🌱 Lesson Plan: Roots, Stems and Leaves

Grade Level: 5
Subject: Life Science
Duration: 45–60
NGSS 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

🎯 Learning Objectives

By the end of this lesson, students will be able to:

- **Identify** the three main organs of a plant: roots, stems, and leaves.
- **Describe** the specific functions of roots, stems, and leaves in plant survival and growth.
- **Explain** how xylem and phloem transport water, nutrients, and sugar throughout the plant.

the plant.

- **Taproot:** A root system that consists of one main large root that grows directly down into the soil.
- **Fibrous Root System:** A root system that consists of many roots that grow underground in many directions.
- **Photosynthesis:** The process by which plants use sunlight, carbon dioxide, and water to produce glucose (sugar) and oxygen in the chloroplasts of their leaves.

Materials Needed: (all links are included in this PDF)

- Printed copies of the Study Guide (https://newpathworksheets.com/api/guide/study-guide-science-grade-5-roots-stems-and-leaves.pdf)
- Activity Lesson handout on plant structures (https://newpathworksheets.com/api/activity-lesson/activity-lesson-science-grade-5-roots-stems-and-leaves-roots-leaves-4.pdf)
- Vocabulary matching worksheet (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-roots-stems-and-leaves-1.pdf)
- Practice Worksheet 0 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-roots-stems-and-leaves-0.pdf)
- Practice Worksheet 1 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-roots-stems-and-leaves-1.pdf)
- Celery stalks with leaves attached (teacher note: place celery in colored water several hours or overnight before class for best results)
- Food coloring (red or blue)

highlighting their specific functions. (https://newpathworksheets.com/api/guide/study-guide-science-grade-5-roots-stems-and-leaves.pdf)

- Demonstrate water transport using celery stalks that were placed in colored water several hours or overnight before class. Explain that students will observe how water moves up through the xylem in the stem to the leaves.
- Discuss the two types of root systems (taproot and fibrous) and stem types (herbaceous and woody) using diagrams from the Activity Lesson. (https://newpathworksheets.com/api/activity-lesson/activity-lesson-science-grade-5-roots-stems-and-leaves-roots-leaves-4.pdf)

- Explain photosynthesis: how leaves use sunlight, carbon dioxide, and water to make glucose and release oxygen. (https://newpathworksheets.com/api/activity-lesson/activity-lesson-science-grade-5-roots-stems-and-leaves-roots-leaves-4.pdf)

Step 3: Guided Practice (15 minutes)

- Distribute the vocabulary matching worksheet and work through it as a class, reinforcing key terms like xylem, phloem, chloroplast, and photosynthesis. (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-roots-stems-and-leaves-1.pdf)
- Use the Activity Lesson handout to label plant cell structures and leaf parts together, discussing the function of each component. (https://newpathworksheets.com/api/activity-lesson/activity-lesson-science-grade-5-roots-stems-and-leaves-roots-leaves-4.pdf)
- Have students observe the celery demonstration and predict what will happen to the colored water over time.

Step 4: Independent Practice (15 minutes)

- Ask students to classify everyday examples: Is a carrot a taproot or fibrous root? Is a sunflower stem herbaceous or woody?
- Review the celery demonstration results and discuss how the colored water traveled through the xylem to reach the leaves.

Differentiation Strategies

For advanced learners:

- Challenge advanced learners to research and compare vascular and non-vascular plants, explaining why mosses do not have true roots, stems, or leaves.
- Have students design an experiment to test how different environmental factors (light, water, soil type) affect plant growth and structure.

For learners needing support:

- Provide pre-labeled plant diagrams with color-coded parts (roots in brown, stems in green, leaves in dark green) for students who need visual support.
- Offer one-on-one or small-group assistance during the labeling activity, using a real plant or 3D model so students can touch and identify each part.

