

Sci Educ Center

A Collection of Alternative Assessment Tasks
for
Biology

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Susan A. Agruso

With Special Assistance From:
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Karen White
Gina Paduano

New York State Education Department
University at Buffalo
1996

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Introduction

This collection of tasks was produced as part of the New York State Alternative Assessment project (NSF Grant ESI 9154506). Separate collections were assembled for use at grade 4, grade 8, Earth science, and biology. Some of the tasks are in a manipulative skills format (where students manipulate objects, and/or equipment), and some are in a paper and pencil format (often including diagrams, graphs and/or data tables).

Another product of this assessment grant was the Alternative Assessment in Science: A Teacher's Guide (Reynolds, Doran, Allers, & Agruso, 1996). This guide was designed to provide teachers and supervisors with background information, procedures, and examples in developing alternative assessment tasks in science.

These resources were produced by the staff of the project and hundreds of New York State teachers who wrote, trial tested, and revised the tasks included in the Task Collections and the Teacher's Guide. The Teacher's Guide was intended to provide the general background and skills appropriate for elementary, middle, and high school teachers of science, while the Task Collections provide a set of examples for teachers to try and to modify as best fit their teaching situations.

Recommended Use

These two documents can be used in professional development workshops at the school building, district, regional, and/or state levels. The Teacher's Guide and the Task Collections were designed to be used together. The former provides general background and procedures for developing and trial testing tasks; while the latter provides a sample of tasks, designed for a particular grade or subject, that have been developed and trial tested with students.

We have found that everything takes longer than one initially thinks. This is especially true when teachers are expected to try some tasks with their students between separate sessions of the professional development activity. Be sure to allow enough time for each stage of the planned workshop and enough time between the stages.

While the Guide and the Collections were designed to be read and used by individual teachers, some sections could be presented via overheads of key visuals or sections of text and guided practice on applying some small set of skills (e.g. writing rubrics).

Structure of Task Packets

On the following pages you will find the tasks that have been developed for Biology. Each task includes several parts that may be used by teachers, students, or scorers.

The structure of each task collection is as follows:

- A. Task Information Sheet (blue - for teachers)
- B. Student Task Sheets (white - directions, questions, and space for student's written responses)
- C. Scoring Rubric and Scoring Form (yellow)
- D. Samples of scored student booklets (white)

Each part will be described briefly in the following section.

Task Information Sheet

The Task Information sheet includes descriptions of the task in terms of **grade level/subject** of recommended use, **content** reference from the relevant syllabus or learning standards, **format** and **purpose** of the task, as well as **skills** assessed in the task. To help a teacher plan and prepare to use a task, this sheet also includes **time** for administration, **materials** needed to perform and prepare the task for administration, as well as detailed directions for the **preparation** of the task materials. If there are any potential **safety** issues they are noted, as well as possible **extensions** or **modifications** of a task. Lastly, when appropriate the **credit / source** of the assessment task is listed.

A more detailed description of each of the parts of the task information is presented in the following section. It is presented in the same format as it will appear in each of the task packets.

Task Title
Task Information

Grade/Subject: The **grade level** or **subject** for which the task was designed to be used.

Content: The **Content** listing specifies the subject matter or the particular knowledge area that is covered by the task., with detailed references to the related section of the relevant state syllabus.

Format: The **Format** of the task describes the general method of assessment. The task may be paper and pencil, or it may be a manipulative task in which students work with objects or equipment.

Purpose: The statement of **Purpose** indicates the detailed outcome the author(s) intends to be assessed by the task.

Skills: Identifies the **skills** students need to use in order to complete the task. These skills have been taken from lists included in the related syllabus.

Primary: The skills which are the predominant ones used by the students.

Secondary: Other skills required for successful performance in the task

Time: The approximate **Time** required for student completion of the task

Materials: **Materials** needed for **per student** to complete the task. In addition are a list of materials used by the **teacher** in preparing for the task.

Preparation: Some of the tasks have detailed teacher directions which give information on assembly and set up of materials and further **Preparation** instructions.

Safety: Any potential **Safety** issues which may arise about the task or the use of the equipment and materials are noted here.

Extensions/Modifications: Suggestions for minor changes to directions and/or materials that shift the focus of the task or provide a different amount of help or support for the student completing the task are included here.

Credit/Source: Some tasks may have been modified from different **sources**. In this section appropriate **credit** is given.

Student Task Sheet

The student instructions and answer sheet provide detailed directions on what the student is to do in order to perform the task and respond appropriately. Some task sheets are quite open ended and require much insight, interpretation, and creativity on the part of the student. Others are more structured and clearly describe the procedures which the student is expected to follow. By looking at the statement of purpose from the task information sheet, and knowing one's students, a teacher can decide which style would be most appropriate. The student answer sheet is part of the task sheet. The structure of the answer sheet is determined by the style of student directions. Some of the tasks have integrated directions and answer sheets, (all in one package), while other tasks have separate student directions and answer sheets (and are so labeled). Considerable space is provided for student's written responses. This is what is rated or scored by the teacher.

Scoring Rubric and Scoring Form

The next section of the task collection includes the Scoring Rubric and Scoring Form. The development of these is described in detail in Chapter 4 of the Teacher's Guide. The scoring rubric provides detailed information on how to rate each student's responses. The rubric includes the performance standards, criteria for awarding points, and sample acceptable answers. For each task a sample scoring form is provided to facilitate the rating of individual student's performance. This scoring form briefly identifies each question and provides numbers to circle (corresponding to the points possible for that question) and space to indicate the total score earned by that student.

Scored Student Responses

For most tasks we have selected three student's work as part of the task packet. We selected tasks that illustrate excellent, adequate, and minimal levels of performance. Each student response sheet has an accompanying scoring form, with the points earned. One can see which responses earned the low, medium, and high scores.

Task Collections

Listed below are the titles and a brief description of each task included in this task collection. The tasks are assembled in two sections: manipulative tasks, and paper and pencil tasks. More information about each task is included on the Task Information Sheet (blue pages) at the beginning of each collection.

Biology

Manipulative Tasks:

Are Enzymes Specific for their Substrates?:

Students collect and analyze data about enzymes and the specificity of substrates.

Are Fruits and Vegetables Really Made of Cells?:

Students demonstrate and communicate the evidence that a given fruit or vegetable is made up of cells.

How Effective is Perspiration at Cooling?:

Students collect and analyze data on a perspiration "model".

Sow Bug Habitats:

Students plan and conduct an experiment to determine what type of environment sow bugs prefer.

Vitamin C Testing:

Students conduct an experiment to determine the amount of vitamin C in three (3) unknown beverages.

Paper and Pencil Tasks:

Ajax Seed Company:

Students analyze the genetic characteristics of some hypothetical seeds.

Dichotomous Key 2:

Students use a dichotomous key to identify unknown organisms.

Fish Kill:

Students analyze data related to temperature and dissolved oxygen and infer consequences for different species of fish.

Human Inheritance:

Students apply their knowledge of genetics to the occurrence of traits on a family tree.

Seasonal Changes:

Students interpret data on plant blooming patterns.

Testing a New Drug:

Students establish conditions under which a new experimental drug will be used.

Water Regulation:

Students interpret graphical data about cells in different solutions and predict future consequences.

Are Enzymes Specific for their Substrates?

Task Information

April 30, 1996

Subject: Biology

Content:

- MST Framework Reference:
Standard 4- Science: The Living Environment
- Regents Biology Syllabus:
Unit I: Topic III.B.2.1 and Topic III.B.3
- Variance Biology Program Guide:
Energy, Matter, and Organization: Enzymes

Format: Manipulative

Purpose: Collection and analyzation of data about enzymes activity.

Skills:

Primary: Interpreting Data, Investigating
Secondary: Recording Data, Observing

Time: 30-35 minutes

Materials:

- 1% glucose solution
- 3 Unknown Disaccharide Solutions: A, B, and C
"A" = water ; "B" = 1 - 3% Lactose solution; "C" = water
- Enzyme Solution: LACTAID Liquid (over-the-counter in grocery or drug stores)
- Test strip indicator for glucose (over-the-counter in drug stores)
- Spot plate (depression plate) with at least 9 to 12 wells
- China marker to mark spot plates

Preparation:

- Prepare solutions and dispense in either dropper bottles or microscale disposable pipettes. Label all containers.
- Glucose solution: 1 gram of glucose dissolved in 99 ml distilled water.
- Lactose solution: 3 grams of lactose dissolved in 97 ml distilled water.
- Lactase solution: LACTAID Liquid (over-the-counter in grocery or drug stores): 1 small bottle per 100 ml distilled water

Safety:

DO NOT INGEST ANY MATERIALS.

Be certain MSDS information is available for each chemical substance used in this activity.

Extensions/Modifications: N/A

Are Enzymes Specific for Their Substrates?

Task: At this station, you will be collecting and analyzing data about enzymes activity.

Materials

- Glucose solution
- 3 Unknown Disaccharide Solutions: A, B, and C
- Enzyme Solution
- Indicator strips for glucose
- Spot plate (depression plate)

Background

Disaccharides are chemically changed to simple sugar molecules by enzymes. In this exercise, you will determine whether a certain enzyme is specific for only one disaccharide.

Read through all the directions before beginning.

Directions

After reading the directions, set up a rough copy of a data table to record your observations.

1. Add two drops of the known glucose solution to Well #1 of the spot plate. Insert the end of one strip of the glucose test strip indicator. Wait 15 - 30 seconds before reading the results. Record your observations.
2. Add one drop of the enzyme solution to Well #2 of the spot plate. Repeat the above test with the test strips and record your observations.
3. Add two drops of each of the unknown disaccharide solutions to the spot plate as follows:

"A" in spot #3, "B" in spot #4, "C" in spot #5

Test each with a different indicator strip. Record your observations.

4. Add two drops of each of the unknown disaccharide solutions to the spot plate as follows:

"A" in spot #6, "B" in spot #7, "C" in spot #8.

To each sample of unknown disaccharide, add one drop of the enzyme. Wait about two minutes and then test with the indicator strip. Record your observations.

Please Continue on the Next Page

Are Enzymes Specific for Their Substrates?
Answer Sheet

Observations:

In the space below, draw an appropriate table to record your observations.

Analysis:

1. Using complete sentences, explain why testing well #2 is a necessary step in the procedure.

2. Explain in complete sentences, how this experiment shows that enzymes are specific for only one substrate?

Please Continue on the Next Page

3. If the enzyme used in this experiment was lactase, name the specific substrate on which it acts.

4. If the enzyme used in this experiment was lactase, which spot contained that substrate?

5. Using complete sentences, explain your answer to question 4.

6. Write the **word equation** for the chemical reaction that is catalyzed by lactase.

7. Is the reaction in this activity dehydration synthesis or hydrolysis (digestion)?

8. Using complete sentences, explain your answer to question 7.

Are Enzymes Specific For Their Substrates? - Scoring Rubric

Maximum Score - 15 points

Data Table**3 points total**

Sample data table showing correct results of testing the specificity of the enzyme lactase.

Title: Testing for Enzyme Specificity

Spot	Substance Tested	Glucose present	
		yes	or no?
1	glucose solution	x	
2	enzyme solution		x
3	unknown A solution		x
4	unknown B solution		x
5	unknown C solution		x
6	unknown A + enzyme solution		x
7	unknown B + enzyme solution	x	
8	unknown C + enzyme solution		x

Criteria:

Allow 1 point for each of the following;

- Appropriate title present.
- Substances tested are identified.
- Results of tests recorded and paired. Accuracy of results are not considered here.

Question 1 - Indicates need for control**2 points total****Criteria:**

- 2 points** Correctly / generally states that well #2 acts as a control to show that the enzyme solution does not contain glucose. Answer should be written in complete sentences.
- 1 point** Correct statement, but not in complete sentences.
- 0 points** Incorrect responses, even if it is in complete sentences, or no response provided.

Question 2 - Explain enzyme specificity**2 points total****Criteria:**

- 2 points** Correctly states that enzyme activity was indicated by the presence of glucose in spot 7. Answer should be written in complete sentences.
- 1 point** Correct statement, but not in complete sentences.
- 0 points** Incorrect responses, even if it is in complete sentences, or no response provided.

Question 3 - Lactose as specific substrate/disaccharide 1 point total**Criteria:**

- 1 point** Correctly names lactose as the specific substrate/disaccharide on which lactase acts.
- 0 points** Incorrect responses or no response provided.

Question 4 - Identifies substrate 1 point total**Criteria:**

- 1 point** Correctly identifies depression/spot/well 7 as containing the substrate.
- 0 points** Incorrect responses, or no response provided.

Question 5 - Explain chemical activity 2 points total**Criteria:**

- 2 points** Correctly explains that in spot 7 chemical activity occurred as indicated by a positive test for glucose. Answer should be written in complete sentences.
- 1 point** Correct statement, but not in complete sentences.
- 0 points** Incorrect responses, even if it is in complete sentences, or no response provided.

Question 6 - Components in chemical reaction 1 point total**Criteria:**

- 1 point** lactose + lactase + water yields glucose + galactose
or
 lactose + water $\xrightarrow{\text{lactase}}$ glucose + galactose
- 0 points** Incorrect responses, or no response provided.

Question 7 - Type of reaction 1 point total**Criteria:**

- 1 point** Correctly identifies this as a hydrolysis reaction.
- 0 points** Incorrect responses, or no response provided.

Question 8 - Explain hydrolysis 2 points total**Criteria:**

- 2 points** Correctly states that the lactose (disaccharide) is broken down into simpler molecules of glucose and galactose (monosaccharides) by the addition of a water molecule. Answer should be written in complete sentences.
- 1 point** Correct statement, but not in complete sentences.
- 0 points** Incorrect responses, even if it is in complete sentences, or no response provided.

Highest possible score - 15 points

Student ID _____

Scoring Form

Male / Female (circle one) Are Enzymes Specific for Their Substrates?

Directions: Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Data Table	0	1	2	3
1. Indicates need for control	0	1	2	
2. Explanation of enzyme specificity	0	1	2	
3. Lactose as specific substrate/disaccharide	0	1		
4. Identifies spot 7 as containing substrate	0	1		
5. Explanation of chemical activity in spot 7	0	1	2	
6. Identifies components in chemical reaction	0	1		
7. Identifies type of reaction	0	1		
8. Explanation of hydrolysis	0	1	2	

Total Score _____
Total possible score - 15 points

Student ID _____

Scoring Form

Male / Female (circle one) Are Enzymes Specific for Their Substrates?

Directions: Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Data Table	0	1	2	3
1. Indicates need for control	0	1	2	
2. Explanation of enzyme specificity	0	1	2	
3. Lactose as specific substrate/disaccharide	0	1		
4. Identifies spot 7 as containing substrate	0	1		
5. Explanation of chemical activity in spot 7	0	1	2	
6. Identifies components in chemical reaction	0	1		
7. Identifies type of reaction	0	1		
8. Explanation of hydrolysis	0	1	2	

Total Score _____
Total possible score - 15 points

Student ID Bio-E.S.- 1

Scoring Form

Male / Female (circle one) Are Enzymes Specific for Their Substrates?

Directions: Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Data Table	0	1	2	(3)
1. Indicates need for control	0	1	(2)	
2. Explanation of enzyme specificity	0	1	(2)	
3. Lactose as specific substrate/disaccharide	0	(1)		
4. Identifies spot 7 as containing substrate	0	(1)		
5. Explanation of chemical activity in spot 7	0	1	(2)	
6. Identifies components in chemical reaction	0	(1)		
7. Identifies type of reaction	0	(1)		
8. Explanation of hydrolysis	0	1	(2)	

Total Score 15
Total possible score - 15 points

Student ID Bio-ES-2

Scoring Form

Male / Female (circle one) Are Enzymes Specific for Their Substrates?

Directions: Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Data Table	0	1	(2)	3
1. Indicates need for control	0	1	(2)	
2. Explanation of enzyme specificity	0	(1)	2	
3. Lactose as specific substrate/disaccharide	0	(1)		
4. Identifies spot 7 as containing substrate	0	(1)		
5. Explanation of chemical activity in spot 7	0	1	(2)	
6. Identifies components in chemical reaction	(0)	1		
7. Identifies type of reaction	0	(1)		
8. Explanation of hydrolysis	0	1	(2)	

Total Score 12
Total possible score - 15 points

Student ID B:0 E.S. - 3

Scoring Form

Male / Female (circle one) Are Enzymes Specific for Their Substrates?

Directions: Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Data Table	0	1	2	3
1. Indicates need for control	0	1	2	
2. Explanation of enzyme specificity	0	1	2	
3. Lactose as specific substrate/disaccharide	0	1		
4. Identifies spot 7 as containing substrate	0	1		
5. Explanation of chemical activity in spot 7	0	1	2	
6. Identifies components in chemical reaction	0	1		
7. Identifies type of reaction	0	1		
8. Explanation of hydrolysis	0	1	2	

Total Score 7
Total possible score - 15 points

Student ID _____

Scoring Form

Male / Female (circle one) Are Enzymes Specific for Their Substrates?

Directions: Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Data Table	0	1	2	3
1. Indicates need for control	0	1	2	
2. Explanation of enzyme specificity	0	1	2	
3. Lactose as specific substrate/disaccharide	0	1		
4. Identifies spot 7 as containing substrate	0	1		
5. Explanation of chemical activity in spot 7	0	1	2	
6. Identifies components in chemical reaction	0	1		
7. Identifies type of reaction	0	1		
8. Explanation of hydrolysis	0	1	2	

Total Score _____
Total possible score - 15 points

Observations:

In the space below, draw an appropriate table to record your observations.

ENZYME Reaction Test.

Well	Solution Tested	Results
1	Glucose	Positive
2	Enzyme	Negative
3	Solution A	Negative
4	Solution B	Negative
5	Solution C	Negative
6	Solution A + Enzyme	Negative
7	Solution B + Enzyme	Positive
8	Solution C + Enzyme	Negative

15
15

Analysis:

1. Using complete sentences, explain why testing well #2 is a necessary step in the procedure.

Testing well #2 is necessary because it acts as a control to show that there is no glucose already in the enzyme solution.

2. Explain in complete sentences, how this experiment shows that enzymes are specific for only one substrate?

This experiment illustrates that enzymes are specific since the enzyme would only act on one of the three disaccharides to cause it to breakdown.

Please Continue on the Next Page

3. If the enzyme used in this experiment was lactase, name the specific substrate on which it acts.

lactose is the substrate

4. If the enzyme used in this experiment was lactase, which spot contained that substrate?

spot 7

5. Using complete sentences, explain your answer to question 4.

Lactase will act on lactose to produce glucose and galactose. The only spot (compound) that showed the presence of glucose after the enzyme was added was spot 7 with solution B.

6. Write the word equation for the chemical reaction that is catalyzed by lactase.

Lactose + water $\xrightarrow{\text{Lactase}}$ glucose + galactose

7. Is the reaction in this activity dehydration synthesis or hydrolysis (digestion)?

hydrolysis

8. Using complete sentences, explain your answer to question 7.

In the reaction, water was added to the lactose to cause it to change from a disaccharide to the 2 monosaccharides. This is a breaking down process which is digestion.

Observations:

In the space below, draw an appropriate table to record your observations.

Well	Solution	Observation
1	Glucose	Dark Green
2	Enzyme	Yellow
3	Sol. A	Yellow
4	Sol. B	Yellow
5	Sol. C	Yellow
6	A + Enzyme	Dark Green Yellow
7	B + Enzyme	Green
8	C + Enzyme	Yellow

12
—
15

Analysis:

1. Using complete sentences, explain why testing well #2 is a necessary step in the procedure.

This was necessary to be sure that the enzyme doesn't have any glucose in it.

2. Explain in complete sentences, how this experiment shows that enzymes are specific for only one substrate?

Because only one solution was affected by the enzyme.

Please Continue on the Next Page

3. If the enzyme used in this experiment was lactase, name the specific substrate on which it acts.

Lactose

4. If the enzyme used in this experiment was lactase, which spot contained that substrate?

7

5. Using complete sentences, explain your answer to question 4.

Number 7 was the only solution that was affected by the enzyme so it must have had the substrate.

6. Write the **word equation** for the chemical reaction that is catalyzed by lactase.

Lactose $\xrightarrow{\text{lactase}}$ monosaccharides

7. Is the reaction in this activity dehydration synthesis or hydrolysis (digestion)?

hydrolysis

8. Using complete sentences, explain your answer to question 7.

The enzyme digests the solution.

Observations:

In the space below, draw an appropriate table to record your observations.

1 - dk green
2 - dk green
3 - yellow
4 - yellow
5 - yellow

Spot plate #	color of test tape
1	dk green
2	dk green yellow
3	yellow
4	yellow
5	yellow
6	green
7	yellow
8	yellow

7
15

Analysis:

1. Using complete sentences, explain why testing well #2 is a necessary step in the procedure.

This is necessary because it is the enzyme.

2. Explain in complete sentences, how this experiment shows that enzymes are specific for only one substrate?

This experiment showed that enzymes are specific because only one of the unknown disaccharides change.

Please Continue on the Next Page

3. If the enzyme used in this experiment was lactase, name the specific substrate on which it acts.

Lactose

4. If the enzyme used in this experiment was lactase, which spot contained that substrate?

Six

5. Using complete sentences, explain your answer to question 4.

Because this depression changed the testape
from yellow to green

6. Write the **word equation** for the chemical reaction that is catalyzed by lactase.

Lactose + lactase → Lactose Lactose + water

7. Is the reaction in this activity dehydration synthesis or hydrolysis (digestion)?

hydrolysis

8. Using complete sentences, explain your answer to question 7.

Because your breaking down lactose

Are Fruits and Vegetables Really Made of Cells?

Task Information

Subject: Biology

Content: MST Framework Reference:
 Standard 1 - Analysis, Inquiry, & Design: Scientific Inquiry
 Standard 4 - Science: The Living Environment
 Regents Biology Syllabus:
 Unit I, Topic III
 Variance Biology Program Guide:
 Energy, Matter, and Organization: Levels of Organization
 RCT Guide in Science:
 Middle School Block C - Living Systems

Format: manipulative

Purpose: To demonstrate that a given fruit or vegetable is cellular, and be able to communicate this fact.

skills: **Primary:** Investigation, Collecting Data
Secondary: Data Interpretation, Communication

Time: 1-2 class periods (40-45 minutes each), with introduction given before the class period

Materials: Compound microscopes, slides and cover slips, stains (iodine, methylene blue), plant dissection equipment, cotton swabs, beakers, paper towels, toothpicks, a variety of fruits and vegetables as described below.

Preparation: This assessment would be given to students after they had done the classical onion and check cell lab, and preparing wet mounts.

Having the students design an exercise that the teacher approves before the students begin their work has purposefully been left out. The idea behind this assessment is what can the students do on their own: here is a problem, solve it. Part of this assessment is to see what the students really do in going about the solving of the problem. The teacher must be available for help though, whether solicited or not.

A wide sampling of fruits and vegetables should be available to the students: apple, pear, potato, celery, banana, squash, tomato, turnip, radish, and cucumber are all good choices. These may be supplied by the teacher or students may be asked to bring them from home. The samples should be checked for easily seen cells. Samples such as oranges and grapefruits are generally not good to use unless some tissue is taken from the rind. Samples such as kidney beans, peas, peaches, strawberries, and blueberries should be avoided. Students should not be asked to bring in just any fruit or vegetable from home without checking with the teacher first.

Safety: Be certain MSDS information is available for each chemical substance used in this activity.

Extensions/Modifications: None

Are Fruits and Vegetables Really Made of Cells?

Task: To demonstrate that a given fruit or vegetable is cellular, and be able to communicate this fact.

The cell theory says that all living organisms are cellular, or are composed of cells. For some organisms the truth of this theory may be hard to recognize. For example, various fruits and vegetables by themselves sitting in the grocery store do not seem to be alive. Yet they are alive. They grow, they use oxygen, and perform many of the other processes associated with life. But are they cellular? That is what you will try to determine, is a fruit or a vegetable composed of cells?

Materials

The supplies and materials you need will depend upon the kind of investigation you want to carry out. Once you have decided upon how you will go about solving this problem, prepare a list of materials you will need and discuss it with your teacher.

Directions

1. On the front desk are a number of fruits. Select one of the fruits, and using the supplies and equipment in the room, or that you may wish to bring from home, design and carry out an exercise that will demonstrate that the fruit is or is not composed of cells. If you do not see the supplies or equipment that you need ask the teacher for help in locating the item.
2. Once you have determined that the fruit or vegetable that you choose is or is not cellular you will demonstrate this fact to the teacher by visually showing the teacher your evidence, and by drawing an accurately labeled diagram of the fruit or vegetable showing the presence or absence of cells.

Please Continue on the Next Page

Student Response

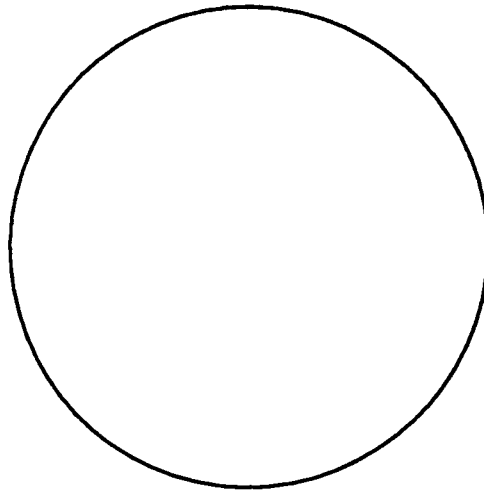
April 29, 1996

2

Name _____

Materials:

Observation:



Are Fruits and Vegetables Really Made of Cells?

Scoring Rubric

Maximum Score - 17 points

What is looked for in this assessment is the ability of the student to: realize that cells are small, therefore a microscope is to be used; realize that a thin section of tissue is needed so that light can pass through; be able to prepare a wet mount slide; realize the need for a stain to observe the cells better; and be able to communicate the shape of the cells and their relationship to other cells by drawing.

1. Ability to work independently 5 points total

- Allow 5 points if the student works independently with little or minor input from teacher.
- Allow 4 points if the student's work was somewhat independent with minor input from teacher.
- Allow 3 points if student's work was somewhat independent with medium input from teacher.
- Allow 2 points if student's work was dependent on major input from someone else.
- Allow 1 point if student's work was dependent on someone else.
- No credit if the work was not done.

2. Technique and procedure 5 points total

- Allow 5 points if proper techniques and procedures were clearly demonstrated.
- Allow 4 points if techniques and procedures were correct, but showed minor faults (e.g.: sample was sliced a little too thick OR not enough stain was placed on the sample OR slide did not have enough water on it OR correct power of the microscope was not used to demonstrate slide)
- Allow 3 points if techniques and procedures were marginal, and showed major faults (ex: sample was sliced too thick OR no stain was added to the sample OR sample was placed directly on dry slide), difficulty in locating and focusing on cells.
- Allow 2 points if techniques and procedures were poor (ex: compound faults such as a combination of those listed in the 3 point section).
- Allow 1 point if student was able to produce a usable slide, but only with the help of someone else.

3. Slide 3 points total

- Allow 3 points if the slide shows excellent examples of stained cells.
- Allow 2 points if the slide showed cells, but individual cells were hard to see clearly.
- Allow 1 point if the slide showed tissue, but individual cells were obscure or could only be seen with difficulty. Student needed help in locating cells.
- No credit if no cells could be seen.

4. Diagram evidence 4 points total

- Allow 4 points if the diagram is accurately drawn with properly labeled visible structures, and shows proper relation to other cells.
- Allow 3 points if the diagram is accurately drawn, but does not have all visible structures labeled clearly.
- Allow 2 points if the diagram is not accurately drawn, (i.e.: basic shape evident, but not accurate, cellular structures not clearly drawn), proper relation to other cells not accurate, visible structures are not labeled or nonvisible structures are drawn and labeled.
- Allow 1 point if the diagram sloppy and shows little relation to actual cell, visible structures not drawn in or are hastily done, no labels or mislabeling.
- No credit if the diagram is not drawn.

Highest possible score - 17 points

Are Fruits and Vegetables Really Made of Cells ?

Student ID _____

Scoring Form

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

- | | | | | | | |
|---|---|---|---|---|---|---|
| 1. Student's work was independently done | 0 | 1 | 2 | 3 | 4 | 5 |
| 2. Proper techniques and procedures | 0 | 1 | 2 | 3 | 4 | 5 |
| 3. Slide demonstrated examples of stained cells | 0 | 1 | 2 | 3 | | |
| 4. Diagram accurately drawn and labeled | 0 | 1 | 2 | 3 | 4 | |

Total Score _____

Total Possible score - 17 points

Are Fruits and Vegetables Really Made of Cells ?

Student ID _____

Scoring Form

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

- | | | | | | | |
|---|---|---|---|---|---|---|
| 1. Student's work was independently done | 0 | 1 | 2 | 3 | 4 | 5 |
| 2. Proper techniques and procedures | 0 | 1 | 2 | 3 | 4 | 5 |
| 3. Slide demonstrated examples of stained cells | 0 | 1 | 2 | 3 | | |
| 4. Diagram accurately drawn and labeled | 0 | 1 | 2 | 3 | 4 | |

Total Score _____

Total Possible score - 17 points

Are Fruits and Vegetables Really Made of Cells ?

Student ID _____

Scoring Form

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

- | | | | | | | |
|---|---|---|---|---|---|---|
| 1. Student's work was independently done | 0 | 1 | 2 | 3 | 4 | 5 |
| 2. Proper techniques and procedures | 0 | 1 | 2 | 3 | 4 | 5 |
| 3. Slide demonstrated examples of stained cells | 0 | 1 | 2 | 3 | | |
| 4. Diagram accurately drawn and labeled | 0 | 1 | 2 | 3 | 4 | |

Total Score _____

Total Possible score - 17 points

Student ID Bio FV-1 **Are Fruits and Vegetables Really Made of Cells ?**
Scoring Form

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

1. Student's work was independently done	0	1	2	3	4	5
2. Proper techniques and procedures	0	1	2	3	4	5
3. Slide demonstrated examples of stained cells	0	1	2	3		
4. Diagram accurately drawn and labeled	0	1	2	3	4	

Total Score 17 pts
 Total Possible score - 17 points

Student ID Bio FV-2 **Are Fruits and Vegetables Really Made of Cells ?**
Scoring Form

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

1. Student's work was independently done	0	1	2	3	4	5
2. Proper techniques and procedures	0	1	2	3	4	5
3. Slide demonstrated examples of stained cells	0	1	2	3		
4. Diagram accurately drawn and labeled	0	1	2	3	4	

Total Score 14 pts
 Total Possible score - 17 points

Student ID Bio FV-1 **Are Fruits and Vegetables Really Made of Cells ?**
Scoring Form

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

1. Student's work was independently done	0	1	2	3	4	5
2. Proper techniques and procedures	0	1	2	3	4	5
3. Slide demonstrated examples of stained cells	0	1	2	3		
4. Diagram accurately drawn and labeled	0	1	2	3	4	

Total Score 9 pts
 Total Possible score - 17 points

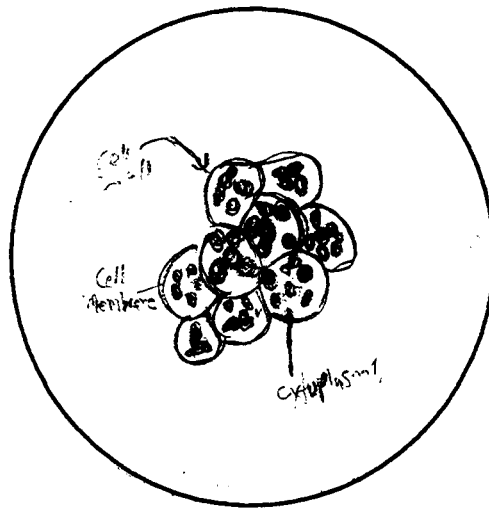
Name

Bio - FV - 1

Materials:

cover slip, stain, sweet potato, water, slide
 ↑
 Iodine Razor blade

Observation:



After it was stained it brought out the features pretty. The biggest thing that caught my attention was the black blotches, but when I looked really hard I saw thin, almost clear separating lines, I increased the power and they became more apparent. This gives me reason to believe that a sweet potato is cellular.

