LESSON 2: CORN EATS LUNCH

SUBJECT: Science

OBJECTIVE: Students will be able to label a diagram of a corn root and describe the process of nutrient exchange (eating lunch) in a corn plant.

EVAULATION: Students can to identify the parts of a corn root and describe in simple terms how it eats lunch.

BACKGROUND FOR TEACHERS:

Corn obtains nutrients and moisture from the soil through its roots.

The hard, tough root cap, located on the tip, protects the growing root. In the area immediately behind the root cap, cells are rapidly dividing to form new cells. This is called the region of elongation. The combination of cell division and elongation creates great pressures that push the root through the soil.

Roots get energy to grow from sugars that are made during photosynthesis (see Unit 1, Lesson 1) which occurs in the leaves. As the roots grow, they use oxygen from the surrounding pore spaces (see Unit 2, Lesson 3) to breathe. The carbon dioxide given off in respiration reacts with soil water to form weak carbonic acid.

Roots absorb nutrients and water primarily through tiny projections called root hairs. This is called the region of absorption. Soil water places the root hairs in chemical contact with nutrients that are on the surface of clay and organic matter particles. The weak carbonic acid clinging to the root hairs provides hydrogen ions to the soil water. The hydrogen ions are then exchanged with chemical nutrients held on the surfaces of soil particles. These nutrients are then absorbed by root hairs.

Soil water is distributed through the corn plant by osmosis, a method of diffusion by which a solvent (water) and solute (nutrients) pass through membranes of living cells. This is how the water, nutrients and chemicals slowly progress from the root to the tip of the plant.

The growth of a corn plant is affected by the fertility of the soil. Most plants need about 10-12 chemical elements. Three major elements include nitrogen, phosphorus and potassium. Secondary elements include calcium, magnesium, and sulfur. Trace, or minor, elements include zinc, iron, boron, manganese, copper, and aluminum.

Nitrogen stimulates the growth of leaves and stems, and produces the rich green color which is characteristic of a healthy plant. The plant's use of potassium, phosphorus and other nutrients is also stimulated by the presence of nitrogen.

Phosphorus is present in all living tissue. It is particularly concentrated in the younger parts of the plant and in the flowers and the seed. Phosphorus is necessary for such life processes as photosynthesis, the synthesis and breakdown of carbohydrates, and the transfer of energy within the plant.

Potassium is necessary for basic plant physiological functions and also assists different plants in a number of specialized ways. It enhances the size, flavor and color of some fruits and vegetables. It increases the resistance of some plants to particular diseases. It improves the rigidity of stalks and stems.

Nitrogen, phosphorus and potassium are so commonly used in commercial fertilizers that their percentage is always noted on the fertilizer bag in the same order. For example, a 10-20-10 fertilizer is one that contains 10 percent nitrogen (N), 20 percent phosphorus (P), and 10 percent potassium (K).

Since very few soils contain the right balance of all the elements needed for any one plant, some kind of fertilizer is usually needed. A soil may be high in nitrogen and potassium but low in phosphorus. Since crop yields are limited by the element most deficient, the elements that are deficient should be added.

STUDENT ACTIVITIES:

1. Ask students to read the story Ann Learns to Plow, and ask them to imagine, as she does, how corn eats…"Once she'd seen a root under a microscope…She'd heard her dad talk about feeding phosphorus and potassium to the corn…Thinking of corn plants eating supper made her laugh…"

2. Explain "nutrient exchange" with this simple analogy: The root hairs use hydrogen from their root surface like money to "buy" a nutrient from the soil. The soil takes the hydrogen, and the roots keep the nutrient.

   Ask students to role-play the process. One student can be a "root" holding a hydrogen ion, another student is the "soil particle" (see Lesson 3 to learn more about soil particles) holding a phosphorus or potassium nutrient. The "root" gives the hydrogen to the "soil" and in exchange, the "soil" hands over the nutrient, which the "root" then "eats" (absorbs).

3. To demonstrate the ability of plants to absorb the nutrients ("eat"), and move them to the leaves, ear and other important parts of the plant where they're used to manufacture food (See Unit 1, Lesson 1), use the following activity:

   - Cut a celery stalk at the end where the stalks meet.
   - Stand the stalk in a jar of water and add red ink or food color to the water.
   - At the next class period, remove the stalk and cut it into cross sections at various places. Have the students observe the red areas. Explain that the water has been rising in the plant, carrying nutrients with it.

