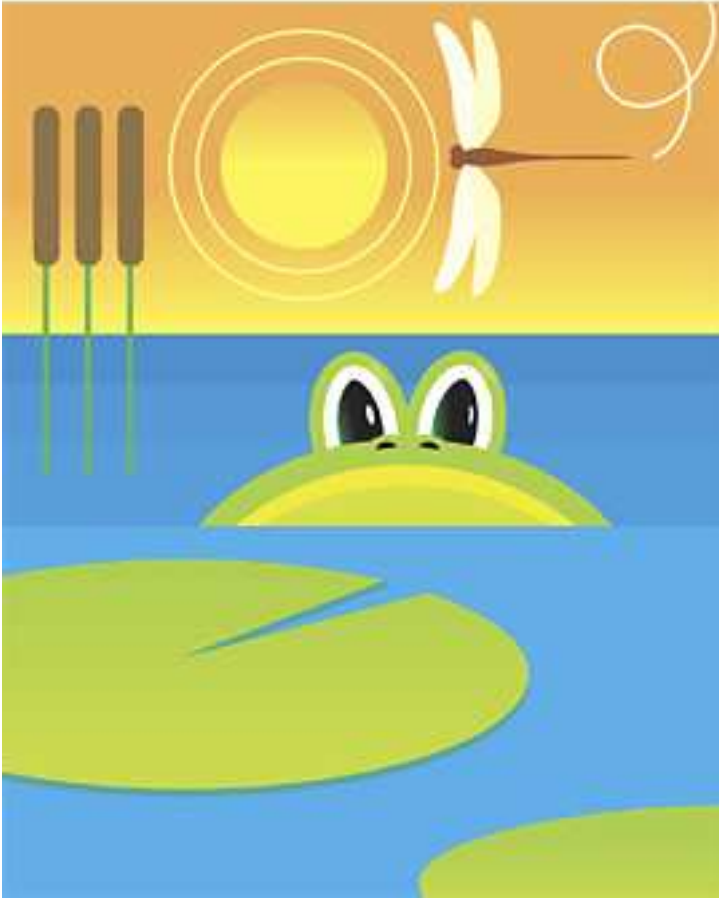


Threads in a Web



STUDENT ANSWER BOOKLET

Name

Date

Threads in a Web

Engagement



The science teachers in your school are having a contest. All science students are being asked to create a design for the bulletin board in the science hallway. The students in each class with the most effective bulletin board proposals will be invited to a pizza party, and the student whose design is judged best in the school will select a team of students to help install his or her design on the bulletin board.

The theme of the bulletin board is "All life on earth is linked, directly or indirectly, by the transfer of energy from its original source." Bulletin boards will be judged on how creatively and effectively they explain this theme, how accurately science concepts are stated, the amount of information used to illustrate and clarify science concepts, and how well the designs work visually.

Activity 1a – What Do You Already Know?

Before beginning the designs, all classes are divided into teams to research the flow of energy through the food chain. Start your research by discussing with your group what you already know about the topic. Make a list of what your group already knows about:

"All life on earth is linked by the transfer of energy throughout the food chain."

Exploration

In thinking about the flow of energy through the food chain, many of you probably remembered that plants make their own food. A process called **photosynthesis** enables plants to use the energy in sunlight to make sugars (food) out of carbon dioxide and water. This food can be used immediately for fuel or it may be stored for later use. A simple test has been developed that can demonstrate that the plant foods we eat contain sugar, even when they don't taste sweet.

The following roles may be assigned to individual students for this task:

- **Principal Investigator** - is in charge of all operations associated with the group activity. The "PI" checks the assignment, communicates the directions of the teacher, provides assistance to other group members, and conducts group discussions about results.
- **Materials Manager** - the "MM" obtains and dispenses materials and equipment for activity. The "MM" also sets up and operates the activity equipment in cooperation with the "PI."
- **Recorder/Reporter** - the "R&R" is in charge of collecting and recording information on the group worksheet(s). Also reports results to the class.
- **Maintenance Director** - the "MD" is in charge of cleaning up the work station and can assign other members to assist. Also is in charge of group and individual safety. Also verifies the work of the "R&R."