🎨 Extension Activities

- Have students grow bean plants from seeds in clear cups so they can observe root

- Practice Worksheet 0 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-roots-stems-and-leaves-0.pdf)
- Practice Worksheet 1 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-roots-stems-and-leaves-1.pdf)
- Practice Worksheet 2 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-roots-stems-and-leaves-2.pdf)
- Practice Worksheet 3 (https://newpathworksheets.com/api/worksheet/worksheet-science-grade-5-roots-stems-and-leaves-3.pdf)
- Vocabulary Set 1 (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-roots-stems-and-leaves-1.pdf)

- Vocabulary Set 2 (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-roots-stems-and-leaves-2.pdf)
- Vocabulary Set 3 (https://newpathworksheets.com/api/vocabulary/vocabulary-science-grade-5-roots-stems-and-leaves-3.pdf)

PREVIEW

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ROOTS, STEMS, AND LEAVES

Plants have structures that serve different purposes for keeping the plant alive and healthy.

Let's start from the bottom up, with the ROOTS:

The roots of a plant have three jobs to do:

- to anchor the plant firmly into the soil,
- to store food, and most importantly,
- to absorb water and nutrients from soil.

Plants have two different root systems.

A **taproot** system consists of one main large root that grows directly down into the soil.

A **fibrous** root system consists of many roots that grow underground in many directions.

Taproot Fibrous Roots

Next, the STEM:

The stem also has several jobs. It helps the plant reach up tall which enable the plant to take in more sunlight. The stem also carries food, water, and nutrients all throughout the plant. All parts of a plant need food, water, and nutrients. These essential necessities get to all parts of the plant through the tissues in the plant, called the xylem and phloem.

Vascular plants have special tubes that carry food, water, and nutrients throughout a plant. The **xylem** is the tube that carries water and nutrients from the roots to leaves. The **phloem** carries sugar away from leaves to the rest of the plant.

Now to the LEAVES:

Most of a plant's food is made in its leaves.
Leaves of a plant are made of plant organs and tissues. The top layer of leaf, which protects the leaf, is called its epidermis. Leaves have tiny openings underneath them called the stomata which let air and water in and out of the leaf.

Lesson Checkpoint:
What three jobs do roots do for the plant?

How do plants reproduce?

Flowers pass along their hereditary information in seeds. The seeds thus contain all the information for reproducing the flower, stem, leaves, and roots of a plant

A seed is made up of three parts: a seed coat, embryo (which is a new plant ready to grow), and endosperm.

Spores, asexual reproduction (reproduction involving only one parent), budding, and runners are all ways some plants reproduce without seeds.

Lesson Checkpoint: What is pollination?

Plants make their food through the process of photosynthesis

Photosynthesis occurs in the **chloroplast** of a plant cell, where the plant absorbs sunlight. Plants use carbon dioxide they take in from the air around them, water they get from the soil through their roots, and energy from the sun to produce sugar and oxygen. Plants release the oxygen, which they don't need, into the air for us aerobic organisms, who need oxygen to survive.

Lesson Checkpoint: What absorbs sunlight in a plant cell?

Roots, Stems & Leaves

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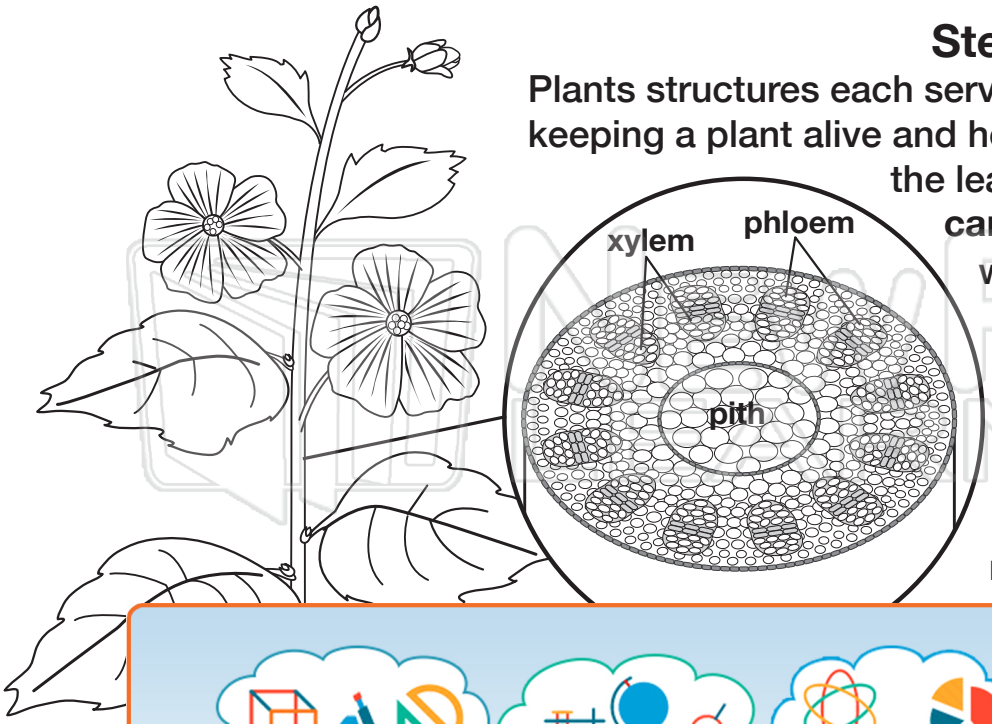
Name _____ Class _____ Date _____

