



LESSON 1

Which Came First, the Corn or the Kernel?

Kentucky Academic Standards

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.

K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

07-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

07-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

BACKGROUND *****

Corn grows from kernels, or seeds of the plant. A kernel has four parts. The *pericarp* (seed coat) is the outer covering for protection. The *endosperm* is the largest section and stores food for the seed. The *germ* (embryo) is the only living part of the kernel. The *tip cap* attaches the kernel to the cob.

Growth of the Plant

A corn plant is a member of the grass family, made up of *seed*, *ear* (enclosed by husks), *root*, *stalk*, *leaf*, and *tassel*. Corn is usually planted about 2” deep in rows 15 to 30 inches apart. A corn kernel serves as the seed. Seeds need their own food supply to help them get started. The *endosperm* serves as the food supply for the corn kernel as it grows from *embryo* to plant. Thus, the corn plant begins its life cycle of approximately 120 days.

How does it all begin? Seeds soak up water which makes them swell. Once they swell enough to burst through their outer covering (*pericarp*) and sprout, they start to grow. Part of the embryo

grows down into the soil. Here the root can pick up water and minerals to support plant growth and serve as an anchor for the plant. Fields are fertilized and crops rotated to preserve nutrients in the soil.

Part of the plant pushes up through the soil to reach the sunlight. A single stalk forms and bears about 15 long broad leaves. Sunlight provides the energy necessary for *photosynthesis* to begin. During this process, the plant absorbs sunlight, water, and carbon dioxide which work with the plant's *chlorophyll* to produce the sugar that feeds the plant.

Once the plant matures and begins to produce the ears, the pollen from the tassels on top of the plant must fall on the silks to produce the corn kernels. Pollination, as it is called, occurs by the pollen falling, blowing in the wind, or being transferred by insects and birds to the silks. It is possible that the pollen from the tassel of one plant could pollinate the silks of another plant several fields away. For instance, when you shuck sweet corn, some kernels may be yellow, and some may be white. More than likely, those kernels have different parents.

Photosynthesis

Leaves are the part of the corn plant where food is produced by the process known as *photosynthesis*. Leaves are green because they contain chlorophyll. *Chlorophyll* is responsible for the green color of the leaves because it reflects green light and absorbs the other colors in sunlight. *Chlorophyll* is the substance that enables plants to combine carbon dioxide and water to form sugar. Carbon dioxide is found in the air and enters the corn plant through the *stomates* (tiny openings) on the underside of the leaves.

Water is absorbed from the soil through the roots, passing upward through xylem cells to the leaves. When chlorophyll is present and exposed to light, the carbon dioxide and water in the leaves combine to form sugar. Most of the sugar is converted to starch and stored in the plant cells until needed.

Oxygenation

During photosynthesis, oxygen is produced as a by-product and released into the air, creating the interdependent symbiotic relationship between the carbon dioxide absorbing plants and the oxygen absorbing animals.

TEACH

Activities:

1. Planting Corn Kernels - from Seed to Stalk

Materials

- corn kernels (3 per student or group)
- clear plastic wrap
- clear plastic bag or cup (1 per student or group)
- shoebox (1 for class or group)
- soil (1 cup per student or group)

Procedure

Give each student a clear plastic bag or cup. Have them fill bag/cup with about 1 cup soil. Next make a 1" depression with finger for planting 3 kernels. Cover the kernels with about 1 tablespoon soil. Sprinkle 1/3 cup water over planted kernels. Close bag, or cover cup, with clear plastic wrap and place plant in sunny area. Check planted kernel daily, record progress. Within 5 -10 days, sprouts (root and shoot) should be observed.

Remove a sprout from the soil so that students observe the parts of the corn kernel as it sprouts and grows (either a class demonstration or within groups). Note how gravity has affected the roots to head down deeper into the soil. Observe how the stem grows to reach the sun, quickly developing leaves to gather sun for photosynthesis. Encourage students to date and record observations of their corn plant, noting change over time (or draw a representation of their plant).