Total Score 17/19

Name Bio - FV - 2

Materials:

razor blade

slide

eyedropper

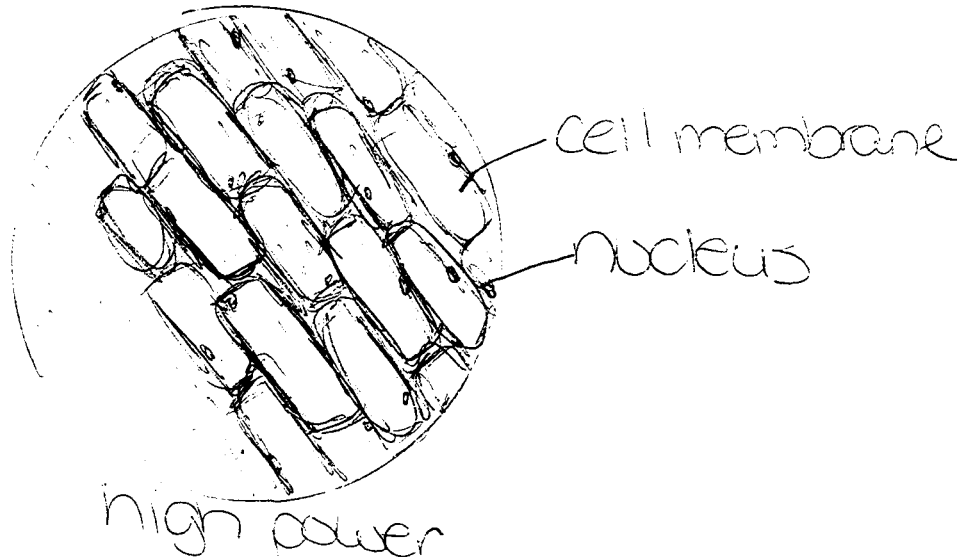
coverslip

water

celery

microscope

Observation:



Total Score

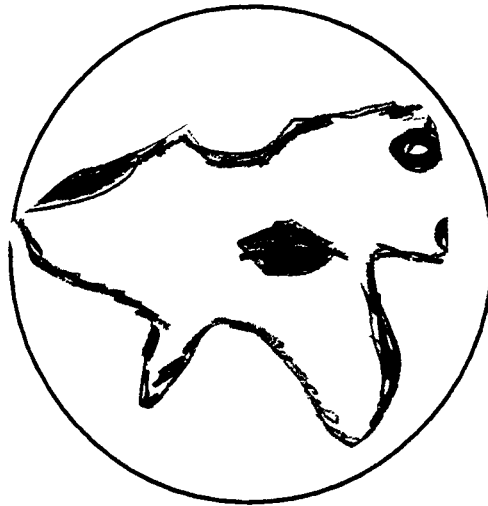
Name

Bio FV-3

Materials:

Apple, razor, wet mount slide,
microscope, methylene blue

Observation:



Total Score 9/17

How Effective is Perspiration at Cooling?

Task Information

Subject: Biology

Content:

- Biology Syllabus - Unit III
- MST Framework Reference; Standard 4 - Science - The living Environment

Format: Manipulative

Purpose: To collect and analyze data on cooling effect of perspiration/evaporation

Skills:

Primary: Measuring, recording data, graphing

Secondary: Interpreting data, generalizing/infering

Time: 25-30 minutes

Materials:

- 2 test tubes
- test tube rack - clear container to hold test tubes upright
- newspaper - cut into strips the same length as the test tubes
- hot water - in Styrofoam or insulated cups
- thermometers - to fit in the test tubes
- 4 rubber bands
- eye dropper
- funnel

Preparations:

- 25 - 30 minutes preparation time for teacher to set up required stations and heat H₂O to 32° C.

Safety: Students need to be advised on the use of hot H₂O.

Extensions/Modifications: None

How Effective is Perspiration at Cooling?

Task: At this station you will collect and analyze data on a model of the perspiration process.

Materials:

- test tubes
- hot water in styrofoam cups
- timer or clock
- eye dropper
- paper towels
- test tube rack
- room temperature water
- thermometer
- 4 rubber bands
- funnel

Background:

You know that when you get hot you perspire. This is your body's way of maintaining normal body temperature. But how effective is perspiring in doing this?

Directions:

1. Examine the apparatus at this station.
2. Place the test tube rack on a paper towel. Prepare your test tubes by wrapping each one with a strip of newspaper. Use two rubber bands to hold the paper on the test tubes.
3. Quickly fill both test tubes with hot water. Taking care not to spill any on the newspaper.
4. Place one thermometer in each test tube. Record the starting temperature for each test tube on the data table. In the next step one (1) test tube will become the wet test tube and one (1) will remain dry.
5. Use the eye dropper to quickly wet the newspaper of one (1) of the test tubes with hot water. The newspaper on the test tube should be completely saturated.
6. Measure and record the water temperature in each test tube at intervals of one minute for the next twelve (12) minutes.
7. Make a line graph of your data and answer questions 3 - 9.

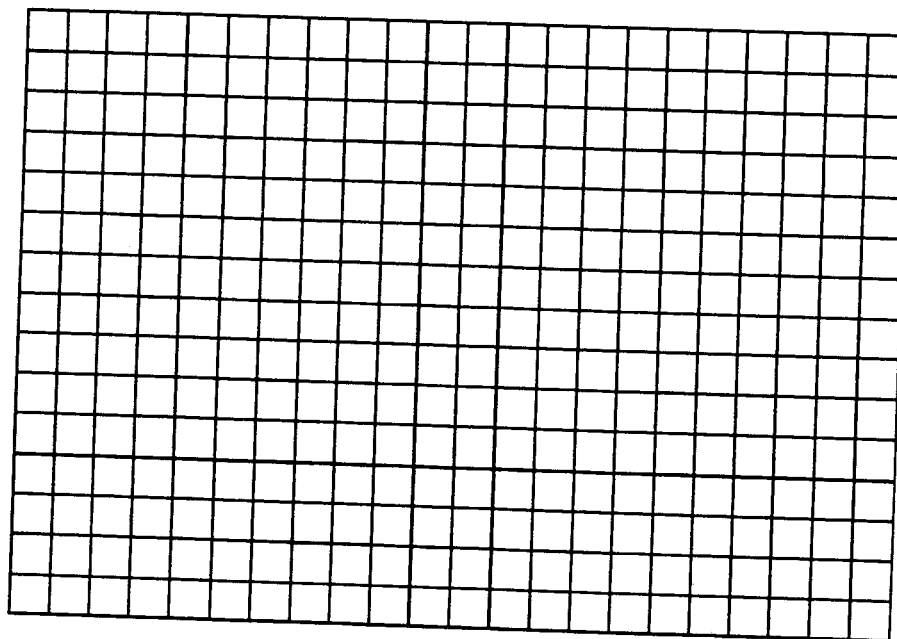
Please Continue on the Next Page

1. Record your data in the data table below.

Cooling Rates of Wet and Dry Tubes

MINUTES	TEMPERATURE °C	
	Wet Tube	Dry Tube
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

2. Plot your data on the graph below.



3. From your table, what was the temperature of the water at 6 minutes?
In the dry tube? _____ In the wet tube? _____
4. From your graph, what was the temperature of the water at 9.5 minutes?
in the dry tube? _____ In the wet tube? _____
5. Use your graph to predict what the temperature would be in the dry tube after 15 minutes.

Using complete sentences, suggest an explanation for your prediction.

6. Using complete sentences, describe and compare the cooling patterns in the test tubes.

7. Using complete sentences, explain what causes the difference in water temperature between the water in the two tubes.

8. Using complete sentences, describe what comparison you could make between the effect of perspiration on the skin of the human body and the newspaper on the wet test tube. Relate your answer to body temperature control.

April 29, 1996 1

How Effective Is Perspiration At Cooling? - Scoring Rubric

Maximum score - 23 points

1. Data Table

2 points total

Allow 1 point for each of the following;

- Table completed
 - Data consistent with expectation of results
-

2. Graph

5 points total

Allow 1 point for each of the following;

- Appropriate title
 - Axes labeled w/ correct variables (units included)
 - Appropriate scale
 - Points plotted accurately
 - Curves are appropriate to data trend
-

3. Data transfer from table

2 points total

Allow 1 point for each of the following;

- Correct 6 minute dry tube reading based on data collected
 - Correct 6 minute wet tube reading based on data collected
-

4. Graph Interpretation/Prediction

2 points total

Allow 1 point for each of the following;

- Corresponds to student's dry tube graph at 9.5 minutes
 - Corresponds to student's wet tube graph at 9.5 minutes
-

5. Extrapolation Prediction

3 points total

- Allow 1 point for correct temperature prediction based on student's graph/data.
 - Allow 2 points if the explanation refers to extrapolation from graph or data and is in complete sentences.
 - Allow 1 point if the explanation refers to extrapolation from graph or data and is not in complete sentences.
 - Allow 0 points if explanation is not correct even if it is in complete sentences.
-

6. Data Interpretation/Comparison

4 points total

Allow 1 point for each of the following;

- States pattern for dry tube readings
 - States pattern for wet tube readings
 - States relationship/comparison
 - Correct statement or statements and all in complete sentences
-

7. Data Explanation**2 points total**

Allow 2 points if the explanation is correct and in complete sentences.

Allow 1 point if the explanation is correct, but not in complete sentences.

Allow 0 points if the explanation is incorrect even if it is in complete sentences.

Correct statements may include:

- The wet tube is cooled by evaporation.

OR

- Heat energy is removed more quickly from water in wet tube.

OR

- The dry tube temperature is maintained by better insulation.
-

8. Comparison**3 points total**

Allow 1 point for each of the following;

- States correct comparison between wet paper towel and perspiration on human skin
- Relates to process/role of evaporation to cooling/heat loss
- Correct statement or statements and all in complete sentences

Allow 0 points if the explanation is incorrect even if it is in complete sentences.

Highest possible score - 23 points

Student ID _____

Scoring Form

Male / Female (circle one)

How Effective is Perspiration At Cooling?

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Data table	0	1	2			
2. Graph	0	1	2	3	4	5
3. Data transfer from table	0	1	2			
4. Graph interpretation	0	1	2			
5. Data prediction	0	1				
Data explanation	0	1	2			
6. Data interpretation / comparison	0	1	2	3	4	
7. Data explanation	0	1	2			
8. Comparison	0	1	2	3		

Total Score _____

Total possible score - 23 points

Student ID _____

Scoring Form

Male / Female (circle one)

How Effective is Perspiration At Cooling?

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Data table	0	1	2			
2. Graph	0	1	2	3	4	5
3. Data transfer from table	0	1	2			
4. Graph interpretation	0	1	2			
5. Data prediction	0	1				
Data explanation	0	1	2			
6. Data interpretation / comparison	0	1	2	3	4	
7. Data explanation	0	1	2			
8. Comparison	0	1	2	3		

Total Score _____

Total possible score - 23 points

Student ID BIO-EP-1

Scoring Form

Male / Female (circle one)

How Effective is Perspiration At Cooling?

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Data table	0	1	2			
2. Graph	0	1	2	3	4	5
3. Data transfer from table	0	1	2			
4. Graph interpretation	0	1	2			
5. Data prediction	0	1				
Data explanation	0	1	2			
6. Data interpretation / comparison	0	1	2	3	4	
7. Data explanation	0	1	2			
8. Comparison	0	1	2	3		

Total Score 23 pts

Total possible score - 23 points

Student ID BIO-EP-2

Scoring Form

Male / Female (circle one)

How Effective is Perspiration At Cooling?

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Data table	0	1	2			
2. Graph	0	1	2	3	4	5
3. Data transfer from table	0	1	2			
4. Graph interpretation	0	1	2			
5. Data prediction	0	1				
Data explanation	0	1	2			
6. Data interpretation / comparison	0	1	2	3	4	
7. Data explanation	0	1	2			
8. Comparison	0	1	2	3		

Total Score 18 pts

Total possible score - 23 points

Student ID BIO - EP - 3

Scoring Form

Male / Female (circle one)

How Effective is Perspiration At Cooling?

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Data table	0	<u>1</u>	2			
2. Graph	0	1	2	<u>3</u>	4	5
3. Data transfer from table	<u>0</u>	1	2			
4. Graph interpretation	0	<u>1</u>	2			
5. Data prediction	<u>0</u>	1				
Data explanation	<u>0</u>	1	2			
6. Data interpretation / comparison	0	<u>1</u>	2	3	4	
7. Data explanation	<u>0</u>	1	2			
8. Comparison	<u>0</u>	1	2	3		

Total Score 6 pts

Total possible score - 23 points

Student ID _____

Scoring Form

Male / Female (circle one)

How Effective is Perspiration At Cooling?

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Data table	0	1	2			
2. Graph	0	1	2	3	4	5
3. Data transfer from table	0	1	2			
4. Graph interpretation	0	1	2			
5. Data prediction	0	1				
Data explanation	0	1	2			
6. Data interpretation / comparison	0	1	2	3	4	
7. Data explanation	0	1	2			
8. Comparison	0	1	2	3		

Total Score _____

Total possible score - 23 points

1. Record your data in the data table below.

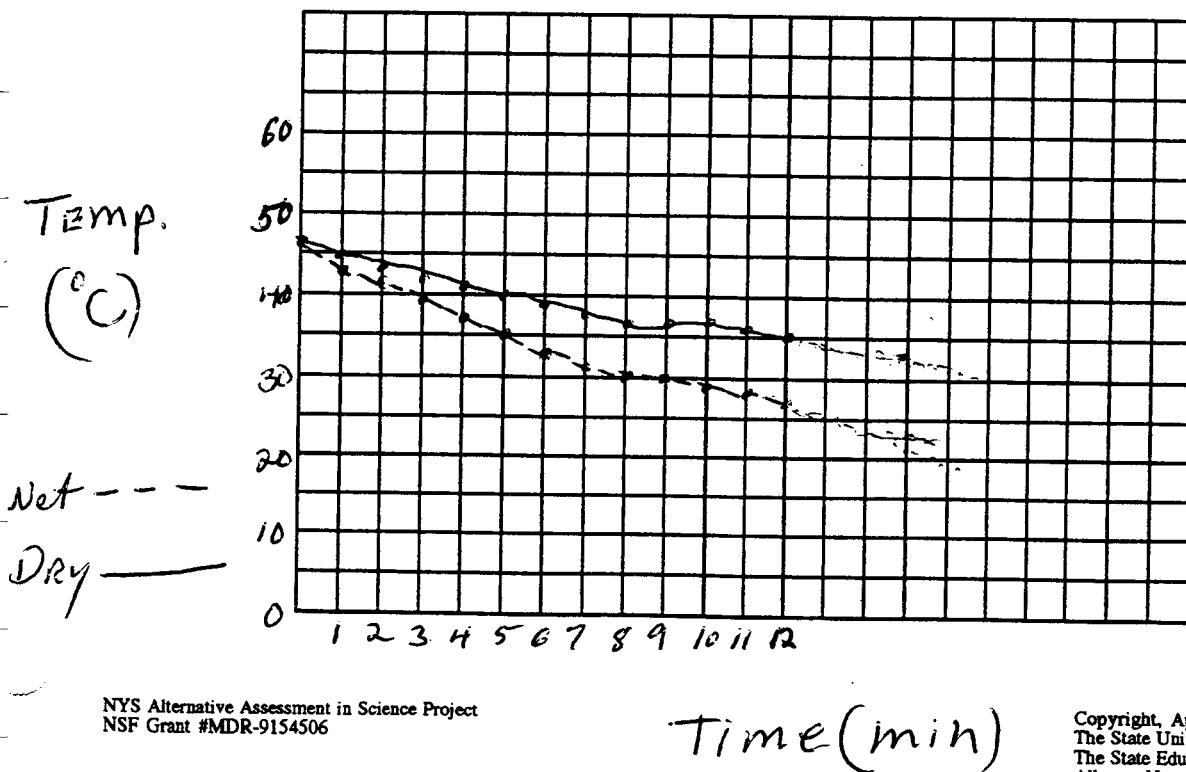
Cooling Rates of Wet and Dry Tubes

MINUTES	TEMPERATURE °C	
	Wet Tube	Dry Tube
0	46	46
1	43	45
2	42	43
3	39	42
4	37	41
5	35	40
6	33	39
7	32	38
8	30	37
9	30	37
10	29	37
11	28	36
12	27	35

23
23

2. Plot your data on the graph below.

Cooling Rates of water



3. From your table, what was the temperature of the water at 6 minutes?

In the dry tube? 39°C

In the wet tube? 33°C

4. From your table, what was the temperature of the water at 9.5 minutes?

in the dry tube? 37°C

In the wet tube? 29.5°C

5. Predict what the temperature would be in the dry tube after 15 minutes.

33°C

Using complete sentences, suggest an explanation for your prediction.

The water in the dry tube seems to be
slowing down a bit and not quite dropping
1°C each minute. It would probably go down
only 2° in 3 minutes.

6. Using complete sentences, describe and compare the cooling patterns in the test tubes.

The dry tube drops only about 1°C in a min.
at first, while the wet tube drops 2 or 3° in
a minute. They both start to level off towards
the end.

7. Using complete sentences, explain what causes the difference in water temperature between the water in the two tubes.

I think the water on the wet tube is cooling
faster because the water is evaporating.

8. Using complete sentences, describe what comparison you could make between the effect of perspiration on the skin of the human body and the newspaper on the wet test tube. Relate your answer to body temperature control.

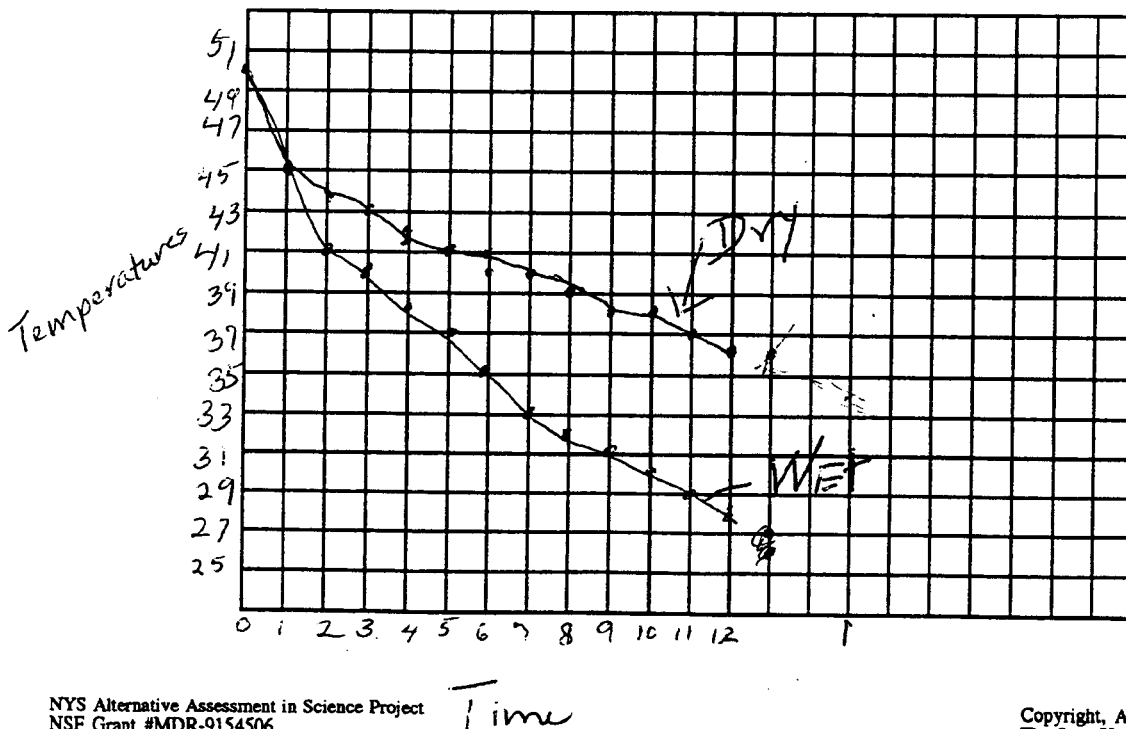
The water cooling off the wet tube is
like when perspiration is on your skin.
When you get hot you sweat.

1. Record your data in the data table below.

Cooling Rates of Wet and Dry Tubes

MINUTES	TEMPERATURE °C	
	Wet Tube	Dry Tube
0	50	50
1	45	45
2	41	44
3	40	43
4	39	42
5	37	41
6	38	40
7	33	40
8	32	39
9	31	38
10	30	38
11	29	37
12	28	36

2. Plot your data on the graph below.



3. From your table, what was the temperature of the water at 6 minutes?

In the dry tube? ~~35~~ 40°C In the wet tube? 35°C

4. From your table, what was the temperature of the water at 9.5 minutes?

in the dry tube? 38°C In the wet tube? 30.5°C

5. Predict what the temperature would be in the dry tube after 15 minutes.

32

Using complete sentences, suggest an explanation for your prediction.

Since the temperature is going down, it will probably keep
on going down.

6. Using complete sentences, describe and compare the cooling patterns in the test tubes.

The wet tube cooled faster than the dry tube. The difference
between them was about 5 degrees. Both go down
faster at the start.

7. Using complete sentences, explain what causes the difference in water temperature between the water in the two tubes.

The difference is caused by the wet paper. This
acted as a cooling agent.

8. Using complete sentences, describe what comparison you could make between the effect of perspiration on the skin of the human body and the newspaper on the wet test tube. Relate your answer to body temperature control.

The wet newspaper acts as perspiration on the skin.
The wet newspaper cools the tube just like perspiration cools
the skin.

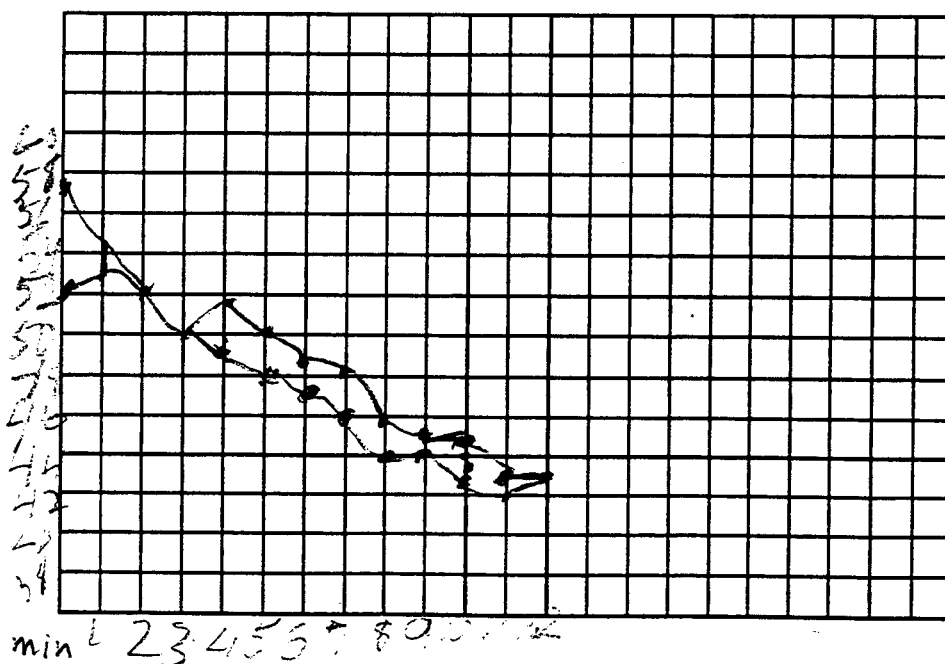
1. Record your data in the data table below.

Cooling Rates of Wet and Dry Tubes

MINUTES	TEMPERATURE °C	
	Wet Tube	Dry Tube
0	52	57
1	53	54
2	52	52
3	50	50
4	49	48
5	48	47
6	47	49
7	46	48
8	44	48
9	44	47
10	43	45
11	42	43
12	43	43

2. Plot your data on the graph below.

Cooling rates



Sow Bug Habitats

Task Information

Subject: Biology

Content:

- Biology Regents Syllabus p. 43
- Syllabus Laboratory Skills #1, 3, 9, 14, page, X.

Format: Manipulative

Purpose:

Conducting an experiment to determine what type of environment sow bugs prefer.

Skills:

Primary: Predicting, interpreting data

Secondary: Collecting data, recording data, inferring

Time: 30-40 minutes

Materials:

- beaker of water
- scissors
- eyedropper
- clock/timer
- 1 extra petri dish lid
- stack of paper towels
- masking tape
- 1 sheet black construction paper
- a petri dish with 10 sow bugs

Preparation:

Sow bugs/Pill bugs are scavengers which are easy to culture. You can order a kit from various science supply houses. Another option is to establish your own culture. These animals can be easily found under rocks and rotting logs. A plastic shoe box with holes melted in the lid with a hot dissecting needle will serve as a container. Place several centimeters of soil in the bottom of the box. The soil should be from a wooded area with much organic matter. There should be wood chips, leaves, and stones. Be certain to keep the soil moist since sow bugs are crustaceans and use gills to breathe. Sprinkle a little oatmeal on the surface of the soil and add some potato slices and a few lettuce leaves or carrot peels. Place your culture where it won't be disturbed being certain to keep it moist and to periodically add vegetable scraps.

Sow bugs can be placed into petri dishes a day or two ahead of time only if the sow bugs are provided with a source of moisture. A wet piece of paper towel can be used. Remove prior to the start of the experiment by the teacher. To remove sow bugs from the paper towel, gently shake or move them with forceps or small paint brush. At the end of the experiment, return wet paper towel to petri dishes. Approximate time to set up 10 petri dishes with 10 sow bugs in each: 20-30 minutes.

Safety: N/A

Extensions/Modifications: None

Sow Bug Habitats

Task: At this station, you will be conducting an experiment to determine what type of environment sow bugs prefer.

Sow bugs are crustaceans and close relatives of crabs and lobsters. Like their relatives, sow bugs use gills for respiration. But, unlike most crustaceans, they live on land and not in the water.

Materials:

- beaker of water
- eyedropper
- scissors
- clock/timer
- stack of paper towels
- masking tape
- 1 sheet black construction paper
- 1 petri dish with 10 sow bugs
- 1 extra petri dish lid

Directions:

Part A

1. Answer questions 1 & 2 on page 2.

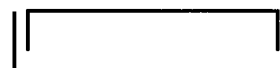
Part B

1. Using the extra petri dish lid as a pattern, trace two circles on a piece of paper towel.
2. Cut out the two circles. Fold each circle in half. Saturate one folded circle with water. It should be moist, but not soaking wet. The second folded circle should remain dry.
3. Arrange the folded circles in the extra petri dish lid to create a habitat which is half moist and half dry.
4. Remove the lid from the petri dish containing the sow bugs and replace it with the wet/dry habitat lid you prepared.
5. Invert the petri dish so the wet/dry lid becomes the bottom and the petri dish bottom becomes the top.



Before

Invert



After

6. Using black construction paper, cover the moist side of the petri dish to make it dark.
7. Note the time on your clock, or start your timer now. Record your start time in the data table on your answer sheet.
8. The sow bugs should remain undisturbed for five (5) minutes. While you are waiting, check your answers to questions 1 & 2 on page 2.
9. At the conclusion of the five (5) minute time period, record you time and the location of the sow bugs in the data table on your answer sheet.
10. Complete the remaining questions in Part B of the lab.

Please Continue on the Next Page

Sow Bug Habitats Answer Sheet

Part A

- Using complete sentences, predict what you think the sow bugs will do, if they are released into a habitat with different areas of moisture and light.

- Using complete sentences, explain why you think the sow bugs will be arranged in the way you predicted?

Part B

Data Table

	Environment	Number of Sow Bugs
Start time _____	Moist/Dark	
Stop time _____	Dry/Light	

- Did the animals prefer one environment to another? State evidence for your answer in complete sentences.

Please Continue on the Next Page

4. For this question, answer **either (a) or (b)**.

a) If most of the animals were found on the dark, moist side of the container, would this be proof that sow bugs prefer a moist environment to a dry one? Explain your answer in complete sentences.

b) If most of the animals were found on the illuminated, dry side of the container, would this be proof that sow bugs prefer light to darkness? Explain your answer in complete sentences.

5. Based on the way this experiment was run can you say the sow bugs behavior was due to differences in light conditions alone? **Yes or No.**

6. Using complete sentences, explain your reasoning to question #5.

7. How could the variables in this experimental set up be changed to allow for better conclusions to be drawn? Answer in complete sentences.

Please Continue on the Next Page

8. For this question, answer **either (a) or (b)** depending on your results.

a) If there is a preference, how does it relate to their survival? In other words, how do the environmental factors of light/dry or dark/moist make it possible for them to be better able to survive?

b) If there is no preference, explain why this is the case in terms of sow bug survival and life processes.

Sow Bug Habitats - Scoring Rubric**Maximum score - 24 points****Student Setup****3 points total**

Scoring should be done by teacher observation during the exercise.

- 3 points** Successfully sets up the Petri dish with the arrangement of wet/dry paper towels, and construction paper screen.
- 2 points** For having two factors correct
- 1 point** For having one factor correct
- 0 points** Incorrect setup; no factors correct.

Answer Sheet - Part A**Question 1.****3 points total**

- 3 points** Predictions relate to both variables.
A prediction might be: (a) The sow bugs will seek the moist/dark side of the Petri dish, (b) The sow bugs will be all over the setup, (c) The sow bugs will move toward the dry/light side of the petri dish, etc. Answers should be written using complete sentences.
- 2 points** For having a prediction, for only one factor in complete sentences.
A prediction might be: (a) The sow bugs will seek the dark side of the petri dish.
*** Deduct 1 point if complete sentences are not used. ***
- 0 points** Incorrect response, even if in complete sentences, or no response provided.

Question 2.**3 points total**

- 3 points** As long as students provide a sound rationale for both factors based on biological principles. They may have answers such as: (a) They will prefer the dark because it is cooler or because they can hide from predators or they normally feed at night. (b) They will scatter all over because they are disoriented due to being handled or they are attempting to find their home area. (c) They seek moisture because they require the dampness for respiration or to keep from drying out, etc. Predictions should be written using complete sentences.
- 2 points** Identifies only one factor in explanation
*** deduct 1 point if complete sentences are not used. ***
- 0 points** Incorrect response even if in complete sentence, or no response provided.