Stems

Plants structures each serve a different purpose for keeping a plant alive and healthy. Plant **stems** support the leaves and flowers, and they carry water and nutrients within the plant.



The **xylem** carries water and nutrients from the roots to the leaves. The **phloem** carries sugar away from leaves to the rest of the plant.

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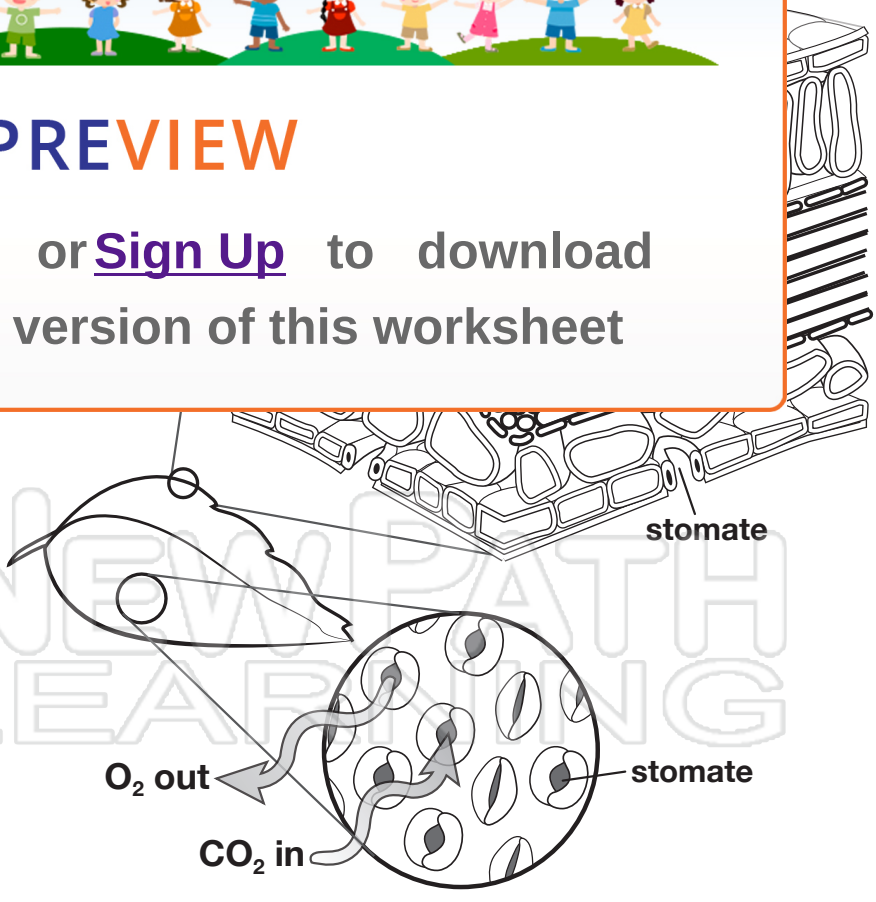
Leaves

