

***Campbell's Biology: Concepts and Connections, 7e (Reece et al.)***  
**Chapter 33 Control Systems in Plants**

33.1 Multiple-Choice Questions

1) Which of the following is a health benefit associated with increasing the amount of soybeans in the human diet?

- A) decreased LDL levels
- B) removal of antioxidants from the body
- C) decreased amount of fiber in the diet
- D) decreased HDL levels

Answer: A

Topic: 33.1

Skill: Knowledge/Comprehension

2) Plants grow toward light through the action of

- A) hormones.
- B) nerves.
- C) solar energy.
- D) chloroplasts.

Answer: A

Topic: 33.1

Skill: Knowledge/Comprehension

3) Grass shoots bend toward the light because, on the shadowed side, a(n)

- A) reduction in auxin levels promotes cell elongation.
- B) reduction in auxin levels prevents cell elongation.
- C) increase in auxin levels promotes cell elongation.
- D) increase in auxin levels promotes cell division.

Answer: C

Topic: 33.1

Skill: Knowledge/Comprehension

4) One of the experiments in phototropism involved cutting off the tips of grass seedlings before exposing them to light from one side. The decapitated seedlings did not bend toward light. A valid conclusion from this experiment would be that

- A) plants cannot engage in photosynthesis without the tip of the plant.
- B) light is perceived by the tip of grass plants.
- C) a foil cover over the tip of the seedlings would cause them to bend.
- D) hormones are produced in all parts of the plant.

Answer: B

Topic: 33.1

Skill: Knowledge/Comprehension

5) Plant hormones

- A) must be produced in large quantities to be effective.
- B) act on all cells they encounter.
- C) are chemical signals that influence growth and development.
- D) are rare and produced only in response to stress.

Answer: C

Topic: 33.2

Skill: Knowledge/Comprehension

6) Which of the following statements about plant hormones is *true*?

- A) Plant hormones are produced in very small concentrations.
- B) Plant hormones mainly affect reproductive processes.
- C) Individual hormones typically have single, specific effects.
- D) Plant hormones play a vital role in photosynthesis.

Answer: A

Topic: 33.2

Skill: Knowledge/Comprehension

7) What is one main effect of auxins on plant growth?

- A) They reduce growth by inhibiting cell division.
- B) They increase growth by promoting cell elongation.
- C) They increase growth by increasing the rate of photosynthesis.
- D) Auxins have no effect on plant growth.

Answer: B

Topic: 33.3

Skill: Knowledge/Comprehension

8) If the auxin that is produced by an apical meristem is transported in equal amounts down all sides of a twig, the twig will probably

- A) elongate evenly.
- B) branch near its tip.
- C) flower.
- D) bend away from the apical meristem.

Answer: A

Topic: 33.3

Skill: Knowledge/Comprehension

9) When a nursery worker pinches off the terminal buds on a young chrysanthemum plant to make it grow bushy, which of the following plant hormones is mainly responsible for growth of side branches?

- A) an auxin
- B) a gibberellin
- C) a cytokinin
- D) abscisic acid

Answer: C

Topic: 33.4

Skill: Knowledge/Comprehension

10) Which class of hormones produced in the roots of plants promotes cell division and growth, and retards the aging of flowers and leaves?

- A) gibberellins
- B) phytochromes
- C) cytokinins
- D) ethylene

Answer: C

Topic: 33.4

Skill: Knowledge/Comprehension

11) The most reliable way to stimulate branching in a plant is to

- A) apply auxin to the axillary buds.
- B) remove the terminal bud.
- C) give short-day light treatments.
- D) add extra fertilizer.

Answer: B

Topic: 33.4

Skill: Knowledge/Comprehension

12) Shoot branching is controlled mainly by the interaction of

- A) auxins and gibberellins.
- B) auxins and cytokinins.
- C) gibberellins and cytokinins.
- D) cytokinins and abscisic acid.

Answer: B

Topic: 33.4

Skill: Knowledge/Comprehension

13) The event that triggers fruit formation is the growth of a pollen tube through the carpel of a flower. Which of the following would be a reasonable hypothesis about the basis of this effect?

