Lead Information Packet

Module 1: Respiration

4th Grade

This document is not intended to give you all of the information you need to lead the module. It is only intended to be a reference during the module. You can find the complete instructions at scitrek.chem.ucsb.edu/module as well as the notebook and picture packet used during the module.

Important Things to Remember During the Module

1. You are responsible for keeping track of time in the classroom and making sure **all** activities run smoothly. There will be a time card in the lead box with suggested times to start/stop each activity.
2. You are responsible for keeping volunteers and students on track.
3. Walk around during times volunteers are working with students and help struggling groups/subgroups.

Types of Documents:

Notebook:

One given to every student and is filled out by the student. The lead will use a notebook to write in as an example for students. The notebook the lead uses is referred to as the class notebook in these instructions.

Notepad:

One given to every group and is filled out by the volunteer. In these instructions, the examples are narrower and taller than the notebook pages.

Picture Packet:

One per class that, if needed, the lead fills out. In these instructions, the examples are the same size as the notebook pages but are labeled.

In these instructions, all other example documents are labeled.

Day 1: Procedure Assessment/Observations/Variables

Schedule: *You are responsible for **BOLD** sections*

Introduction (SciTrek Lead) – 2 minutes
Procedure Assessment (SciTrek Lead) – 10 minutes
Observation Discussion (SciTrek Lead) – 4 minutes
Observations (SciTrek Volunteers) – 14 minutes
Variable Discussion (SciTrek Lead) – 8 minutes
Variables (SciTrek Volunteers) – 19 minutes
Wrap-Up (SciTrek Lead) – 3 minutes

Preparation:

1. Make sure volunteers are passing out nametags.
2. Make sure volunteers are setting up for the initial observation.
3. Set up the document camera for the initial bottle picture (picture packet, page 1) and class question (notebook, front cover).
4. Pass out the procedure assessments.

Introduction: *(2 minutes – Full Class – SciTrek Lead)*

- Allow volunteers to introduce themselves.
- Introduce the module.

Procedure Assessment: *(10 minutes – Full Class – SciTrek Lead)*

- Question *1*: Have students write in their own words what they think is the definition of a procedure.
- Read step 1 of the directions. Then read the question, changing variable (Ex: the changing variable was solid amount), and controls (Ex: the controls were solid type, liquid type, liquid amount…). Do not read values of the changing variable or controls.
- Read step 2 of the directions. Then read the statement in question 2 and have students underline controls, circle changing variables, and box information about data collection.
- Read step 3 of the directions. Then have students circle if the statement, in question 2, could be an appropriate procedure step.
- Read the statement in question 3 and have students underline controls, circle changing variables, and box information about data collection.
- Have students circle if the statement, in question 3, could be an appropriate procedure step.
- Repeat the process for questions 4-8
- Collect assessments.

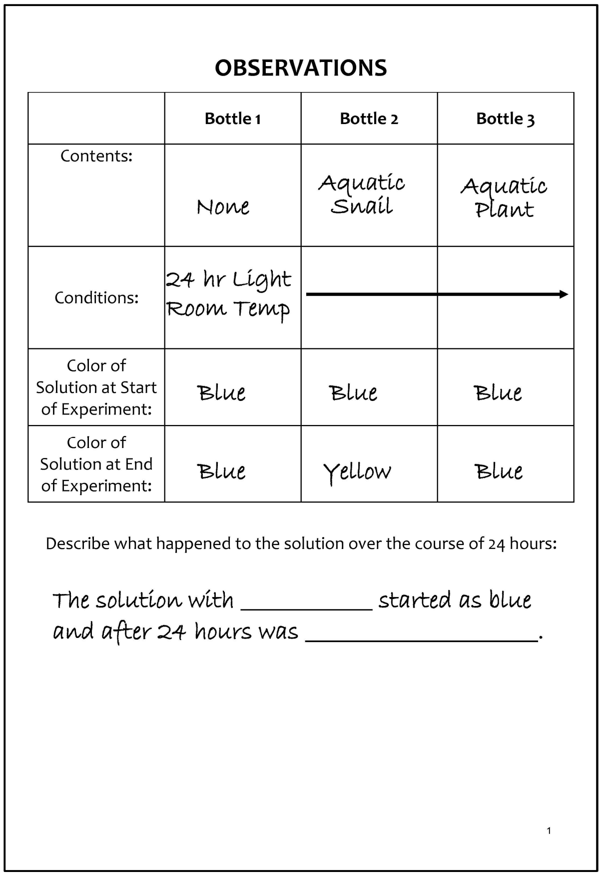
Observation Discussion: *(4 minutes – Full Class – SciTrek Lead)*