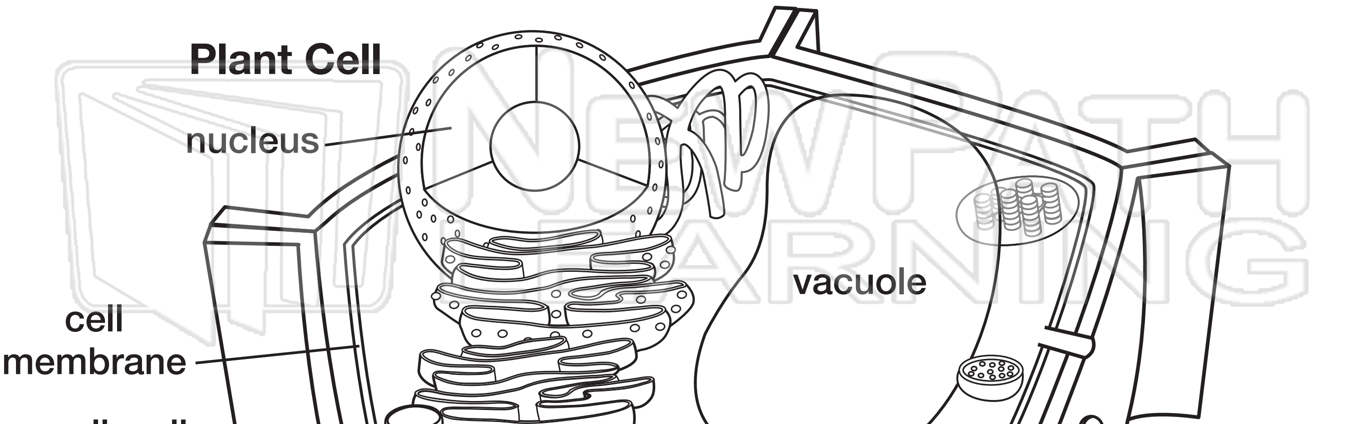
A plant **leaf** has many layers. Two outer layers of tough skin cells, called the **epidermis**, provide protection for the leaf. Leaves have tiny pores called **stomates** which allow water and gases to pass in and out of the plant.



Name ______________________ Class ____________ Date ____________

Process of Photosynthesis

Plants make food in the form of **sugar** through the process of **photosynthesis**. **Photosynthesis** takes place in the **chloroplast** of a plant cell.



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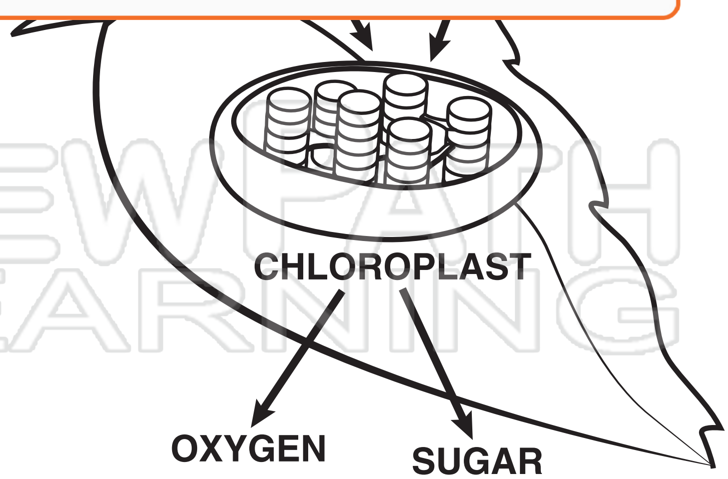