- A) Pollen tubes grow in response to a cytokinin produced by the carpel.
- B) Pollen tubes grow in response to abscisic acid.
- C) The growing pollen tube produces ethylene.
- D) The growing pollen tube produces auxins and/or gibberellins.

Answer: D

Topic: 33.5

Skill: Knowledge/Comprehension

14) Which of the following hormones might induce seeds treated with it to break dormancy?

- A) an auxin
- B) a cytokinin
- C) a gibberellin
- D) ethylene

Answer: C

Topic: 33.5

Skill: Knowledge/Comprehension

15) Fruit that forms on an unpollinated plant in response to a hormone will lack

- A) flavor.
- B) seeds.
- C) rind.
- D) naturally occurring hormones.

Answer: B

Topic: 33.5

Skill: Knowledge/Comprehension

16) Bush beans grow as small bushes rather than as vines because their internodes are short and they branch close to the apical meristem. Which of the following substances, if applied to a bush bean, might cause it to revert to a vine habit?

- A) a cytokinin
- B) a gibberellin
- C) abscisic acid
- D) ethylene

Answer: B

Topic: 33.5

Skill: Knowledge/Comprehension

17) Which of the following substances induces "bolting," the rapid elongation of a plant stem?

- A) a gibberellin
- B) abscisic acid
- C) ethylene
- D) phytochrome

Answer: A

Topic: 33.5

Skill: Knowledge/Comprehension

18) About how many gibberellins have been identified in plants?

- A) one
- B) five
- C) over one hundred
- D) thousands

Answer: C

Topic: 33.5

Skill: Knowledge/Comprehension

19) Which type of plant hormone generally acts as a growth inhibitor?

- A) auxins
- B) gibberellins
- C) cytokinins
- D) abscisic acid

Answer: D

Topic: 33.6

Skill: Knowledge/Comprehension

20) Under what conditions would you expect a plant to have the highest concentration of abscisic acid?

- A) in a wet tropical rain forest
- B) in a cool environment after a heavy rain
- C) in a houseplant growing in low light conditions
- D) in a desert after a long drought

Answer: D

Topic: 33.6

Skill: Knowledge/Comprehension

21) Which hormone prevents a seed released in the fall from germinating immediately?

- A) auxins
- B) abscisic acid
- C) gibberellins
- D) ethylene

Answer: B

Topic: 33.6

Skill: Knowledge/Comprehension

22) What stimulates germination of desert plant seeds after a hard rain?

- A) production of auxins
- B) removal of abscisic acid
- C) cooler temperatures
- D) activation of cytokinins

Answer: B

Topic: 33.6

Skill: Knowledge/Comprehension

23) In leaf abscission, the abscission layer forms where the

- A) leaf stalk joins the stem.
- B) axillary bud joins the stem.
- C) root joins the stem.
- D) leaf stalk joins the leaf.

Answer: A

Topic: 33.7

Skill: Knowledge/Comprehension

24) Which of the following would be a good way to ripen a green tomato?

- A) putting it in a darkened area such as a drawer or box
- B) placing it in a sealed plastic bag with an overripe banana
- C) placing it in a microwave, on low power, for 5 minutes
- D) placing it under a bright light for 24 hours

Answer: B

Topic: 33.7

Skill: Knowledge/Comprehension

25) Which of the following is one adaptive advantage for deciduous plants that lose their leaves during the winter?

- A) It prevents water loss from leaves when soil water is unavailable due to freezing.
- B) Production of new leaves each spring is more efficient than supporting old leaves all winter.
- C) If leaves are damaged by frost, the tree will die.
- D) A layer of leaves on the ground helps keep plant roots warm.

Answer: A

Topic: 33.7

Skill: Knowledge/Comprehension

26) In many grocery stores, fresh fruits are sold prebagged in plastic bags dotted with holes so that they will not overripen. The main function of the holes is to

- A) permit the fruit to drain after being washed.
- B) facilitate diffusion of ethylene away from the fruit.
- C) prevent buildup of CO<sub>2</sub>.
- D) facilitate diffusion of O<sub>2</sub> to the fruit.

