BE SURE TO CAREFULLY READ THE INTRODUCTION PRIOR TO ANSWERING THE QUESTIONS!!!

You will need to refer to your text book to answer some of the questions on this worksheet.

EXERCISE 20.1: Plant Morphology

Procedure

1. Examine a living herbaceous (non-woody) plant and identify the following structures in the: shoot system: nodes, internodes, terminal buds, axillary (lateral) buds, leaf blades and petiole

2. Gently remove the plant from the container and identify the following structures of the root system: primary roots, secondary roots, root apical meristem, root cap and root hairs.

In the boxes below, draw a simple picture of a plant shoot system and root system and label the parts above.

Discussion

1. Describe the major functions of the following plant parts:

   Stems –

   Roots –

   Leaves –
EXERCISE 20.2: Plant Primary Growth and Development

Procedure

1. Examine a prepared slide of a longitudinal section through the terminal bud of the stem of the Coleus plant. Observe the structures and identify the following parts (Figure 20.3): leaf primordial, axillary bud primordial, undifferentiated vascular traces, apical meristem and xylem.

In the box below, draw a picture of this terminal bud and label the parts listed above.

![Coleus terminal bud (tip of stem)](image)

Discussion

1. Describe the changes in cell size and structure in the tip of the stem you observe. Continue from the youngest cells of the apical meristem and continue down to the xylem near the bottom.

2. The meristems of plants continue to grow throughout their lifetime, which is an example of indeterminate growth. Imagine a 200 year old oak tree, with active meristem producing new buds, leaves and stems each year. How is this different than human growth and development?
**EXERCISE 20.3: Cell Structure of Primary Tissues**

**Lab Study A - Stems**

**Procedure**

1. Obtain a prepared slide of a cross-section through the stem of a plant. Observe its structure and cells under the compound light microscope. Identify the following parts (Figure 20.5): epidermis, cortex, pith, vascular bundle, fiber bundle cap (sclerenchyma), phloem (sieve tube members and companion cells), vascular cambium, xylem vessels and xylem tracheids.

In the box below, draw a picture of this cross section and label all of these parts.

![Cross-section through a plant stem](image)

**Discussion**

1. Which are larger and more distinct to observe: xylem cells or phloem cells?

2. What type of cells actually provides support for the stem? Where are these cells located?

3. For the cells described in question 2 above, how does their observed structure relate to their function, which is support?
4. What are the functions of xylem and phloem?

5. The pith and the cortex are made up of parenchyma cells. Describe the many functions of these cells (you may refer to your text).

Lab Study B – Roots

Procedure

1. Obtain a prepared slide of a cross-section through a buttercup (Ranunculus) root. Observe its structure and cells under the compound light microscope. Identify the following parts (Figure 20.6): vascular cylinder, cortex, epidermis, xylem, phloem, endodermis, Casperian strip and pericycle.

In the box below, draw a picture of this root cross section and label the parts listed above.

Cross-section through a plant root

Discussion

1. Suggest what soil conditions would be best for a taproot vs. a fibrous root.
3. Compare the structure and organization of roots vs. stems. How do these plant organs differ?

4. Explain the specific role of the endodermis and the Casperian strip (you may want to refer to your text).

5. Note that the epidermis of the root lacks a **cuticle**. Why do the leaves and shoots have a cuticle while the roots do not?

**Lab Study C – Leaves**

**Procedure**

1. Obtain a prepared slide of a cross-section through a leaf. Observe its structure and cells under the compound light microscope. Identify the following parts (Figure 20.6): **cuticle**, **epidermis**, **mesophyll** (parenchyma with chloroplasts), **vascular bundle** with the **phloem** and **xylem**, **stomata** with their **guard cells**.

   In the box below, draw a picture of this leaf cross section and label the parts listed above.
2. With regards to the internal leaf structure:

b. The vascular bundles of the leaf are often called **veins** and can be seen in both a cross-section and longitudinal section of a leaf. Observe the structure of the cells in the central midvein. Is the xylem or the phloem on the top part of the leaf?

c. Observe the distribution of the stomata in the upper and lower epidermis. Where are they more abundant?

**Discussion**

1. Describe the function of the leaves of a plant.

3. Explain your observation that there are more stomata on the lower surface of the plant leaf.

**EXERCISE 20.5: Grocery Store Botany: Modifications of Plant Organs**

**Discussion**

2. Based on your knowledge of the different functions of a root, why do you think roots have been selected so often as a source of food?
In the table below, select five “grocery store” items and list the part of the plant that it is.

<table>
<thead>
<tr>
<th>Name of Grocery Store Item</th>
<th>Part of the Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<td>2.</td>
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<td>3.</td>
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<td>4.</td>
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<td>5.</td>
<td></td>
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</tbody>
</table>

REVIEWING YOUR KNOWLEDGE

In the table below, list the function and plant organ for each of the following plant parts. You may choose to use your text as a reference.

<table>
<thead>
<tr>
<th>Plant Part</th>
<th>Function</th>
<th>Plant Organ Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidermis</td>
<td></td>
<td></td>
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<tr>
<td>Guard cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parenchyma</td>
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<td></td>
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<td>Collenchyma</td>
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<tr>
<td>Sclerenchyma</td>
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<td>Tracheids</td>
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<tr>
<td>Vessels</td>
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<tr>
<td>Sieve Tubes</td>
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<tr>
<td>Endodermis</td>
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<td></td>
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<tr>
<td>Primary meristems</td>
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<tr>
<td>------------------</td>
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<td></td>
</tr>
<tr>
<td>Vascular cambium</td>
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<tr>
<td>Pericycle</td>
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</tr>
<tr>
<td>Periderm</td>
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</tbody>
</table>