Part B**Data Table****2 points total**

- 2 points** For completing chart properly with both sets of time and numbers
- 1 point** One part of the data is missing.
- 0 points** If there is more than one part missing.

Part B**Question 3****3 points total**

3 points "Yes, most or all of the sow bugs were on the moist/dark side or dry/light side." They may say "Yes, 7 of the 10 sow bugs were on the moist/dark side." or "No, 6 bugs were on the moist/dark side and 4 were on the illuminated/dry side." The students should use the numbers of sow bugs located in the various parts of the setup. As long as they have an appropriate response based on what they discovered and recorded on their chart and answers are written in complete sentences.

2 points In the case of partial answers, for correctly deciding "yes or no" based on their numbers for preference.

or

For properly using the numbers of bugs in various locations as evidence but with a weak explanation.

*** Deduct 1 point if complete sentences are not used. ***

0 points Incorrect response even if in complete sentence, or no response provided.

Question 4a.**3 points total**

3 points "No. Movement to the moist/dark side could be evidence that the sow bugs prefer darkness and have nothing to do with the moisture." Students should indicate that there are two variables involved, not just one. Answers should be written in complete sentences.

2 points Identifies only one of the above variables,

*** Deduct 1 point if complete sentences are not used. ***

0 points Incorrect response even if in complete sentence, or no response provided.

Question 4b.**3 points total**

3 points "No. Movement to the dry/light side might indicate preference for a dry environment. It might not be related to the amount of light available." Again, students should indicate that there are two variables involved, not just one. Answers should be written in complete sentences.

2 points Identifies only one of the above variables.

*** Deduct 1 point if complete sentences are not used. ***

0 points Incorrect response even if in complete sentence, or no response provided.

Question 5**1 point total**

1 point Student responds, "No."

Question 6**2 points total**

2 points Student explains that two (2) variables were used at the same time. Answers should be written in complete sentences.

1 point Student gives a correct explanation for answer, but not in complete sentences.

0 points Incorrect answer even if written in complete sentences.

Question 7**2 points total**

2 points Student suggest a procedure to eliminate the problem of two (2) variables, such as, "The construction paper screen could be left off the petri dish. That way the sow bugs would be selecting between a moist and a dry environment." Or, "The towels on the bottom of the petri dish could all be dry or all moist, with the construction paper shading on one side and the other side illuminated." Answers should be written in complete sentences.

*** Deduct 1 point if complete sentences are not used. ***

0 points If student responds that the design is fine as it is, even if it is written in complete sentences.

Question 8a**2 points total**

2 points The sow bugs prefer a moist environment because they respire with gills. They must have moisture to keep their gills so that the diffusion of gases can occur.

or

The sow bugs prefer a dark environment because it keeps them from being easily spotted by predators. It also keeps them cooler and prevents them from drying out.

or

The sow bugs prefer dry environments so that they are not drowned. They must have the proper moisture level. Answers should be written in complete sentences.

Answers should be written in complete sentences.

*** Deduct 1 point if complete sentences are not used. ***

NOTE: There are other possible correct answers. Use your discretion in deciding if the choice is reasonable based on the findings and that the survival factors are based on sound, biological reasoning.

Question 8b.**2 points total**

2 points There is no preference since neither the moist and dark or the dry and light are a detriment to the animal's survival, and neither condition is needed for their survival.

or

In order to maintain a proper homeostatic balance, the sow bugs must move back and forth between the two environments.

Answers should be written in complete sentences.

*** Deduct 1 point if complete sentences are not used. ***

0 points If either choice (a) or (b) is selected and is not based on a reasonable interpretation of the lab results even if it is written in complete sentences.

0 points Incorrect response, even if written in complete sentences, or no response provided.

Highest possible score - 24 points

Student ID _____ Scoring Form - Sow Bug Habitats

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Student Setup

Building a sow bug habitat	0	1	2	3
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II Answer sheet

Part A

1.	Predicting the reaction of the sow bugs to their habitat	0	1	2	3
----	--	---	---	---	---

2.	Explaining their prediction	0	1	2	3
----	-----------------------------	---	---	---	---

Part B

	Data Table	0	1	2	
--	------------	---	---	---	--

3.	Drawing conclusions from data	0	1	2	3
----	-------------------------------	---	---	---	---

4. (a or b)	Identifying the two (2) variables	0	1	2	3
-------------	-----------------------------------	---	---	---	---

5.	Validity of experiment	0	1		
----	------------------------	---	---	--	--

6.	Explanation of # 3	0	1	2	
----	--------------------	---	---	---	--

7.	Changes in experiment design	0	1	2	
----	------------------------------	---	---	---	--

8 (a or b)	Factors for survival	0	1	2	
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Total Score _____

Total Possible score - 24 points

Student ID BIO - SB - 1

Scoring Form - Sow Bug Habitats

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Student Setup

Building a sow bug habitat 0 1 2 3

II Answer sheet

Part A

1. Predicting the reaction of the sow bugs
 to their habitat 0 1 2 3

2. Explaining their prediction 0 1 2 3

Part B

Data Table 0 1 2

3. Drawing conclusions from data 0 1 2 3

4. (a or b) Identifying the two (2) variables 0 1 2 3

5. Validity of experiment 0 1

6. Explanation of # 3 0 1 2

7. Changes in experiment design 0 1 2

8 (a or b) Factors for survival 0 1 2

Total Score 24 pts
Total Possible score - 24 points

Sow Bug Habitats Answer Sheet

Part A

1. Using complete sentences, predict what you think the sow bugs will do, if they are released into a habitat with different areas of moisture and light.

I think the sowbugs will go mostly to the moist towel in the dark.

2. Using complete sentences, explain why you think the sow bugs will be arranged in the way you predicted?

The sow bugs will need water for survival. I usually see sow bugs in soil which is moist and dark.

Part B

	Environment	Number of Sow Bugs
Start time <u>8:49</u>	Moist/Dark	10
Stop time <u>8:59</u>	Dry/Light	0

3. Did the animals prefer one environment to another? State evidence for your answer in complete sentences.

Yes, they preferred the dark, moist side. All of the sow bugs were found in the moist, dark side at the end of the ten minute period.

Please Continue on the Next Page

4. For this question, answer **either (a) or (b)**.
- a) If most of the animals were found on the dark, moist side of the container, would this be proof that sow bugs prefer a moist environment to a dry one? Explain your answer in complete sentences.

No, the results would be inconclusive because you can't be sure they chose it because it was dark or because it was moist.

- b) If most of the animals were found on the illuminated, dry side of the container, would this be proof that sow bugs prefer light to darkness? Explain your answer in complete sentences.

5. Based on the way this experiment was run can you say the sow bugs behavior was due to differences in light conditions alone?

No.

6. Using complete sentences, explain your reasoning to question #5.

Two variables are being tested at the same time. It would be more ideal to test for "amount of moisture" or "different amounts of light", but not both during the same experiment.

7. How could the variables in this experimental set up be changed to allow for better conclusions to be drawn? Answer in complete sentences.

The removal of the black construction paper would allow the sow bug to choose either a moist or dry environment. This would test for one variable not two.

Please Continue on the Next Page

8. For this question, answer **either (a) or (b)** depending on your results.

- a) If there is a preference, how does it relate to their survival? In other words, how do the environmental factors of light/dry or dark/moist make it possible for them to be better able to survive?

In a dark moist environment, the temperature of their surroundings would be lower. The lower temperature would prevent them from drying out and dehydrating.

- b) If there is no preference, explain why this is the case in terms of sow bug survival and life processes.

Student ID B10 - SB - 2

Scoring Form - Sow Bug Habitats

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Student Setup

Building a sow bug habitat 0 1 2 3

II Answer sheet

Part A

1. Predicting the reaction of the sow bugs
 to their habitat 0 1 2 3

2. Explaining their prediction 0 1 2 3

Part B

Data Table 0 1 2

3. Drawing conclusions from data 0 1 2 3

4. (a or b) Identifying the two (2) variables 0 1 2 3

5. Validity of experiment 0 1

6. Explanation of # 3 0 1 2

7. Changes in experiment design 0 1 2

8 (a or b) Factors for survival 0 1 2

Total Score

14

Total Possible score - 24 points

Sow Bug Habitats Answer Sheet

Part A

1. Using complete sentences, predict what you think the sow bugs will do, if they are released into a habitat with different areas of moisture and light.

They will migrate or move to the moist dark side

2. Using complete sentences, explain why you think the sow bugs will be arranged in the way you predicted?

they're natural habitat is moist and usually dark, so the moist dark side would be the appropriate choice

Part B

Data Table

	Environment	Number of Sow Bugs
Start time <u>9:00</u>	Moist/Dark	10
Stop time <u>9:05</u>	Dry/Light	0

3. Did the animals prefer one environment to another? State evidence for your answer in complete sentences.

yes, They all moved toward the moist/dark side almost immediately.

Please Continue on the Next Page

4. For this question, answer either (a) or (b).
- a) If most of the animals were found on the dark, moist side of the container, would this be proof that sow bugs prefer a moist environment to a dry one? Explain your answer in complete sentences.

Yes. Their natural environment is moist and dark which is the reason why they chose the dark side.

- b) If most of the animals were found on the illuminated, dry side of the container, would this be proof that sow bugs prefer light to darkness? Explain your answer in complete sentences.

5. Based on the way this experiment was run can you say the sow bugs behavior was due to differences in light conditions alone? **Yes or No.**

Yes

6. Using complete sentences, explain your reasoning to question #5.

Considering they live in darkness they chose to move to the darker side.

7. How could the variables in this experimental set up be changed to allow for better conclusions to be drawn? Answer in complete sentences.

Leave the black cloth or paper off the dish and keep the moist dry towel. Then watch to see which side they chose with no light difference.

Please Continue on the Next Page

8. For this question, answer **either (a) or (b)** depending on your results.
- a) **If there is a preference**, how does it relate to their survival? In other words, how do the environmental factors of light/dry or dark/moist make it possible for them to be better able to survive?

*moistness helps them with their respiration
They have gills to breathe. They may also need
moisture for their bodies. Light may affect them
~~or~~ or dry up the moisture*

- b) **If there is no preference**, explain why this is the case in terms of sow bug survival and life processes.

Student ID B10-5B-3

Scoring Form - Sow Bug Habitats

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Student Setup

Building a sow bug habitat 0 1 **(2)** 3

II Answer sheet**Part A**

1. Predicting the reaction of the sow bugs
to their habitat 0 **(1)** 2 3

2. Explaining their prediction 0 **(1)** 2 3

Part B

Data Table **(0)** ~~1~~ 2

3. Drawing conclusions from data 0 1 **(2)** 3

4. (a or b) Identifying the two (2) variables **(0)** 1 2 3

5. Validity of experiment 0 **(1)** 2

6. Explanation of # 3 0 **(1)** 2

7. Changes in experiment design 0 **(1)** 2

8 (a or b) Factors for survival 0 **(1)** 2

Total Score

10
Total Possible score - 24 points

**Sow Bug Habitats
Answer Sheet**

Part A

1. Using complete sentences, predict what you think the sow bugs will do, if they are released into a habitat with different areas of moisture and light.

The area with the moist moisture I think
The bugs will go to.

2. Using complete sentences, explain why you think the sow bugs will be arranged in the way you predicted?

Because even though they live on land they
have gills so they ~~can breathe~~ can carry
on respiration

Part B

Data Table

	Environment	Number of Sow Bugs
Start time _____	Moist/Dark	10
Stop time _____	Dry/Light	0

3. Did the animals prefer one environment to another? State evidence for your answer in complete sentences.

based on the data they all went
to the moist/dark environment

Please Continue on the Next Page

4. For this question, answer **either (a) or (b)**.

- a) If most of the animals were found on the dark, moist side of the container, would this be proof that sow bugs prefer a moist environment to a dry one? Explain your answer in complete sentences.

yes, because if they didn't they would have went to the dry/light side.

- b) If most of the animals were found on the illuminated, dry side of the container, would this be proof that sow bugs prefer light to darkness? Explain your answer in complete sentences.

5. Based on the way this experiment was run can you say the sow bugs behavior was due to differences in light conditions alone? **Yes or No.**

No

6. Using complete sentences, explain your reasoning to question #5.

It was both light and the amount of moisture

7. How could the variables in this experimental set up be changed to allow for better conclusions to be drawn? Answer in complete sentences.

Only have one variable instead of two

Please Continue on the Next Page

3. From your table, what was the temperature of the water at 6 minutes?

In the dry tube? 47 In the wet tube? 49

4. From your table, what was the temperature of the water at 9.5 minutes?

in the dry tube? 46.5 In the wet tube? 43.5

5. Predict what the temperature would be in the dry tube after 15 minutes.

About 35

Using complete sentences, suggest an explanation for your prediction.

It has to go down

6. Using complete sentences, describe and compare the cooling patterns in the test tubes.

as the tubes sit, the temperatures will keep going slowly down like they are during sun + if they hit sun temperature

7. Using complete sentences, explain what causes the difference in water temperature between the water in the two tubes.

It is because one of them is wet.

8. Using complete sentences, describe what comparison you could make between the effect of perspiration on the skin of the human body and the newspaper on the wet test tube. Relate your answer to body temperature control.

As the cooler the temperature gets the cooler is a body ~~the~~ or Testtube gets and as the hotter or warmer the the temperature is the warmer the Testtube or body gets.

8. For this question, answer **either (a) or (b)** depending on your results.

- a) **If there is a preference**, how does it relate to their survival? In other words, how do the environmental factors of light/dry or dark/moist make it possible for them to be better able to survive?

*the bugs need moisture for ~~B~~ respiration
and the darkness retains more moisture.*

- b) **If there is no preference**, explain why this is the case in terms of sow bug survival and life processes.

Vitamin C Testing

Task Information

Grade: Biology

Content:

- MST Framework Reference:
Standard 4 - Science: The Human Organism
Standard 1 - Analysis, Inquiry, & Design: Scientific Inquiry
- Regents Biology Syllabus: Unit I: Topic I.B.1; Unit III: Topic I
- Variance Biology Program Guide: Energy, Matter and Organization: Nutrition

Format: Manipulative

Purpose: To determine and rank the amount of Vitamin C contained in 3 unknown beverages.

Skills:

Primary: Investigating, Interpreting, Gathering data
Secondary: Hypothesizing, Observing
Regents Biology Syllabus Lab Skills: 3, 8, 9, 11

Time: 20 - 30 min.

Materials:

Per Student Or Group:

- 3 - 5 oz. plastic cups labeled Test A, Test B, Test C
- 3 - 5 oz. plastic cups labeled Control A, Control B, Control C
- 3 beverage samples marked A, B, C
- 6 stirrers
- 3 eyedroppers (disposable)
- 10 ml graduated cylinder
- indophenol solution (60 ml dropper bottle)
- paper towels
- safety goggles
- water

Preparation:

- Use beverages that have a large, definite difference of vitamin C content to facilitate the qualitative decision of color change made by the students.
- Purchase, or prepare, a 1% indophenol solution by dissolving 1 gram of indophenol in 99 grams of water.
- Label all cups as indicated in the materials list.

Safety:

Safety goggles must be worn while completing this task.
Students must be reminded NOT to taste any substance used in this task.

The salt form of indophenol should not be used by students as it has been identified as a potentially hazardous material.

Have MSDS sheets available

Extensions/Modifications: None

Vitamin C Testing

Task: At this station, you will experiment to determine the amount of Vitamin C contained in three unknown beverages.

Materials

- 3- 5 oz. plastic cups labeled Test A, Test B, Test C
- 3- 5 oz. plastic cups labeled Control A, Control B, Control C
- 3 beverages marked A, B, C
- 6 stirrers
- 3 eyedroppers (disposable)
- 10 ml graduated cylinder
- indophenol solution (60 ml dropper bottle)
- paper towels
- safety goggles
- water

Directions:

- **SAFETY GOGGLES MUST BE WORN WHILE COMPLETING THIS TASK.**
- **DO NOT TASTE ANY SUBSTANCE USED IN THIS TASK.**
 1. Put on safety goggles.
 2. Place 10 ml. indophenol solution in test cup A.
 3. Place 10 ml. water in cup **Control A**.
 4. Add one drop of test beverage A to each cup and stir well.
 5. Keep adding beverage, drop by drop, until the contents of both cups look the same color. Stir after each drop.
 6. On the data table record the number of beverage drops it takes to make the test cup liquid look like the control.
 7. Repeat the steps above for beverages **B** and **C**.

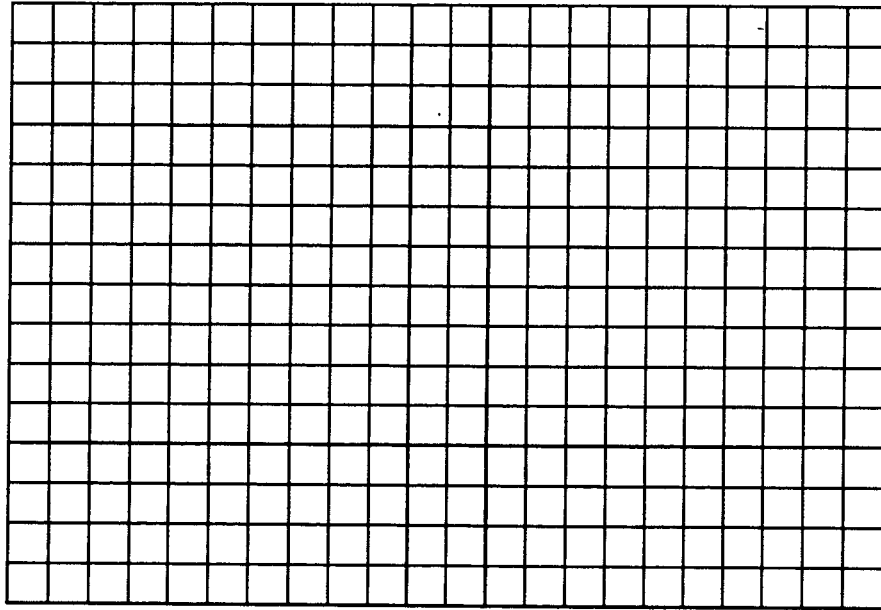
Test Beverage	Number of Drops	Rank (1 = most Vit. C)

8. Construct a bar graph of the results on the graph sheet on the next page.
9. After testing all beverages and graphing the results, rank the beverages in Vitamin C content : most = 1, second most = 2, etc. and record on the chart on this page.

NOTE: The fewer the drops of beverage needed, the greater the vitamin C content of the beverage!

Please Continue on the Next Page

Graph your results below.



10. Based on your results, which of the drinks, solutions A, B, or C contains the greatest amount of Vitamin C?

11. Sodium bicarbonate (baking soda) is added to vegetables like broccoli, asparagus, and spinach in some restaurants to preserve their green color while cooking. Some people are concerned that sodium bicarbonate might break down or reduce the Vitamin C content of these foods. Using complete sentences describe a hypothesis that could be used in an experiment to test this concern.

Vitamin C Testing - Scoring Rubric

Maximum Score - 12 points

Steps 6 & 7 Data collection 3 points total

- Allow 3 points if the letters and number of drops is recorded for all three (3) of the beverages.
 - Allow 2 points if only two (2) of the beverages are recorded in the data table
 - Allow 1 point if only 1 set of data is complete.
 - No credit if the data table is incomplete for all three beverages.
- *** Rank is not scored here.

Step 8 Graph 4 points total

- Allow 4 points if data is plotted accurately, appropriate scales are used, axis are labeled, and an appropriate title is given.
- Allow 3 points for any three of the above criteria
- Allow 2 points for any two of the above criteria
- Allow 1 point for any one of the above criteria
- No credit for incorrect responses or no response.

Step 9 Rank 2 points total

- Allow 2 points if all of the beverages are ranked correctly. Base the ranking on the teacher's pre-assessment testing.
- Allow 1 point if only 1 beverage is ranked correctly
- No credit for incorrect ranking or no response

Question 10 Beverage with the most Vitamin C Not Scored

This item is not scored as it is counted in the rank as shown in the data table.

Question 11 Statement of Hypothesis 3 points total

- Allow 3 points if the hypothesis includes;
 1. effect linked to the variable
 2. directionality of the effect
 3. expected change due to the variable
 - Allow 2 points for any two of the above criteria
 - Allow 1 point if only one of the above criteria is included
- *** Add 1 point if the response is written in complete sentences.
- No credit if non of the above criteria are included even if it is written in complete sentences.

Total possible score - 12 points

Student ID _____ Scoring Form - Vitamin C Testing

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Steps 6 & 7 Data collection	0	1	2	3	
Step 8 Graph	0	1	2	3	4
Step 9 Rank	0	1	2		
Question 11 Hypothesis	0	1	2	3	

Total points _____

Total possible points - 12

Student ID _____ Scoring Form - Vitamin C Testing

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Steps 6 & 7 Data collection	0	1	2	3	
Step 8 Graph	0	1	2	3	4
Step 9 Rank	0	1	2		
Question 11 Hypothesis	0	1	2	3	

Total points _____

Total possible points - 12

Student ID _____ Scoring Form - Vitamin C Testing

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Steps 6 & 7 Data collection	0	1	2	3	
Step 8 Graph	0	1	2	3	4
Step 9 Rank	0	1	2		
Question 11 Hypothesis	0	1	2	3	

Total points _____

Total possible points - 12

Student ID Bio - VC - 1 Scoring Form - Vitamin C Testing

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Steps 6 & 7 Data collection	0	1	2	(3)	
Step 8 Graph	0	1	(2)	3	(4)
Step 9 Rank	0	1	2		
Question 11 Hypothesis	0	1	2	(3)	
Total points	<u>12 pts</u>				
Total possible points	- 12				

Student ID Bio - VC - 2 Scoring Form - Vitamin C Testing

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Steps 6 & 7 Data collection	0	1	2	(3)	
Step 8 Graph	0	1	2	(3)	4
Step 9 Rank	(0)	1	2		
Question 11 Hypothesis	0	1	2	(3)	
Total points	<u>9 pts</u>				
Total possible points	- 12				

Student ID Bio - VC - 3 Scoring Form - Vitamin C Testing

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Steps 6 & 7 Data collection	0	1	(2)	3	
Step 8 Graph	0	1	(2)	3	4
Step 9 Rank	0	(1)	2		
Question 11 Hypothesis	0	(1)	2	3	
Total points	<u>6 pts</u>				
Total possible points	- 12				

Vitamin C Testing

Task: At this station, you will experiment to determine the amount of Vitamin C contained in three unknown beverages.

Materials

- 3- 5 oz. plastic cups labeled Test A, Test B, Test C
- 3- 5 oz. plastic cups labeled Control A, Control B, Control C
- 3 beverages marked A, B, C
- 6 stirrers
- 3 eyedroppers (disposable)
- 10 ml graduated cylinder
- indophenol solution (60 ml dropper bottle)
- paper towels
- safety goggles
- water

12/12

Directions:

- SAFETY GOGGLES MUST BE WORN WHILE COMPLETING THIS TASK.
- DO NOT TASTE ANY SUBSTANCE USED IN THIS TASK.
 1. Put on safety goggles.
 2. Place 10 ml. indophenol solution in test cup A.
 3. Place 10 ml. water in cup Control A.
 4. Add one drop of test beverage A to each cup, and stir well.
 5. Keep adding beverage, drop by drop, until the contents of both cups look the same color. Stir after each drop.
 6. On the data table record the number of beverage drops it takes to make the test cup liquid look like the control.
 7. Repeat the steps above for beverages B and C.

Test Beverage	Number of Drops	Rank (1 = most Vit. C)
A	5	1
B	12	3
C	8	2

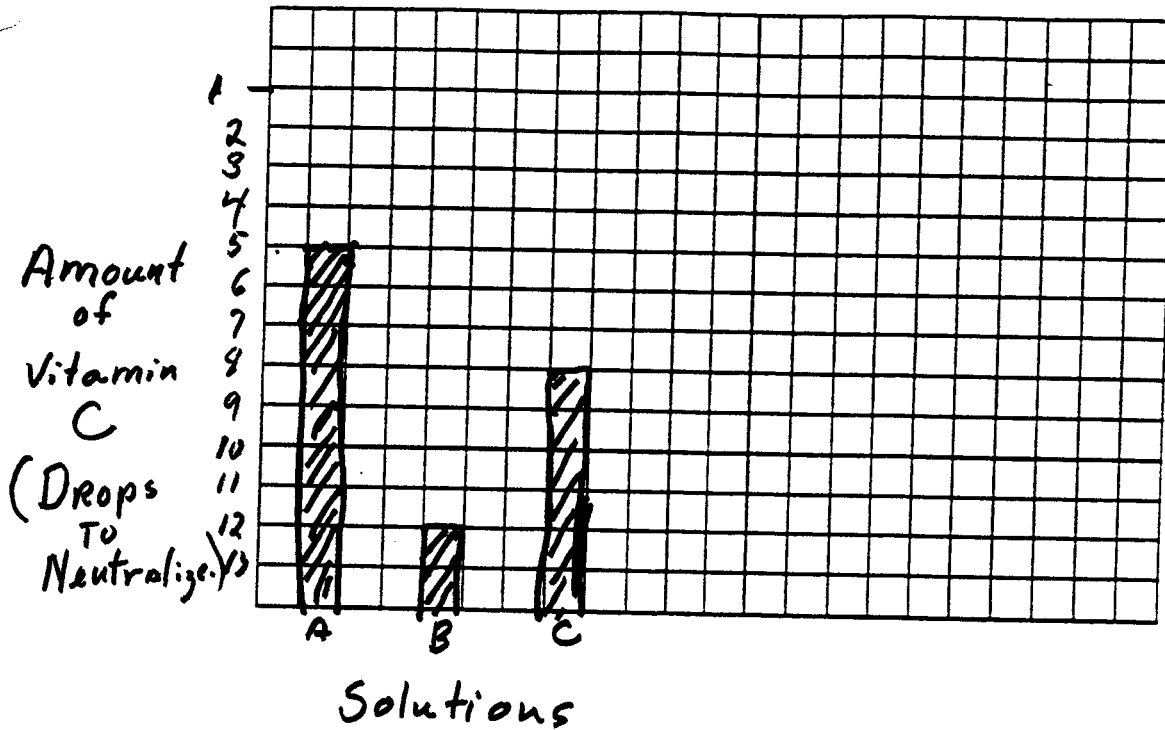
8. Construct a bar graph of the results on the graph sheet on the next page.
9. After testing all beverages and graphing the results, rank the beverages in Vitamin C content : most = 1, second most = 2, etc. and record on the chart on this page.

NOTE: The fewer the drops of beverage needed, the greater the vitamin C content of the beverage!

Please Continue on the Next Page

Graph your results below.

Comparison of
Vitamin C Content of Juices.



10. Based on your results, which of the drinks, solutions A, B, or C contains the greatest amount of Vitamin C?

May 5, 1996

3

Solution A.

11. Sodium bicarbonate (baking soda) is added to vegetables like broccoli, asparagus, and spinach in some restaurants to preserve their green color while cooking. Some people are concerned that sodium bicarbonate might break down or reduce the Vitamin C content of these foods. Using complete sentences describe a hypothesis that could be used in an experiment to test this concern.

Vegetables with ~~it~~ Sodium bicarbonate added
to them will have less Vitamin C than
Vegetables with out Sodium bicarbonate
added to them.

Vitamin C Testing

Task: At this station, you will experiment to determine the amount of Vitamin C contained in three unknown beverages.

Materials

- 3- 5 oz. plastic cups labeled Test A, Test B, Test C
- 3- 5 oz. plastic cups labeled Control A, Control B, Control C
- 3 beverages marked A, B, C
- 6 stirrers
- 3 eyedroppers (disposable)
- 10 ml graduated cylinder
- indophenol solution (60 ml dropper bottle)
- paper towels
- safety goggles
- water

9
12

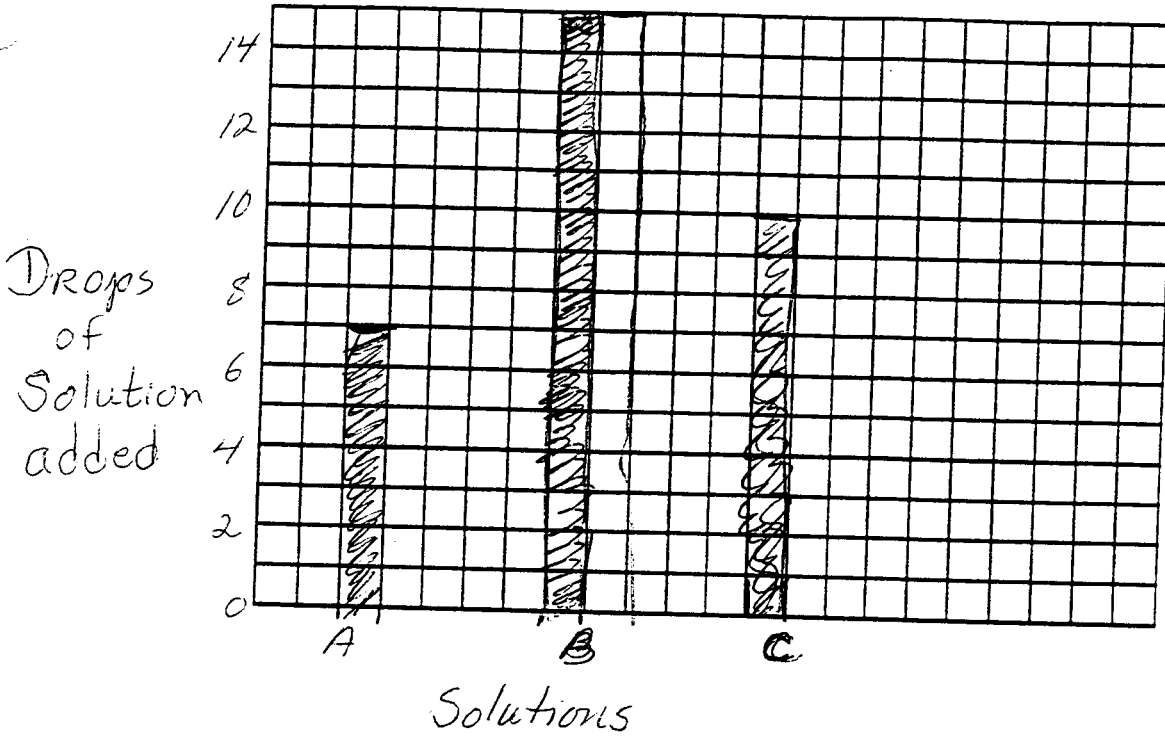
Directions:

- SAFETY GOGGLES MUST BE WORN WHILE COMPLETING THIS TASK.
- DO NOT TASTE ANY SUBSTANCE USED IN THIS TASK.
 1. Put on safety goggles.
 2. Place 10 ml. indophenol solution in test cup A.
 3. Place 10 ml. water in cup Control A.
 4. Add one drop of test beverage A to each cup and stir well.
 5. Keep adding beverage, drop by drop, until the contents of both cups look the same color. Stir after each drop.
 6. On the data table record the number of beverage drops it takes to make the test cup liquid look like the control.
 7. Repeat the steps above for beverages B and C.