Roots, Stems & Leaves

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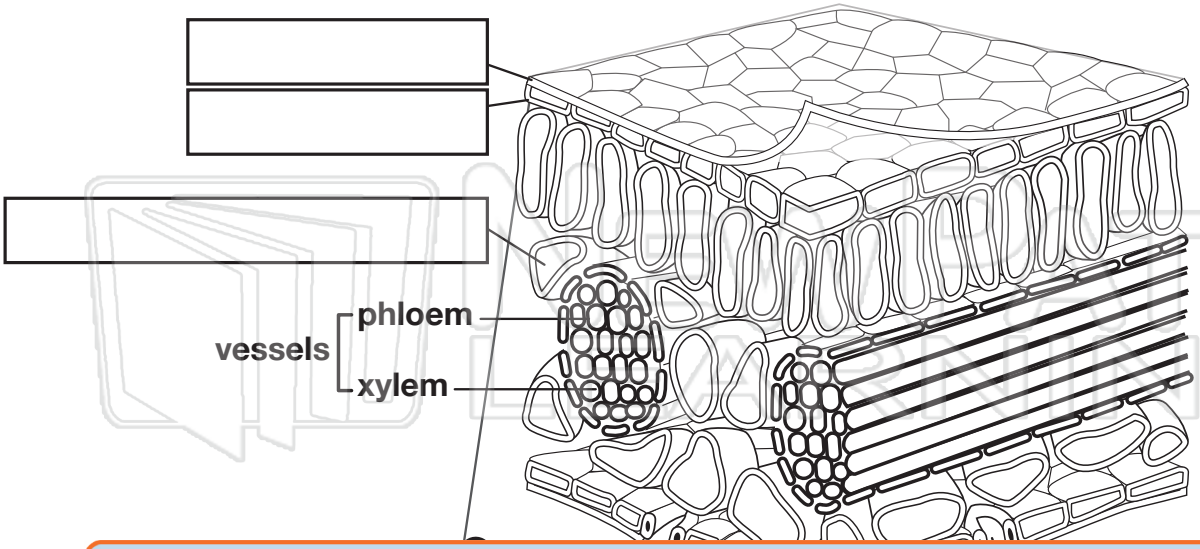
Name _____ Class _____ Date _____

Label the leaf parts.



PREVIEW

Please Sign In or Sign Up to download the printable version of this worksheet

What

_____

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Roots and stems carry water and nutrients around the plant through vessels.

What does **xylem** do?

_____

_____

What does **phloem** do?

_____

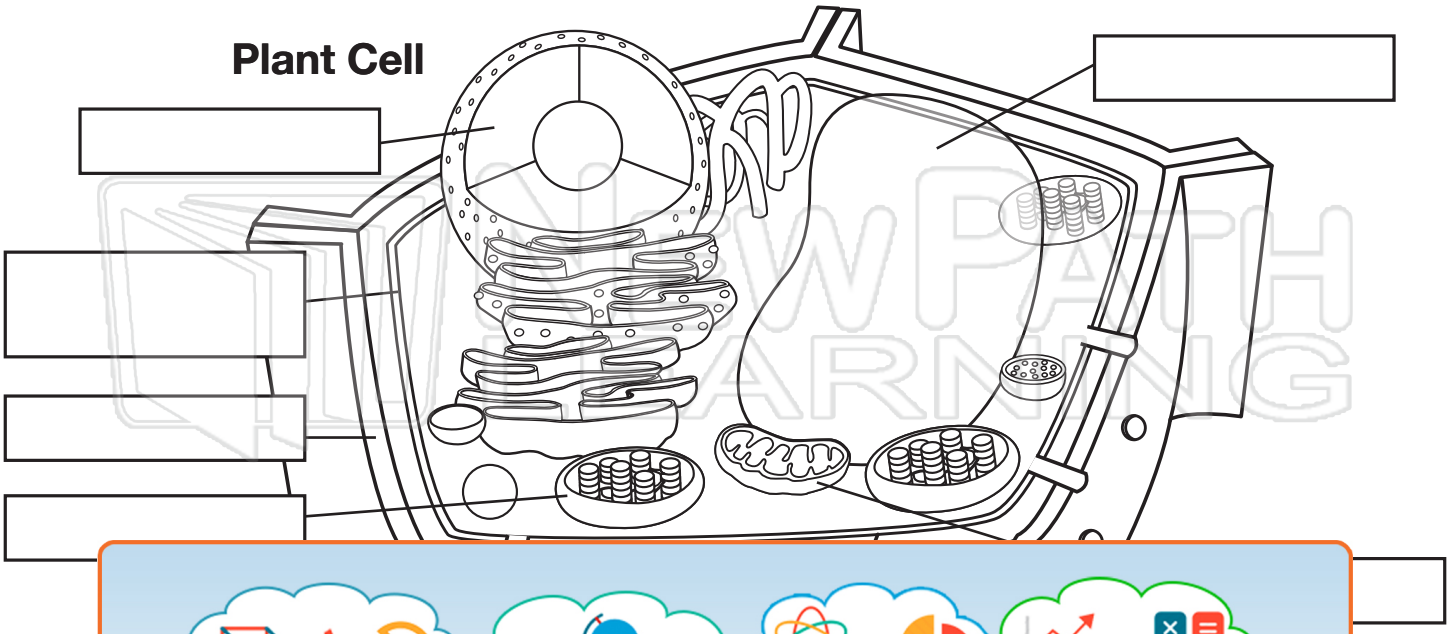
_____

Roots, Stems & Leaves

Sci E

Name _____ Class _____ Date _____

Label the plant cell.