Note: When planting corn kernels, you may want to change variables on some of the plants. For example, plant some with more/less soil; some with more/less water; different light sources, etc. Compare/contrast results.

2. Observing Evidence of Photosynthesis

Materials

corn plant

tin foil, cardboard, or material to cover leaf

Procedure

Without sunlight, photosynthesis stops. But will chlorophyll still be present in the leaves? Cover one or more of the leaves of your plant with tin foil, card board, or some other sun-blocking material. Make sure that it is completely covered and no light will reach the leaf. After a week of sunny weather, observe the effects of the loss of light on you plants' growth and development. (*Note: The greater the leaf surface exposed to the sun, the greater opportunity for photosynthesis to occur for food production for your plant.*) Compare and contrast the *covered* leaf to one exposed to sunlight, or a plant with covered leaves and one without. You should discover that light **IS** needed for chlorophyll production in leaves.

3. Leaf's Surface Area in Correlation with Photosynthesis

Materials

corn plant

centimeter graph paper

Procedure

The surface area of leaves directly correlates to the amount of food that a plant can produce through photosynthesis. Find the average surface area of a typical corn leaf from a mature stalk. To find the area, place a leaf over a sheet of centimeter graph paper and trace around it. Count the number of squares to determine the area of the leaf in square centimeters.

4. Observing Oxygenation

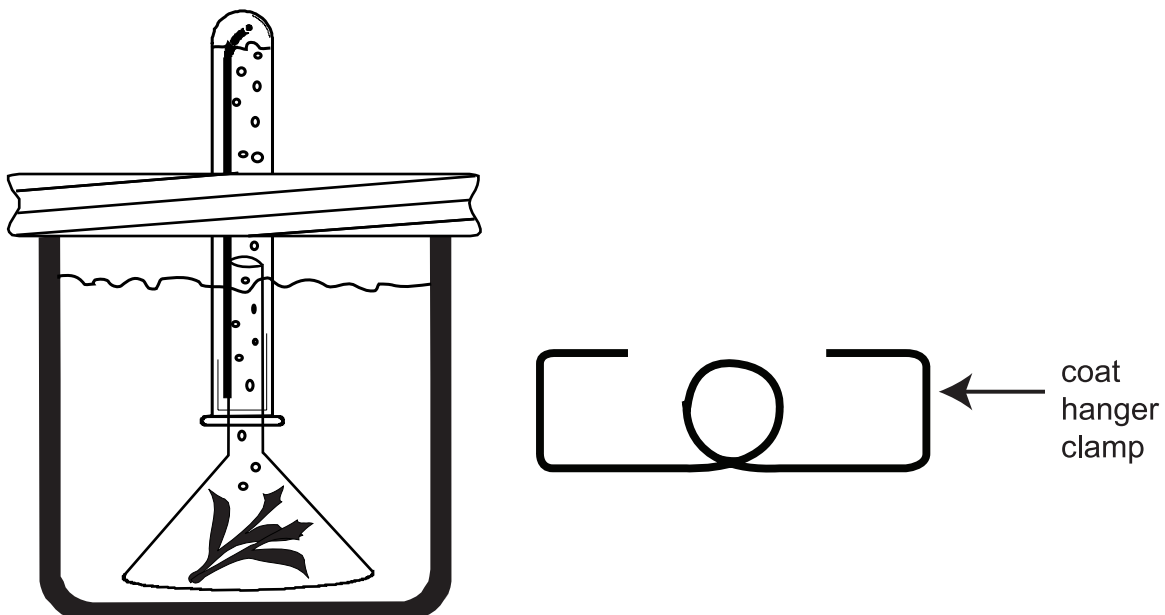
Materials

large wide-mouthed jar
long slender jar or test tube
coat hanger
glass or clear plastic funnel
thin strip of wood
sprig of Elodea (available at pet or aquarium stores)
plastic tubing or straw

Procedure

As a plant grows, through photosynthesis it produces its own food and creates oxygen as a waste by-product. Therefore, as plants grow they supply the atmosphere with oxygen. To observe this first hand, start with your large jar filled with water to within 2" of the top. Add the Elodea, and cover with funnel.