Activity 1b- How Sweet It Is

Read over the materials and procedures on the next page. What **question** do you think this experiment is designed to answer?

Based on what you already know about the foods you will be testing, which ones do you **predict** will have the highest percentage of sugar?

Materials You Will Need:

- Liquefied lemon, lettuce, onion and banana
- Eye dropper
- Tweezers
- Lab aprons
- Eight test tubes and test tube rack
- "Clinitest" tablets and color chart
- Safety goggles

Procedure:

1. Protect your eyes with goggles and your clothing with lab aprons.
2. Place 12 drops of each liquefied food into four separate test tubes, rinsing the eyedropper after each use. Label each test tube using masking tape or wax pencil.
3. Pick up "Clinitest" tablets with tweezers, adding one half (1/2) tablet to each test tube. Record the **data** below. Put a title on your table, and appropriate headings on both columns and rows.
4. **Repeat** the test for each food. Use clean test tubes and eye droppers for each trial.
5. Calculate the mean (average %) for each material being tested.



Materials Being Tested				
Trial 1				
Trial 2				
Trial 3				
Mean (Average %)				

Activity 1c – Graphing Your Data

Now make a bar graph comparing the amount of sugar in the different foods. Be sure to properly label your axes, and to put a title on your graph.



Activity 1d – Drawing Conclusions

What **conclusions** can you draw from your data? Did the percentage of sugar in each food appear to be more or less than you expected?

Activity 1e – Chlorophyll and Photosynthesis

Now go to the website - http://www.educationworld.com/a_lesson/lesson/lesson024.shtml.

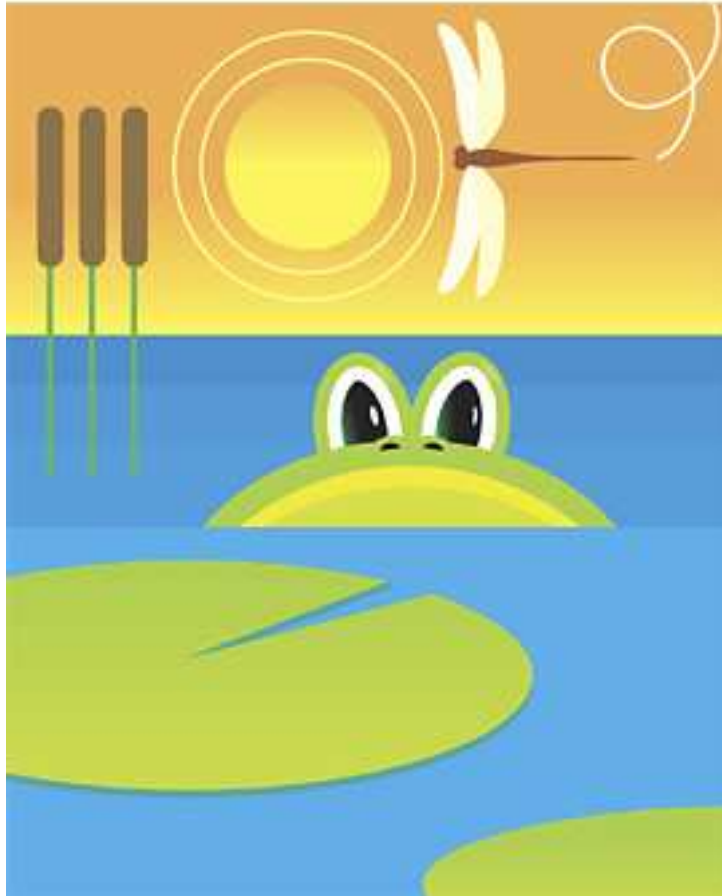
What is the role of the green pigment chlorophyll in photosynthesis?

What two things happen to the sugars formed by the plant during photosynthesis?

Activity 1f – Source of Energy for Photosynthesis

What is the source of the energy that flows through most of the food chains on earth?

Threads in a Web



Assessment/Scoring Guide

SCORING GUIDE

Activity 1a

Lists of at least three ideas about the transfer of energy through the food chain.

1 pt. - Lists done

0 pt. - Blank or incomplete

Activity 1b

Answers will vary.

