



# SCIENCE

TEACHER'S GUIDE

▶ **6th Grade**

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# SCIENCE 600

## Teacher's Guide

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## INSTRUCTIONS FOR SCIENCE

The LIFEPAC curriculum for grades two through twelve was written with the daily instructional material written directly in the LIFEPACs. The student is encouraged to read and follow his own instructional material, thus developing independent study habits. The teacher should introduce the LIFEPAC to the student, set a required completion schedule, complete teacher checks, be available for questions regarding both subject content and procedures, administer and grade tests, and develop additional learning activities as desired. Teachers working with several students may schedule their time so that students are assigned a quiet work activity when it is necessary to spend instructional time with one particular student.

The Teacher Notes section of the Teacher's Guide lists the required or suggested materials for the LIFEPACs and provides additional learning activities for the students. The materials section refers only to LIFEPAC materials and does not include materials which may be needed for the additional activities. Additional learning activities provide a change from the daily school routine, encourage the student's interest in learning, and may be used as a reward for good study habits.

If you have limited facilities and are not able to perform all the experiments contained in the LIFEPAC curriculum, the Science Project List may be a useful tool for you. This list prioritizes experiments into three categories: those essential to perform, those which should be performed as time and facilities permit, and

those not essential for mastery of LIFEPACs. Of course, for complete understanding of concepts and student participation in the curriculum, all experiments should be performed whenever practical. Materials for the experiments are shown in Teacher Notes - Materials Needed.

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A suggested support item for this course is the 6th Grade Science Experiments video, SD0601. The video includes presentations of many of the experiments in this course. Several of the experiments that require special equipment or materials are demonstrated on these videos. They can either be used for answering the questions of the lab report or as a demonstration of the procedure prior to performing the experiment. A notice is included with each experiment in the LIFEPAC where the video is available.

# **SCIENCE 601**

## Unit 1: Plant Systems

# TEACHING NOTES

## MATERIALS NEEDED FOR LIFE PAC

### Required

- growing plant
- 4 kernels of corn
- 4 tall, thin bottles
- soda crackers
- iodine solution
- 2 small baby-food jars
- Benedict's solution or glucose test strips
- 4 radish or corn seeds
- 1 plastic bag
- paper towels
- scissors
- stapler
- 2 thumbtacks
- hand lens
- water
- food coloring (red or blue)
- celery stick with leaves
- tall baby food jar or glass
- metric ruler
- fresh leaf of lettuce
- single-edged razor blade
- microscope
- microscope slide and slip cover

### Suggested

- plant publications from county agent
- Pyrex container (about 250 ml)
- alcohol
- hot plate
- iodine solution
- test tube
- encyclopedia or online resources
- 6th grade Science Experiments video

## ADDITIONAL LEARNING ACTIVITIES

### Section 1: Photosynthesis System

1. Have your students place several plants on the window sill. Turn several of them slightly each day. Let others remain in one position. Compare the plants at the end of two weeks.
2. Place several plants in different types of light, including the darkness of a closet. Compare plants at the end of two weeks.
3. Have the students examine different fall leaves under a microscope. How are they different from the green leaf section?
4. Have the students examine the root of a plant. Then, have them describe the nodules on the plant.
5. Look up several desert plants in an encyclopedia or online. Compare these plants to plants with leaves.
6. Plant some morning glory plants. Observe the time that the flower blooms. Why does this happen?

**Section 2: Transport System**

1. Dissect a plant.
2. Make cuttings of a fast-growing plant such as philodendron or coleus. Have each student grow his cutting in water and then plant it.
3. Go outside with a friend and select several plant stems that look different. Try to locate the pith and vascular bundles.
4. With a classmate or friend, make a large poster showing the parts of a plant. Label the parts.

**Section 3: The Regulatory System**

1. Place several plants in your classroom. Let your students take care of them.
2. With several classmates, soak some radish seeds for three hours. Then plant them in cut-off milk cartons. In some of them, add nothing but water. In the others, add house plant fertilizer. Compare the growth of the plants.
3. Repeat the above activity, but plant the seeds in different types of soil (sandy, clay, etc.), adding no fertilizer, only water.
4. Visit a local nursery and ask one of the workers to explain how and why bushes are pruned to make them full. Encourage your students to ask any other questions that might interest them about landscaping, plant care, etc.
5. Investigate how plants are grown organically. Why are organically grown plants better for your body? Write a report (minimum 2 pages) about what you learn.