Make a clamp with coat hanger as shown in the diagram. Fill the small jar or test tube to the brim with water. Cover with fingers, plunge into the larger jar over the funnel trying not to let air enter the small jar. Attach the clamp. Remove any air from the small jar by sucking it out with a piece of tubing or a straw.



Set the entire experiment into strong sunlight. Tiny bubbles will appear on the leaves and rise in the small jar. These bubbles of pure oxygen will slowly force water out of the jar.

To prove that pure oxygen has been produced, when a considerable amount of gas has displaced the water in the jar, ignite the wood strip and blow it out. Remove the jar and insert the strip. It should glow brighter or re-ignite once it comes in contact with the pure oxygen produced by the Elodea plant.

5. Observing Phototropism

Materials

corn plant(s)
shoebox
plastic wrap

Procedure

Watch your plant grow toward the light source. Try placing one of the corn plants you grew in Activity 1 (should be a few inches tall) in a shoebox with an opening at one end to let sunlight in, but *not* directly on the plant. Note that *phototropism* (growth in a direction as a response to light) will cause the plant to grow toward the sun. Phototropism reinforces the need plants have for sunlight during photosynthesis, as the plant takes in sunlight for food production.

6. Observing Transpiration

Materials

corn plant
sheet of plastic wrap
string
food coloring (optional)

Procedure

Transpiration is how plants perspire! Students can observe the process by which plants absorb water from the ground and cycle it back into the air through evaporation. Cover your corn plant with a sheet of plastic wrap to form a puffy bag around the leafy part of the plant. Seal the bag by gathering the plastic at the base of the plant just above the soil and tying it with a string. Put the plant in direct sunlight for several hours. Observe the moisture collecting on the leaves and on the inside of the plastic. Adding food coloring to the water you feed your plant may make the results of this experiment more dramatic. (*Note: A single mature corn plant can give off as much as 50 gallons of water in one growing season!*)

ASSESSMENT

- Have students describe the role photosynthesis plays in oxygenation. What by-product is given off? How does this by-product affect animals?
- Draw a chart to show transpiration occurring during plant growth. How might pollution affect this process?
- Describe the symbiotic relationship between plants and animals, using correct terminology (oxygenation and transpiration resulting from photosynthesis).
- Crossword puzzle to reinforce vocabulary. Use Vocabulary Sheet to work puzzle.



Can you identify the parts of a corn plant?

Please draw a line from the terms on the right to the correct part of the plant.