Answer: B

Topic: 33.7

Skill: Application/Analysis

27) Which of the following options lists the events leading to leaf fall in deciduous trees in the correct order?

- A) formation of abscission layer, increase in ethylene levels, decrease in auxin levels
- B) shortening days, increase in ethylene production, formation of abscission layer
- C) shortening days, formation of abscission layer, decrease in ethylene levels
- D) decrease in ethylene levels, shortening days, formation of abscission layer

Answer: B

Topic: 33.7

Skill: Knowledge/Comprehension

28) Synthetic auxins are used commercially

- A) to promote seed germination.
- B) to promote flowering in ornamental crops.
- C) to promote side branching to produce bushier crops.
- D) as a broadleaf weed killer.

Answer: D

Topic: 33.8

Skill: Knowledge/Comprehension

29) There is concern over the use of dioxin, a synthetic plant hormone, as a weed killer because

- A) it can cause irreversible mutations in crop plants.
- B) it causes massive fish kills when it gets into lakes and streams.
- C) it can cause birth defects and leukemia in mammals.
- D) it weakens the shells of the eggs of predatory birds, resulting in the death of their offspring.

Answer: C

Topic: 33.8

Skill: Knowledge/Comprehension

30) Which of the following growth responses causes the shoots of a plant grown in the dark to grow upward?

- A) phototropism
- B) thigmotropism
- C) photoperiodism
- D) gravitropism

Answer: D

Topic: 33.9

Skill: Knowledge/Comprehension

31) The plant growth response to touch is known as

- A) gravitropism.
- B) geotropism.
- C) bolting.
- D) thigmotropism.

Answer: D

Topic: 33.9

Skill: Knowledge/Comprehension

32) What dense storage granules in plant cells are thought to contribute to gravitropism?

- A) starch
- B) cellulose
- C) proteins
- D) chlorophyll

Answer: A

Topic: 33.9

Skill: Knowledge/Comprehension

33) Which of the following processes underlies the thigmotropic behavior of a green bean tendril?

- A) rotation of the tendril in response to photoperiod
- B) rotation of the tendril in response to a biological clock
- C) extra proliferation of cells on the shaded side of the tendril
- D) slower growth on the side where an object is touching the tendril

Answer: D

Topic: 33.9

Skill: Knowledge/Comprehension

34) *Mimosa* plants spread their leaflets during the day and fold them at night. You decide to design an experiment to test whether *Mimosa's* leaf movements are controlled by a biological clock. Which of the following experiments would be the best test of your hypothesis?

A) Growing the plant indoors and turning the lights on in the middle of the night. If a biological clock is controlling leaf movement, the leaves will open.

B) Putting the plant in a dark closet in the middle of the day. If the leaves close, a biological clock mechanism is ruled out.

C) Subjecting the plant to a flash of red light in the middle of the night. If the leaves open at the usual time the next morning, a biological clock mechanism is ruled out.

D) Putting the plant in a dark closet at nightfall. Check on the plant in the morning about 10 hours later, while the plant is still in the closet. If the leaves are open, a biological clock is indicated.

Answer: D

Topic: 33.10

Skill: Application/Analysis

35) Which of the following statements concerning biological clocks is *false*?

A) Innate circadian rhythms generally differ slightly from a 24-hour period.

B) Circadian rhythms occur with or without external stimuli.

C) Biological clocks are strongly influenced by external temperatures.

D) Movement of plants long distances very quickly induces a kind of plant "jet lag."

Answer: C

Topic: 33.10

Skill: Knowledge/Comprehension

36) Which of the following plant responses is affected by photoperiod?

A) gravitropism

B) apical dominance

C) onset of dormancy

D) cell division

Answer: C

Topic: 33.11

Skill: Knowledge/Comprehension

37) What term refers to seasonal changes in the relative lengths of night and day?

A) photoperiod

B) circadian rhythm

C) gravitropism

D) phototaxis

Answer: A

Topic: 33.11

Skill: Knowledge/Comprehension

38) A plant will only flower if the night length is longer than 14 hours. This plant is a

A) long-day plant.

B) short-night plant.

C) short-day plant.