Test Beverage	Number of Drops	Rank (1 = most Vit. C)
A	7	3
B	15	1
C	10	2

8. Construct a bar graph of the results on the graph sheet on the next page.
 9. After testing all beverages and graphing the results, rank the beverages in Vitamin C content : most = 1, second most = 2, etc. and record on the chart on this page.
- NOTE: The fewer the drops of beverage needed, the greater the vitamin C content of the beverage!**

Please Continue on the Next Page



10. Based on your results, which of the drinks, solutions A, B, or C contains the greatest amount of Vitamin C?

May 5, 1996

3

Solution B

11. Sodium bicarbonate (baking soda) is added to vegetables like broccoli, asparagus, and spinach in some restaurants to preserve their green color while cooking. Some people are concerned that sodium bicarbonate might break down or reduce the Vitamin C content of these foods. Using complete sentences describe a hypothesis that could be used in an experiment to test this concern.

If Sodium Bicarbonate is added to vegetables,
it may reduce the vitamin C content
of these foods.

Vitamin C Testing

Task: At this station, you will experiment to determine the amount of Vitamin C contained in three unknown beverages.

Materials

- 3- 5 oz. plastic cups labeled Test A, Test B, Test C
- 3- 5 oz. plastic cups labeled Control A, Control B, Control C
- 3 beverages marked A, B, C
- 6 stirrers
- 3 eyedroppers (disposable)
- 10 ml graduated cylinder
- indophenol solution (60 ml dropper bottle)
- paper towels
- safety goggles
- water

6/12

Directions:

- **SAFETY GOGGLES MUST BE WORN WHILE COMPLETING THIS TASK.**
- **DO NOT TASTE ANY SUBSTANCE USED IN THIS TASK.**
 1. Put on safety goggles.
 2. Place 10 ml. indophenol solution in test cup A.
 3. Place 10 ml. water in cup **Control A**.
 4. Add one drop of test beverage A to each cup and stir well. *of the above*
 5. Keep adding beverage, drop by drop, until the contents of both cups look the same color. Stir after each drop.
 6. On the data table record the number of beverage drops it takes to make the test cup liquid look like the control.
 7. Repeat the steps above for beverages B and C.

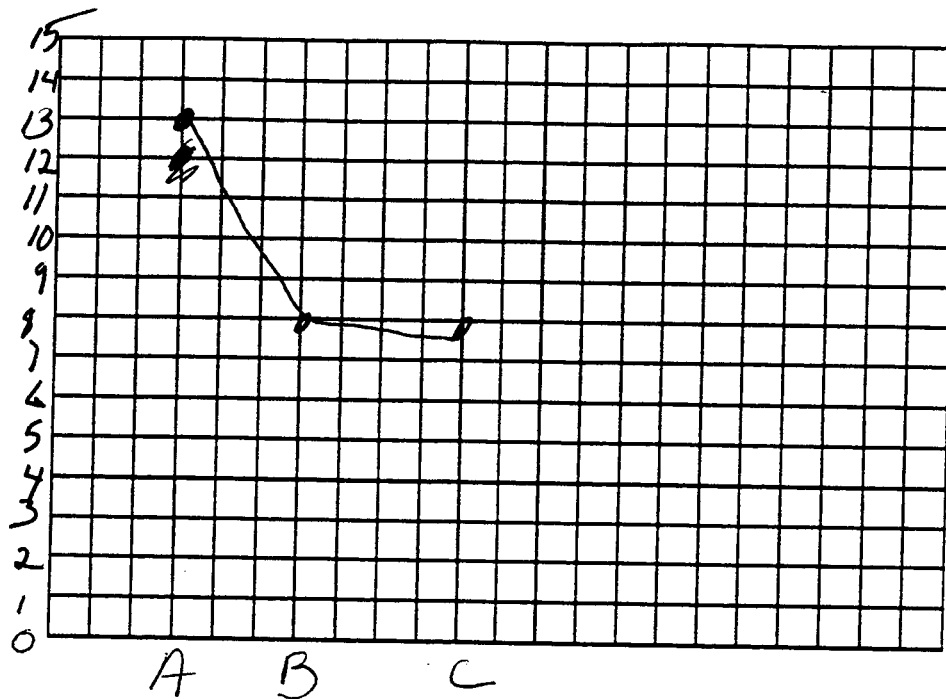
Test Beverage	Number of Drops	Rank (1 = most Vit. C)
A	13	3
B	8	2
C	8 ↓	1

8. Construct a bar graph of the results on the graph sheet on the next page.
9. After testing all beverages and graphing the results, rank the beverages in Vitamin C content : most = 1, second most = 2, etc. and record on the chart on this page.

NOTE: The fewer the drops of beverage needed, the greater the vitamin C content of the beverage!

Please Continue on the Next Page

drop



10. Based on your results, which of the drinks, solutions A, B, or C contains the greatest amount of Vitamin C?

May 5, 1996 3

Solution C

11. Sodium bicarbonate (baking soda) is added to vegetables like broccoli, asparagus, and spinach in some restaurants to preserve their green color while cooking. Some people are concerned that sodium bicarbonate might break down or reduce the Vitamin C content of these foods. Using complete sentences describe a hypothesis that could be used in an experiment to test this concern.

To Test if the baking soda affects the Vitamin's C in the different types of vegetables.

Ajax Seed Company

Task Information

Subject: Biology

Content:

- MST Framework Reference:
Standard 4-Science: The Living Environment
Standard 1-Analysis, Inquiry, & Design: Scientific Inquiry
- Regents Biology Syllabus:
Unit V: Topic I.A & Topic II.A
- Variance Biology Program Guide:
Genetics and Molecular Biology: Patterns of Inheritance

Format: Paper/Pencil

Purpose: To analyze the genetic characteristics of some hypothetical seeds.

Skills:

Primary: Interpreting data, Predicting
Secondary: Communicating, Classifying

Time: 15-20 min.

Materials: Worksheet

Preparation: None

Safety: N/A

Extensions/Modifications: None

Ajax Seed Company

Task: At this station you will be analyzing the genetic characteristics of some hypothetical seeds

Ajax Seed Company has bags of seeds for sale that "...guarantees that all of the plants produced from this bag of seeds will be tall". A farmer planted seeds from one of these bags and found that all of the seeds that germinated grew into tall plants.

The farmer collected the seeds from many of these tall plants. When he planted the collected seeds the following year, only some of the new plants were tall while the others were short.

Note: If symbols are used in your responses, a key must be provided.

1. What are all the possible genotype crosses that the Ajax Seed Company could have used to produced the first bag of seeds ?

Explain your answer, using complete sentences.

2. What are the possible genotype(s) of the seeds in the bag that the farmer bought?

Explain your answer, using complete sentences.

3. Using complete sentences explain how the collected seed could produce both tall and short plants.

4. The farmer wants to produce a pure breeding line of tall plants. Each year he collects seeds **only** from tall plants. The following summer, he plants the collected seeds. After five years of doing this, can he guarantee that all the collected seeds will result in tall plants?

Explain your answer, using complete sentences.

Ajax Seed Company - Scoring Rubric

Maximum score - 12 points

This assessment task is to be used after students have had instruction in Mendelian Genetics.

NOTE: If the student uses symbols, a key must be provided.

Question 1 - First Seeds

4 points total

Criteria ;

- **Genotype identification**

- Allow 2 points if the student identifies all possible crosses using words or symbols (with key)

Key:

T = tall allele

t = short allele

pure tall (TT) X heterozygous tall (Tt)

pure tall(TT) X pure short (tt)

- Allow 1 point if the student;
 - identifies both crosses with **no** key if symbols are used
 - identifies only one (1) cross with a key if symbols are used
- No credit if the student identifies no correct crosses or only one (1) cross with no key.

- **Explanation**

- Allow 2 points if the student provides a correct explanation that describes the presence of the dominant gene as being necessary for the trait to appear in the first offspring. The response should be written in complete sentences.
- Allow 1 point if the student provides a correct explanation, but it is not in complete sentences.
- No credit if the student gives an incorrect explanation even if it is in complete sentences.

Question 2 - Offspring Seeds

4 points total

Criteria:

- **Genotypes present**

- Allow 2 points if the student identifies all possible correct genotypes using words or symbols with a key. (the key from question 1 may be used)
Both homozygous (pure) tall(TT) and heterozygous(Tt)
- Allow 1 point if the student;
 - Identifies both genotypes with **no** key if symbols are used
 - identifies only heterozygous tall with a key if symbols are used
- No credit if the student makes no correct identifications or only one (1) correct identification with **no** key.

- **Explanation**

- Allow 2 points if the student provides a correct explanation that describes the presence of the recessive gene in some of the seeds using c complete sentences
- Allow 1 point if the student provides a correct explanation, but not in complete sentences.
- No credit if the student gives an incorrect explanation even if it is in complete sentences.

Question 3 - Explanation**2 points total****Criteria:**

- Allow 1 point if the student provides a correct explanation that describes the presence of both dominant and recessive genes as being necessary in each parent for both traits (tall and short height) to appear in the offspring. This explanation may be shown by the cross hybrid tall x hybrid tall by using words, or symbols with a key as shown above. The response should be in complete sentences.
- Allow 1 point if the student provides a correct explanation, but it is not in complete sentences.
- No credit if the student gives an incorrect response even if it is incomplete sentences.

Question 4 - Explanation of Guarantee**2 points total****Criteria:**

- **Do not score** Student's response to "...can he guarantee that...."
- Allow 2 points if the student provides a correct explanation that describes the possibility of the recessive gene being masked by the presence of the dominant gene in any plant with the tall trait from which seeds are collected. The response should be in complete sentences.
- Allow 1 point for a correct explanation, but not written in complete sentences.
- No credit for an incorrect response even if it is in complete sentences.

Highest possible score - 12 points

Student ID _____ Scoring Form - Ajax Seed Company
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | | |
|---|---|---|---|
| 1. First seeds used | | | |
| Cross Identification | 0 | 1 | 2 |
| Explanation | 0 | 1 | 2 |
| 2. Genotypes of seeds purchased | | | |
| Genotype | 0 | 1 | 2 |
| Explanation | 0 | 1 | 2 |
| 3. Explanation of dominant & recessive genes | 0 | 1 | 2 |
| 4. Explanation of guarantee | 0 | 1 | 2 |

Total Score _____
Total possible score - 12 points

Student ID _____ Scoring Form - Ajax Seed Company
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | | |
|---|---|---|---|
| 1. First seeds used | | | |
| Cross Identification | 0 | 1 | 2 |
| Explanation | 0 | 1 | 2 |
| 2. Genotypes of seeds purchased | | | |
| Genotype | 0 | 1 | 2 |
| Explanation | 0 | 1 | 2 |
| 3. Explanation of dominant & recessive genes | 0 | 1 | 2 |
| 4. Explanation of guarantee | 0 | 1 | 2 |

Total Score _____
Total possible score - 12 points

Student ID Bio - AS - 1 Scoring Form - Ajax Seed Company
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | | | |
|----|--|---|---|---------------|
| 1. | First seeds used | | | |
| | Cross Identification | 0 | 1 | (2) |
| | Explanation | 0 | 1 | (2) |
| 2. | Genotypes of seeds purchased | | | |
| | Genotype | 0 | 1 | (2) |
| | Explanation | 0 | 1 | (2) |
| 3. | Explanation of dominant & recessive genes | 0 | 1 | (2) |
| 4. | Explanation of guarantee | 0 | 1 | (2) |
| | Total Score | | | <u>12 pts</u> |
| | Total possible score - 12 points | | | |

Student ID Bio - AS - 2 Scoring Form - Ajax Seed Company
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | | | |
|----|--|---|-----|----------|
| 1. | First seeds used | | | |
| | Cross Identification | 0 | (1) | 2 |
| | Explanation | 0 | 1 | (2) |
| 2. | Genotypes of seeds purchased | | | |
| | Genotype | 0 | (1) | 2 |
| | Explanation | 0 | 1 | (2) |
| 3. | Explanation of dominant & recessive genes | 0 | 1 | (2) |
| 4. | Explanation of guarantee | 0 | (1) | 2 |
| | Total Score | | | <u>9</u> |
| | Total possible score - 12 points | | | |

Student ID Bio-AS-3 Scoring Form - Ajax Seed Company
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1.	First seeds used			
	Cross Identification	0	1	2
	Explanation	0	1	2
2.	Genotypes of seeds purchased			
	Genotype	0	1	2
	Explanation	0	1	2
3.	Explanation of dominant & recessive genes	0	1	2
4.	Explanation of guarantee	0	1	2
	Total Score	<u>2 pts</u>		
		Total possible score - 12 points		

Student ID _____ Scoring Form - Ajax Seed Company
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1.	First seeds used			
	Cross Identification	0	1	2
	Explanation	0	1	2
2.	Genotypes of seeds purchased			
	Genotype	0	1	2
	Explanation	0	1	2
3.	Explanation of dominant & recessive genes	0	1	2
4.	Explanation of guarantee	0	1	2
	Total Score	_____		
		Total possible score - 12 points		

Ajax Seed Company

Task: At this station you will be analyzing the genetic characteristics of some hypothetical seeds

17/12
 Ajax Seed Company has bags of seeds for sale that "...guarantees that all of the plants produced from this bag of seeds will be tall". A farmer planted seeds from one of these bags and found that all of the seeds that germinated grew into tall plants.

The farmer collected the seeds from many of these tall plants. When he planted the collected seeds the following year, only some of the new plants were tall while the others were short.

Note: If symbols are used in your responses, a key must be provided.

1. What are all the possible genotype crosses that the Ajax Seed Company could have used to produce the first bag of seeds?

T = Tall gene
 t = Short gene
 TT x Tt or TT x tt

Explain your answer, using complete sentences.

To have all the plants from the factory to have grown tall, they must have all had the dominant gene. If the pure dominant crosses with anything it must have the dominant gene.

2. What are the possible genotype(s) of the seeds in the bag that the farmer bought?

TT and Tt

Explain your answer, using complete sentences.

Some of the seeds must have had the recessive gene but all must have had at least one dominant gene.

3. Using complete sentences explain how the collected seed could produce both tall and short plants.

If two plant that both have the hidden
recessive gene are crossed, Then There is a
chance The 2 recessive will combinu to make
some short. The plants with only one recessive will
be Tall.

4. The farmer wants to produce a pure breeding line of tall plants. Each year he collects seeds **only** from tall plants. The following summer, he plants the collected seeds. After five years of doing this, can he guarantee that all the collected seeds will result in tall plants?

No

Explain your answer, using complete sentences.

Even after 5 years some hybrid seed
could still have carried a recessive gene which
could combine to make seed have only
short genes.

Ajax Seed Company

Task: At this station you will be analyzing the genetic characteristics of some hypothetical seeds

Ajax Seed Company has bags of seeds for sale that "...guarantees that all of the plants produced from this bag of seeds will be tall". A farmer planted seeds from one of these bags and found that all of the seeds that germinated grew into tall plants.

The farmer collected the seeds from many of these tall plants. When he planted the collected seeds the following year, only some of the new plants were tall while the others were short.

Note: If symbols are used in your responses, a key must be provided.

1. What are all the possible genotype crosses that the Ajax Seed Company could have used to produce the first bag of seeds?

Pure Tall and a pure Short.

Explain your answer, using complete sentences.

This cross would make sure that all the seeds would grow tall but some of the next seeds could be short.

2. What are the possible genotype(s) of the seeds in the bag that the farmer bought?

They would be hybrids.

Explain your answer, using complete sentences.

Some of the next generation were short so this meant there was some recessive genes in the seeds.

3. Using complete sentences explain how the collected seed could produce both tall and short plants.

Since short is recessive, the seeds carried a hidden gene. This can get shown in the next generation.

4. The farmer wants to produce a pure breeding line of tall plants. Each year he collects seeds **only** from tall plants. The following summer, he plants the collected seeds. After five years of doing this, can he guarantee that all the collected seeds will result in tall plants?

no

Explain your answer, using complete sentences.

Some chance of them being hidden short.

Ajax Seed Company

Task: At this station you will be analyzing the genetic characteristics of some hypothetical seeds

Ajax Seed Company has bags of seeds for sale that "...guarantees that all of the plants produced from this bag of seeds will be tall". A farmer planted seeds from one of these bags and found that all of the seeds that germinated grew into tall plants.

The farmer collected the seeds from many of these tall plants. When he planted the collected seeds the following year, only some of the new plants were tall while the others were short.

Note: If symbols are used in your responses, a key must be provided.

- 1. What are all the possible genotype crosses that the Ajax Seed Company could have used to produced the first bag of seeds ?

They cross $Tt \times Tt$

Explain your answer, using complete sentences.

You got to have lots of Big T's together

- 2. What are the possible genotype(s) of the seeds in the bag that the farmer bought?

All Tall's

Explain your answer, using complete sentences.

The all got to be Tall.

- 3. Using complete sentences explain how the collected seed could produce both tall and short plants.

starts as hidden at first
 cross one to himself gets
 you short

- 4. The farmer wants to produce a pure breeding line of tall plants. Each year he collects seeds **only** from tall plants. The following summer, he plants the collected seeds. After five years of doing this, can he guarantee that all the collected seeds will result in tall plants?

No

Explain your answer, using complete sentences.

short is a hidden that you
 don't know there so you
 never know for sure in 5 years

Dichotomous Key 2

Task Information

Grade: Biology, Middle School Science

Content:

- MST framework reference:
 - Standard 4-The Living Environment
- Regents Biology Syllabus:
 - Unit I, Topic II
- Variance Biology Program Guide:
 - Evolution: Unity & Diversity
- RCT Guide in Science:
 - 8 Middle School Block A

Format: Paper/pencil

Purpose: To use a dichotomous key to identify unknown organisms.

Skills:

Primary: Classifying
Secondary: Hypothesizing, Interpreting data

Time: 15 - 25 minutes

Materials:

- metric rulers

Preparation: None

Safety: N/A

Extensions/Modifications: None

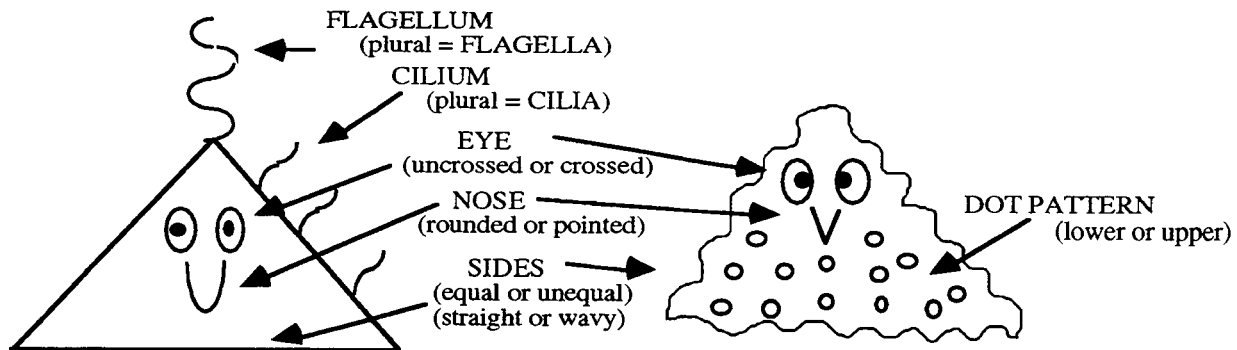
Dichotomous Key 2

Task: With the millions of living organisms in the world, scientists need a method of identifying an unknown organism. To do this, scientists use a dichotomous key. At this station, you will be using a dichotomous key to identify unknown organisms.

Directions

Use the dichotomous key below to identify any three (3) species of the genus *Triangulum* in the accompanying Species Sheet. Record the choices made, and the resulting scientific name, on the answer sheet provided.

Dichotomous Key



- | | |
|--|---|
| 1. A. Three(3) sided with straight lines | Go to 2 |
| B. Three (3) sided with wavy lines | Go to 10 |
| 2. A. Has no eyes | Go to 3 |
| B. Has eyes | Go to 5 |
| 3. A. Has flagella for movement | Go to 4 |
| B. Has cilia for movement | Go to 7 |
| 4. A. The three sides are of equal length | <i>Triangulum equalius</i> |
| B. The three sides are not of equal length | Go to 12 |
| 5. A. Has crossed-eyes | Go to 6 |
| B. Eyes not crossed | Go to 9 |
| 6. A. Has a single flagellum for movement | <i>Triangulum monoflagelleum</i> |
| B. Has two or more flagella for movement | <i>Triangulum polyflagelleum</i> |
| 7. A. Total number of cilia for movement are odd | <i>Triangulum oddcilius</i> |
| B. Total number of cilia for movement are even | Go to 8 |
| 8. A. Has a pointed nose | <i>Triangulum pointiatus</i> |
| B. Has a rounded nose | <i>Triangulum roundiatus</i> |
| 9. A. Has two cilia on each side for movement | <i>Triangulum biciliatus</i> |
| B. Has more than two cilia on each side | <i>Triangulum polycilius</i> |
| 10.A. Has crossed-eyes | Go to 11 |
| B. Eyes not crossed | <i>Triangulum waveus (Samplest correctus)</i> |
| 11.A. Lower half of the body has a dot pattern | <i>Triangulum lowdotteus</i> |
| B. Upper half of the body has a dot pattern | <i>Triangulum upperdotteus</i> |
| 12.A. Has a pointed nose | <i>Triangulum pointiflagelleum</i> |
| B. Has a rounded nose | <i>Triangulum roundiflagelleum</i> |

Answer Sheet

1. Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter for each of the choices you made as you identified the species (see example with species #101). When you are sure of the species identification, write in the scientific name in the space provided.

Example #101	Species # _____	Species # _____	Species # _____
1B _____	_____	_____	_____
↓	↓	↓	↓
10B _____	_____	_____	_____
↓	↓	↓	↓
_____	_____	_____	_____
↓	↓	↓	↓
_____	_____	_____	_____
↓	↓	↓	↓
_____	_____	_____	_____
↓	↓	↓	↓
_____	_____	_____	_____
↓	↓	↓	↓

Scientific name of Example #101 = Samplest correctus

Scientific name of Species # _____ = _____

Scientific name for Species # _____ = _____

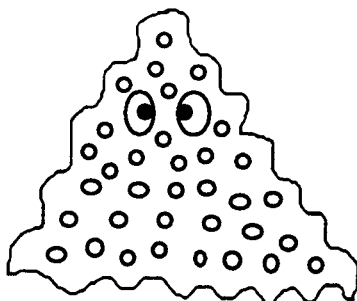
Scientific Name for Species # _____ = _____

2. The following *Triangulum* organism was created by a student. It is **not** the same as any of the thirteen organisms shown on the Species Sheet. Can you determine its species? If so, list the steps, as you did before, in making this determination.



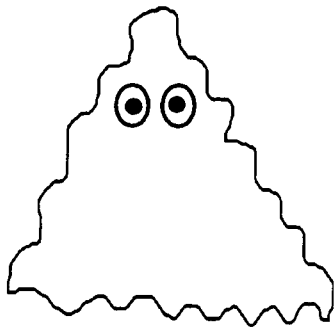
3. Draw another example of the organism in question #2 that would "key out" as being the same species.

4. A new species of *Triangulum* was discovered by a lab student in a sample of stagnant pond water. The dichotomous key must be modified to identify the new organism shown below.

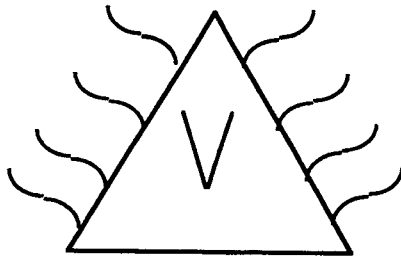


- A. Between which steps in the key should the new trait be added ?
- B. Write the new step to allow the key to fit the newly discovered organism.
- C. Write a complete scientific name for this new species.

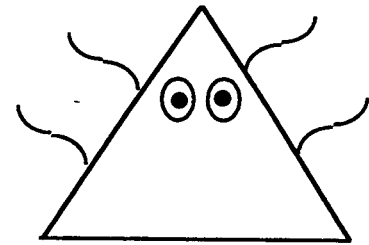
Species Sheet



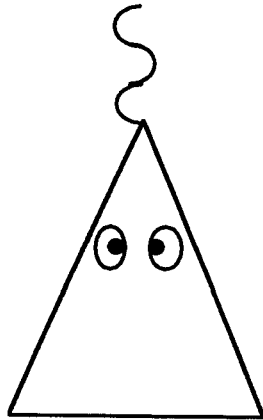
#101



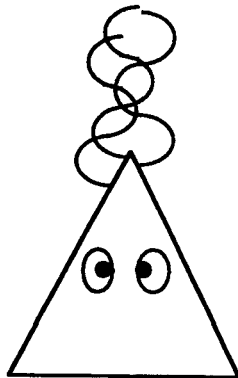
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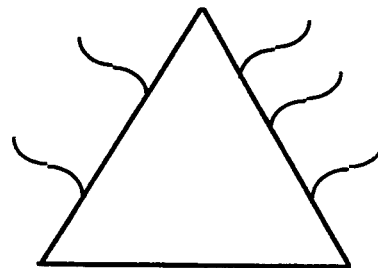
#109



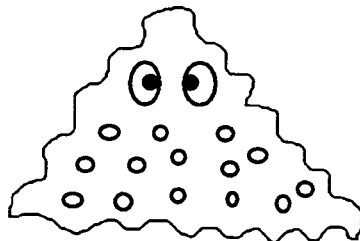
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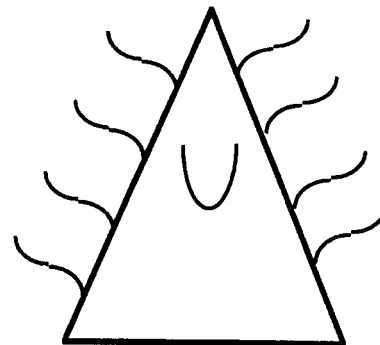
#106



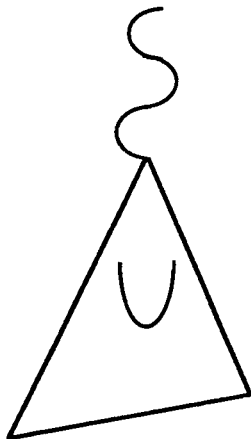
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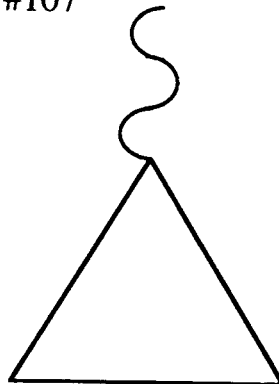
#107



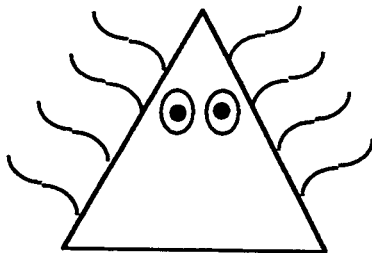
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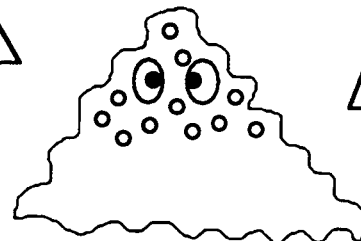
#103



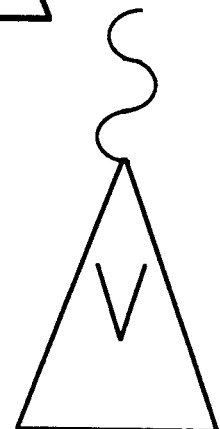
#108



#104



#113



#112

Dichotomous Key 2 - Scoring Rubric

April 30, 1996

1

This activity is to be used as an assessment after students have been exposed to the use of a dichotomous key, and therefore know what the term dichotomous refers to, and how it is used. There are 13 species of *Triangulum* pictured; it is suggested that each student identifies any three of the species.

Question 1

- 1 point is awarded for each correct name identification of each species.
- 1 point is awarded for each correct choice or step along the way.

The scoring of each species should continue until the last correct choice or step.

The Example given on the Student Answer Sheet (#101) would be awarded 3 points for a perfect answer. But if the student had only been able to reach choice 1B before making a mistake, only 1 point would be awarded.

Since a different number of choices is necessary to identify the different species, the students may end up with different total points. Therefore a percent grade may be given.

Total number of points for each species are given below, including the correct choice for each of the steps.

	<u>Species name</u>	<u>Correct steps</u>	<u>Possible points</u>
Species # 101	<i>T. waveus</i> (10B)	(1B - 10B)	3 points
Species # 102	<i>T. monoflagelleum</i> (6A)	(1A - 2B - 5B - 6A)	5 points
Species # 103	<i>T. roundflagelleum</i> (12B)	(1A - 2A - 3A - 4B - 12B)	6 points
Species # 104	<i>T. polycilius</i> (9B)	(1A - 2B - 5B - 9B)	5 points
Species # 105	<i>T. pointiatus</i> (8A)	(1A - 2A - 3B - 7B - 8A)	6 points
Species # 106	<i>T. polyflagelleum</i> (6B)	(1A - 2B - 5A - 6B)	5 points
Species # 107	<i>T. lowdotteus</i> (11A)	(1B - 10A - 11A)	4 points
Species # 108	<i>T. equalius</i> (4A)	(1A - 2A - 3A - 4A)	5 points
Species # 109	<i>T. biciliatus</i> (9A)	(1A - 2B - 5B - 9A)	5 points
Species # 110	<i>T. oddcilius</i> (7A)	(1A - 2A - 3B - 7A)	5 points
Species # 111	<i>T. roundiatus</i> (8B)	(1A - 2A - 3B - 7B - 8B)	6 points
Species # 112	<i>T. pointiflagelleum</i> (12A)	(1A - 2A - 3A - 4B - 12A)	6 points
Species # 113	<i>T. upperdotteus</i> (11B)	(1B - 10A - 11B)	4 points

Sample Answer Sheet

Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter (example #101) for each of the choices you made as you identified the species. When you are sure of the species identification, write in the scientific name in the space provided.

Example #101	Species # <u>105</u>	Species # <u>112</u>	Species # <u>107</u>
1B ↓	1A ↓ (1 point)	1A ↓ (1 point)	1B ↓ (1 point)
10B ↓	2A ↓ (1 point)	2A ↓ (1 point)	10B ↓ (incorrect)
↓	3B ↓ (1 point)	3B ↓ (incorrect)	↓
↓	7B ↓ (1 point)	7A ↓ (incorrect)	↓
↓	8A ↓ (1 point)	↓	↓
↓	↓	↓	↓
↓	↓	↓	↓

• Scientific name of Example #101 = *Samplest correctus*

Question 1.

Scientific name of Species #105 = *Triangulum pointiatus*
 Actual points 6 Possible Points = 6

Scientific name for Species #112 = *Triangulum oddcilus*
 Actual Points 2 Possible points = 6

Scientific Name for Species #107 = *Triangulum waveus*
 Actual Points 1 Possible Points = 4

Question 2**5 points total**

- Award 1 point for each correct step in the determination and correct naming of the organism *Triangulum oddcilus*. (steps; 1A, 2A, 3B, 7A)

Question 3**4 points total**

- Allow **4 points** if each of the following traits are shown in the student drawing:
 - * Sides are straight lines
 - * Has no eyes
 - * Has cilia for movement
 - * Total number of cilia for movement are odd
 (Note: The number must be odd and other than 3)
- **3 points** if any three of the above traits are shown correctly
- **2 points** if any two of the above traits are shown correctly
- **1 point** if any one of the above traits is shown correctly
- **0 points** if responses are incorrect, or no response is provided.