Soil Level

Tassel

Crown Roots

Ear

Stalk

Silk

Prop Roots

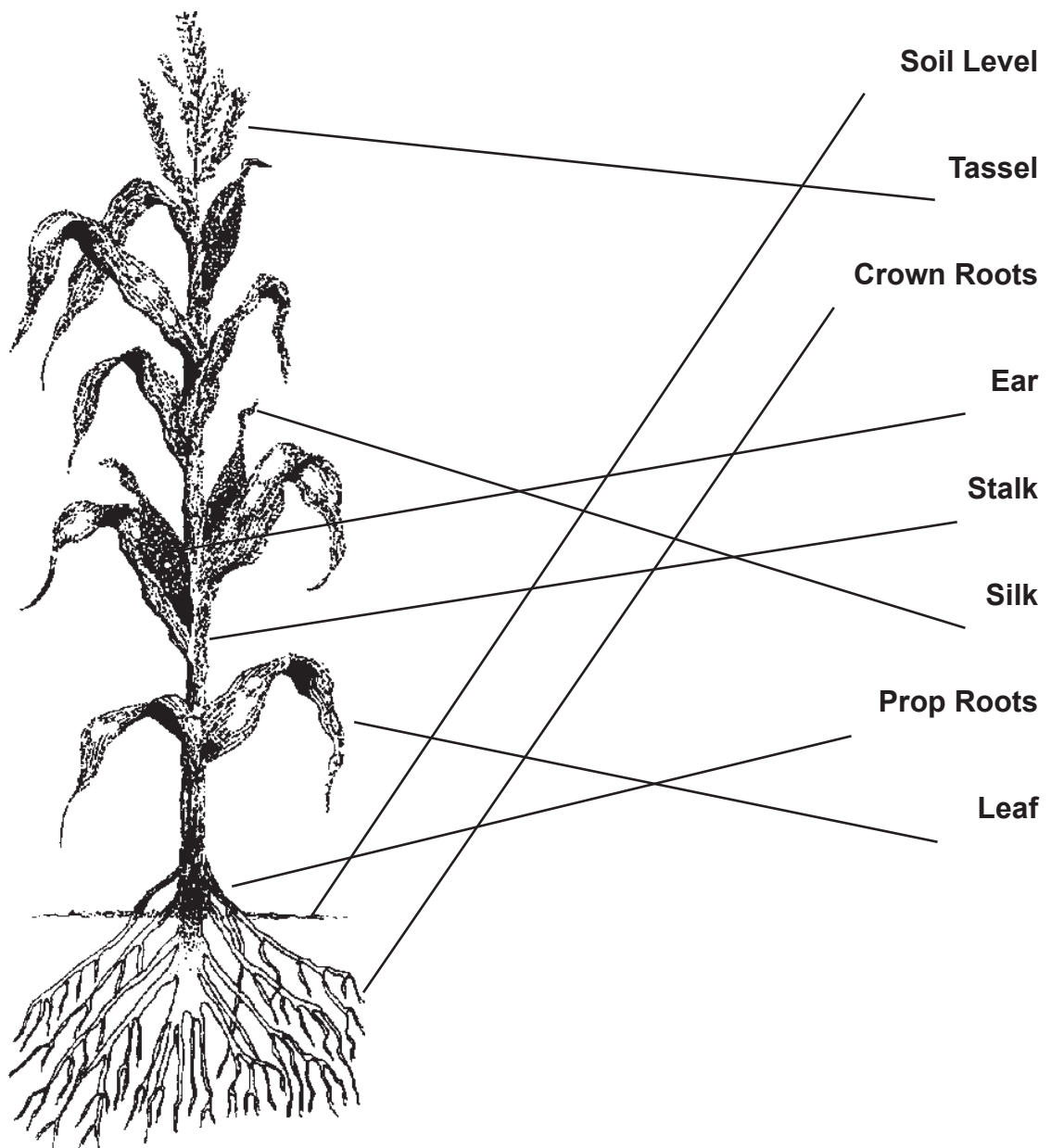
Leaf



ANSWER KEY

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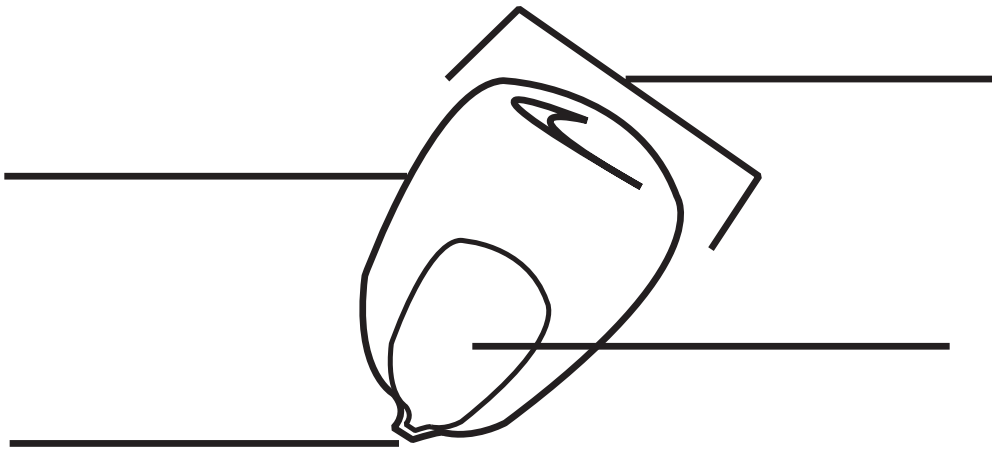


Can you identify the parts of a corn kernel?