4. To better understand roots, and their importance to the plants, ask students to complete the following worksheets. Younger students can match the names of the parts of the corn root to the picture; older students can fill in blanks in the worksheet. (Worksheet 1 for younger students, Worksheets 2 & 3 for older students.)

5. To allow students to see root hairs, germinate a package of radish seeds between two moist cloths. They germinate and grow very quickly! Or use a microscope to examine roots of corn, grass, or any other available plants.

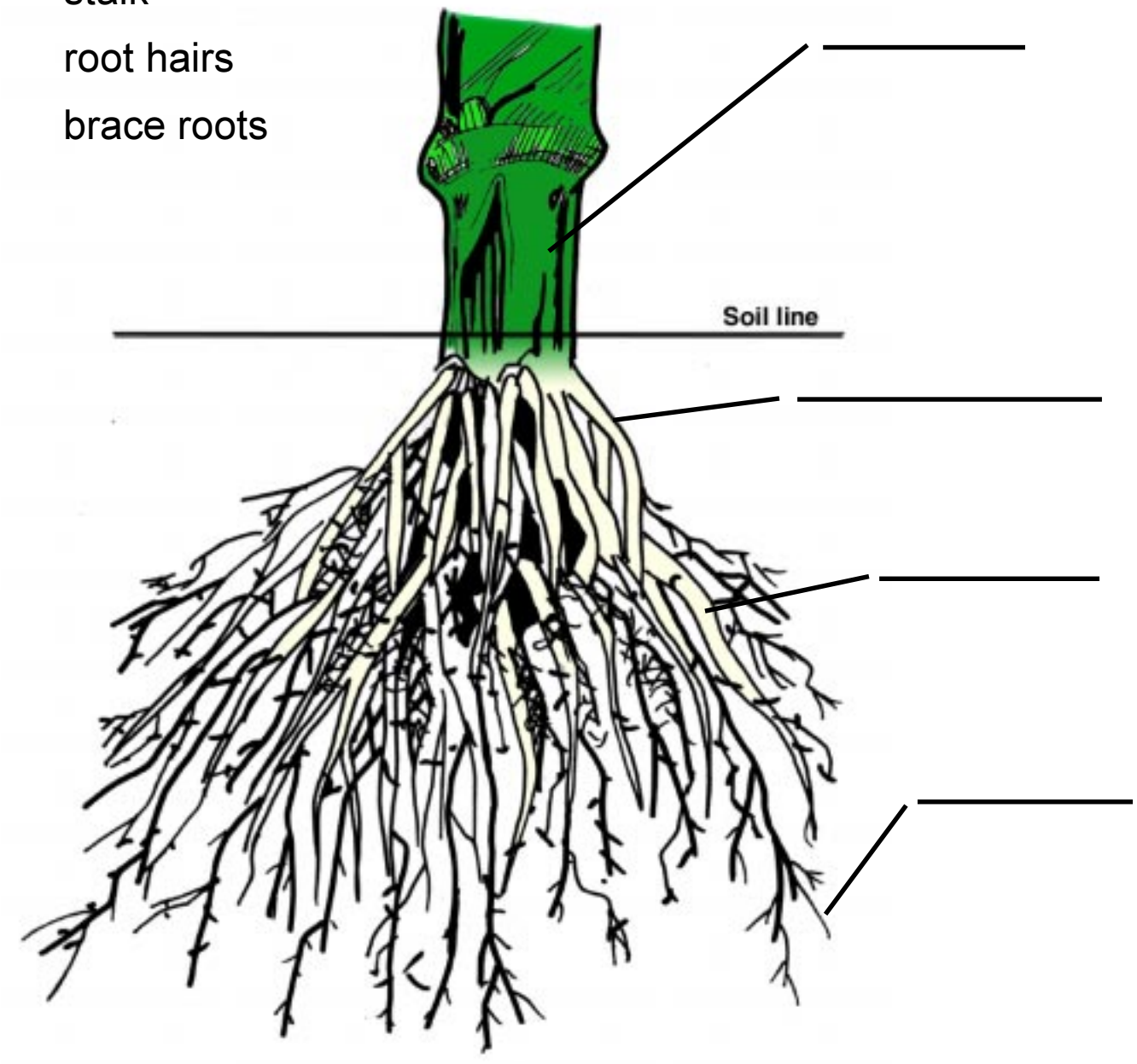
Match the parts to the name

nodal roots

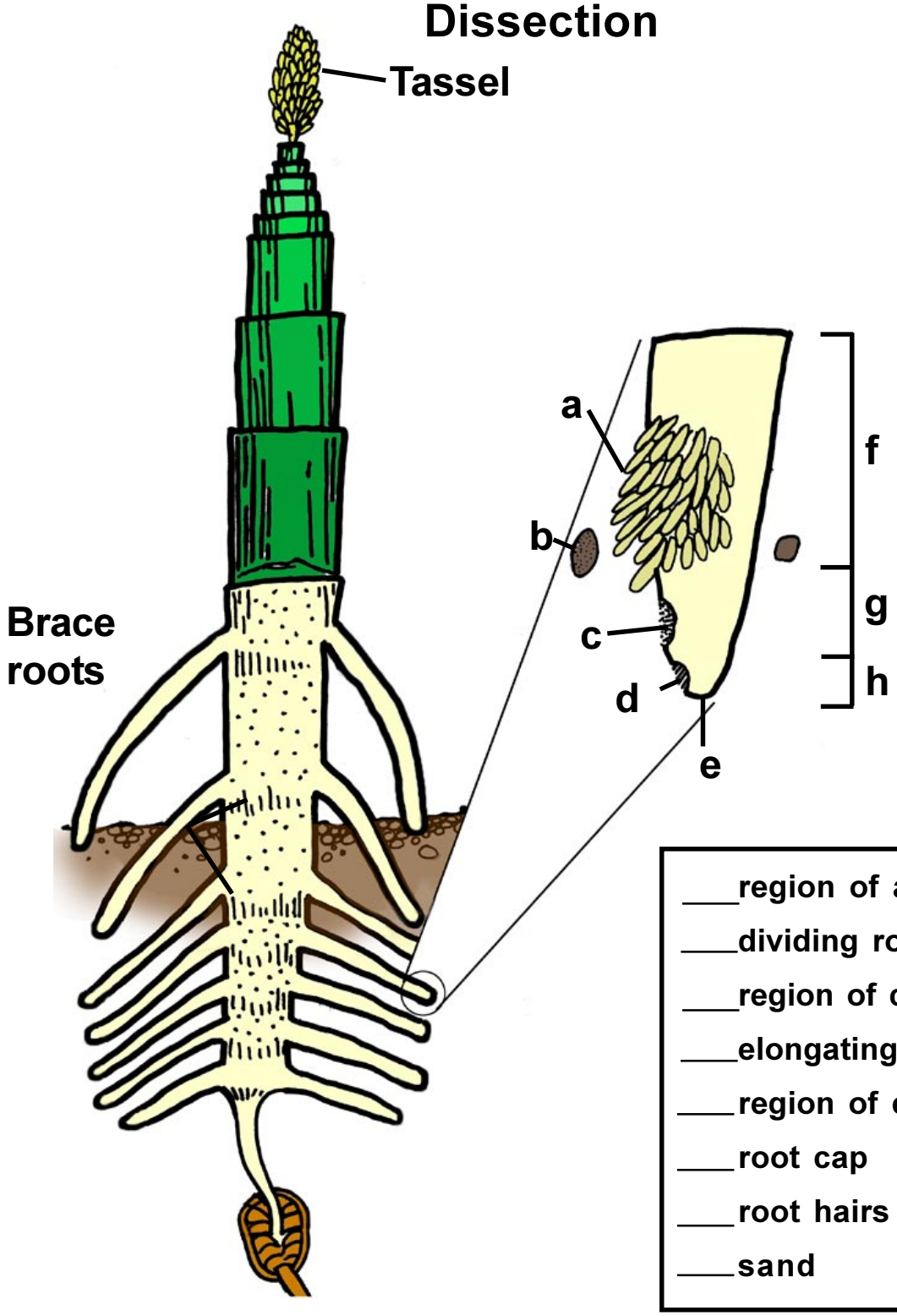
stalk

root hairs

brace roots



Dissection



___region of absorption
___dividing root cells
___region of cell division
___elongating root cells
___region of elongation
___root cap
___root hairs
___sand