PREVIEW

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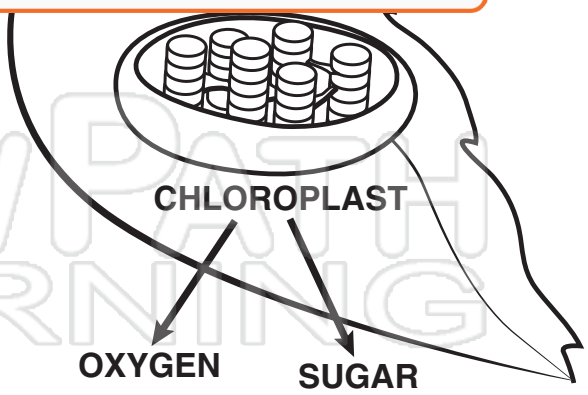
Plant

they

_____ they get from the soil, and _____ from the Sun to produce _____ and _____ during the process of _____.



Roots, Stems & Leaves

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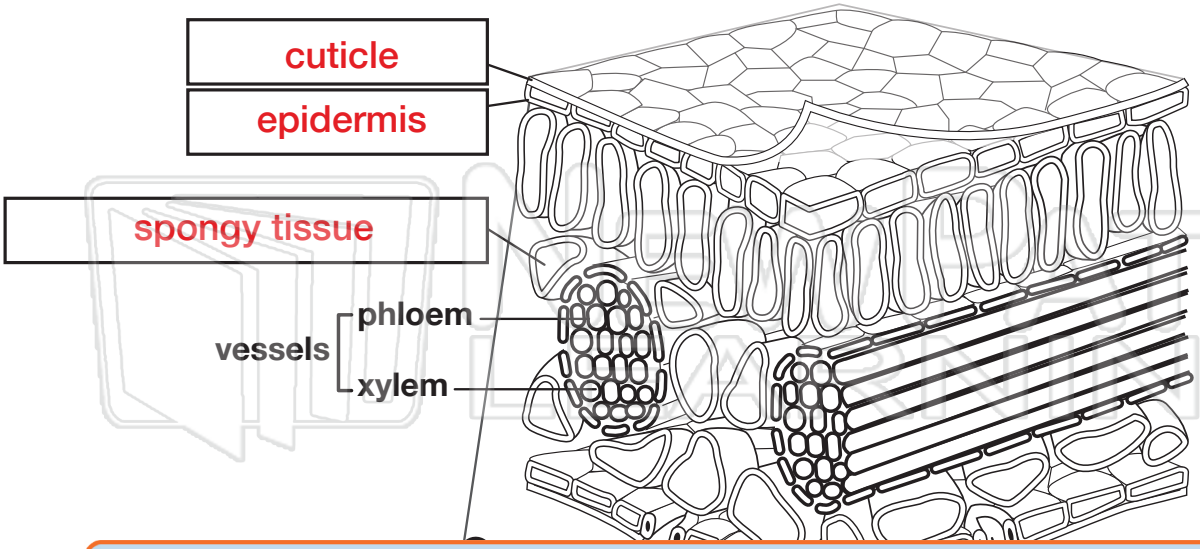
Answer Key

Label the leaf parts.



PREVIEW

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Roots and stems carry water and nutrients around the plant through vessels.

What does **xylem** do?

The xylem carries water and nutrients from the roots to the leaves.

What does **phloem** do?

The phloem carries sugar away from leaves to the rest of the plant. Sugar is made in the leaves during photosynthesis.