2 pt. Any reasonable question and prediction about sugar in plants

Table has title

Table is filled in completely

Table has row and column headings

1 pt. - One or two items missing

0 pt. - Blank or more than two items missing

Activity 1c

Use attached “Graph from Scientific Data” Scoring Tool.

Activity 1d

Answers will vary.

1 pt. - Any reasonable answer in a complete sentence.

0 pt. - Blank or incomplete

Activity 1e

- *Chlorophyll traps light energy from the sun, which is needed to help change water and carbon dioxide into sugar and oxygen.*

- *Some of the sugars formed are used by the plant for its own life processes, such as growth. Some sugar is stored.*

1 pt. - Correct answers

0 pt. - Blank, incomplete or incorrect

Activity 1f

The sun provides the energy that flows through most of the food chains on Earth.

1 pt. - Correct answer

0 pt. - Blank, incomplete or incorrect

Activity 2a

- *Hawks are third-order consumers.*

- *Mockingbirds are secondary consumers.*

- *Grasshoppers are primary consumers.*

- *Grasses are producers.*

1 pt. - Correct answers

0 pt. - Blank, incomplete or incorrect

Activity 2b

Answers will vary. Some good answers are:

- *Humans control the environment by irrigating crops, providing shelter for livestock during severe weather.*

- *Humans have learned to obtain extra energy by burning fossil fuels.*

- *Humans protect themselves with houses and clothing from heat loss.*

1 pt. - Any reasonable answer in a complete sentence

0 pt. - Blank or incomplete

Activity 2c Answers will vary. Some good answers are:

- Dead organisms would take up too much space.
- Nutrients would not be recycled.

1 pt. - Any reasonable answer in a complete sentence
 0 pt. - Blank or incomplete

Activity 2d Answers will vary. Chart should be filled in with at least five items in each column.

1 pt. - Chart filled in
 0 pt. - Blank or incomplete

Activity 2e Answers will vary.

1 pt. - Any reasonable answer in a complete sentence
 0 pt. - Blank or incomplete

Activity 3a List of at least three complex feeding relationships

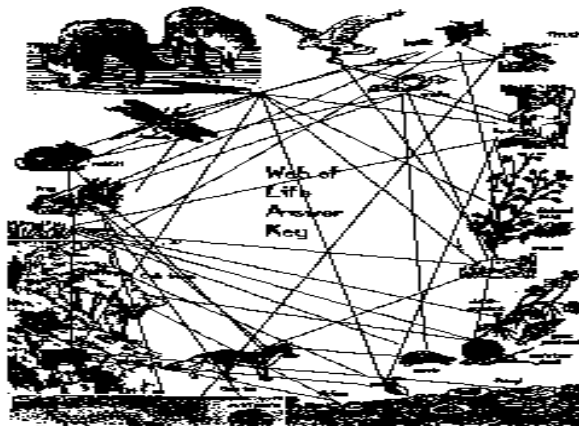
1 pt. - Lists done
 0 pt. - Blank or incomplete

- Activity 3b**
- | | | |
|-------------|---------------|------------|
| 1. Oak Tree | 6. Dragonfly | 11. Lichen |
| 2. Wolf | 7. Grass | 12. Thrush |
| 3. Hawk | 8. Frog | 13. Snail |
| 4. Snake | 9. Fox | 14. Beetle |
| 5. Squirrel | 10. Millipede | |

2 pt. - At least fifteen connections drawn in at least three colors, key to colors given

1 pt. - Ten to fifteen connections drawn, or colors or key missing

0 pt. - Blank or incomplete



Activity 3c List including a plant or animal and its feeding relationship.

1 pt. - Any reasonable answer
 0 pt. -Blank or incomplete

Activity 3d Answers will vary.

2 pt. - Three ways people will be affected by loss of species
 1 pt. - One of the above is missing or not reasonable
 0 pt. - Blank or more than one unreasonable.

Activity 4 Use “Writing About Science Concepts” Scoring Tool (for each paragraph).
 For bulletin board, use “Bulletin Board Display” Scoring Tool.