# ANSWER KEYS

## SECTION 1

- 1.1 The water level in both tubes dropped. The one in the light dropped more than the one in the dark
- 1.2 yes
- 1.3 the one in the light
- 1.4 light
- 1.5 amount of light
- 1.6 chloroplasts
- 1.7 palisade
- 1.8 top
- 1.9 As follows:

SEEDS IN THE DARK		
Date	Wet Seed	Dry Seed
1	no change in size	no change
3	seed larger	no change
5	root and stem have begun to grow	no change
7	root and stem about 4 cm long	no change
9	root and stem about 8 cm long; root white, stem white	no change
11	root and stem about 10 cm long; root and stem white	no change

SEEDS IN THE SUN		
Date	Wet Seed	Dry Seed
1	no change in size	no change
3	seed larger	no change
5	root and stem have begun to grow	no change
7	root and stem about 4 cm long	no change
9	root and stem about 9 cm long; root white, stem green	no change
11	root and stem about 12 cm long; root and stem green	no change

- 1.10 wet
- 1.11 sunlight
- 1.12 Any order:
  - a. water
  - b. sunlight
- 1.13 sunlight
- 1.14 those in sunlight
- 1.15 sunlight
- 1.16 sunlight
- 1.17 palisade
- 1.18 top
- 1.19 The top of the leaf will get more sunshine. The bottom of the leaf will be in the shade (dark).

- |                      |                 |
|----------------------|-----------------|
| <b>1.20 (Across)</b> | <b>(Down)</b>   |
| 1. chloroplast       | 1. complex      |
| 6. life              | 2. root         |
| 7. plants            | 3. animal       |
| 9. algae             | 4. tree         |
| 11. energy           | 5. made or gave |
|                      | 8. say          |
|                      | 10. God         |

- 1.21 **Record of Results**
  - blue
  - yellow
  - orange or green
  - red
- 1.22 b. decreased
- 1.23 a. blue to red
- 1.24 a. glucose increased
- 1.25 b
- 1.26 a
- 1.27 d
- 1.28 e
- 1.29 c
- 1.30 right (red)
- 1.31 left (green)
- 1.32 red
- 1.33 red
- 1.34 red
- 1.35 Because the leaf soaks up the rest of the colors. The green color bounces back so we can see it.
- 1.36 Because all that light bounces off and the leaf doesn't have any sunlight to use in photosynthesis.

- 1.37** Any order:  
 a. temperature  
 b. amount of sunshine  
 c. amount of rain (moisture)
- 1.38** Natural fertilizers that come from living things are called organic fertilizers.
- 1.39** d  
**1.40** a  
**1.41** e  
**1.42** b  
**1.43** f  
**1.44** c

## SELF TEST 1

- 1.01** h  
**1.02** g  
**1.03** a  
**1.04** l  
**1.05** c  
**1.06** k  
**1.07** m  
**1.08** e  
**1.09** f  
**1.010** i  
**1.011** red  
**1.012** glucose  
**1.013** oxygen  
**1.014** organic  
**1.015** Any order:  
 a. light (color)  
 b. water  
 c. minerals  
 d. carbon dioxide
- 1.016** Any order:  
 a. palisade  
 b. spongy
- 1.017** b  
**1.018** c  
**1.019** d  
**1.020** b  
**1.021** d  
**1.022** a  
**1.023** b  
**1.024** a  
**1.025** c  
**1.026** d
- 1.027** The leaf factory takes water and carbon dioxide with chlorophyll and light energy to make starch and oxygen.
- 1.028** Hint: This is a good place to receive oral answers and discussion.
- 1.029** Refer to diagram in LIFE PAC.
- 1.030** Example: I would give the plants the best fertilizer for their growth. I would put them in red light, keep them watered, and obtain a high carbon dioxide level.

## SECTION 2

- 2.1 Hint: Look for detail and specifics.  
 2.2 Hint: Detail is important.  
 2.3 Stress accuracy and detail. Does it “really” look as it is drawn.  
 2.4 Nearer the tip end.  
 2.5 Yes. This is so the greatest amount of water and minerals will be able to be taken into the root. (Should get at concept of increased surface area.)  
 2.6 Look for details.  
 2.7 They spread out in the soil to take in water and minerals and to anchor the plant in the soil.  
 2.8 xylem  
 2.9 phloem  
 2.10 cortex  
 2.11
- | Time    | Observation   |
|---------|---|
| 15 min. | The food coloring has moved up the stalk about 3cm. The coloring is in streaks. The whole stalk is not colored. |
| 30 min. | The coloring has moved up about 15 cm.  |
| 24 hrs. | The coloring has moved all the way up into the leaves. The color has concentrated at the leaf ends.             |
- 2.12 Answers will vary. Probably will include the stringy nature of the celery.  
 2.13 a. red or blue (whichever you use)  
 b. They are the only parts that show the food coloring.  
 2.14 red or blue (whichever you use) at tip  
 2.15 The food coloring had moved all the way up the stem into the leaves.  
 2.16 Teacher check