Note: Deduct 1 point from the total points for this question for each trait shown that should not be present (e.g.: a nose)

Question 4**7 points total**

- A. • Allow **1 point** if the student correctly identifies steps ten (10) and eleven (11).
 • Allow **0 points** for incorrect responses, or no response provided.
- B. • Allow **2 points** if the student correctly describes two different conditions for the new trait.
 (Example: A. Half the body has a dot pattern
 B. The whole body has a dot pattern.)
- Allow **1 point** if the student correctly describes one condition for the new trait.
 - Allow **0 points** for incorrect responses, or no response provided.
- C. • Allow **4 points** if the student properly writes the scientific name of the new species using each of the following conventions:
 - * name consists of genus and species
 - * the genus name is *Triangulum*
 - * underlining entire name
 - * first letter of the genus name capitalized, first letter of the species name lower-case
- Allow **3 points** if any three (3) of the above conventions are used correctly.
 - Allow **2 points** if any two (2) of the above conventions are used correctly.
 - Allow **1 point** if any one (1) of the above conventions is used correctly.
 - Allow **0 points** for incorrect responses, or no response provided.

Student ID _____

Scoring Form - Dichotomous Key 2

Male / Female (circle one)

Question 1:

Directions: Circle each of the species chosen.

Species #	Points Possible	Points Awarded

Possible Points _____ Points Awarded: _ _

Triangulum Identification score: $\frac{\text{points awarded}}{\text{possible points}} = \underline{\underline{\hspace{2cm}}}$

Question 2:

Correct steps and naming of *T. oddcilius* 0 1 2 3 4 5

Question 3:

Traits shown in student drawing
(including deductions) 0 1 2 3 4

*** NOTE: Lowest possible score 0 points ***

Question 4:

A Correctly identifies steps 0 1

B Writes accurate descriptions of the new trait 0 1 2

C Writes a scientific name using binomial
nomenclature 0 1 2 3 4

Total question score: _ _____
Total possible score questions #2 - #4 - 16 points

Student ID B10 - DK - 1

Scoring Form - Dichotomous Key 2

Male / Female (circle one)

Question 1:

Directions: Circle each of the species chosen.

Species #	Points Possible	Points Awarded
102	5	4
103	6	6
104	5	5

Possible Points 16 Points Awarded: 15

Triangulum Identification score: $\frac{\text{points awarded}}{\text{possible points}} = \frac{15}{16} = 93.8\%$

Question 2:

Correct steps and naming of *T. oddcilius* 0 1 2 3 4 5

Question 3:

Traits shown in student drawing (including deductions) 0 1 2 3 4

*** NOTE: Lowest possible score 0 points ***

Question 4:

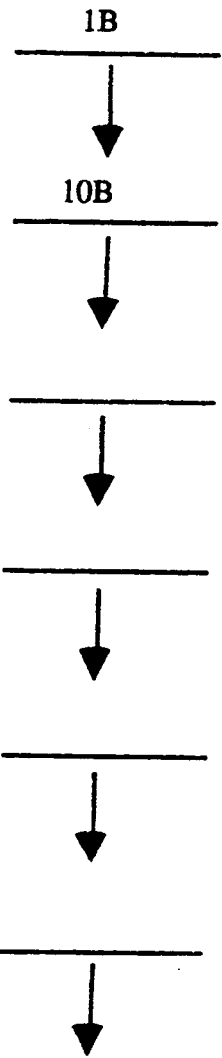
- A Correctly identifies steps 0 1
- B Writes accurate descriptions of the new trait 0 1 2
- C Writes a scientific name using binomial nomenclature 0 1 2 3 4

Total question score: 15 pts
Total possible score questions #2 - #4 - 16 points

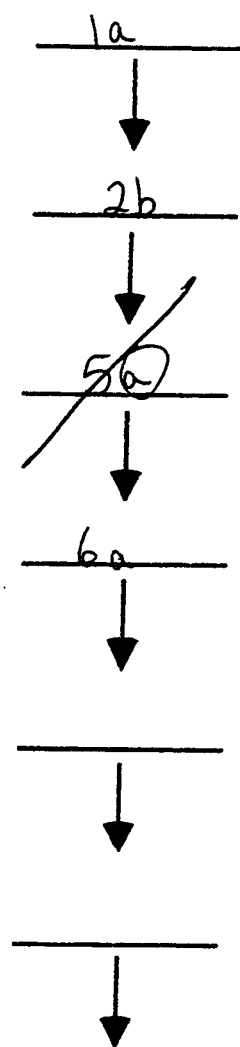
Answer Sheet

Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter for each of the choices you made as you identified the species (see example with species #101). When you are sure of the species identification, write in the scientific name in the space provided.

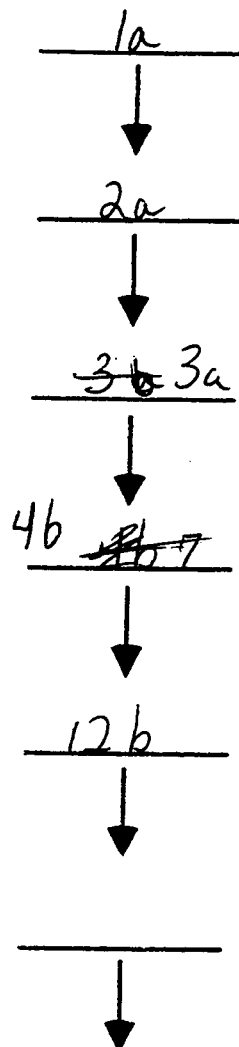
Example #101



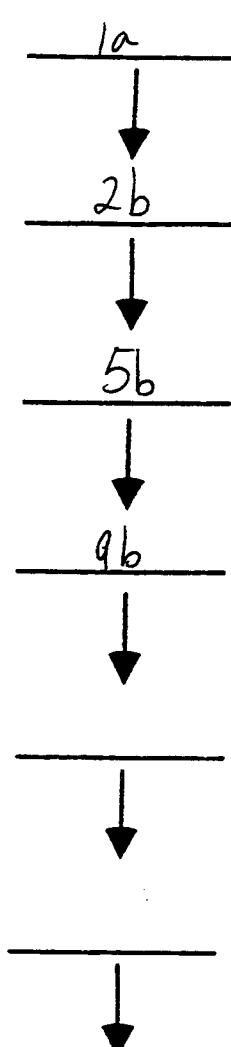
Species # 102



Species # 103



Species # 104



Scientific name of Example #101 = *Samplst correctus*

Scientific name of Species # 102 = *Triangulum monoflagellum*

Scientific name for Species # 103 = ~~*Triangulum addidicilis*~~ *Triangulum roundiflagellum*

Scientific Name for Species # 104 = *Triangulum polycilius*

2. The following *Triangulum* organism was created by a student. It is not one of the thirteen shown on the Species Sheet. Can you determine its species? If so, list the steps, as you did before, in making this determination.

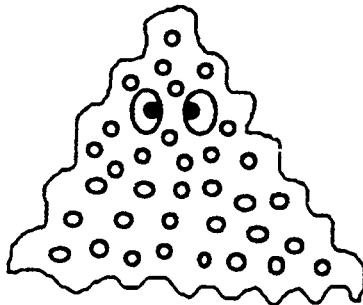


1a, 2a, 3b, 7a *Triangulum addidilium*

3. Draw another example of the organism in question #2 that would "key out" as being the same species.



4. A new species of *Triangulum* was discovered by a lab student in a sample of stagnant pond water. The dichotomous key must be modified to identify the new organism shown below.



- A. Between which steps in the key should the new trait be added?

10 & 12 step 11 should be a new trait.

- B. Write descriptions of this of this trait, for this step, based on the drawing of the newly discovered organism.

The organism has dots on the upper & lower part of its body.

- C. Write the scientific name for this new organism.

Triangulum low; upperdottens

Student ID Bio-DK-2

Scoring Form - Dichotomous Key 2

Male / Female (circle one)

Question 1:

Directions: Circle each of the species chosen.

Species #	Points Possible	Points Awarded
110	5	5
111	6	6
113	4	4

Possible Points 15 Points Awarded: 15

Triangulum Identification score: $\frac{\text{points awarded}}{\text{possible points}} = \frac{15}{15} = 100\%$

Question 2:

Correct steps and naming of *T. oddcilus* 0 1 2 3 4 5

Question 3:

Traits shown in student drawing (including deductions) 0 1 2 3 4

*** NOTE: Lowest possible score 0 points ***

Question 4:

- A Correctly identifies steps 0 1
- B Writes accurate descriptions of the new trait 0 1 2
- C Writes a scientific name using binomial nomenclature 0 1 2 3 4

Total question score: 11 pts
Total possible score questions #2 - #4 - 16 points

Answer Sheet

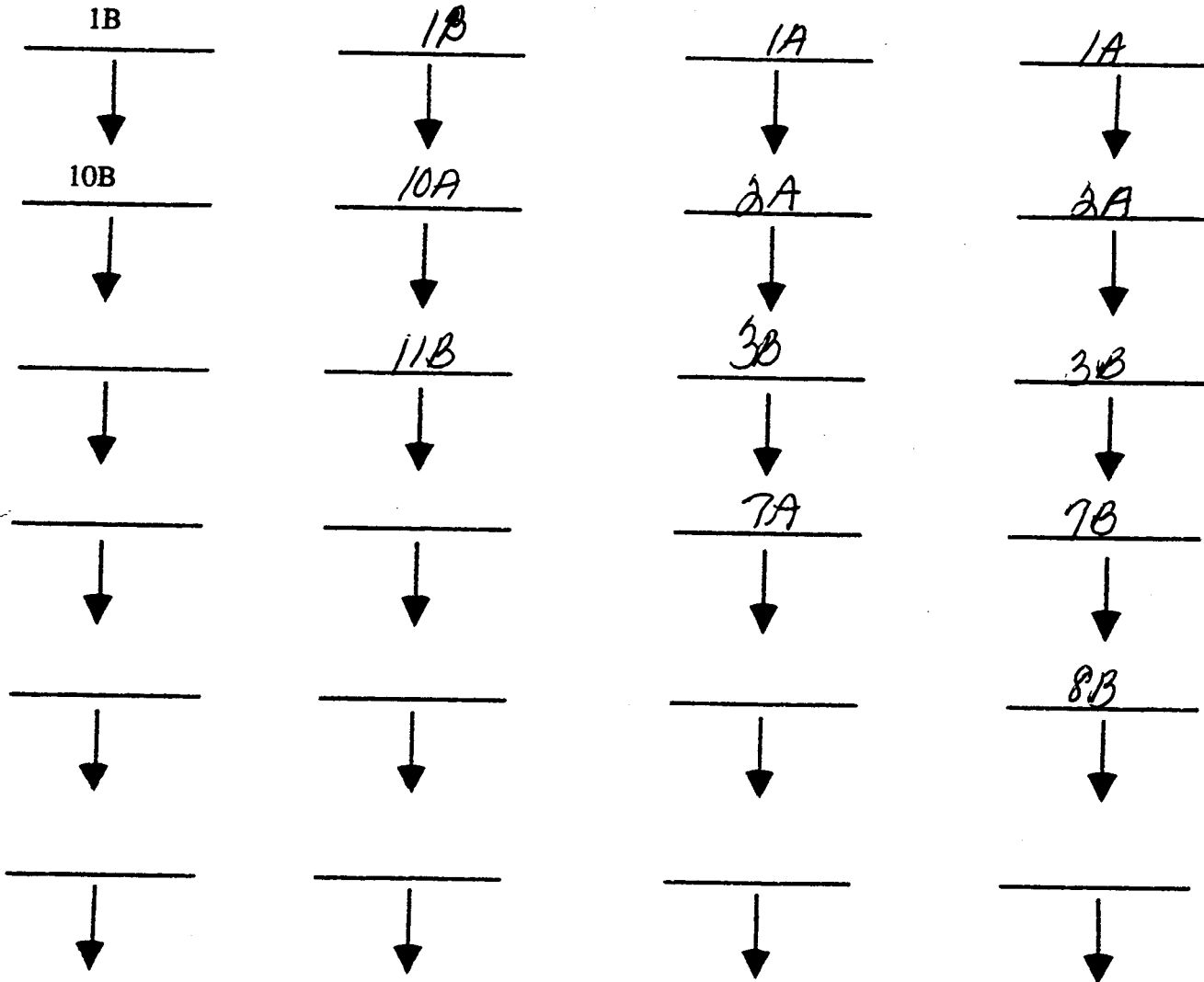
Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter for each of the choices you made as you identified the species (see example with species #101). When you are sure of the species identification, write in the scientific name in the space provided.

Example #101

Species # 113

Species # 110

Species # 111



Scientific name of Example #101 = *Samplst correctus*

Scientific name of Species # 113 = *Triangulum upperdottus*

Scientific name for Species # 110 = *Triangulum oddicilius*

Scientific Name for Species # 111 = *Triangulum roundiatus*

2. The following *Triangulum* organism was created by a student. It is not one of the thirteen shown on the Species Sheet. Can you determine its species? If so, list the steps, as you did before, in making this determination.

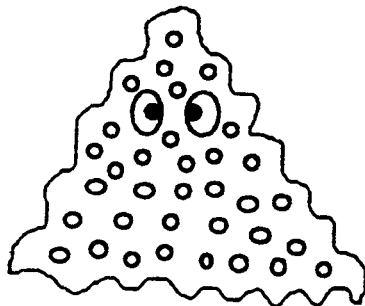


1A → 2A → 3B → 7A Answer: Triangulum oddbillus

3. Draw another example of the organism in question #2 that would "key out" as being the same species.



4. A new species of *Triangulum* was discovered by a lab student in a sample of stagnant pond water. The dichotomous key must be modified to identify the new organism shown below.



A. Between which steps in the key should the new trait be added?

1B → 10A → 11A & B Between: 10 and 11

B. Write descriptions of this of this trait, for this step, based on the drawing of the newly discovered organism.

1B → 10A → 11A & B

C. Write the scientific name for this new organism.

Triangulum icudotus triangulum upper dots

Student ID B10 - DK - 3

Scoring Form - Dichotomous Key 2

Male / Female (circle one)

Question 1:

Directions: Circle each of the species chosen.

Species #	Points Possible	Points Awarded
108	5	2
111	6	4
112	6	2

Possible Points 17 Points Awarded: 8

Triangulum Identification score: $\frac{\text{points awarded}}{\text{possible points}} = \frac{8}{17} = 47.06\%$

Question 2:

Correct steps and naming of *T. oddcilus* 0 1 2 3 4 5

Question 3:

Traits shown in student drawing (including deductions) (-2) 0 1 2 3 4

*** NOTE: Lowest possible score 0 points ***

Question 4:

- A Correctly identifies steps 0 1
- B Writes accurate descriptions of the new trait 0 1 2
- C Writes a scientific name using binomial nomenclature 0 1 2 3 4

Total question score: 10pts
Total possible score questions #2 - #4 - 16 points

Answer Sheet

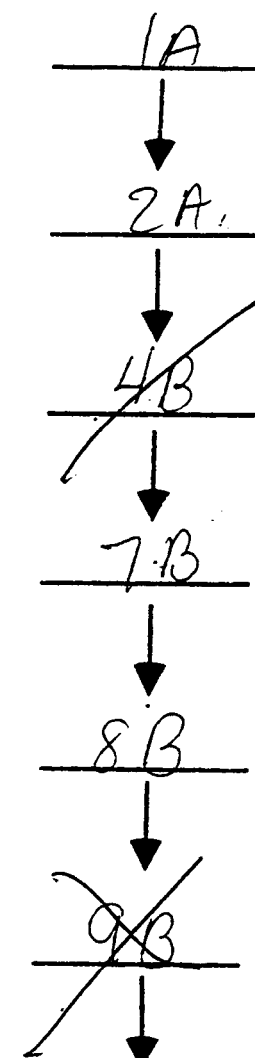
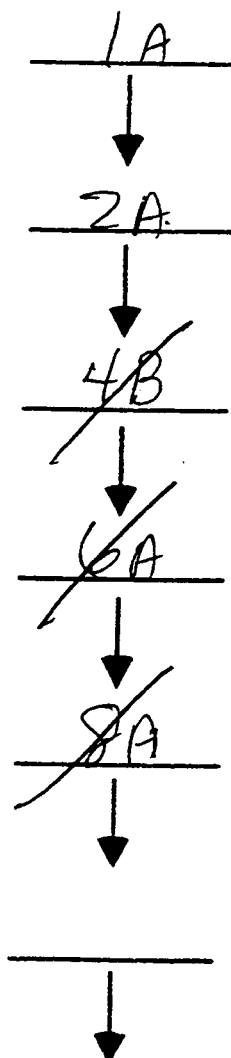
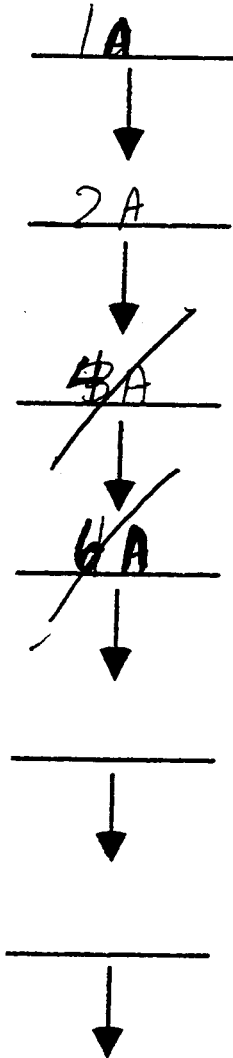
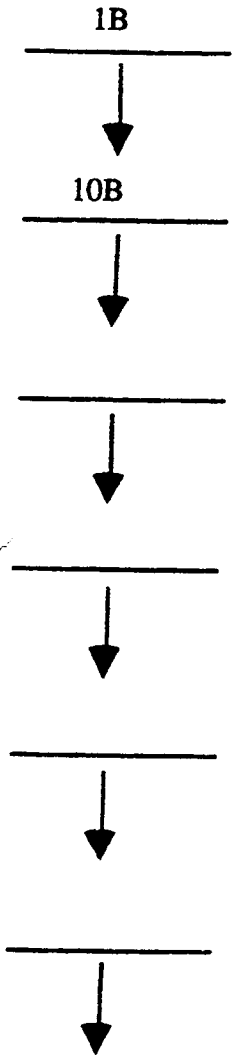
Choose any three of the species of *Triangulum* from the Species Sheet and key them to their scientific names. Be sure to write in the numbers of the species that you are trying to identify. In the proper spaces below write in the number and letter for each of the choices you made as you identified the species (see example with species #101). When you are sure of the species identification, write in the scientific name in the space provided.

Example #101

Species # 108

Species # 112

Species # 111



Scientific name of Example #101 = Samplest correctus

Scientific name of Species # 108 = Triangulum monoflagellum

Scientific name for Species # 112 = Triangulum pointatus

Scientific Name for Species # 111 = Triangulum polycilius

2. The following *Triangulum* organism was created by a student. It is **not** one of the thirteen shown on the Species Sheet. Can you determine its species? If so, list the steps, as you did before, in making this determination.

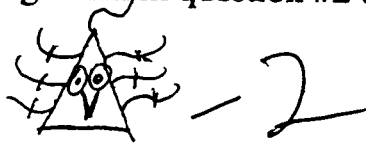
Triangulum oddcilus



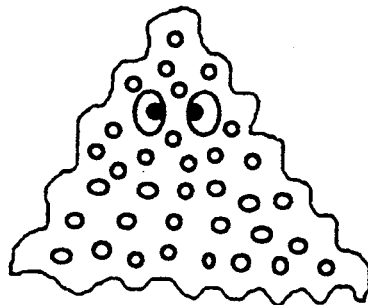
1A
2A
~~3A~~
7A

I determined its characteristics using the dichotomous key and then when I found the last characteristic I looked across from it and found its binomial nomenclature.

3. Draw another example of the organism in question #2 that would "key out" as being the same species.



4. A new species of *Triangulum* was discovered by a lab student in a sample of stagnant pond water. The dichotomous key must be modified to identify the new organism shown below.



1B
2B
4B
5A
10A
11C

- *Triangulum wholedotsus*

A. Between which steps in the key should the new trait be added?

between 11 A+B whole body has dotted pattern

B. Write descriptions of this of this trait, for this step, based on the drawing of the newly discovered organism.

whole body has dotted pattern.

C. Write the scientific name for this new organism.

Triangulum wholedotsus

Fishkill

Task Information

Grade: Biology

Content:

- MST Framework Reference - Standard 4 - The Living Environment
- Regents Biology - Unit VII - Ecology

Format: Paper/Pencil

Purpose: To analyze data related to temperature and dissolved oxygen.

Skills:

Primary: Interpreting data, Predicting, Graphing, Applying math
Secondary: Generalizing, Inferring

Time: 20 minutes

Materials: worksheet, pencil, ruler

Preparation: none

Safety: none

Extensions/Modifications: none

Fishkill

Task: At this station, you will analyze data to determine the effect of thermal pollution on a certain species of fish.

Background

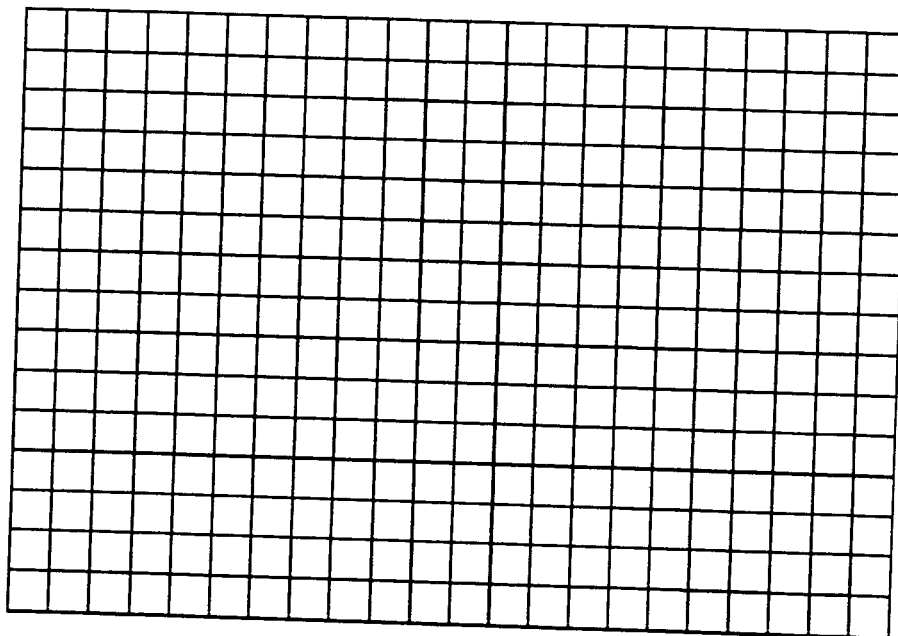
Water temperature is a limiting factor in an aquatic habitat, affecting activities such as respiration and reproduction.

Directions

Examine the data in the table below. It shows the concentration of dissolved oxygen available in water at different temperatures. The oxygen available to fish is in units marked ppm or "parts per million." A higher ppm reading indicates a greater concentration of oxygen.

Water temperature (° Celsius)	Concentration of Dissolved Oxygen (ppm)
30	7.8
20	9.0
10	10.5
0	14.1

1. Construct a line graph of the data presented above.



Please Continue on the Next Page

2. A certain species of fish normally live in a pond that never exceeds the temperature of 10°C. This species of fish requires a dissolved oxygen level 9.5 ppm. Industrial development has the potential of increasing the pond's temperature by releasing hot water produced during a necessary process. Answer the questions below based on your knowledge of biology and using your graph.

A. According to your graph, at what temperature would the dissolved oxygen level in the pond drop below the required level?

B. What impact would the change in temperature have on the fish. Explain your reasoning in complete sentences.

3. Using complete sentences, suggest two (2) ways of preventing the thermal pollution and still have the industrial development occur.

Fishkill - Scoring Rubric**Maximum Score - 16 points****Question 1. - Graph****7 points total****Graph set-up****4 points total**

- Allow 1 point for an appropriate title
- Allow 1 point for labeled axis
 - Temperature - horizontal axis
 - Dissolved oxygen - vertical axis
- Allow 1 point for use of appropriate units
- Allow 1 point for providing appropriate scale on both axis

Graph plotting**2 points total**

- Allow 2 points if **all** four (4) points are plotted correctly
- Allow 1 point if three (3) points are plotted correctly
- No credit if fewer than three(3) points are plotted correctly

Graph line**1 point total**

- Allow 1 point if the line is drawn correctly

Question 2 - Prediction**5 points total****Part A**

- Allow 1 point if the student correctly gives temperature value based on their graph.
- Allow 1 point if the student records units in °Celsius

Part B

- Allow 1 point if the student's statement reflects that the temperature change produces a response due to the unfavorable habitat
- Allow 2 points student uses complete sentences to explain that the temperature change reduces the dissolved oxygen level and produces respiratory stress in the fish population survival.
- Allow 1 point if the student's explanation is correct but not written in complete sentences.
- No credit if the student's explanation is incorrect even if it is in complete sentences.

Question 3 - Prevention methods**4 points total**

- Allow 2 points for each acceptable suggestion for prevention of thermal pollution. Suggestions must be written in complete sentences.
- Allow 1 point for each acceptable suggestion, but **not** written in complete sentences.

Sample of acceptable suggestions:

- Hot water could be stored in holding ponds before release.
- Hot water could be used in some part of the factory.
- Cooling towers could be constructed to let heat leave the water before it is released.

Highest possible score - 16 points

Student ID _____

Scoring Form - Fishkill

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Graph

set- up	0	1	2	3	4
plotting data	0	1	2		
line	0	1			

2. Prediction

A. Temperature value/ units	0	1	2		
B. Effect	0	1	2	3	

3. Prevention

0	1	2	3	4
---	---	---	---	---

Total Score _____
Total Possible score -16 points

Student ID _____

Scoring Form - Fishkill

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Graph

set- up	0	1	2	3	4
plotting data	0	1	2		
line	0	1			

2. Prediction

A. Temperature value/ units	0	1	2		
B. Effect	0	1	2	3	

3. Prevention

0	1	2	3	4
---	---	---	---	---

Total Score _____
Total Possible score -16 points

Student ID BIO - FK - 1

Scoring Form - Fishkill

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Graph

set-up	0	1	2	3	(4)
plotting data	0	1	(2)		
line	0	(1)			

2. Prediction

A. Temperature value/ units	0	1	(2)		
B. Effect	0	1	2	(3)	

3. Prevention

0	1	2	3	(4)
---	---	---	---	-----

Total Score 16 pts
 Total Possible score - 16 points

Student ID BIO - FK - 2

Scoring Form - Fishkill

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Graph

set-up	0	1	(2)	3	4
plotting data	0	(1)	2		
line	0	(1)			

2. Prediction

A. Temperature value/ units	0	1	(2)		
B. Effect	0	1	2	(3)	

3. Prevention

0	1	(2)	3	4
---	---	-----	---	---

Total Score 11 pts
 Total Possible score - 16 points

Student ID BIC - FK - 3

Scoring Form - Fishkill

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Graph

set- up	0	1	2	3	4
plotting data	0	1	2		
line	0	1			

2. Prediction

A. Temperature value/ units	0	1	2		
B. Effect	0	1	2	3	

3. Prevention

	0	1	2	3	4
--	---	---	---	---	---

Total Score 3 pts
Total Possible score - 16 points

Student ID _____

Scoring Form - Fishkill

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Graph

set- up	0	1	2	3	4
plotting data	0	1	2		
line	0	1			

2. Prediction

A. Temperature value/ units	0	1	2		
B. Effect	0	1	2	3	

3. Prevention

	0	1	2	3	4
--	---	---	---	---	---

Total Score _____
Total Possible score - 16 points

Fishkill

Task: At this station, you will analyze data to determine the effect of thermal pollution on a certain species of fish.

Background

Water temperature is a limiting factor in an aquatic habitat, affecting activities such as respiration and reproduction.

+16
16

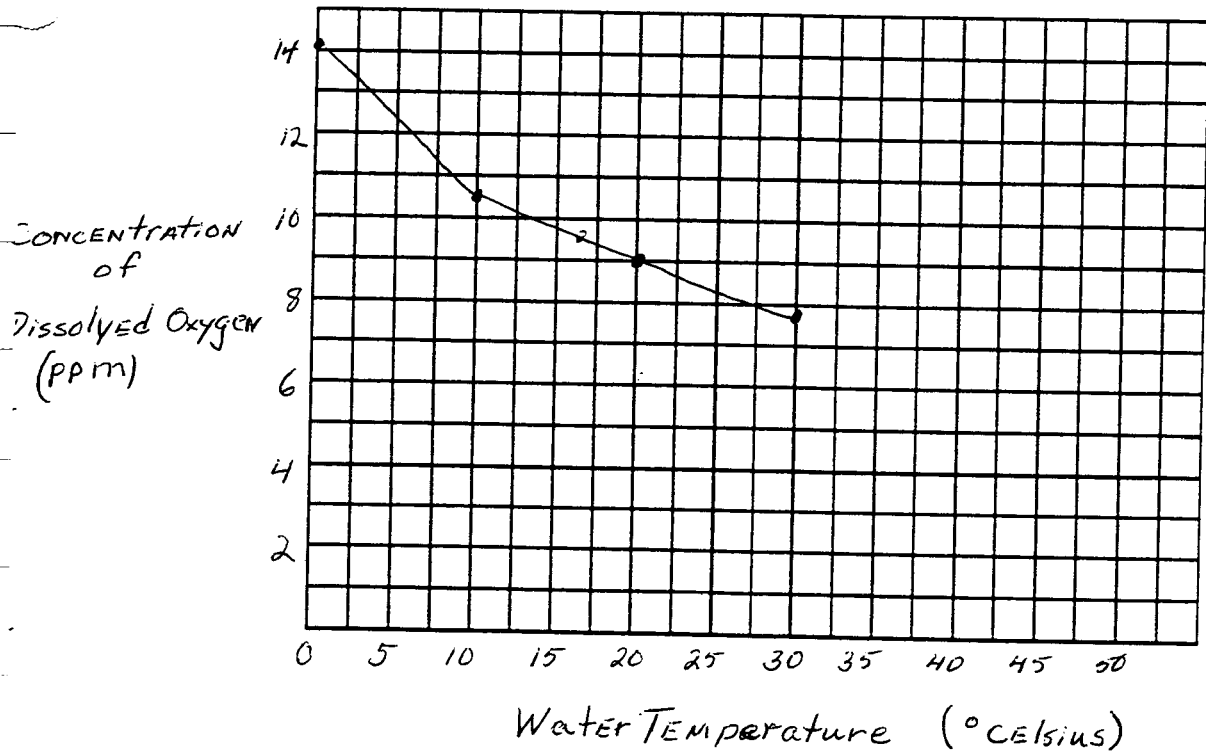
Directions

Examine the data in the table below. It shows the concentration of dissolved oxygen available in water at different temperatures. The oxygen available to fish is in units marked ppm or "parts per million." A higher ppm reading indicates a greater concentration of oxygen.