D) day-neutral plant.

Answer: C

Topic: 33.11

Skill: Knowledge/Comprehension



39) A biologist interested in determining which plant organs (stems, buds, leaves, etc.) are responsible for sensing photoperiod might perform which of the following experiments?

- A) remove the apical meristems from different parts of the plant
- B) measure auxin levels in different parts of the plant before and after exposure to light
- C) cover different plant organs with a foil covering to prevent light exposure
- D) expose the plants to different wavelengths of light

Answer: C

Topic: 33.11

Skill: Application/Analysis

40) Which of the following is the factor that initiates flowering in long-day plants?

- A) nights shorter than a critical length
- B) nights longer than a critical length
- C) days longer than the intervening nights
- D) days shorter than a critical length

Answer: A

Topic: 33.11

Skill: Knowledge/Comprehension

41) Christmas cactus is a short-day plant that usually blooms in the winter. Which of the following strategies might induce it to bloom for the 4th of July?

- A) putting it in a cool, well-lighted place from time to time during June
- B) leaving it in a dark closet all night and part of each morning during June
- C) putting it in a dark closet for a short time every afternoon during June
- D) exposing it to light several times during each night in June

Answer: B

Topic: 33.11

Skill: Application/Analysis

42) Iris is a long-day plant that normally flowers in the spring. Which of the following regimens would be the most effective in making an iris bloom in late fall?

- A) interrupting the plants' nights at 2:00 A.M. with a flash of far-red light
- B) interrupting the plants' nights at 2:00 A.M. with a flash of red light followed by a flash of far-red light
- C) interrupting the plants' nights at 2:00 A.M. with a red flash, then a far-red flash, then a red flash
- D) interrupting the plants' days at 2:00 P.M. by putting them in the dark

Answer: C

Topic: 33.12

Skill: Application/Analysis

43) How does phytochrome control flowering?

- A) by determining whether day length exceeds a critical minimum
- B) by determining whether day length is shorter than a critical maximum
- C) by sensing sunrise and sunset
- D) by inducing differentiation of cells in the apical meristem

Answer: C

Topic: 33.12

Skill: Knowledge/Comprehension

44) A plant's first line of defense against infection is

- A) *Avr* genes.
- B) its epidermis.
- C) *R* genes.
- D) salicylic acid.

Answer: B

Topic: 33.13

Skill: Knowledge/Comprehension

45) Which of the following is a way that plants use animals as a defense against herbivores?

- A) production of an amino acid that harms herbivores
- B) attraction of wasps that kill herbivorous caterpillars
- C) release of microbe-killing chemicals in response to infection
- D) coevolution between plants and predators

Answer: B

Topic: 33.13

Skill: Knowledge/Comprehension

46) Salicylic acid, the main component of aspirin, may be an example of a(n)

- A) substance that attracts wasps to a plant being eaten by caterpillars.
- B) substance encoded for by *Avr* genes.
- C) amino acid that, when consumed by an insect, will kill that insect.
- D) alarm hormone.

