

Name: _____

AP Biology

Chapter 31 Active Reading Guide

Plant Responses to Internal and External Signals

This concept brings together the general ideas on cell communication from Chapter 5.6 with specific examples of signal transduction in plants. As with animals, plants have receptors that trigger signal transduction pathways when activated. Let's begin with a review of three steps in signal transduction.

Step 1: Reception

Cell signals are detected by receptors that undergo changes in shape in response to a specific stimulus.

Step 2: Transduction

Transduction is a multistep pathway that amplifies the signal. This effect allows a small number of signal molecules to produce a large cellular response.

Step 3: Response

Cellular response is primarily accomplished by two mechanisms:

- a. increasing or decreasing mRNA production
- b. activating existing enzyme molecules

Section 1

1. Have you ever seen a shriveled potato sending out skinny, pale sprouts? What is this called?

2. If you move the potato into the light, the sprout will respond by forming short, sturdy stems and broad, green leaves. What is this response to light called?

3. Explain how the light signal causes the greening response. You may choose to number the steps, as shown in the figure in your text.
 - 1.

 - 2.

 - 3.

4. What are the two second messengers in this pathway?

5. Both plants and animals have hormones. The definition of a hormone has three parts. What are they?

6. Plant physiologists think the term hormone as defined above doesn't quite fit plants. What term do they use instead?

7. What is a tropism?

8. What can be concluded from the phototropism experiments conducted by Charles and Francis Darwin?

9. What conclusions can be drawn from the Boysen-Jensen experiment?

10. Boysen-Jensen's work was published in 1913. In 1926, Frits Went modified the experiment using agar cubes with a chemical from the coleoptile tips. Explain the results of this experiment.

11. What name did Went give to this chemical messenger? What was its chemical structure found to be?

12. In jest, we tell our students that when in doubt about which plant hormone causes which plant response, just answer auxin. Auxin has so many functions, this answer often works. List and describe four functions of auxin.

1.

2.

3.

4.

13. Did you catch the discussion of auxins as herbicides? Perhaps you have used Weed-B-Gon to kill dandelions in your lawn. Explain how this product kills dandelions without killing the grass.

14. How did cytokinins get their name?

15. List and describe three functions of cytokinins.

1.

2.

3.

4.

16. Gibberellins occur naturally in plants, and like the previous two hormones, they have several effects. Describe three of them.

1.

2.

3.

17. Absciscic acid (ABA) is misnamed. Why?
18. Describe three effects of absciscic acid.
- 1.
 - 2.
 - 3.
19. Ethylene is the only hormone in our group that is a gas. Under what conditions is ethylene produced?
20. The effects of ethylene are many and varied. Describe them here.
- 1.
 - 2.
 - 3.
 - 4.
21. You have just finished a very complex look at plant hormones. Let's try to summarize it by completing the following chart.

Hormone	Action
	leaf abscission
	breaking seed dormancy
	maintaining apical dominance
	making internodes of grape bunches elongate to obtain larger fruit
	gravitropism
	drought tolerance
	senescence
	phototropism
	cell elongation
	increased cell division

Section 2

22. Researchers have determined that plants have two major classes of light receptors. List each class.

23. What wavelengths of light are absorbed by phytochromes?

24. What are three different responses initiated by blue light?

25. Read carefully the discussion of phytochromes and how they work. Pay attention to the two types of red light. What is the wavelength of red light? _____ Of far-red light? _____

26. Phytochromes are photoreceptors that have two isomer forms, Pr and Pfr. Sketch the conversion of Pr to Pfr.

27. What is the active form of phytochrome, Pr or Pfr? _____

28. Look again at the effect of light exposure on lettuce seed germination. What determines the seed's response?

29. To make sense of all this, you will want to read carefully the "Phytochromes and Shade Avoidance" section. Which type of red light is more common in a shaded area? Why?

30. What is a circadian rhythm? Give one plant example and one human example.

31. What is the photoperiod?

32. Plants detect photoperiod, and in many species it affects their time of flowering. Explain each of the following, and give an example of a plant that is in the group.
short-day plant:

long-day plant:

day-neutral plant:

33. What is florigen?

Section 3

34. What is gravitropism? How may a plant detect gravity?

35. What is thigmotropism? How is it adaptive?

36. Describe an example of a rapid leaf movement. What do these action potentials resemble?

37. List five different ways in which a plant responds to water deficit.

1.

2.

3.

4.

5.

38. Select any other stress situation besides water deficit, and explain plant mechanisms for dealing with this.

Section 4

39. What are the two ways in which a plants combat excess herbivory?

40. Describe two examples of a plant producing chemicals to deal with herbivory.