Water temperature (° Celsius)	Concentration of Dissolved Oxygen (ppm)
30	7.8
20	9.0
10	10.5
0	14.1

1. Construct a line graph of the data presented above.

TEMPERATURES EFFECT ON DISSOLVED OXYGEN.



Please Continue on the Next Page

2. A certain species of fish normally live in a pond that never exceeds the temperature of 10°C . This species of fish requires a dissolved oxygen level 9.5 ppm. Industrial development has the potential of increasing the pond's temperature by releasing hot water produced during a necessary process. Answer the questions below based on your knowledge of biology and using your graph.

A. According to your graph, at what temperature would the dissolved oxygen level in the pond drop below the required level?

17° Celsius

B. What impact would the change in temperature have on the fish. Explain your reasoning in complete sentences.

I think the species of fish will die off if the water temperature goes above 17° Celsius. Above this temperature there will not be enough oxygen to keep the fish alive.

3. Using complete sentences, suggest two (2) ways of preventing the thermal pollution and still have the industrial development occur.

If the water was cooled in some way like by putting it in ponds, it wouldn't heat the pond where the fish are. The hot water could be run through a refrigerator device.

Fishkill

Task: At this station, you will analyze data to determine the effect of thermal pollution on a certain species of fish.

Background

Water temperature is a limiting factor in an aquatic habitat, affecting activities such as respiration and reproduction.

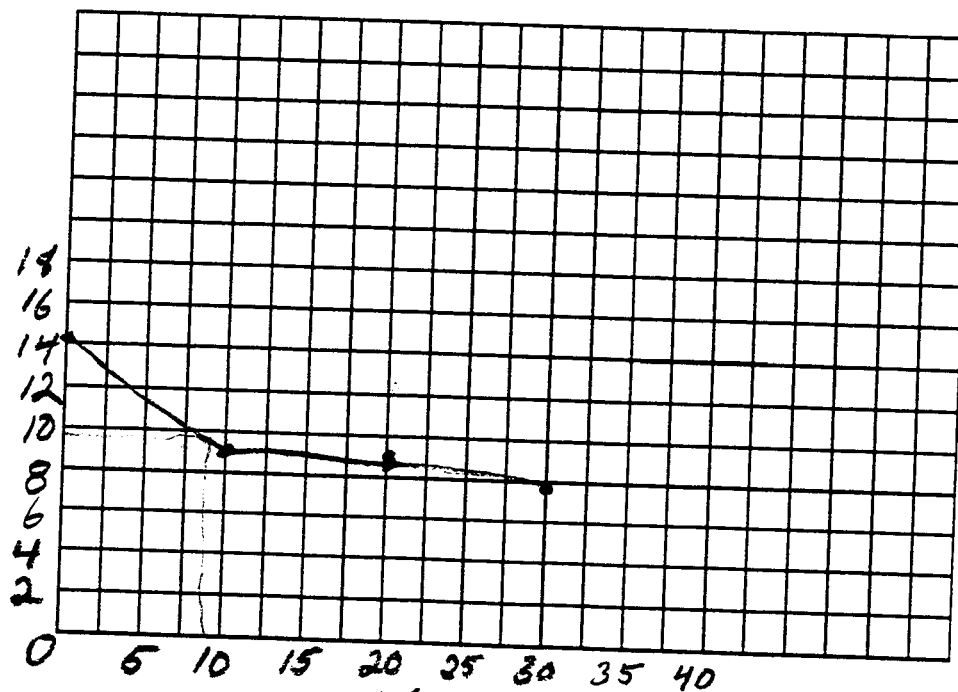
Directions

Examine the data in the table below. It shows the concentration of dissolved oxygen available in water at different temperatures. The oxygen available to fish is in units marked ppm or "parts per million." A higher ppm reading indicates a greater concentration of oxygen.

Water temperature (° Celsius)	Concentration of Dissolved Oxygen (ppm)
30	7.8
20	9.0
10	10.5
0	14.1

Construct a line graph of the data presented above.

Concentration of dissolved oxygen



Temperature

Please Continue on the Next Page

2. A certain species of fish normally live in a pond that never exceeds the temperature of 10°C. This species of fish requires a dissolved oxygen level 9.5 ppm. Industrial development has the potential of increasing the pond's temperature by releasing hot water produced during a necessary process. Answer the questions below based on your knowledge of biology and using your graph.

A. According to your graph, at what temperature would the dissolved oxygen level in the pond drop below the required level?

9°C

B. What impact would the change in temperature have on the fish. Explain your reasoning in complete sentences.

The fish would not have enough oxygen to survive. When the water got so hot it will have less oxygen.

3. Using complete sentences, suggest two (2) ways of preventing the thermal pollution and still have the industrial development occur.

the hot water could be taken to be used for something good.
~~but~~ don't get the water hot.

Task: At this station, you will analyze data to determine the effect of thermal pollution on a certain species of fish.

May 4, 1996

1

Fishkill

Background

Water temperature is a limiting factor in an aquatic habitat, affecting activities such as respiration and reproduction.

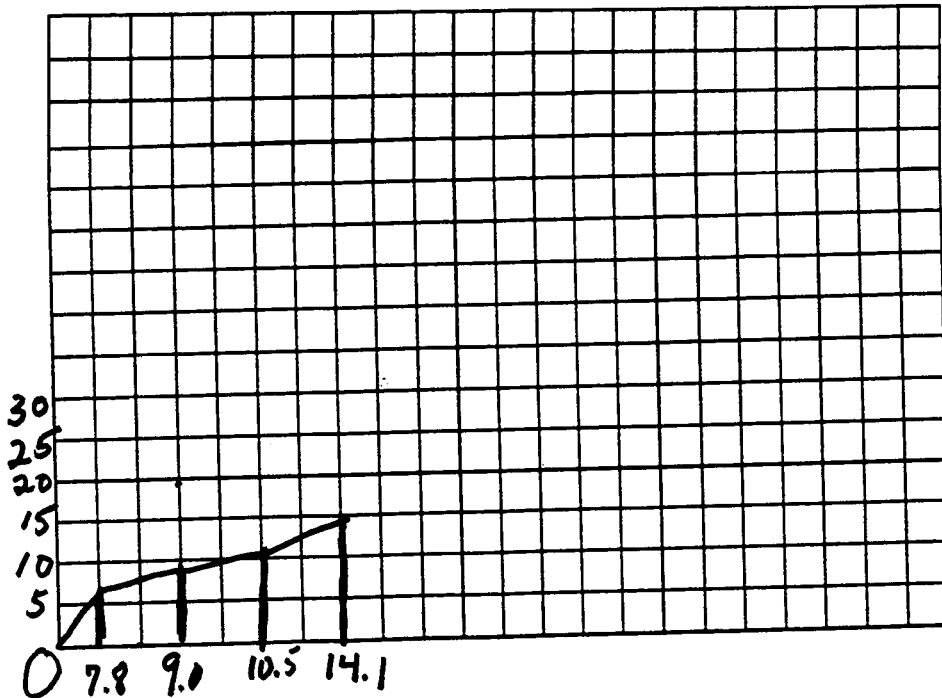
Directions

Examine the data in the table below. It shows the concentration of dissolved oxygen available in water at different temperatures. The oxygen available to fish is in units marked ppm or "parts per million." A higher ppm reading indicates a greater concentration of oxygen.

+ 3/16

Water temperature (° Celsius)	Concentration of Dissolved Oxygen (ppm)
30	7.8
20	9.0
10	10.5
0	14.1

1. Construct a line graph of the data presented above.



Please Continue on the Next Page

2. A certain species of fish normally live in a pond that never exceeds the temperature of 10°C . This species of fish requires a dissolved oxygen level 9.5 ppm. Industrial development has the potential of increasing the pond's temperature by releasing hot water produced during a necessary process. Answer the questions below based on your knowledge of biology and using your graph.

A. According to your graph, at what temperature would the dissolved oxygen level in the pond drop below the required level?

10°

B. What impact would the change in temperature have on the fish. Explain your reasoning in complete sentences.

The species will adapt to it, or die off or move to deeper water. Because it can't live without oxygen

3. Using complete sentences, suggest two (2) ways of preventing the thermal pollution and still have the industrial development occur.

making water as it is cooling.

Human Inheritance

Task Information

Subject: Biology

Content:

- MST Framework Reference:
Standard 4-Science: The living environment
- Regents Biology Syllabus:
Unit V: Transmission of traits from generation to generation
- Variance Biology Program Guide:
Genetics and molecular biology: Patterns of inheritance

Format: Paper/Pencil

Purpose: To apply knowledge of genetics to the occurrence of traits on a family tree

Skills:

Primary: Interpreting data, Applying math
Secondary: Generalizing, Inferring

Time: 15-20 min.

Materials: Worksheet

Preparation: None

Safety: N/A

Extensions/Modifications: None

Human Inheritance





Task: In this task you will analyze genetic characteristics from a family tree.

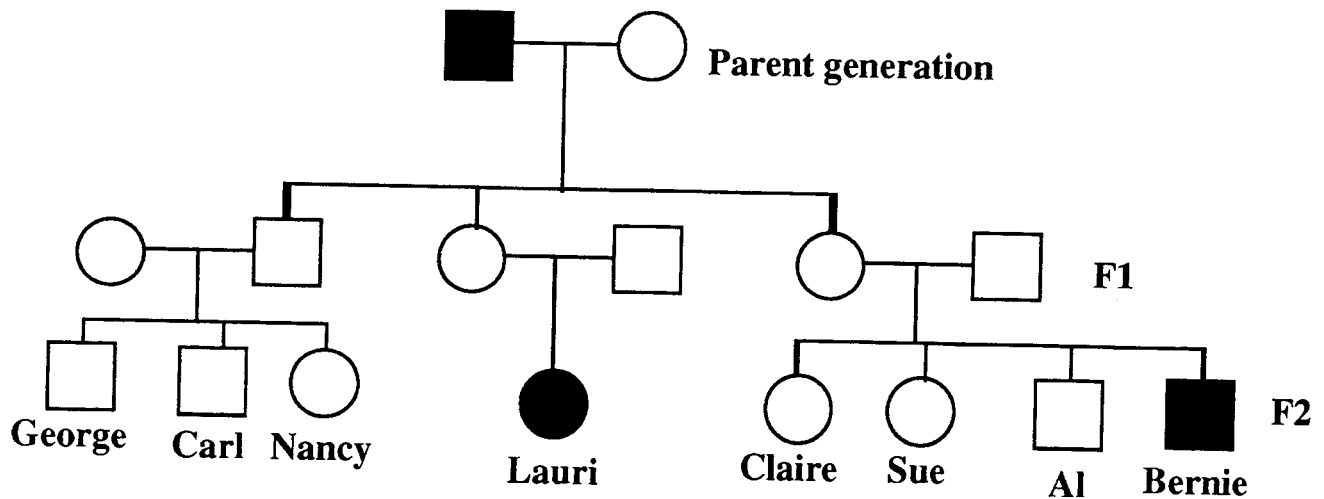
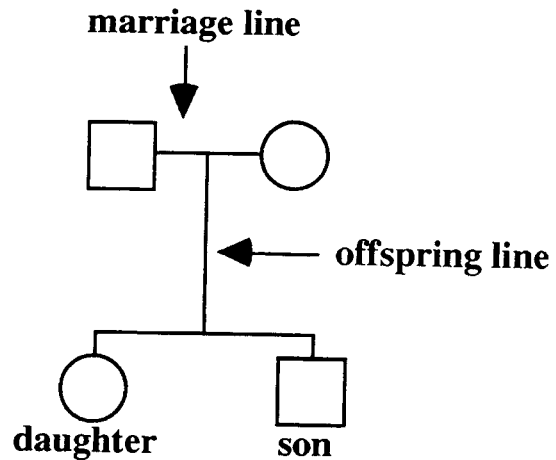
Part 1

Directions

Base your answers to the following questions on the pedigree chart below and on your knowledge of biology. The pedigree traces the expression of a particular trait, represented by the darkened symbol, through three (3) generations. These generations are labeled Parent Generation, F1, and F2 so that they correspond to the generations of pea plants that Gregor Mendel used to formulate his Laws of Heredity.

KEY

-  = male
-  = male with trait
-  = female
-  = female with trait



Please Continue on the Next Page

Answer sheet
Part 1 - Human Inheritance

1. Is the trait represented by the darkened symbol dominant or recessive?

2. Using complete sentences describe how Mendel would have explained your answer to question #1?

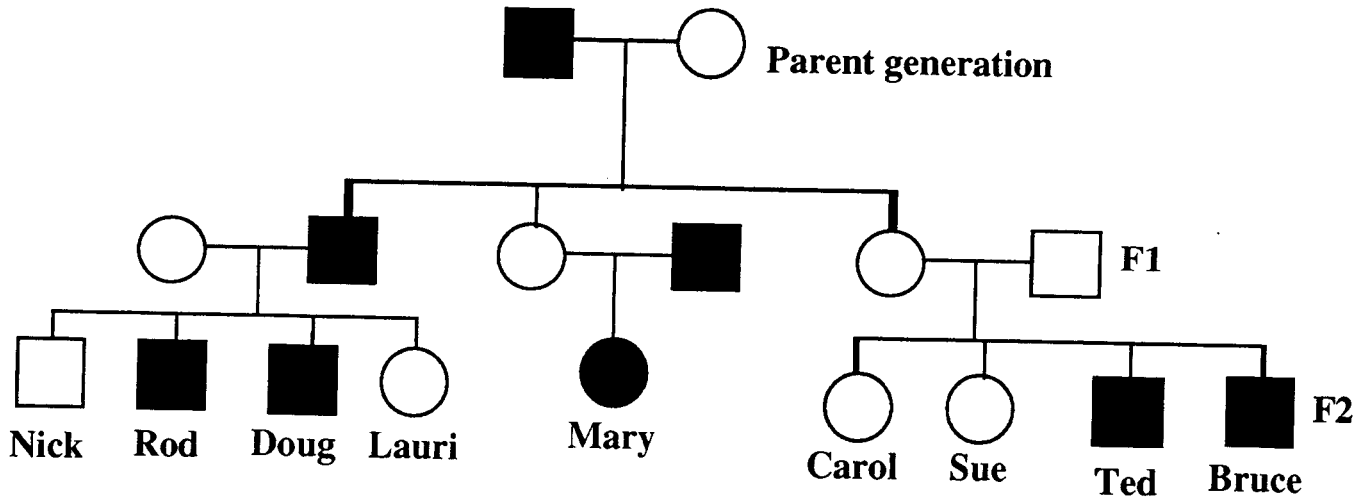
3. Describe all the possible genotypes of Bernie, his mother, his father, and his brother, Al.

4. Using complete sentences explain how you determined your answer to question #3.

Please Continue on the Next Page

Directions:

Base your answers to the following questions on the pedigree chart below and on your knowledge of biology. The pedigree traces the expression of a particular trait, represented by the darkened symbols, through three (3) generations. Studies have shown that individuals with this trait are frequently male. The trait rarely appears in females and only if the father also has the trait.



1. Is the gene for this trait dominant or recessive?

2. Is the gene for this trait carried on the X or Y chromosome?

3. Using complete sentences explain why the trait is more common in males than in females?

Please Continue on the Next Page

4. Using coded symbols give the genotypes of the following family members?
Be sure to include your symbol for representing the genotypes you describe.

Symbols -

Bruce - _____

Bruce's Father - _____

Bruce's Mother - _____

Mary - _____

5. If Doug marries a woman whose lacking the trait, but whose father has the trait, what is the probability that they will have a son with the trait? What is the probability of their daughters having the trait?

Human Inheritance - Scoring Rubric

Maximum score - 25 points

Part 1

Question 1 - Recessive trait

1 point total

- Allow 1 point if the student selects the recessive trait
-

Question 2 - Mendel's explanation

2 points total

- Allow 2 points if the student uses complete sentences to explain that parents in the F1 generation both lacked the trait, but must have had hidden recessive unit factor for the trait since they had offspring with the trait,
 - Allow 1 point if the student gives a correct explanation, but it is not in complete sentences.
 - No credit for an incorrect explanation even if it is written in complete sentences.
-

Question 3 - Family genotype

5 points total

- Allow 1 point for each correct genotype indicated (Note - 2 points may be awarded for A1).
 - **Bernie** Homozygous (pure) Recessive
 - **his mother** Heterozygous (hybrid)
 - **his father** Heterozygous (hybrid)
 - **A1** Homozygous (pure) Dominant
and
Heterozygous (hybrid)
-

Question 4 - Explanation for genotypes in #3

4 points total

- Allow 1 point for each of the following if they are included in the student's explanation.
 - Bernie must be pure since he shows the recessive trait
 - Both parents must have been hybrid since they did not have the trait but passed it to Bernie.
 - A1 did not show the trait, but he may have received a dominant from both parents or a dominant from one parent and a recessive from the other.
 - Allow 1 point if all correct statements are written in complete sentences.
-

Part 2

Question 1 - Recessive trait

1 point total

- Allow 1 point if the student selects the recessive trait.
-

Question 2 - X Chromosome

1 point total

- Allow 1 point if the student selects the X chromosome
-

Question 3 - Explanation of sex link**3 points total**

- Allow 2 points if the student indicates knowledge that there is only one (1) X chromosome in males and this allows a single recessive allele to be expressed.
 - Allow 1 point if the student indicates only partial knowledge of the above cause.
- ***Allow an additional 1 point if the student's explanation is written in complete sentences.
- No credit if the explanation is incorrect even if it is written in complete sentences.

Question 4 - Code and genotypes**7 points total****Code****3 points total**

- Allow 1 point for each of the following accounted for in their code;
 - male and female chromosome
 - Trait only on the female chromosome
 - Dominant and recessive form of the gene

Sample of code

- ~ X^N - female chromosome - non trait
- ~ X^n - female chromosome - trait
- ~ Y chromosome

Genotypes**4 points total**

- Allow 1 point for each correctly shown genotype using their code
 - Bruce - X^nY
 - Bruce's Father - $X^N Y$
 - Bruce's Mother - $X^N X^n$
 - Mary - $X^n X^n$

Question 5 - Probability**2 points total**

- Allow 2 points if the student indicates a probability of 50%, $1/2$, or 0.50 for both sons and daughters
- Allow 1 point the student indicates correct probability for only sons or daughters

Highest possible score - 25 points

Student ID _____ Scoring Form - Human Inheritance

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Part 1

- | | | | | | | |
|-------------------------|---|---|---|---|---|---|
| 1. Recessive Trait | 0 | 1 | | | | |
| 2. Mendel's Explanation | 0 | 1 | 2 | | | |
| 3. Family Genotypes | 0 | 1 | 2 | 3 | 4 | 5 |
| 4. Explanation | 0 | 1 | 2 | 3 | 4 | |

Part 2

- | | | | | | |
|----------------------------|---|---|---|---|---|
| 1. Recessive Trait | 0 | 1 | | | |
| 2. X Chromosome | 0 | 1 | | | |
| 3. Explanation of Sex Link | 0 | 1 | 2 | 3 | |
| 4. Code | 0 | 1 | 2 | 3 | |
| Genotypes | 0 | 1 | 2 | 3 | 4 |
| 5. Probability | 0 | 1 | 2 | | |

Total Score _____
Total possible score - 25 points

Student ID _____ Scoring Form - Human Inheritance

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Part 1

- | | | | | | | |
|-------------------------|---|---|---|---|---|---|
| 1. Recessive Trait | 0 | 1 | | | | |
| 2. Mendel's Explanation | 0 | 1 | 2 | | | |
| 3. Family Genotypes | 0 | 1 | 2 | 3 | 4 | 5 |
| 4. Explanation | 0 | 1 | 2 | 3 | 4 | |

Part 2

- | | | | | | |
|----------------------------|---|---|---|---|---|
| 1. Recessive Trait | 0 | 1 | | | |
| 2. X Chromosome | 0 | 1 | | | |
| 3. Explanation of Sex Link | 0 | 1 | 2 | 3 | |
| 4. Code | 0 | 1 | 2 | 3 | |
| Genotypes | 0 | 1 | 2 | 3 | 4 |
| 5. Probability | 0 | 1 | 2 | | |

Total Score _____
Total possible score - 25 points

Student ID BIO-HI-1 Scoring Form - Human Inheritance

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Part 1

- | | | | | | | |
|-------------------------|---|-----|-----|-----|---|-----|
| 1. Recessive Trait | 0 | (1) | | | | |
| 2. Mendel's Explanation | 0 | 1 | (2) | | | |
| 3. Family Genotypes | 0 | 1 | 2 | 3 | 4 | (5) |
| 4. Explanation | 0 | 1 | 2 | (3) | 4 | |

Part 2

- | | | | | | |
|----------------------------|---|-----|-----|-----|-----|
| 1. Recessive Trait | 0 | (1) | | | |
| 2. X Chromosome | 0 | (1) | | | |
| 3. Explanation of Sex Link | 0 | 1 | 2 | (3) | |
| 4. Code | 0 | 1 | 2 | (3) | |
| Genotypes | 0 | 1 | 2 | 3 | (4) |
| 5. Probability | 0 | 1 | (2) | | |

Total Score 24 pts
Total possible score - 25 points

Student ID BIO-HI-2 Scoring Form - Human Inheritance

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Part 1

- | | | | | | |
|-------------------------|---|-----|-----|-----|-------|
| 1. Recessive Trait | 0 | (1) | | | |
| 2. Mendel's Explanation | 0 | 1 | (2) | | |
| 3. Family Genotypes | 0 | 1 | 2 | 3 | (4) 5 |
| 4. Explanation | 0 | 1 | 2 | (3) | 4 |

Part 2

- | | | | | | |
|----------------------------|-----|-----|-----|-----|---|
| 1. Recessive Trait | 0 | (1) | | | |
| 2. X Chromosome | 0 | (1) | | | |
| 3. Explanation of Sex Link | 0 | 1 | (2) | 3 | |
| 4. Code | 0 | 1 | 2 | (3) | |
| Genotypes | 0 | 1 | 2 | (3) | 4 |
| 5. Probability | (0) | 1 | 2 | | |

Total Score 20 pts
Total possible score - 25 points

Student ID BIO - HI - 3

Scoring Form - Human Inheritance

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Part 1

1. Recessive Trait	0	<u>1</u>				
2. Mendel's Explanation	<u>0</u>	1	2			
3. Family Genotypes	0	<u>1</u>	2	3	4	5
4. Explanation	<u>0</u>	1	2	3	4	

Part 2

1. Recessive Trait	<u>0</u>	1				
2. X Chromosome	0	<u>1</u>				
3. Explanation of Sex Link	<u>0</u>	1	2	3		
4. Code	<u>0</u>	1	2	3		
Genotypes	<u>0</u>	1	2	3	4	
5. Probability	<u>0</u>	1	2			

Total Score 3 pts
Total possible score - 25 points

Student ID _____

Scoring Form - Human Inheritance

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

Part 1

1. Recessive Trait	0	1				
2. Mendel's Explanation	0	1	2			
3. Family Genotypes	0	1	2	3	4	5
4. Explanation	0	1	2	3	4	

Part 2

1. Recessive Trait	0	1				
2. X Chromosome	0	1				
3. Explanation of Sex Link	0	1	2	3		
4. Code	0	1	2	3		
Genotypes	0	1	2	3	4	
5. Probability	0	1	2			

Total Score _____
Total possible score - 25 points

Human Inheritance





Task: In this task you will analyze genetic characteristics from a family tree.

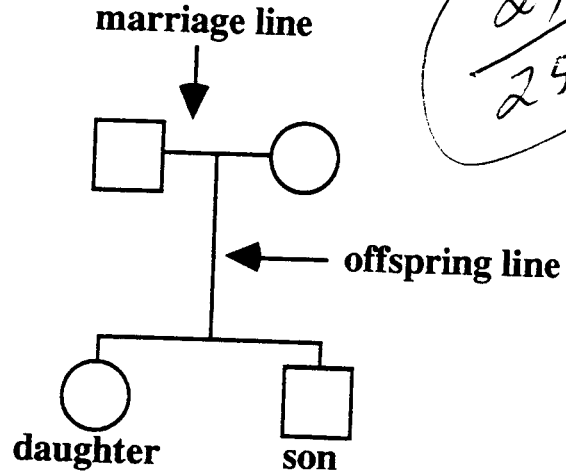
Part 1

Directions

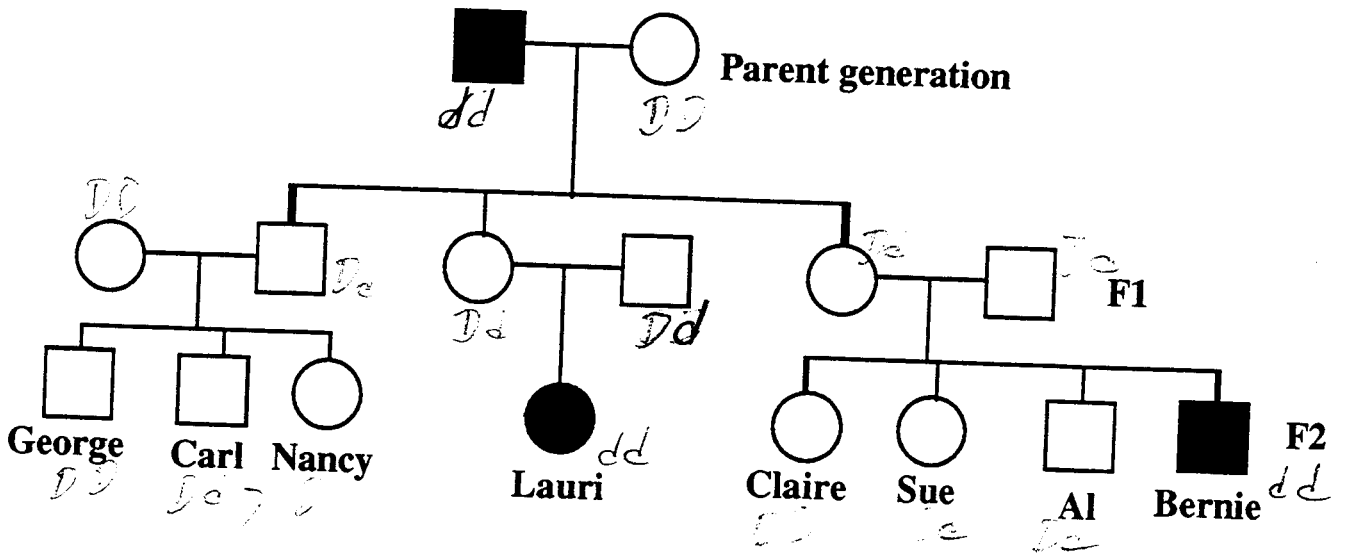
Base your answers to the following questions on the pedigree chart below and on your knowledge of biology. The pedigree traces the expression of a particular trait, represented by the darkened symbol, through three (3) generations. These generations are labeled Parent Generation, F1, and F2 so that they correspond to the generations of pea plants that Gregor Mendel used to formulate his Laws of Heredity.

KEY

-  = male
-  = male with trait
-  = female
-  = female with trait



24
25



Please Continue on the Next Page

1. Is the trait represented by the darkened symbol dominant or recessive?

Recessive

2. Using complete sentences describe how Mendel would have explained your answer to question #1?

Mendel would have said that
the trait must have been hidden (recessive)
for Laurie and Bernie to have gotten
the trait from their parents who
did not have it.

3. Describe all the possible genotypes of Bernie, his mother, his father, and his brother, Al.

Bernie was pure recessive, his mother
and father were hybrid but his brother
Al could have been hybrid or pure dominant

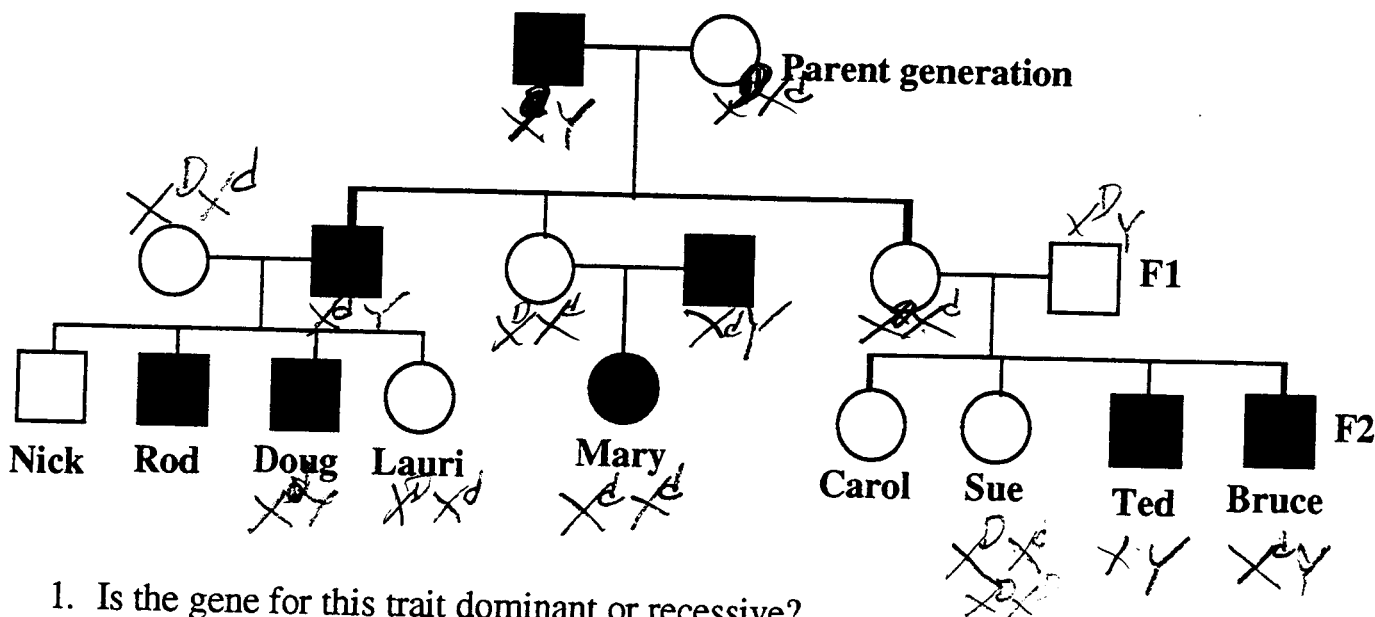
4. Using complete sentences explain how you determined your answer to question #3.

To have the trait Bernie must be pure
if it is recessive and his parents must
have both had the hidden gene.

Please Continue on the Next Page

Directions:

Base your answers to the following questions on the pedigree chart below and on your knowledge of biology. The pedigree traces the expression of a particular trait, represented by the darkened symbols, through three (3) generations. Studies have shown that individuals with this trait are frequently male. The trait rarely appears in females and only if the father also has the trait.



1. Is the gene for this trait dominant or recessive?

Recessive

2. Is the gene for this trait carried on the X or Y chromosome?

X chromosome

3. Using complete sentences explain why the trait is more common in males than in females?

To have the trait a female must have two recessive alleles but a male will have it with only one.

