gravity, touch, or environmental stresses.
12. Plants live and adapt to a wide variety of environments. Plants provide diverse habitats for birds, beneficial insects, and other wildlife in ecosystems.

More information about the **American Society of Plant Biologists** and its Education Foundation can be found on the ASPB website at <http://www.aspb.org>. This site is intended to be a valuable resource for educators, students, and scientists and includes a list of volunteer scientists available to work with educators around the country.

The National Research Council's Life Science Standards may be found at

<http://www.nap.edu/readingroom/books/nse/html/contents.html>.

Suggested integration of the *Principles of Plant Biology* into the NRC standards:

Standards	Principles
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Levels K-4	
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Characteristics of organisms	1,2,4,5,7,11
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Life cycles of organisms	4
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Organisms and environments	1,2,9-12
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Levels 5-8	
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Structure and function in living system	1,4-6,10
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Reproduction and heredity	4
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Regulation and behavior	11,12
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Populations and ecosystems	1,2,6,9,12
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Diversity and adaptations of organisms	5-12
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Levels 9-12	
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The cell	1,5,6,10
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Molecular basis of heredity	1,4
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Biological evolution	3,4,7,12
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Interdependence of organisms	1-3,6,8,12
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Matter, energy, & organization in living systems	1-3,5,10
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Behavior of organisms	11
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American Society of Plant Biologists

15501 Monona Drive
Rockville, MD 20855-2768 USA

Tel: 301-251-0560

Fax: 301-279-2996

E-mail: katie@aspb.org

<http://www.aspb.org>