Label the parts of the corn kernel. On the lines below, tell what each part does.

endosperm
pericarp

germ (embryo)
tip cap





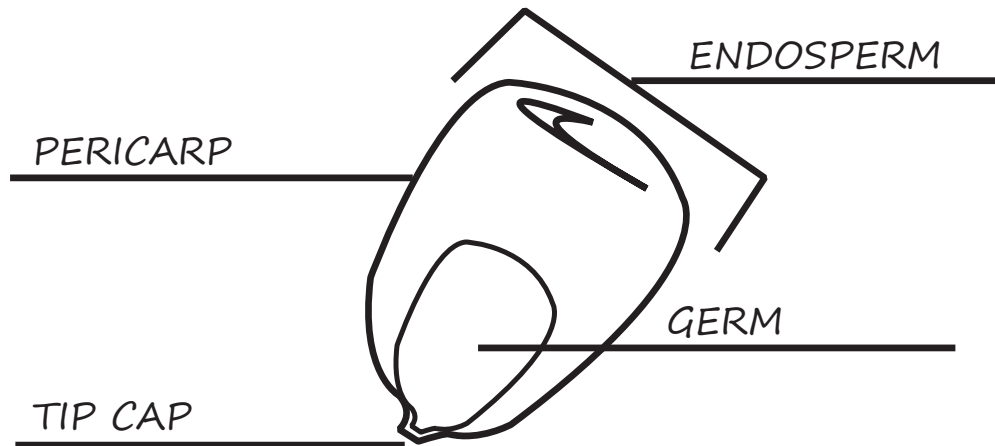
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ENDOSPERM - starchy part of the kernel; provides food for the sprouting plant.

GERM - live part of the kernel from which the corn plant develops when planted.

PERICARP - hard covering that protects the kernel.

TIP CAP - where the kernel attaches to the cob of the ear.



Corn Vocabulary & Crossword Puzzle

chlorophyll - substance that enables plants to combine carbon dioxide and water to form sugar; green coloring matter in plants that reflects green light and absorbs the other colors in sunlight.

endosperm - the largest section of the corn kernel; stores food for seed; serves as the food supply for the corn kernel as it grows from embryo to plant

germ - only living part of kernel

kernel - the corn seed

leaf - part of the plant where food is produced by photosynthesis

oxygenation - release of oxygen by plants

pericarp - when seeds soak up water and swell, they burst through their outer covering, the pericarp; outer covering that protects the seed

photosynthesis - process by which plants make their own food

phototropism - growth in a direction in response to light

pollination - fertilization of the plant

root - in the soil; picks up water and minerals to support plant growth and anchors plant to ground