Please Continue on the Next Page

4. Using coded symbols give the genotypes of the following family members?
Be sure to include your symbol for representing the genotypes you describe.

Symbols - X^D - female No trait, X^d - female trait, Y - male chromosome

Bruce - $X^d Y$

Mary ~~Sue~~ - $X^D X^d$

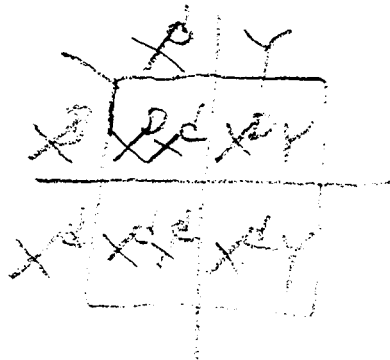
Their Mother - $X^D X^d$

Their Father - $X^D Y$

5. If Doug marries a woman whose lacking the trait, but whose father has the trait, what is the probability that they will have a son with the trait? What is the probability of their daughters having the trait?

There is a 50-50 chance for both their sons and daughters.

Doug $X^d Y$
woman $X^d X^d$



Human Inheritance





Task: In this task you will analyze genetic characteristics from a family tree.

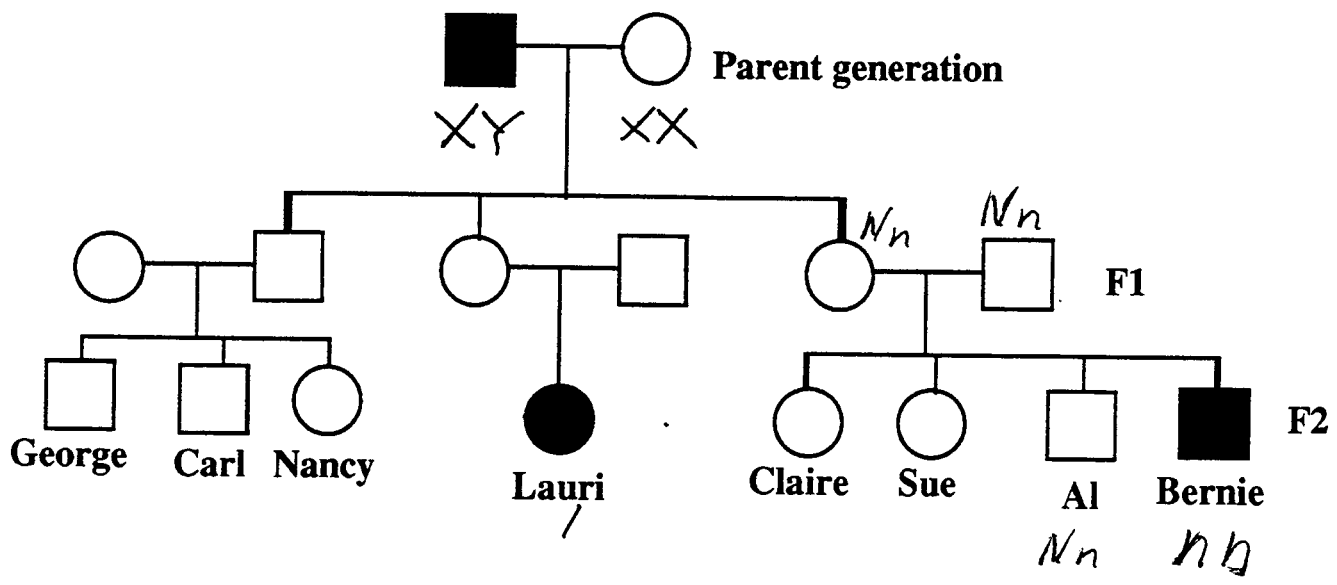
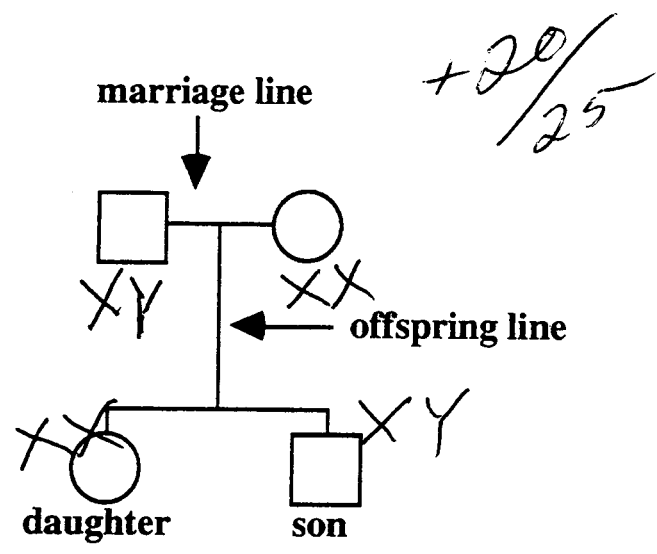
Part 1

Directions

Base your answers to the following questions on the pedigree chart below and on your knowledge of biology. The pedigree traces the expression of a particular trait, represented by the darkened symbol, through three (3) generations. These generations are labeled Parent Generation, F1, and F2 so that they correspond to the generations of pea plants that Gregor Mendel used to formulate his Laws of Heredity.

KEY

-  = male *X Y*
-  = male with trait *X X*
-  = female *X X*
-  = female with trait *X X*



Please Continue on the Next Page

1. Is the trait represented by the darkened symbol dominant or recessive?

RECESSIVE

2. Using complete sentences describe how Mendel would have explained your answer to question #1?

THE TRAIT STAYED HIDDEN FOR A GENERATION
SO MENDEL WOULD HAVE CALLED IT RECESSIVE.
IN F₁ FAMILIES TWO NORMAL PARENTS HAD CHILDREN
WITH THE TRAIT.

3. Describe all the possible genotypes of Bernie, his mother, his father, and his brother, Al.

BERNIE - homozygous recessive. Mother - heterozygous.
FATHER - heterozygous + Al - heterozygous.

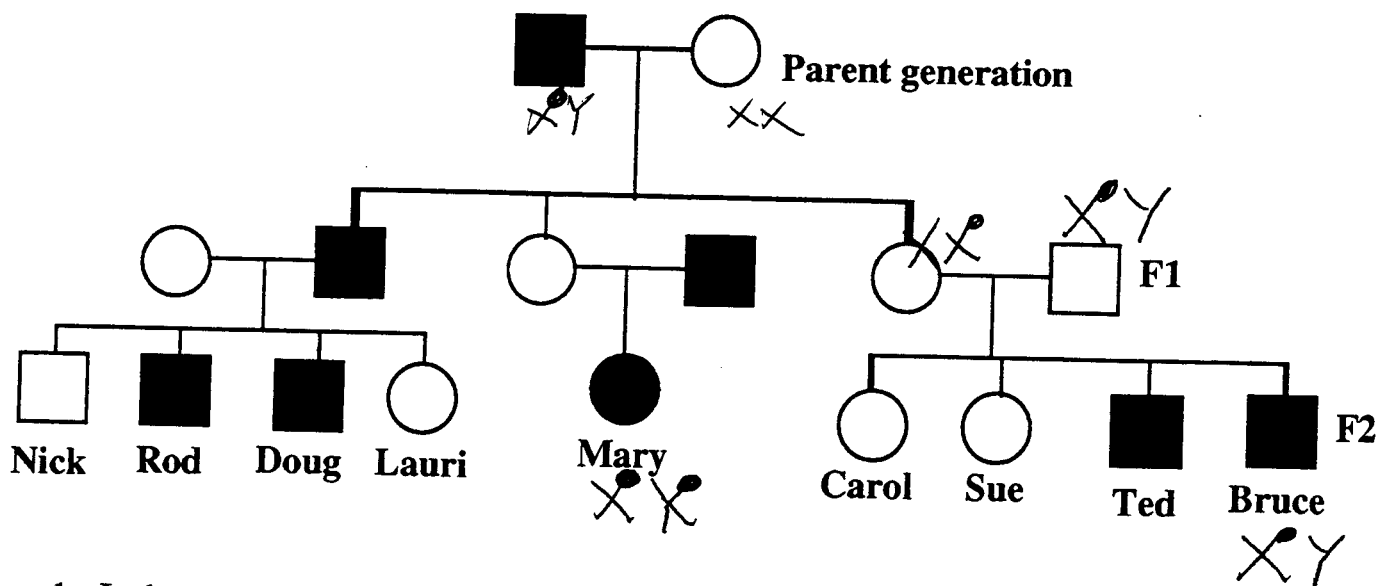
4. Using complete sentences explain how you determined your answer to question #3.

I USED LETTERS TO SHOW THE ALLELES AND GENES
IN EACH PERSON. BERNIE HAD TWO ~~n~~ n AND
THE OTHERS HAD ONE OF EACH. ~~N~~ N AND n.

Please Continue on the Next Page

Directions:

Base your answers to the following questions on the pedigree chart below and on your knowledge of biology. The pedigree traces the expression of a particular trait, represented by the darkened symbols, through three (3) generations. Studies have shown that individuals with this trait are frequently male. The trait rarely appears in females and only if the father also has the trait.



1. Is the gene for this trait dominant or recessive?

RECESSIVE

2. Is the gene for this trait carried on the X or Y chromosome?

X

3. Using complete sentences explain why the trait is more common in males than in females?

MALES HAVE AN X AND Y CHROMOSOME BUT FEMALES ONLY HAVE TWO X.

Please Continue on the Next Page

4. Using coded symbols give the genotypes of the following family members?
Be sure to include your symbol for representing the genotypes you describe.

Symbols - XX^{\bullet} FEMALE $X^{\bullet}Y$ MALE

Bruce - $X^{\bullet}Y$

Mary - XX^{\bullet}

Their Mother - XX

Their Father - $X^{\bullet}Y$

5. If Doug marries a woman whose lacking the trait, but whose father has the trait, what is the probability that they will have a son with the trait? What is the probability of their daughters having the trait?

There is a good chance that the son will get it, but not the daughter.

Human Inheritance





Task: In this task you will analyze genetic characteristics from a family tree.

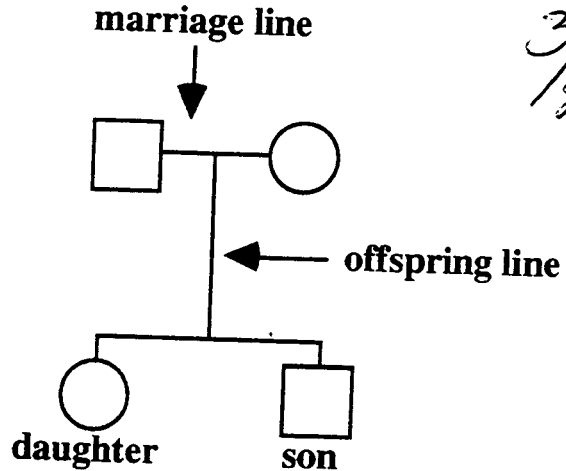
Part 1

Directions

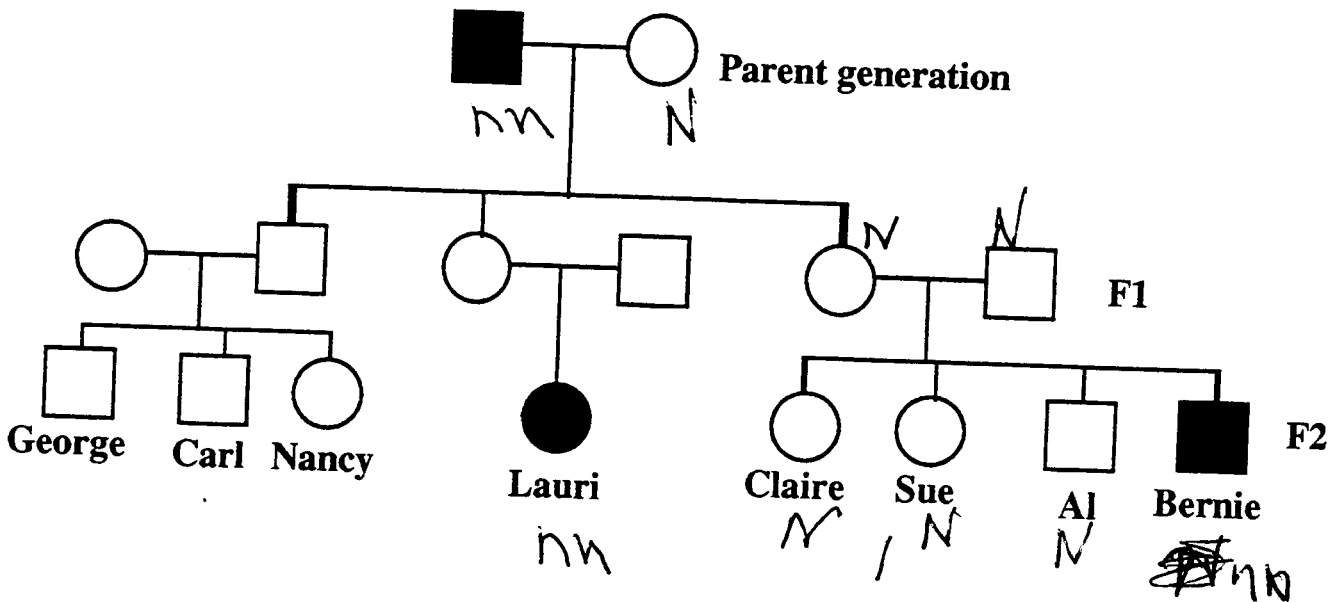
Base your answers to the following questions on the pedigree chart below and on your knowledge of biology. The pedigree traces the expression of a particular trait, represented by the darkened symbol, through three (3) generations. These generations are labeled Parent Generation, F1, and F2 so that they correspond to the generations of pea plants that Gregor Mendel used to formulate his Laws of Heredity.

KEY

-  = male
-  = male with trait
-  = female
-  = female with trait



3/25



Please Continue on the Next Page

1. Is the trait represented by the darkened symbol dominant or recessive?

Recessive

2. Using complete sentences describe how Mendel would have explained your answer to question #1?

There are only three of the black squares and circles

3. Describe all the possible genotypes of Bernie, his mother, his father, and his brother, Al.

Bernie has the trait so is nn. None of the others have it so they are all Nn normal.

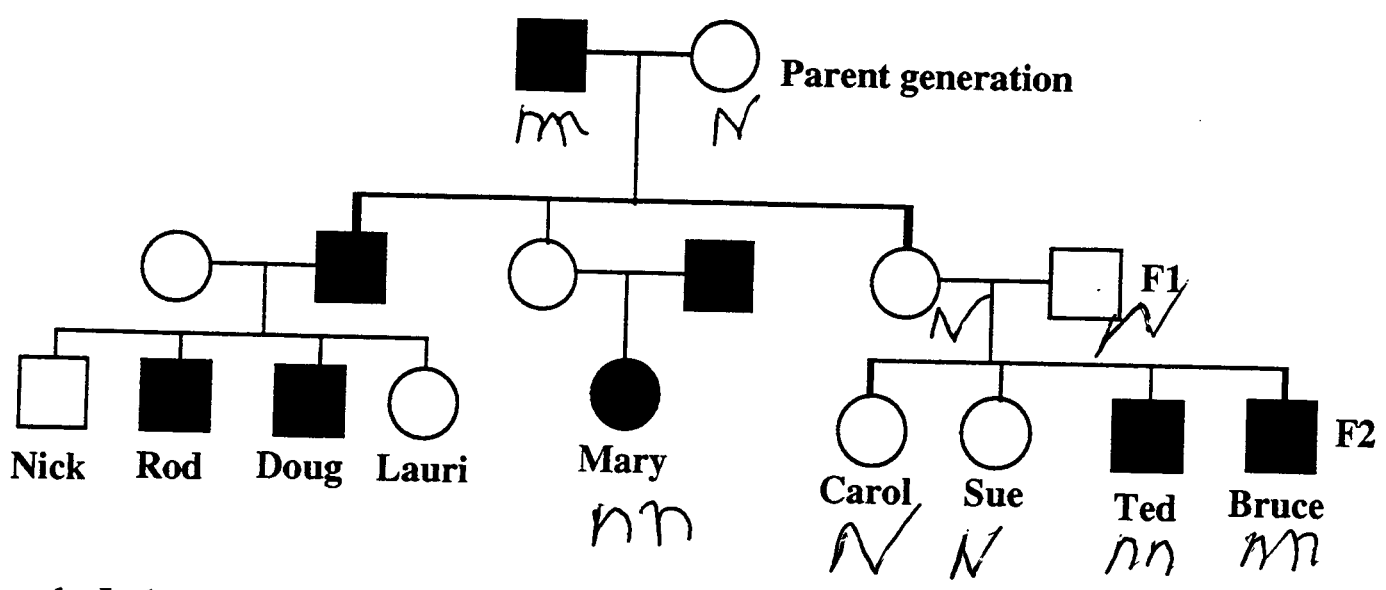
4. Using complete sentences explain how you determined your answer to question #3.

I looked at the picture and figured out things.

Please Continue on the Next Page

Directions:

Base your answers to the following questions on the pedigree chart below and on your knowledge of biology. The pedigree traces the expression of a particular trait, represented by the darkened symbols, through three (3) generations. Studies have shown that individuals with this trait are frequently male. The trait rarely appears in females and only if the father also has the trait.



1. Is the gene for this trait dominant or recessive?

in men

2. Is the gene for this trait carried on the X or Y chromosome?

X

3. Using complete sentences explain why the trait is more common in males than in females?

most often men get the genes like in color blind people

Please Continue on the Next Page

4. Using coded symbols give the genotypes of the following family members?
 Be sure to include your symbol for representing the genotypes you describe.

Symbols - N normal. ~~n~~ n - recessive. Not there.

Bruce - nn

Mary ~~Mark~~ nn

Their Mother - N

Their Father - N

5. If Doug marries a woman whose lacking the trait, but whose father has the trait, what is the probability that they will have a son with the trait? What is the probability of their daughters having the trait?

girls dont get it but their boys do.

Seasonal Changes

Task Information

Grade: Biology

Content:

- MST Framework - Standard 4 - The living Environment
- Regents Biology - Unit II - Maintenance in Living things
Topic V - Regulation
Unit VII - Ecology

Format: Paper/pencil

Purpose: The student will interpret data on plant blooming patterns.

Skills:

Primary: Interpreting data
Secondary: Inferring & Generalizing

Time: 15 minutes

Materials:

- test sheets

Preparation: none

Safety: none

Extensions/Modifications: none

Seasonal Changes

Task: At this station, you will be interpreting seasonal data concerning the blossoming pattern of certain plants.



Directions

1. Read the information below which describes data collected for a scientific experiment.
2. When you are finished, answer questions 1 through 3 on your answer sheet.





































THE EXPERIMENT

Each year, students in the biology classes at a local high school are required to keep wildlife journals. One of the necessary observations is a record of how seasonal changes in the area influence plant and animal populations. Information about three different plant species was taken from the last four years of journals, pooled and recorded in chart form. It seems that each spring, students recorded when dandelions, Trout lily, and violets blossomed in the nature area adjacent to the school.

Flower Key

Symbol	Flower Name
	Dandelion
J	Trout Lily
	Violet

The chart below shows when students recorded the appearance of flowers for the above species over a three year period. Dandelion information for year four has been omitted.

Years	Early March	Late March	Early April	Late April	Early May	Late May	Early June	Late June
Year 1		 J	  J	  J	  J	 	 	
Year 2				 J	  J	  J	  J	 
Year 3				 J	  J	  J	 	 
Year 4			 J	 J	 J	 J		

Please Continue on the Next Page

Answer Sheet

1. Study the flowering times for the Trout Lily, and Violet on the chart. Using complete sentences, describe four patterns you detect.

2. In year four, the dandelion bloom was not recorded. **On the chart, draw in** what you predict the data would have been had it been recorded. Use the dandelion symbol. Explain your reasoning for the dandelion data you predicted, using complete sentences.

Please Continue on the Next Page

Answer Sheet

3. Using complete sentences, describe two (2) factors that may have caused the differences in the time of flowering from one year to the next?

Seasonal Changes - Scoring Rubric

April 29, 1996

Maximum score - 11 points

Question 1 Blooming Patterns

5 points total

- Allow one point for each of the correct patterns up to 4 points.

Samples of acceptable patterns

- Trout lilies & violets start to flower at the same time
- Violets have a longer flowering period than trout lilies
- The flowering time of both is not at the same time each year.
- Allow 1 point if all the correct statements are written in complete sentences.
- No credit should be given if statements are incorrect even if they are in complete sentences.

Question 2 Fourth year dandelion bloom

3 points total

Prediction

1 point total

- Allow 1 point for completing the chart indicating start in late April and continuing through late June

Explanation

2 points total

- Allow 2 points an explanation based on the data using complete sentences.

Sample explanation

- The dandelions were always blossoming one time period before the violets and trout lilies in the first three (3) years.
- Allow 1 point for an explanation based on the data, but not written in complete sentences.
- No credit for an incorrect explanation even if it is written in complete sentences.

Question 3 Factor that affect flowering time

3 points total

- Allow 2 points if the student describes two (2) acceptable environmental factors
- Allow 1 point if the student describes one (1) environmental factor
- *** Allow 1 point if all of the correct factors are written in complete sentences.

- No credit for inappropriate environmental factors even if they are written in complete sentences.

Highest possible Score - 11 points

Student ID _____ **Scoring Form - Seasonal Changes**
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | | | | | | |
|----|----------------------------|---|---|---|---|---|---|
| 1. | Patterns identified | 0 | 1 | 2 | 3 | 4 | 5 |
| 2. | Dandelion bloom - 4th year | | | | | | |
| | Prediction | 0 | 1 | | | | |
| | Explanation | 0 | 1 | 2 | | | |
| 3. | Environmental factors | 0 | 1 | 2 | 3 | | |

Total Score _____
Total possible score 11 points

Student ID _____ **Scoring Form - Seasonal Changes**
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | | | | | | |
|----|----------------------------|---|---|---|---|---|---|
| 1. | Patterns identified | 0 | 1 | 2 | 3 | 4 | 5 |
| 2. | Dandelion bloom - 4th year | | | | | | |
| | Prediction | 0 | 1 | | | | |
| | Explanation | 0 | 1 | 2 | | | |
| 3. | Environmental factors | 0 | 1 | 2 | 3 | | |

Total Score _____
Total possible score 11 points

Student ID _____ **Scoring Form - Seasonal Changes**
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | | | | | | |
|----|----------------------------|---|---|---|---|---|---|
| 1. | Patterns identified | 0 | 1 | 2 | 3 | 4 | 5 |
| 2. | Dandelion bloom - 4th year | | | | | | |
| | Prediction | 0 | 1 | | | | |
| | Explanation | 0 | 1 | 2 | | | |
| 3. | Environmental factors | 0 | 1 | 2 | 3 | | |

Total Score _____
Total possible score 11 points

Student ID B10 - SC - 1

Scoring Form - Seasonal Changes

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1.	Patterns identified	0	1	2	3	4	(5)
2.	Dandelion bloom - 4th year						
	Prediction	0	(1)				
	Explanation	0	1	(2)			
3.	Environmental factors	0	1	2	(3)		

Total Score 11 pts
Total possible score 11 points

Student ID B10 - SC - 2

Scoring Form - Seasonal Changes

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1.	Patterns identified	0	1	2	3	(4)	5
2.	Dandelion bloom - 4th year						
	Prediction	(0)	1				
	Explanation	(0)	1	2			
3.	Environmental factors	0	1	2	(3)		

Total Score 7 pts
Total possible score 11 points

Student ID B10 - SC - 3

Scoring Form - Seasonal Changes

Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1.	Patterns identified	0	1	(2)	3	4	5
2.	Dandelion bloom - 4th year						
	Prediction	(0)	1				
	Explanation	0	(1)	2			
3.	Environmental factors	0	(1)	2	3		

Total Score 4 pts
Total possible score 11 points

Seasonal Changes

Task: At this station, you will be interpreting seasonal data concerning the blossoming pattern of certain plants.

Directions

1. Read the information below which describes data collected for a scientific experiment.
2. When you are finished, answer questions 1 through 3 on your answer sheet.

11
11

THE EXPERIMENT

Each year, students in the biology classes at a local high school are required to keep wildlife journals. One of the necessary observations is a record of how seasonal changes in the area influence plant and animal populations. Information about three different plant species was taken from the last four years of journals, pooled and recorded in chart form. It seems that each spring, students recorded when dandelions, Trout lily, and violets blossomed in the nature area adjacent to the school.

Flower Key

Symbol	Flower Name
	Dandelion
J	Trout Lily
	Violet

The chart below shows when students recorded the appearance of flowers for the above species over a three year period. Dandelion information for year four has been omitted.

Years	Early March	Late March	Early April	Late April	Early May	Late May	Early June	Late June
Year 1		J	J	J	J			
Year 2				J	J	J	J	
Year 3				J	J	J		
Year 4			J	J	J	J		

Please Continue on the Next Page

1. Study the flowering times for the Trout Lily, and Violet on the chart. Using complete sentences, describe four patterns you detect.

- ① The two flowers both bloom at the same times.
- ② The violets last longer than the Trout Lily.
- ③ They both start before the dandelions.
- ④ During different years they start at different times.

2. In year four, the dandelion bloom was not recorded. On the chart, draw in what you predict the data would have been had it been recorded. Use the dandelion symbol. Explain your reasoning for the dandelion data you predicted, using complete sentences.

The dandelions always start after the Trout lilies and violets and last the longest too.

3. Using complete sentences, describe two (2) factors that may have caused the differences in the time of flowering from one year to the next?

Some years could have had
lower temperatures than
others, and there could be
more rain some times.

Seasonal Changes

Task: At this station, you will be interpreting seasonal data concerning the blossoming pattern of certain plants.

Directions

1. Read the information below which describes data collected for a scientific experiment.
2. When you are finished, answer questions 1 through 3 on your answer sheet.

7
11

THE EXPERIMENT

Each year, students in the biology classes at a local high school are required to keep wildlife journals. One of the necessary observations is a record of how seasonal changes in the area influence plant and animal populations. Information about three different plant species was taken from the last four years of journals, pooled and recorded in chart form. It seems that each spring, students recorded when dandelions, Trout lily, and violets blossomed in the nature area adjacent to the school.

Flower Key

Symbol	Flower Name
⊗	Dandelion
J	Trout Lily
✱	Violet

The chart below shows when students recorded the appearance of flowers for the above species over a three year period. Dandelion information for year four has been omitted.

Years	Early March	Late March	Early April	Late April	Early May	Late May	Early June	Late June
Year 1		✱ J	⊗ ✱ J	⊗ ✱ J	⊗ ✱ J	⊗ ✱	⊗ ✱	⊗
Year 2				✱ J	⊗ ✱ J	⊗ ✱ J	⊗ ✱ J	⊗ ✱
Year 3				✱ J	⊗ ✱ J	⊗ ✱ J	⊗ ✱	⊗ ✱
Year 4			✱ J	✱ J	✱ J	⊗ ✱ J	⊗ ✱	⊗ ✱

Please Continue on the Next Page

1. Study the flowering times for the Trout Lily, and Violet on the chart. Using complete sentences, describe four patterns you detect.

I detect that the trout lilies and the violets appear first. They also always appear at the same time but violets last longer. Violets last the longest every year of all the flowers.

2. In year four, the dandelion bloom was not recorded. On the chart, draw in what you predict the data would have been had it been recorded. Explain your reasoning using complete sentences.

I think they would of appeared in late May and lasted until late June. Each year it is going longer in the season

3. Name two (2) factors may have caused the differences in the time of flowering from one year to the next?

The weather could of made a difference. If there was a lot of rain, a frost, or a lot of sun.

Another factor would be wind. How much they would get spread around.

Seasonal Changes

Task: At this station, you will be interpreting seasonal data concerning the blossoming pattern of certain plants.

Directions



1. Read the information below which describes data collected for a scientific experiment.
2. When you are finished, answer questions 1 through 3 on your answer sheet.

4/11








































THE EXPERIMENT

Each year, students in the biology classes at a local high school are required to keep wildlife journals. One of the necessary observations is a record of how seasonal changes in the area influence plant and animal populations. Information about three different plant species was taken from the last four years of journals, pooled and recorded in chart form. It seems that each spring, students recorded when dandelions, Trout lily, and violets blossomed in the nature area adjacent to the school.

Flower Key

Symbol	Flower Name
	Dandelion
J	Trout Lily
	Violet

The chart below shows when students recorded the appearance of flowers for the above species over a three year period. Dandelion information for year four has been omitted.

Years	Early March	Late March	Early April	Late April	Early May	Late May	Early June	Late June
Year 1		 J	  J	  J	  J	 	 	
Year 2				 J	  J	  J	  J	 
Year 3				 J	  J	  J	 	 
Year 4			 J	 J	 J	  J	 	 

Please Continue on the Next Page

1. Study the flowering times for the Trout Lily, and Violet on the chart. Using complete sentences, describe four patterns you detect.

they come up first

some times the late and other times early

they dont like dandelions

2. In year four, the dandelion bloom was not recorded. On the chart, draw in what you predict the data would have been had it been recorded. Use the dandelion symbol. Explain your reasoning for the dandelion data you predicted, using complete sentences.

years 2 and 3 are later than year 1
so I think that 4 is later too

3. Using complete sentences, describe two (2) factors that may have caused the differences in the time of flowering from one year to the next?

~~Less precipitation~~
hotter and colder years

Testing a New Drug 1

Task Information

Subject: Biology

Content:

- MST Framework Reference:
Standard 4 - Science: The Human Organism
Standard 1 - Analysis, Inquiry, & Design: Scientific Inquiry
- Regents Biology Syllabus: Unit III: Topic II.B.1.a
- Variance Biology Program Guide: Energy, Matter and Organization: Transport

Format: Paper/Pencil: individual or cooperative group

Purpose: To establish the conditions under which a new experimental drug will be tested.

Skills:

Primary: Hypothesizing, Controlling variables
Secondary: Predicting, Communicating

Time: 20 - 35 min.

Materials: Paper for rough copies, pencils, pens

Preparation:

This activity can be done independently by students or in cooperative groups.

The students should be encouraged to be as original as possible in their write up. Emphasize that the students are to act out the role of the chief research scientist and to write the explanations as a report going to a committee for approval. Therefore, it is important that the responses be detailed, and very clear in their meanings.

Safety: N/A

Extensions/Modification:

As an extension to this assessment, students could form committees to read each others report and to grant, or not to grant, approval for the implementation of the test design.

Testing a New Drug

Task: At this station, you will be establishing the conditions under which a new experimental drug will be tested.

Background

The drug ALAMAIN has been developed by the Gentronic Drug Company to lower blood pressure in people whose blood pressure is too high. The drug has been thoroughly tested on animals with positive results. The Gentronic Drug Company feels it is now time for the drug to be tested on humans, and have contacted the Human Improvement Laboratory to do the testing.

Directions

As chief research scientist at the Human Improvement Laboratory (HIL) you have been assigned the task of developing the human testing program for the new high blood pressure drug Alamain. You and your assistants are to confer on the experimental design of this testing program, and to write a report outlining the program. The report is to be submitted to the chairperson of the HIL Drug-Testing Committee for approval. Complete the following sections as you would included them in your report.