## SELF TEST 2

- 2.01 true  
 2.02 false  
 2.03 false  
 2.04 true  
 2.05 true  
 2.06 true  
 2.07 true  
 2.08 false  
 2.09 false  
 2.010 true  
 2.011 b  
 2.012 c  
 2.013 a  
 2.014 c  
 2.015 d  
 2.016 a  
 2.017 a  
 2.018 d  
 2.019 a  
 2.020 c  
 2.021 a  
 2.022 c  
 2.023 d  
 2.024 b  
 2.025 e  
 2.026 d  
 2.027 b  
 2.028 e  
 2.029 a  
 2.030 f  
 2.031 c  
 2.032 g  
 2.033 stem  
 2.034 starch or glucose  
 2.035 starch  
 2.036 cortex  
 2.037 starch  
 2.038 bark  
 2.039 oxygen  
 2.040 stem

## SECTION 3

- 3.1** Record of observations of stem in water
- | Date | Observations  |
|------|---|
| 1    | No change.  |
| 3    | No change.  |
| 5    | White bumps begin to show at the cut on the stem.     |
| 7    | Roots appear to be growing on the stem.               |
| 9    | Roots are about 2-5 mm long. Several are now visible. |
- 3.2** It starts to grow roots.
- 3.3** yes
- 3.4** The stem produced chemicals to start the roots growing.
- 3.5** Use gibberellin.
- 3.6** Place the stem in water.
- 3.7**
- nongreen
  - abnormal
  - nonflowering
  - misuse
  - nontoxic
  - nonrigid
  - misinterpret
  - nonprotective
  - misplant
- 3.8** 2, 4-D
- 3.9** cancer, liver decay, or disease
- 3.10** Examples: oats, soybeans, beets
- 3.11** Examples: Farmers and gardeners use chemical regulators to control harmful weeds in their crops.
- 3.12** Example: Some chemical regulators are harmful to man. Some chemical regulators pollute the soil and atmosphere.

## SELF TEST 3

- 3.01** h
- 3.02** g
- 3.03** j
- 3.04** d
- 3.05** l
- 3.06** i
- 3.07** e
- 3.08** c
- 3.09** a
- 3.010** b
- 3.011** false
- 3.012** false
- 3.013** true
- 3.014** true
- 3.015** false
- 3.016** false
- 3.017** true
- 3.018** true
- 3.019** false
- 3.020** false
- 3.021** b
- 3.022** c
- 3.023** a
- 3.024** d
- 3.025** Any order:
- anchor plants
  - transport water and minerals
  - store food
- 3.026** broad
- 3.027** tissue decay
- 3.028** cortex
- 3.029** glucose
- 3.030** The grass will turn yellow because it can't get sunlight and the chloroplasts die.
- 3.031** Plant veins transport minerals and water from the roots to the leaf tips.
- 3.032** The stomata open and close, letting oxygen out and carbon dioxide into the leaf.
- 3.033** When the leaf dies, the chloroplast dies. This causes the green chlorophyll to be lost so the other colors can be seen.

## LIFEPAC TEST

1. a
2. g
3. f
4. j
5. c
6. i
7. e
8. h
9. d
10. b
11. cuticle
12. epidermis
13. chloroplast
14. xylem
15. phloem
16. d. epidermis
17. b. root hair
18. a. vascular cylinder
19. e. root cap
20. c. cortex
21. a
22. b
23. a
24. d
25. c
26. d
27. d
28. a
29. a
30. c
31. Any order:
  - a. color of light
  - b. amount of water and/or minerals
  - c. amount of carbon dioxide
32. Answers may vary. Any order:
  - a. can cause cancer in man and animals
  - b. may kill plants you don't want killed

## ALTERNATE LIFEPAC TEST

1. c
2. e
3. h
4. b
5. j
6. i
7. a
8. f
9. g
10. d
11. b
12. e
13. a
14. c
15. d
16. vascular cylinder
17. root hair
18. cortex
19. epidermis
20. root cap
21. b
22. a
23. c
24. c
25. c
26. a
27. c
28. b
29. c
30. d
31. Answers may vary. Examples; any order:
  - a. Auxin causes young cells to grow longer than normal.
  - b. Gibberellin helps corn and wheat grow three to five times as tall as normal.
  - c. Auxin can produce tomatoes with no seeds.
32. Answers may vary. Examples; either order:
  - a. Some artificial regulators are selective. They kill weeds but not crops.
  - b. Yields are greater so prices are lower.