Roots, Stems & Leaves

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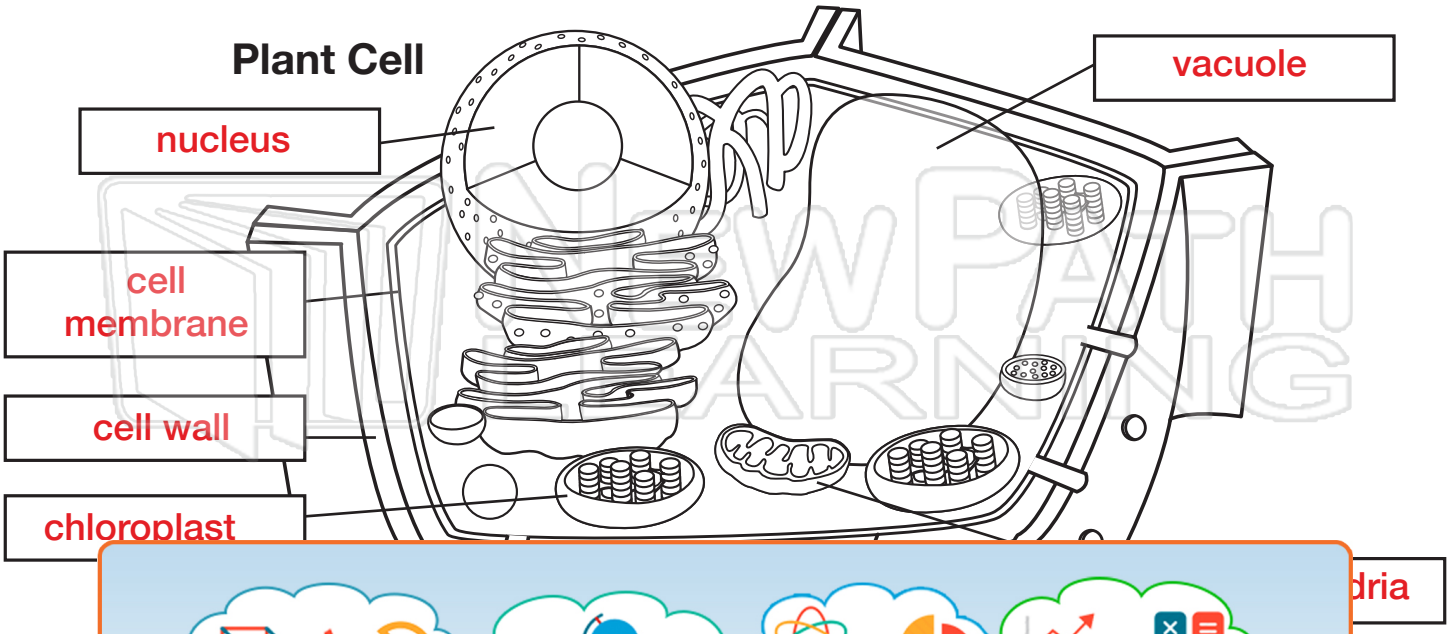
Answer Key

Label the plant cell.



PREVIEW

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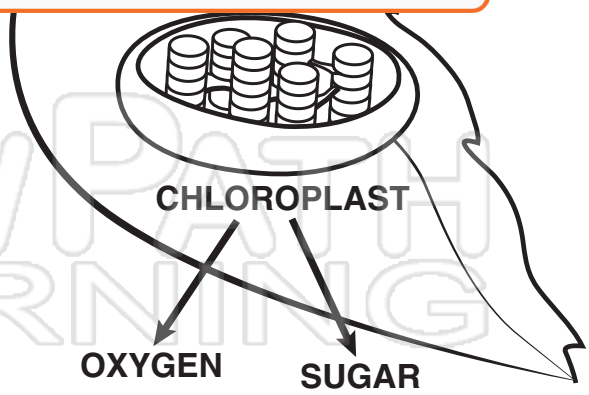
Plant

they

water they get from the soil, and energy from the Sun to produce oxygen and sugar during the process of photosynthesis.



Roots, Stems and Leaves

Sci E

Name_____ Class_____ Date_____

1 What type of **root system** is pictured below?

A taproot system
B fibrous system
C above ground system
D cellulose system

2 Kara pulled a plant from the soil and noticed that the plant had **many roots** shooting out in **many directions**. What type of root system was Kara observing?

A taproot system
B fibrous system
C above ground system
D cellulose system

3 What would happen to a plant if it **did not have roots** during a windstorm?

A It would produce seeds.
B It would not flower.

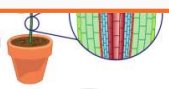
4 Which is a **function** of some plant's **roots**?