sunlight - what plants need to make their own food

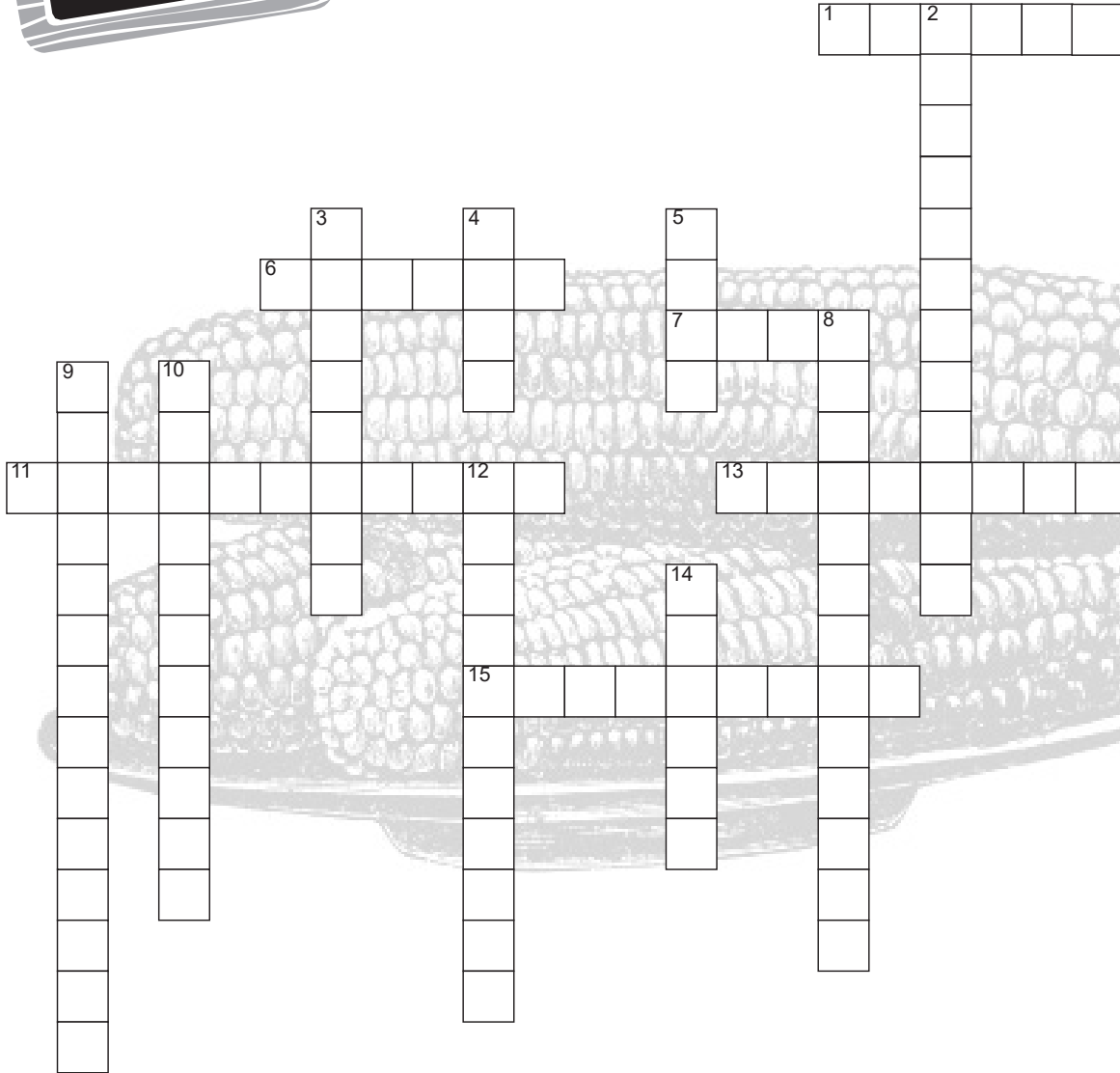
tassel - at the top of the corn stalk; produces pollen

tip cap - attaches kernel to cob

transpiration - process by which plants recycle ground water to air



Use the vocabulary words you just learned to fill in the crossword puzzle below. If you get stumped, look back at your vocabulary words to match them with the clues below.



