In this unit on plants, the challenge for students will be to learn the new vocabulary. As we work through this unit, you will find an emphasis on labeling and explaining plant diagrams and specific directions for which terms you should know.

**Concept 35.1 The plant body has a hierarchy of organs, tissues, and cells**

1. This concept is organized into three sections—plant organs, tissues, and cells. Begin by defining a *tissue* and an *organ*.

2. The three plant organs are ____________, ____________, and ________________.

3. On Figure 35.2, label the *shoot system*, *root system*, *apical bud*, *axillary bud*, and *root system*.

4. Define *root* and then explain the difference between a *taproot* and *lateral roots*.

**Root**

**Taproot and lateral roots**
5. This photograph shows the root hairs of a radish. What is the function of root hairs?

6. What is the advantage of apical dominance to a plant?

7. The main function of a leaf is ________________________________ .

8. What are five additional functions that modified leaves can perform?

9. Plants have three types of tissues. Place the name of each tissue type and its function in the table below.

<table>
<thead>
<tr>
<th>Tissue type</th>
<th>Function</th>
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10. What is the function of the cuticle?

11. Xylem conducts ________________________________ .

12. Xylem transport tends to be in one direction, but phloem transport is more complicated. Explain the pattern of sugar flow in phloem tissue.
13. The two major tissues of the *ground tissue system* are *pith* and *cortex*. Where are they found in the plant?

14. Plants have five major types of cells. Below you will find a picture of each cell type. Give the major function of each cell type. Specific questions may follow your general description of the cell type.

<table>
<thead>
<tr>
<th>Parenchyma cells</th>
<th>Function</th>
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<tbody>
<tr>
<td><img src="image" alt="Parenchyma cells" /></td>
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<table>
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<tr>
<th>Collenchyma cells</th>
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<td><img src="image" alt="Collenchyma cells" /></td>
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<tr>
<th>Sclerenchyma cells</th>
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<td><img src="image" alt="Sclerenchyma cells" /></td>
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<thead>
<tr>
<th>Xylem cells</th>
<th>Label <em>vessel elements, tracheids, and pits.</em></th>
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</thead>
<tbody>
<tr>
<td><img src="image" alt="Xylem cells" /></td>
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</table>
15. Compare and contrast the following structures:

**Tracheids and vessel elements**

**Sieve tube elements and companion cells**

16. At the end of this first extensive concept, do not lose sight of the big picture. Complete the following summary charts.

The three plant organs are

The three basic plant tissues are

The five basic plant cells are

**Concept 35.2 Meristems generate cells for new plant organs**

17. What is the difference between *indeterminate growth* and *determinate growth*?
18. Although plants generally show indeterminate growth, what are three examples of plant parts that show determinate growth?

19. Based on the length of their life cycle, plants are categorized into three groups. Explain what each category means below, and provide an example.

**Annuals**

**Biennials**

**Perennials**

20. Plants are capable of indeterminate growth because they have perpetually embryonic tissues called __________________________.

21. Explain the following relationships.

**Apical meristems** and **primary growth**

**Lateral meristems** and **secondary growth**

**Primary growth** and **secondary growth**

*Concept 35.3 Primary growth lengths roots and shoots*

22. The figure below shows an image that is like a slide many students study in a mitosis lab and is labeled for this lesson as the “Primary growth of a root.” Label the nine structures shown in the figure: cortex, vascular cylinder, epidermis, apical meristem, root cap, root hair, zone of differentiation, zone of elongation, and zone of cell division.
23. Explain what events occur in the zone of cell division, zone of elongation, and zone of differentiation.

24. In most roots, the xylem and phloem is a solid cylinder of vascular tissue located in the center of the root and called the stele. The figure below shows the stele of a dicot root. Label the xylem, phloem, endodermis, and pericycle. Also define the two new terms as indicated.

Endodermis

Pericycle

25. Why must new roots formed by the pericycle originate in the center of the root?
26. From Figure 35.16, label shoot apical meristem, leaf primordia, young leaf, developing vascular strand, and axillary bud meristems.

27. What structure in this figure is responsible for primary growth?

28. It is possible to tell a young eudicot from a monocot by the structure of the stem. In the following figure, label the eudicot, monocot, epidermis, and vascular bundles.

29. How is the arrangement of vascular bundles different in monocot and dicot stems?
30. To understand the process of photosynthesis, students are expected to know leaf structure in greater detail. Using Figure 35.18, label each structure just as shown in the text.

31. What gas critical to photosynthesis enters the leaf through stoma? _____________________

32. What is lost through the stoma that leads to transpiration? _____________________________

33. Is this a C₃, C₄, or CAM leaf? ___________________________________________________

34. Primary growth arises from apical meristems and results in _______________ of roots, stems, and leaves. Secondary growth arises from ________________ and ________________ cambium and results in increased _______________ of roots and stems.

35. Explain what is produced by these structures.

Vascular cambium

Cork cambium
36. Read the text that accompanies Figure 35.19 and then answer these questions.
   a. What results in primary growth of the stem?
   b. What cells are formed to the inside and the outside of the vascular cambium?
   c. What is the difference in the formation of primary xylem and phloem versus secondary xylem and phloem?

37. What vascular tissue forms the bark, and what is the function of the bark?

38. What tissues are included in the bark of a tree?

39. On this figure, add these labels: cork cambium, cork, periderm, bark, growth ring, secondary xylem, secondary phloem, and vascular cambium.

40. Look back at the stem in Figure 35.19 and find the horizontal slits in the bark, known as lenticels. You may have noticed lenticels on the young twigs of trees or shrubs. What is the function of lenticels?

Concept 35.5 is omitted. These topics have not been included on recent AP Biology exams.

Testing Your Knowledge: Self-Quiz Answers
Now you should be ready to test your knowledge. Place your answers here:

1. __________ 2. __________ 3. __________ 4. __________ 5. __________ 6. __________