A to take in oxygen
B to produce food
C to store food

5

7

C embryo and endoderm
D spores and seeds



C Vascular
D Cellular

9 What structure of a plant carries water and nutrients **upward** from roots to other parts of a plant?

A chloroplast
B epidermis
C phloem
D xylem

10 What structure of a plant carries sugar **away from leaves** to the rest of the plant?

A phloem
B xylem
C pistil
D stamen

Roots, Stems and Leaves

Sci E

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PREVIEW

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Roots, Stems and Leaves

Sci E

Name_____ Class_____ Date_____

1 What is the function of **leaves**?

A to provide shade for the plant
B to make food for the plant
C to absorb water
D to eliminate wastes

2 The outside layer of a leaf is called the **epidermis**, which protects the leaf just like _____.

A our kidneys remove waste from our body
B our brain controls our body systems
C our heart pumps our blood
D our skin protects our bodies

3 What are the **tiny openings** in the leaf that let air and water in and out of the leaf called?

A vessels
B epidermis

4 Where is most of a plant's food **made** in a plant?

A in its leaves
B in its roots
C in its stems

5

to another
C needs to drop to the soil
D needs water to soften it

7

9 _____ is the **movement of pollen** from one flower to another.

A Transportation
B Transpiration
C Photosynthesis
D Pollination

10 Plants pass along _____ in **seeds**. This is why the new plant will have the **same type** of flower, stem, leaves, and roots.

A water
B grain
C hereditary information
D pollen

Roots, Stems and Leaves

Sci E

Name_____ Class_____ Date_____

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A water
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D pollen

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Roots, Stems and Leaves

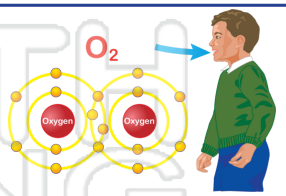
Sci E

Name_____ Class_____ Date_____

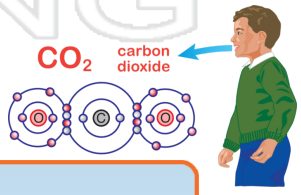
Match each of the following terms to its definition:

ATP	Oxygen	Chloroplast	Alcoholic fermentation
Cellular respiration	Fibrous root system	Carbon dioxide	Cellulose

1. - a colorless and tasteless gas that forms part of the earth's atmosphere; composed of two oxygen molecules; a special gas that plants give off that humans and animals need to breathe in to live



2. - a heavy colorless gas composed of one carbon and two oxygen molecules; makes up about 1/100th of the earth's atmosphere; a special gas that people and animals give off and is needed by plants



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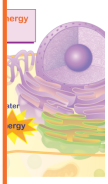
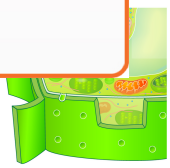
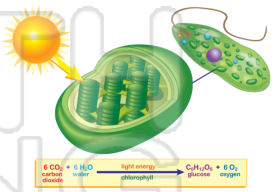


6.



7. - an organelle found in plant cells which contains chlorophyll that captures energy from the Sun and uses it to produce food in the form of sugar for the plant during a process known as photosynthesis



8. - a root system which consists of many roots that grow underground in many directions

Roots, Stems and Leaves

Name_____ Class_____ Date_____

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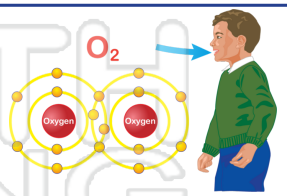
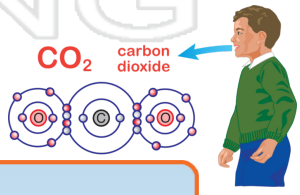


2. carbon dioxide - a heavy colorless gas composed of one carbon and two oxygen molecules; makes up about 1/100th of the earth's atmosphere; a special gas that people and animals give off and is needed by plants



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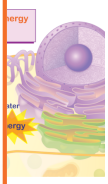

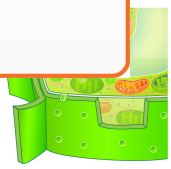

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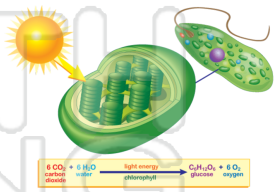

8. fibrous root system - a root system which consists of many roots that grow underground in many directions