Across

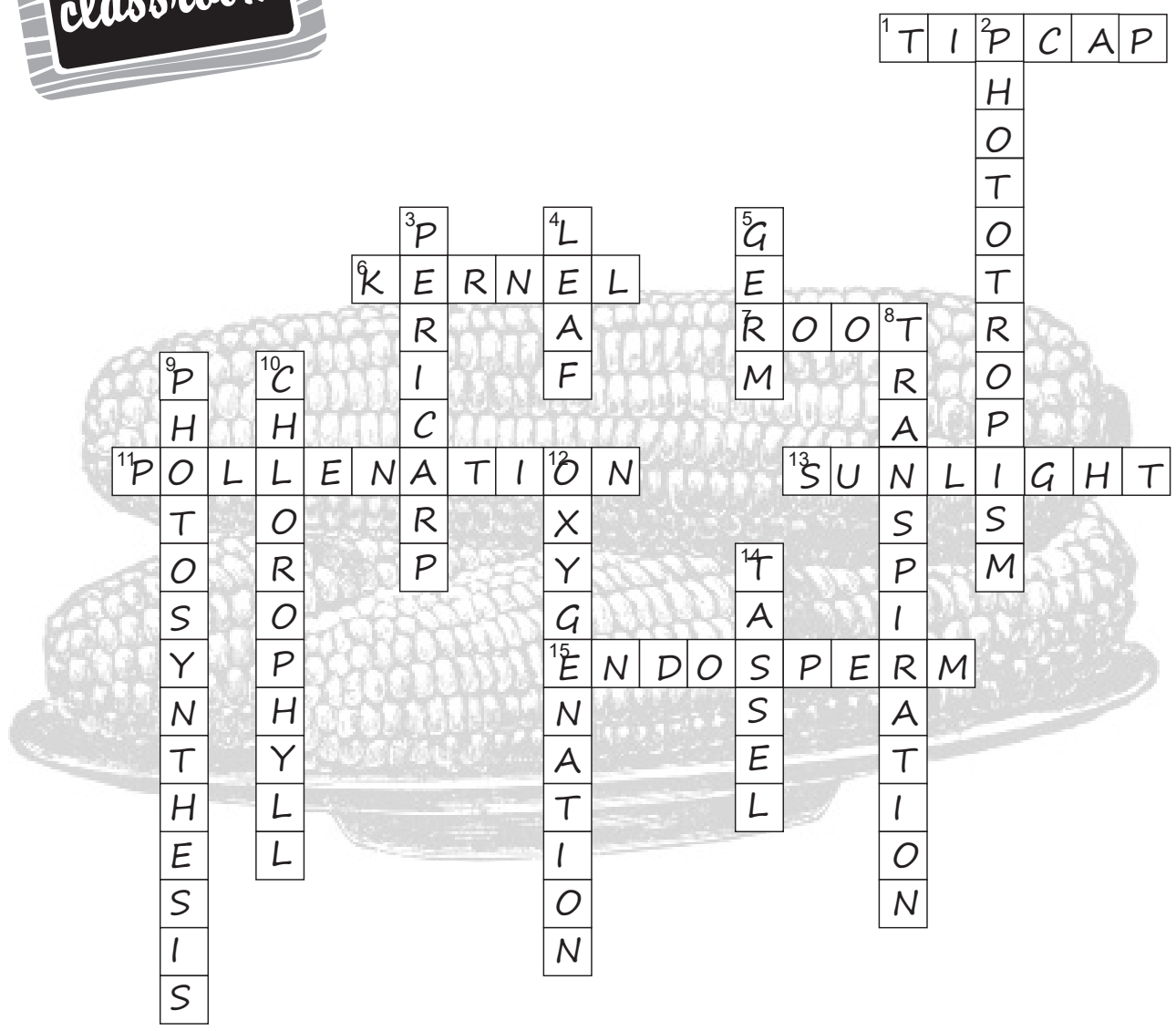
- 1 attaches kernel to cob
- 6 corn seed
- 7 anchors plant in ground
- 11 fertilization of the plant
- 13 what plants need to make their own food
- 15 stores food for seed

Down

- 2 growth in a direction in response to light
- 3 outer seed coat for protection
- 4 part of plant where food is produced
- 5 only living part of kernel
- 8 process by which plants recycle ground water to air
- 9 process by which plants make their own food
- 10 green coloring matter in plants
- 12 release of oxygen by plants
- 14 male part of corn plant



ANSWER KEY



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