# SCIENCE 601

## ALTERNATE LIFEPAC TEST

**NAME** \_\_\_\_\_

**DATE** \_\_\_\_\_

**SCORE** \_\_\_\_\_

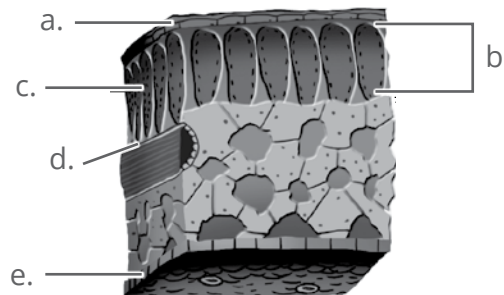


**Match these items** (each answer, 2 points).

- |                      |   |
|----------------------|---|
| 1. _____ chlorophyll | a. sugar made during photosynthesis                   |
| 2. _____ light       | b. a chemical produced in the growing tips of roots   |
| 3. _____ oxygen      | c. green "stuff" in plants                            |
| 4. _____ auxin       | d. storage part of root                               |
| 5. _____ legume      | e. energy for photosynthesis                          |
| 6. _____ enzyme      | f. natural fertilizer                                 |
| 7. _____ glucose     | g. man-made   |
| 8. _____ manure      | h. by-product of photosynthesis                       |
| 9. _____ artificial  | i. chemical used to help digestion                    |
| 10. _____ cortex     | j. a plant which does not take nitrogen from the soil |

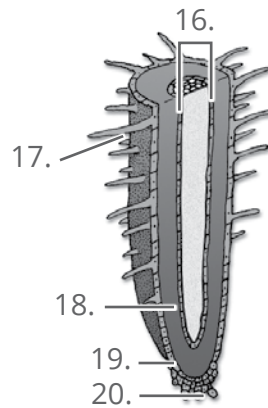
**Write the correct letter to match with the part on the line** (each answer, 3 points).

11. \_\_\_\_\_ palisade layer
12. \_\_\_\_\_ stomata
13. \_\_\_\_\_ cuticle
14. \_\_\_\_\_ chloroplast
15. \_\_\_\_\_ phloem



Complete this diagram with the name of each part (each answer, 4 points).

16. \_\_\_\_\_
17. \_\_\_\_\_
18. \_\_\_\_\_
19. \_\_\_\_\_
20. \_\_\_\_\_



Write the letter of the correct answer on each line (each answer, 3 points).

21. Iodine turns \_\_\_\_\_ bluish-black.
 

a. sugar	b. starch	c. fats	d. protein
----------	-----------	---------	------------
22. The worst light for growing plants is \_\_\_\_\_.
 

a. green	b. blue	c. orange	d. red
----------	---------	-----------	--------
23. Leaves appear green because the \_\_\_\_\_ light bounces off the leaf.
 

a. white	b. black	c. green	d. red
----------	----------	----------	--------
24. For plants to grow best, they must have \_\_\_\_\_.
  - a. light and food
  - b. oxygen and food
  - c. light, food, water, and carbon dioxide
  - d. air
25. Natural fertilizer is called \_\_\_\_\_ fertilizer.
 

a. artificial	b. liquid	c. organic	d. spongy
---------------	-----------	------------	-----------
26. The use of \_\_\_\_\_ indicates the presence of glucose by turning red.
 

a. Benedict's solution	b. litmus	c. iodine	d. alcohol
------------------------	-----------	-----------	------------
27. Water and minerals are absorbed by \_\_\_\_\_.
 

a. leaves	b. stems	c. root hairs	d. cortex
-----------	----------	---------------	-----------
28. Water and minerals are carried upward by \_\_\_\_\_.
 

a. phloem	b. xylem	c. pith	d. bark
-----------	----------	---------	---------
29. The gas plants need to carry on photosynthesis is \_\_\_\_\_.
 

a. oxygen	b. nitrogen	c. carbon dioxide	d. methane
-----------	-------------	-------------------	------------
30. The chemical found in saliva is a(n) \_\_\_\_\_.
 

a. legume	b. bacteria	c. starch	d. enzyme
-----------	-------------	-----------	-----------

**Complete these activities** (each answer, 3 points).

**31.** List three ways plants regulate growth naturally.

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

**32.** Name two advantages of using artificial regulators.

a. \_\_\_\_\_

b. \_\_\_\_\_







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