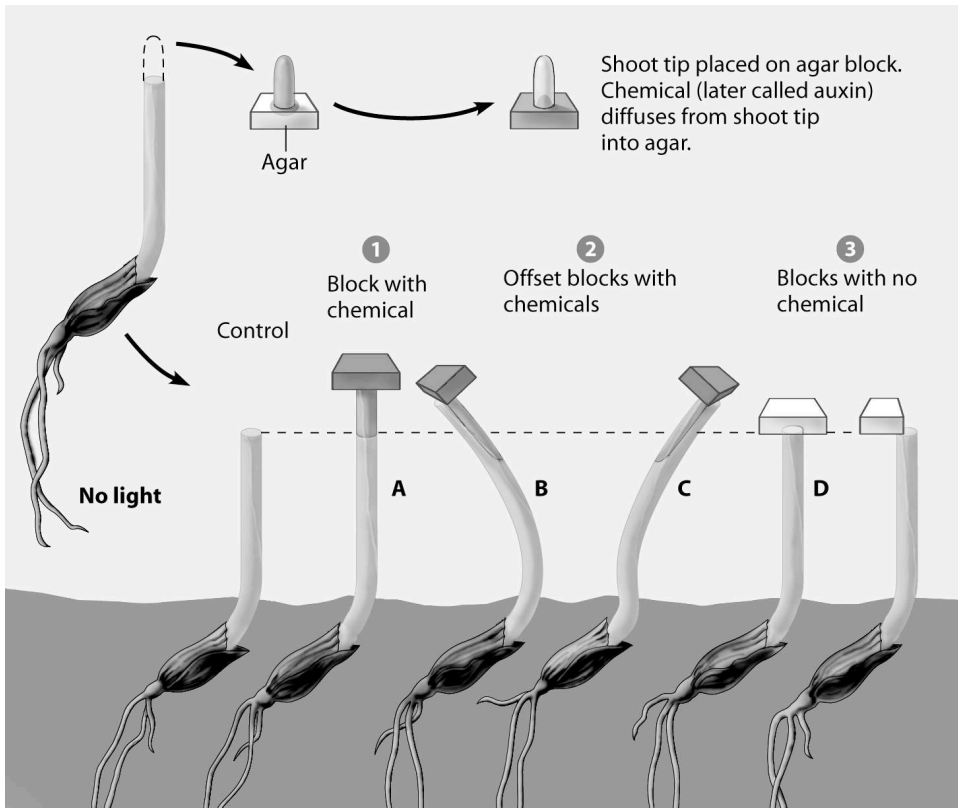
Answer: D

Topic: 33.13

Skill: Knowledge/Comprehension

33.2 Art Questions

1) Which plant in Went's experiment shows auxin stimulating elongation in the left side of the plant only?



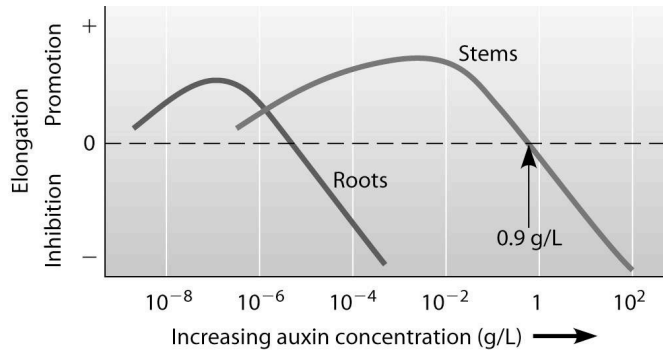
- A) plant A
- B) plant B
- C) plant C
- D) plant D

Answer: C

Topic: 33.1

Skill: Application/Analysis

2) Which of the following statements is supported by this figure?



- A) The greater the concentration of auxin, the more promotion of root elongation occurs.
- B) Auxin concentrations below  $10^{-8}$  g/L promote both root and stem elongation.
- C) Auxin concentrations around  $10^{-4}$  g/L promote stem elongation but inhibit root elongation.
- D) Auxin concentrations above 0.9 g/L are best for promoting stem elongation.

Answer: C

Topic: 33.3

Skill: Knowledge/Comprehension

### 33.3 Scenario Questions

*After reading the paragraph, answer the question(s) that follow.*

A student taking a plant physiology class is interested in investigating what will happen if the apical bud is removed from a growing plant and supplementary hormones are introduced.

He set up his experiment with two groups of plants of the same species. In groups A and B, the apical buds were removed and the cut apical ends were wrapped with hormone-impregnated cotton. The plants were observed over a five-week period for growth and development. In group A, many axillary buds and leaves appeared along the sides of the stem, but the plants had minimal root growth. In group B, minimal growth occurred in the shoot and roots and no axillary buds formed.

1) What hormone was in the cotton used to wrap the apical ends of the group A plants?

- A) cytokinin
- B) gibberellin
- C) ethylene
- D) auxin

Answer: A

Topic: 33.3, 33.4

Skill: Application/Analysis

2) What hormone was in the cotton used to wrap the apical ends of the group B plants?

- A) cytokinin
- B) giberellin
- C) abscisic acid
- D) auxin

Answer: C

Topic: 33.2, 33.6

Skill: Application/Analysis