Writing to Inform in Science (Lantz, 2004)

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Performance Criteria	Assessment			
	Points	Self	Teacher	Other(s)
1. Accurate, specific, and purposeful scientific facts and concepts are extended and expanded to fully explain the topic				
2. An organizational plan is established and consistently maintained.				
3. Scientific information that is relevant to the needs of the audience is used throughout the text.				
4. Scientific vocabulary and language choices enhance the text.				
5. Diagrams, pictures, and other graphics are of quality and add to the overall effectiveness of the text.				
6. There are no errors in the mechanics (spelling and grammar.)				

O Comments	O Goals	O Actions
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Graphing Scientific Data (Lantz, 2004)

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Performance Criteria	Assessment			
	Points	Self	Teacher	Other(s)
1. An appropriate type of graph was expertly used (line graph, bar graph, pictograph, histogram, stem-and-leaf, circle graph, line plot, etc.) to display the data set(s).				
2. The title of the graph clearly identifies the data displayed on the graph.				
3. The range of data were used to choose an appropriate sequence of numbers for both the x and the y-axes (2's, 3's, 5's, 10's, 100's, etc.).				
4. Physical intervals on the graph are scaled appropriately and spaced evenly.				
5. All the parts of the graph are clearly labeled (units of measurement, x and y-axes, columns, rows, etc.).				
6. The independent (manipulated) variable is labeled on the x - axis and the dependent (responding) variable is labeled on the y - axis.				
7. A very precise technique is used to plot the data points.				
8. The set of data is plotted on the graph completely and accurately and the slope of the relationship is indicated.				
9. The graph can be used for predictive purposes.				

Graphing Scientific Data (continued)

Performance Criteria

10. If needed, a key is provided.
11. Colors, textures, labels, graphics or other features are used to enhance the graph.
12. The graph is clear and complete.

Assessment			
Points	Self	Teacher	Other(s)

<input type="checkbox"/> Comments	<input type="checkbox"/> Goals	<input type="checkbox"/> Actions
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Graphing Scientific Data (Lantz, 2004)

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Expert 4	An appropriate type of graph was expertly used for the data set(s). The title of the graph clearly relates to the data displayed and reflects both the independent and dependent variables. Physical intervals on the graph are scaled appropriately and spaced evenly. All the parts of the graph are clearly and accurately labeled. The set of data is plotted on the graph completely and accurately and the slope of the relationship is indicated. Colors, textures, labels, or other features are used to enhance the graph.
Proficient 3	An appropriate type of graph was used for the data set(s). The title of the graph relates to the data displayed and reflects both the independent and dependent variables. Physical intervals on the graph are scaled appropriately and spaced evenly. Most parts of the graph are clearly and accurately labeled. The set of data is plotted with only minor errors. Colors, textures, labels, or other features are used to enhance the graph.
Emergent 2	An appropriate type of graph was used for the data set(s). The title of graph relates somewhat to the data displayed, but does not reflect both the independent and dependent variables. Physical intervals on the graph are scaled appropriately and spaced evenly. Some confusion exists as to labeling the parts of the graph. The set of data is plotted with some errors. There is minimal use of colors, textures, labels, or other features to enhance the graph.
Novice 1	An inappropriate type of graph was used for the data set(s). The title of graph vaguely relates to the data displayed and does not reflect both the independent and dependent variables. Major problems exist with labeling the axes with an appropriate sequence of numbers based upon the range of the data. Physical intervals on the graph are not scaled appropriately nor spaced evenly. Much confusion exists as to labeling the parts of the graph. The set of data is plotted, with many errors. There is little, if any, use of colors, textures, labels, or other features to enhance the graph.

O Comments	O Goals	O Actions
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Bulletin Board Display (Lantz, 2004)

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Performance Criteria	Assessment			
	Points	Self	Teacher	Other(s)
1. The theme of the bulletin board is immediately evident.				
2. Appropriate science concepts are stated accurately.				
3. Adequate and accurate supporting details explain the concepts.				
4. The display appears organized and uncluttered.				
5. The display has an easy to follow sequence.				
6. Colors, pictures, diagrams, graphics and other visuals add to the interest and quality of information.				
7. Visuals can be easily seen from several meters away.				
8. Printed material is easy to read from several meters away.				
9. The display is creative and original.				
10. The bulletin board is neat and presentable.				

<input type="checkbox"/> Comments	<input type="checkbox"/> Goals	<input type="checkbox"/> Actions
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