1. Using complete sentences state the hypothesis to be tested.

2. A. How many people will be included in the experimental and the control groups.

B. Using complete sentences explain your answer.

Please Continue on the Next Page

3. Since there are several contributing factors that can affect high blood pressure, list **five** factors that will be kept constant between the experimental and the control groups.

4. Based on the factors list in Question 3, using complete sentences explain why certain criteria need to be used in choosing the participants in this study.

5. Once the list of participants has been created, using complete sentences explain how they will be selected to be a member of either the experimental or the control group.

Please Continue on the Next Page

6. Using complete sentences, explain the characteristics of what must be given to the control group in place of the experimental drug to act as a placebo, and why the participants should be given this substance. **Note:** The drug Alamain is to be developed as a pill to be taken orally with water.

7. Using complete sentences, suggest how often the drug is to be administered to the experimental group, and the placebo to the control group.

8. Using complete sentences, explain what measurements and/or tests will be made on the experimental and control groups to judge the efficiency of Alamain, and how often the measurements and/or tests will be taken.

9. Using complete sentences, explain what criteria will be used to indicate the success or failure of the drug Alamain to reduce high blood pressure in humans.

Testing A New Drug - Scoring Rubric

Maximum Score - 29 points

Question 1.

4 points total

Criteria:

- Allow 4 points if the student states a hypothesis that identifies a variable, expected effect/change, and directionality of effect.

Sample of acceptable response:

- Alamain lowers the blood pressure in humans with high blood pressure.
- Allow 3 points if the stated hypothesis includes only 2 of the factors above.
- Allow 2 points if the stated hypothesis includes only 1 of the factors above.
- No credit if the stated hypothesis includes none of the factors above even if it is in complete sentences.

*** Deduct 1 point if the answer includes at least one of the above factors, but is not in complete sentences

Question 2

4 points total

Criteria:

- Allow 4 points if the student states these factors:
 - an equal number in the experimental and control groups,
 - a number between 50 and 1000 is suggested, but the teacher should decide if the chosen number is acceptable.
 - an adequate explanation why the particular number was chosen.

Sample of acceptable response:

- The number 50 was chosen since it will average out any variations not controlled for in the experimental design.
 - The number 100 was chosen since it is a large enough number to eliminate any uncontrolled variables, but not too large as to be unmanageable.
 - Any other explanation that is determined by the teacher to be appropriate.
 - Allow 3 points if the student states only two of the above factors.
 - Allow 2 points if the student states only one of the above factors.
 - No credit if the student states none of the above factors.
- *** Deduct 1 point if the answer includes at least one of the above factors, but is not in complete sentences

Question 3.

5 points total

Criteria:

- Allow 1 point for each of the **five** factors listed that can be associated with causing high blood pressure.

Sample of acceptable responses, but not limited to:

age, smoker or nonsmoker, sex, present blood pressure, diet, stress, amount of daily exercise, percent body fat, weight, family history, daily or weekly alcohol consumption, cholesterol level, plus any other factor deemed appropriate by the teacher.

Question 4.

2 points total

Criteria:

- Allow 2 points for an explanation that all of the participants should be matched as closely as possible to the factors listed in Question 3 to reduce the variation between participants or that the participants start out as similar as possible so no other variable could be affecting the blood pressure.
- Allow 1 point for a correct explanation, but not written in complete sentences.
- No credit for an incorrect response even if it is in complete sentences.

Question 5.**2 points total**

Criteria:

- Allow 2 points for stating or describing that random sampling must be used. Statement should be written in complete sentences.
- Allow 1 point for a correct statement, but not in complete sentences.
- No credit for an incorrect response even if it is in complete sentences.

Question 6.**3 points total**

Criteria:

- Allow 3 points if the student states that a harmless substance be made into a pill with the same size and shape as the experimental pill, **and** this would be done to make sure the participants would not know if they were given the drug or not.
- Allow 2 points if only one of the above is stated.
- *** Deduct 1 point if the answer includes at least one of the above factors, but is not in complete sentences
- No credit for an incorrect response even if it is in complete sentences.

Question 7.**2 points total**

Criteria:

- Allow 2 points if the student states that the experimental and placebo pills should be administered to the participants on a regular basis (once a day, once a week, every two weeks, etc.).
- Allow 1 point for a correct statement, but not in complete sentences
- No credit for an incorrect statement even if it is in complete sentences.

Question 8.**4 points total**

Criteria:

- Allow 4 points for stating the following measurements/tests/observations:
 - measurement of blood pressure.
 - the measurement should be done on a regular basis. (Once a day, once a week, every two weeks, etc.).
 - tests or observations to measure harmful side effects.
- Allow 3 points if the student states any two of the above items.
- Allow 2 points if the student states only one of the above items.
- *** Deduct 1 point if the answer includes at least one of the above factors, but is not in complete sentences
- No credit for an incorrect response even if it is in complete sentences.

Question 9.**3 points total**

Criteria:

- Allow 3 points for stating these criteria or observations:
 - the drug is successful if it lowered the blood pressure of the experimental group
 - there were no harmful side effects

Allow 2 points if the student states only one of the above items.

*** Deduct 1 point if the answer includes at least one of the above factors, but is not in complete sentences

- No credit for an incorrect response even if it is in complete sentences.

Highest Possible Score - 29 points

Student ID: _____ **Testing A New Drug - Scoring Form**
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Stating a hypothesis	0	1	2	3	4	
2. Size of control and experimental groups	0	1	2	3	4	
3. Listing contributing factors	0	1	2	3	4	5
4. Explanation of need for criteria	0	1	2			
5. Selection of participants	0	1	2			
6. Identifying characteristics of the placebo	0	1	2	3		
7. Establish a timetable for administering the drug	0	1	2			
8. Explaining measurements, tests, observations	0	1	2	3	4	
9. Explaining the criteria for the drug's success	0	1	2	3		

Total Points: _____

Total possible score - 29 points

Student ID: BIO - ND - 1 Testing A New Drug - Scoring Form
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Stating a hypothesis	0	1	2	3	(4)	
2. Size of control and experimental groups	0	1	2	3	(4)	
3. Listing contributing factors	0	1	2	(3)	4	5
4. Explanation of need for criteria	0	1	(2)			
5. Selection of participants	0	1	(2)			
6. Identifying characteristics of the placebo	0	1	2	(3)		
7. Establish a timetable for administering the drug	0	1	(2)			
8. Explaining measurements, tests, observations	0	1	2	3	(4)	
9. Explaining the criteria for the drug's success	0	1	(2)	3		

Total Points: 26 pts
Total possible score - 29 points

26
9

Testing a New Drug

Task: At this station, you will be establishing the conditions under which a new experimental drug will be tested.

Background

The drug ALAMAIN has been developed by the Gentronic Drug Company to lower blood pressure in people whose blood pressure is too high. The drug has been thoroughly tested on animals with positive results. The Gentronic Drug Company feels it is now time for the drug to be tested on humans, and have contacted the Human Improvement Laboratory to do the testing.

Directions

As chief research scientist at the Human Improvement Laboratory (HIL) you have been assigned the task of developing the human testing program for the new high blood pressure drug Alamain. You and your assistants are to confer on the experimental design of this testing program, and to write a report outlining the program. The report is to be submitted to the chairperson of the HIL Drug-Testing Committee for approval. Complete the following sections as you would included them in your report.

- Using complete sentences state the hypothesis to be tested.

ALAMAIN WILL BE SUCCESSFUL IN LOWERING THE BLOOD PRESSURE IN HUMANS.

- How many people will be included in the experimental and the control groups.

50 in each.

- Using complete sentences explain your answer.

This would give enough to get the laws of chance to work.

Please Continue on the Next Page

3. Since there are several contributing factors that can affect high blood pressure, list five factors that will be kept constant between the experimental and the control groups.

I would have to put the people into categories, male, female, race, weight, etc. Then I would see how it affected each person. Then I would know ~~that~~ ^{who} would be able to take the drug w/o a problem.

4. Based on the factors list in Question 3, using complete sentences explain why certain criteria need to be used in choosing the participants in this study.

The categories would have to be chosen to match up the people in the two different groups.

5. Once the list of participants has been created, using complete sentences explain how they will be selected to be a member of either the experimental or the control group.

I would just divid them up hit and miss -

Please Continue on the Next Page

6. Using complete sentences, explain the characteristics of what must be given to the control group in place of the experimental drug to act as a placebo, and why the participants should be given this substance. Note: The drug Alamain is to be developed as a pill to be taken orally with water.

The placebo would be a pill the same as the real thing but with nothing really in it. This will make it so that no one really knows who is getting the real drug.

7. Using complete sentences, suggest how often the drug is to be administered to the experimental group, and the placebo to the control group.

Both groups would get the pill once a day.

8. Using complete sentences, explain what measurements and/or tests will be made on the experimental and control groups to judge the efficiency of Alamain, and how often the measurements and/or tests will be taken.

I would check their blood pressure and heart rate at least once a day. Also I would check to see if they felt good too.

9. Using complete sentences, explain what criteria will be used to indicate the success or failure of the drug Alamain to reduce high blood pressure in humans.

I will decide if the drug was successful or not by how it helped each person. The drug might end up helping only women, for example, and then the drug would only be available for them.

Student ID: B10-ND-2 Testing A New Drug - Scoring Form
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

- | | | | | | |
|---|----------|----------|----------|----------|------------|
| 1. Stating a hypothesis | 0 | 1 | 2 | <u>3</u> | 4 |
| 2. Size of control and experimental groups | 0 | 1 | 2 | <u>3</u> | 4 |
| 3. Listing contributing factors | 0 | 1 | 2 | 3 | 4 <u>5</u> |
| 4. Explanation of need for criteria | <u>0</u> | 1 | 2 | | |
| 5. Selection of participants | 0 | <u>1</u> | 2 | | |
| 6. Identifying characteristics of the placebo | <u>0</u> | 1 | 2 | 3 | |
| 7. Establish a timetable for administering the drug | 0 | 1 | <u>2</u> | | |
| 8. Explaining measurements, tests, observations | 0 | 1 | 2 | <u>3</u> | 4 |
| 9. Explaining the criteria for the drug's success | 0 | 1 | <u>2</u> | 3 | |

Total Points: 19 pts
Total possible score - 29 points

Testing a New Drug

Task: At this station, you will be establishing the conditions under which a new experimental drug will be tested.

19
29

Background

The drug ALAMAIN has been developed by the Gentronic Drug Company to lower blood pressure in people whose blood pressure is too high. The drug has been thoroughly tested on animals with positive results. The Gentronic Drug Company feels it is now time for the drug to be tested on humans, and have contacted the Human Improvement Laboratory to do the testing.

Directions

As chief research scientist at the Human Improvement Laboratory (HIL) you have been assigned the task of developing the human testing program for the new high blood pressure drug Alamain. You and your assistants are to confer on the experimental design of this testing program, and to write a report outlining the program. The report is to be submitted to the chairperson of the HIL Drug-Testing Committee for approval. Complete the following sections as you would included them in your report.

- 1. Using complete sentences state the hypothesis to be tested.

Will the drug Alamain effect blood pressure?

- 2. A. How many people will be included in the experimental and the control groups.

100 people

- B. Using complete sentences explain your answer.

With 100 people you could split them up in to two groups of 50 people each.

Please Continue on the Next Page

3. Since there are several contributing factors that can affect high blood pressure, list five factors that will be kept constant between the experimental and the control groups.

Their blood pressures, weight
how much exercise they get,
where they live, what they eat.

4. Based on the factors list in Question 3, using complete sentences explain why certain criteria need to be used in choosing the participants in this study.

Because you have to know
what kind of people you want.

5. Once the list of participants has been created, using complete sentences explain how they will be selected to be a member of either the experimental or the control group.

some of each type in both
groups.

Please Continue on the Next Page

6. Using complete sentences, explain the characteristics of what must be given to the control group in place of the experimental drug to act as a placebo, and why the participants should be given this substance. Note: The drug Alamain is to be developed as a pill to be taken orally with water.

It would be unfair to some people not to get anything even if the Alamain was only a pill.

7. Using complete sentences, suggest how often the drug is to be administered to the experimental group, and the placebo to the control group.

I would think the pill would be given everyday.

8. Using complete sentences, explain what measurements and/or tests will be made on the experimental and control groups to judge the efficiency of Alamain, and how often the measurements and/or tests will be taken.

Their blood pressure should be taken every week.

9. Using complete sentences, explain what criteria will be used to indicate the success or failure of the drug Alamain to reduce high blood pressure in humans.

The pill would be successful if it lowered the peoples blood pressure who took it.

Student ID: B10-ND-3 Testing A New Drug - Scoring Form
Male / Female (circle one)

Circle the student's score for each question. Add the points for each question and write the total score at the bottom of the scoring form.

1. Stating a hypothesis	0	1	2	<u>3</u>	4	
2. Size of control and experimental groups	<u>0</u>	1	2	3	4	
3. Listing contributing factors	0	<u>1</u>	2	3	4	5
4. Explanation of need for criteria	0	1	<u>2</u>			
5. Selection of participants	<u>0</u>	1	2			
6. Identifying characteristics of the placebo	<u>0</u>	1	2	3		
7. Establish a timetable for administering the drug	0	<u>1</u>	2			
8. Explaining measurements, tests, observations	0	<u>1</u>	2	3	4	
9. Explaining the criteria for the drug's success	0	<u>1</u>	2	3		

Total Points: 9 pts
Total possible score - 29 points

Testing a New Drug

Task: At this station, you will be establishing the conditions under which a new experimental drug will be tested.

Background

The drug ALAMAIN has been developed by the Gentronic Drug Company to lower blood pressure in people whose blood pressure is too high. The drug has been thoroughly tested on animals with positive results. The Gentronic Drug Company feels it is now time for the drug to be tested on humans, and have contacted the Human Improvement Laboratory to do the testing.

Directions

As chief research scientist at the Human Improvement Laboratory (HIL) you have been assigned the task of developing the human testing program for the new high blood pressure drug Alamain. You and your assistants are to confer on the experimental design of this testing program, and to write a report outlining the program. The report is to be submitted to the chairperson of the HIL Drug-Testing Committee for approval. Complete the following sections as you would included them in your report.

- 1. Using complete sentences state the hypothesis to be tested.

If the drug Alamain will cure or help lower high blood pressure.

- 2. A. How many people will be included in the experimental and the control groups.

10

- B. Using complete sentences explain your answer.

10 people with high blood pressure. - I am not sure. would not know how many to test.

Please Continue on the Next Page

3. Since there are several contributing factors that can affect high blood pressure, list **five** factors that will be kept constant between the experimental and the control groups.

(amounts)
The people and the material you used to help lower the high blood pressure. I don't know how I would do it. Keep the amounts constant.

4. Based on the factors list in Question 3, using complete sentences explain why certain criteria need to be used in choosing the participants in this study.

The people would all need to have about the same blood pressure.

5. Once the list of participants has been created, using complete sentences explain how they will be selected to be a member of either the experimental or the control group.

people with high blood pressure.

Please Continue on the Next Page

BIO-ND-3

6. Using complete sentences, explain the characteristics of what must be given to the control group in place of the experimental drug to act as a placebo, and why the participants should be given this substance. **Note:** The drug Alamain is to be developed as a pill to be taken orally with water.

The control group would only get water

7. Using complete sentences, suggest how often the drug is to be administered to the experimental group, and the placebo to the control group.

every day - not sure. I don't know how long the medicine takes to work.

8. Using complete sentences, explain what measurements and/or tests will be made on the experimental and control groups to judge the efficiency of Alamain, and how often the measurements and/or tests will be taken.

how many amounts to lower high blood pressure, each person's blood pressure should be recorded from start to finish.

9. Using complete sentences, explain what criteria will be used to indicate the success or failure of the drug Alamain to reduce high blood pressure in humans.

The people's blood pressure went down, if not the drug did not work and I would try again.

Water Regulation Task Information

Subject: Biology

Content:

- MST Framework - Standard 4 - The living environment
- Regents Biology Syllabus - Unit II - Maintenance in living things

Format: Paper/Pencil

Purpose: To interpret graphical data about cells in different solutions.

Skills:

Primary: Observing, Interpreting data

Secondary: Generalizing/Inferring, Predicting

Time: 20 - 30 Minutes

Materials: Task Sheet

Preparation: None

Safety: N/A

Extensions/Modifications: None

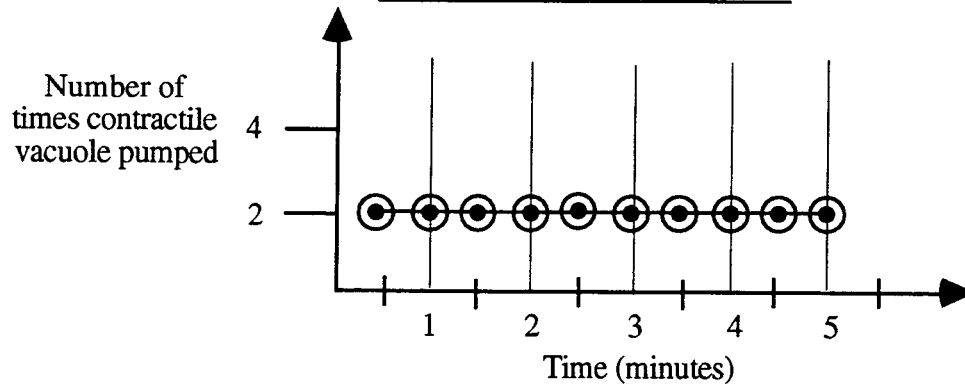
Water Regulation

Task: At this station, you will be interpreting data presented in graphs.

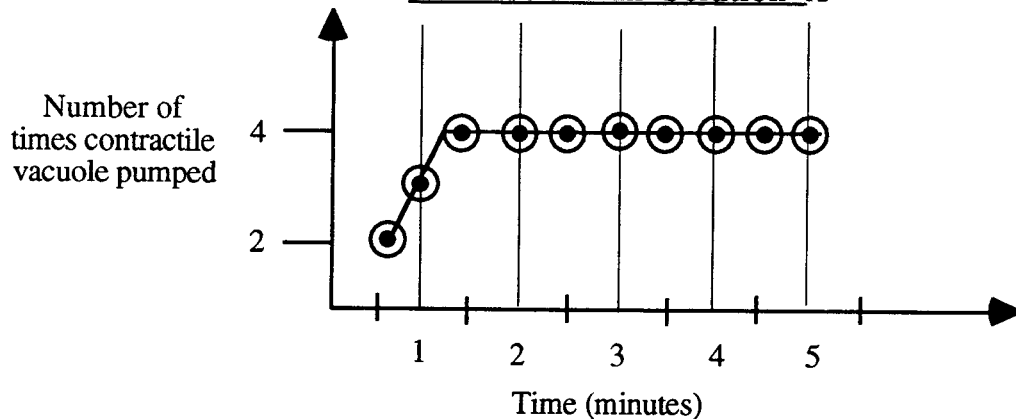
Background

Paramecia are found in stagnant pond water. Excess water is regularly removed from these organisms by the pumping action of contractile vacuoles. Paramecia were placed in 3 different solutions: Pond water (containing 95% water and various dissolved materials), Solution A, and Solution B. While observing a contractile vacuole using the high power magnification (400x) of a microscope, a student counted, in 30 second intervals, the number of times the contractile vacuole pumped water out of the cell and repeated his counts in the three solutions. The results are presented in the graphs below:

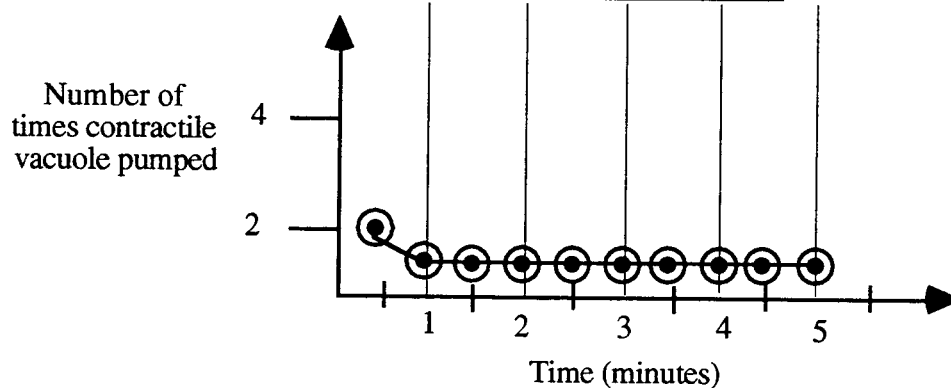
Paramecium In Pond Water



Paramecium In Solution A



Paramecium In Solution B



Please Continue on the Next Page

Base your answers to the following questions on these graphs.

1. Using complete sentences describe your observations of the behavior of the contractile vacuole in each solution:

A. Pond water: _____

B. Solution A: _____

C. Solution B: _____

2. Think about the relationship between the concentration of dissolved materials in the two solutions and pond water. Use the following terms to complete the two statements below.

Same as OR Greater than OR Less than

A. The concentration of solution A was _____ the concentration of pond water.

B. The concentration of solution B was _____ the concentration of pond water.

3. What would you add to Solution A to restore the vacuole contraction to the same rate as in pond water?

4. Using complete sentences suggest an explanation to your answer to question 3:

5. Using complete sentences what would you add to Solution B to restore the vacuole contraction to the same rate as in pond water.

6. Using complete sentences suggest an explanation to your answer to question 5.

Please Continue on the Next Page

7. What will happen to a paramecium if the contractile vacuole failed to remove the excess water.

8. Using complete sentences explain how you have reached your prediction in question 7.

9. Name two (2) biological processes which take place in this investigation.

Water Regulation - Scoring Rubric**Maximum score - 24 points****1. Observations****9 points total**

Allow 1 point for each of the following components

- Correct rate of contraction
- Indication of no change over time
- answer is correct and in a complete sentence

1A. Pond Water**3 points total**Sample of acceptable answer for 1A

~ The contractile vacuole pumped twice per 30 second interval the whole time.

1B. Solution A**3 points total**Sample of acceptable answer for 1B

~ The contractile vacuole initially pumped 2 times per 30 second interval. This rate increased to 4 times per 30 second interval and then remained constant.

1C. Solution B**3 points total**Sample of acceptable answer for 1C

~ The contractile vacuole initially pumped 2 per 30 second interval. This rate decreased to 1 time per 30 second interval and then remained constant.

2. Relationship between water concentration**2 points total**

Allow 1 point for part A and 1 point for part B.

2A. The concentration of material in Solution A was **less than** pond water.2B. The concentration of material in Solution B was **greater than** pond water.**3. What would you add to Solution A?****1 point total**

- Allow 1 point if the student states that a solute, such as salt, could be added to solution A to restore the vacuole contraction to the same rate as in the pond water.

4. Explanation of answer to question #3**3 points total**

Allow 1 point for each of the following;

- States or implies correct relationships between water and amount of solute.
- States or implies correct relationships between concentration of solute and activity of contractile vacuole.
- Answer is correct and in complete sentences

Sample of Acceptable answer:

~ would add solute to the solution in order to increase the concentration of solute. This would decrease the concentration of water and the paramecium wouldn't have to pump as often.

5. What would you add to Solution B?**1 point total**

- Allow 1 point if the student states that a solvent, such as water, could be added to solution B.

6. Explanation of what would add to Solution B**3 points total**

- Allow 1 point for each of the following;
 - states or implies the correct relationship between concentration of water and the amount of solute in a solution.
 - States or implies the correct relationship between concentration and the activity of the contractile vacuole.
 - Answer is correct and in complete sentences

7. Prediction if the contractile vacuole failed**1 point total**

- Allow 1 point if the student states or implies that the paramecium becomes non functional;. (i.e. Dies or bursts)

8. Explain your prediction in question #7**2 points total**

- Allow 1 point if the student includes the following components;
 - States or implies the correct relationship between function of the vacuole and the well being of the paramecium.

OR

 - States or implies the correct relationship between too much water and the death of the organism
 - Answer is correct and in complete sentences

9. Two Biological processes**2 points total**

- Allow 1 point for each of the biological processes named.
 - osmosis
 - Homeostasis
 - other processes may be appropriate

Highest possible score 24 points

Student ID _____

Scoring Form - Water Regulation

Male / Female (circle one)

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

1. Observations

1A	0	1	2	3
1B	0	1	2	3
1C	0	1	2	3
2. Relationship between water concentration	0	1	2	
3. What would add to solution A?	0	1		
4. Explanation of answer to #3	0	1	2	3
5. What would you add to solution B	0	1		
6. Explanation for answer to #5	0	1	2	3
7. Prediction if contractile vacuole failed	0	1		
8. Explain your prediction in #7	0	1	2	
9. Two biological process	0	1	2	

Total Score _____

Total possible score - 24 points

Student ID BIO - WR - 1
Male / Female (circle one)

Scoring Form - Water Regulation

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

1. Observations

1A	0	1	2	3
1B	0	1	2	3
1C	0	1	2	3
2. Relationship between water concentration	0	1	2	
3. What would add to solution A?	0	1		
4. Explanation of answer to #3	0	1	2	3
5. What would you add to solution B	0	1		
6. Explanation for answer to #5	0	1	2	3
7. Prediction if contractile vacuole failed	0	1		
8. Explain your prediction in #7	0	1	2	
9. Two biological process	0	1	2	

Total Score 24 pts
Total possible score - 24 points

Base your answers to the following questions on these graphs.

1. Using complete sentences describe your observations of the behavior of the contractile vacuole in each solution:

- A. Pond water: The number of times the contractile vacuole pumped stayed the same for all 5 minutes at 2 x⁵/_{30s}
- B. Solution A: The number of times went up after the first 1 1/2 min. from 2 to 4 pumps per ~~int~~ 30 sec.
- C. Solution B: The number of times went down in the first 1/2 min. from 2 to 1 times per 30 sec.

2. Think about the relationship between the concentration of dissolved materials in the two solutions and pond water. Use the following terms to complete the two statements below.

Same as OR Greater than OR Less than

- A. The concentration of solution A was Less than the concentration of pond water.
- B. The concentration of solution B was Greater than the concentration of pond water.
3. What would you add to Solution A to restore the vacuole contraction to the same rate as in pond water?

Some salt-but not too much.

4. Using complete sentences suggest an explanation to your answer to question 3:

The salt would change the water concentration to make it more like the pond water. The contractile vacuole would slow down to normal.

5. Using complete sentences what would you add to Solution B to restore the vacuole contraction to the same rate as in pond water.

More water would need to be added to B.

6. Using complete sentences suggest an explanation to your answer to question 5.

Adding more water would dilute the solution to make it more like the pond water so the contractile vacuole acts normal.

Please Continue on the Next Page

7. What will happen to a paramecium if the contractile vacuole failed to remove the excess water.

It would explode because too much
water would come in.

8. Using complete sentences explain how you have reached your prediction in question 7.

Too much water would diffuse in to
the cell causing pressure.

9. Name two (2) biological processes which take place in this investigation.

diffusion, active transport.

Student ID BIO - WR - 2

Scoring Form - Water Regulation

Male / Female (circle one)

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

1. Observations

1A

0 1 2 (3)

1B

0 1 2 (3)

1C

0 1 (2) 3

2. Relationship between water concentration

0 1 (2)

3. What would add to solution A?

0 (1)

4. Explanation of answer to #3

0 1 (2) 3

5. What would you add to solution B

0 (1)

6. Explanation for answer to #5

0 1 2 (3)

7. Prediction if contractile vacuole failed

0 (1)

8. Explain your prediction in #7

0 1 (2)

9. Two biological process

(0) 1 2

Total Score

20

Total possible score - 24 points

Base your answers to the following questions on these graphs.

1. Using complete sentences describe your observations of the behavior of the contractile vacuole in each solution:

A. Pond water: It stayed at 2 the whole time.

B. Solution A: It jumped up from about two to about 4 times then leveled off.

C. Solution B: down to about 1 and stayed there.

2. Think about the relationship between the concentration of dissolved materials in the two solutions and pond water. Use the following terms to complete the two statements below.

Same as OR Greater than OR Less than

A. The concentration of solution A was less than the concentration of pond water.

B. The concentration of solution B was greater than the concentration of pond water.

3. What would you add to Solution A to restore the vacuole contraction to the same rate as in pond water?

something with out water

4. Using complete sentences suggest an explanation to your answer to question 3:

there is more water to be pumped in A than is in the pond so if you want it to pump the same you shouldn't add water to it

5. Using complete sentences what would you add to Solution B to restore the vacuole contraction to the same rate as in pond water.

more water

6. Using complete sentences suggest an explanation to your answer to question 5.

There is less water in B than in pond water so to make it the same you add water.

Please Continue on the Next Page

7. What will happen to a paramecium if the contractile vacuole failed to remove the excess water.

It would die.

8. Using complete sentences explain how you have reached your prediction in question 7.

If the contractile vacuole is meant to get rid of water it does that to keep the paramecium alive. If it doesn't its job the paramecium dies.

9. Name two (2) biological processes which take place in this investigation.

Storage of food.

Student ID B10 - WR - 3
Male / Female (circle one)

Scoring Form - Water Regulation

Circle the student's score for each part of the exercise. Add the points for each part and write the total score at the bottom of the scoring form.

1. Observations

1A	0	(1)	2	3
1B	0	1	(2)	3
1C	0	1	(2)	3
2. Relationship between water concentration	0	1	(2)	
3. What would add to solution A?	(0)	1		
4. Explanation of answer to #3	0	1	2	(3)
5. What would you add to solution B	(0)	1		
6. Explanation for answer to #5	0	1	2	(3)
7. Prediction if contractile vacuole failed	(0)	1		
8. Explain your prediction in #7	(0)	1	2	
9. Two biological process	(0)	1	2	

Total Score 13 pts
Total possible score - 24 points

Base your answers to the following questions on these graphs.

1. Using complete sentences describe your observations of the behavior of the contractile vacuole in each solution:

- A. Pond water: It stays the same through out the 5 minutes while in the pond water
- B. Solution A: It pumps more in the same amount of time that it takes to pump in pond water
- C. Solution B: The number of times the vacuole pumps drops in solution B.

13
24

2. Think about the relationship between the concentration of dissolved materials in the two solutions and pond water. Use the following terms to complete the two statements below.

Same as OR Greater than OR Less than

- A. The concentration of solution A was less ~~greater~~ than the concentration of pond water.
- B. The concentration of solution B was greater than the concentration of pond water.
3. What would you add to Solution A to restore the vacuole contraction to the same rate as in pond water?

pond water

4. Using complete sentences suggest an explanation to your answer to question 3:

This would change the composition of solution A, and change the way that the Paramecium reacts. If there is more pond water, they will react with more normal pumping of the contractile vacuole

5. Using complete sentences what would you add to Solution B to restore the vacuole contraction to the same rate as in pond water.

I would add some of what was in solution A.

6. Using complete sentences suggest an explanation to your answer to question 5.

Since the beating was low in B and high in A, adding A to B would probably bring the number of times towards the middle

Please Continue on the Next Page

7. What will happen to a paramecium if the contractile vacuole failed to remove the excess water.

The paramecium would leak water.

8. Using complete sentences explain how you have reached your prediction in question 7.

If it was gone there would be a hole.

9. Name two (2) biological processes which take place in this investigation.

Excretion, Cyclosis.