- Review the definition of an observation (a description using your five senses).
- Tell students, "The term **contents** refers to materials inside the bottle, besides the solution."
    - Have students identify the contents in one of the bottles (nothing, aquatic snail, or aquatic plant).
- Tell students, "The term **conditions** refers to other variables outside of the bottle that may affect the solution."
    - Have students identify a condition of the bottles (Ex: full light or 24 hours).
- Have students move to their groups.
    - If a student does not have a nametag, identify the group color with the least number of students in it and write the student's name on one of the extra nametags in the lead box using that color of marker.

Observations: *(14 minutes – Groups – SciTrek Volunteers)*

- Put the initial bottle picture (picture packet, page 1 or picture taken by classroom teacher) under document camera.
- Walk around and help groups who are struggling.
- Make sure groups are moving along and only spending ~5 minutes filling out the table and ~9 minutes describing what happened to the solution over the course of 24 hours.

Picture Packet, Page 1



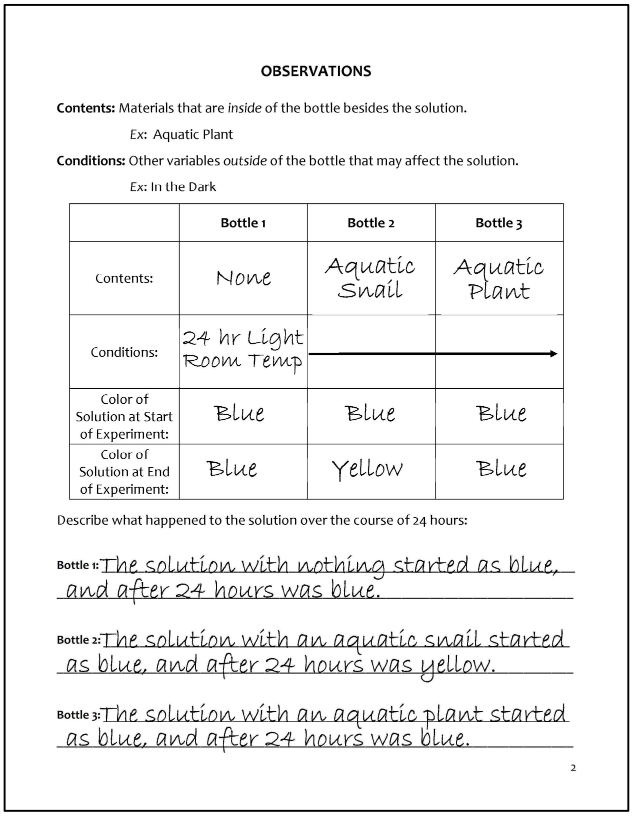
OBSERVATIONS

	Bottle 1	Bottle 2	Bottle 3
Contents:	None	Aquatic Snail	Aquatic Plant
Conditions:	24 hr Light Room Temp	⟶	⟶
Color of Solution at Start of Experiment:	Blue	Blue	Blue
Color of Solution at End of Experiment:	Blue	Yellow	Blue

Describe what happened to the solution over the course of 24 hours:

The solution with ___________ started as blue and after 24 hours was ___________________.

1



OBSERVATIONS

Contents: Materials that are *inside* of the bottle besides the solution.

Ex: Aquatic Plant

Conditions: Other variables *outside* of the bottle that may affect the solution.

Ex: In the Dark

	Bottle 1	Bottle 2	Bottle 3
Contents:	None	Aquatic Snail	Aquatic Plant
Conditions:	24 hr Light Room Temp	⟶	⟶
Color of Solution at Start of Experiment:	Blue	Blue	Blue
Color of Solution at End of Experiment:	Blue	Yellow	Blue

Describe what happened to the solution over the course of 24 hours:

Bottle 1: The solution with nothing started as blue, and after 24 hours was blue.

Bottle 2: The solution with an aquatic snail started as blue, and after 24 hours was yellow.

Bottle 3: The solution with an aquatic plant started as blue, and after 24 hours was blue.

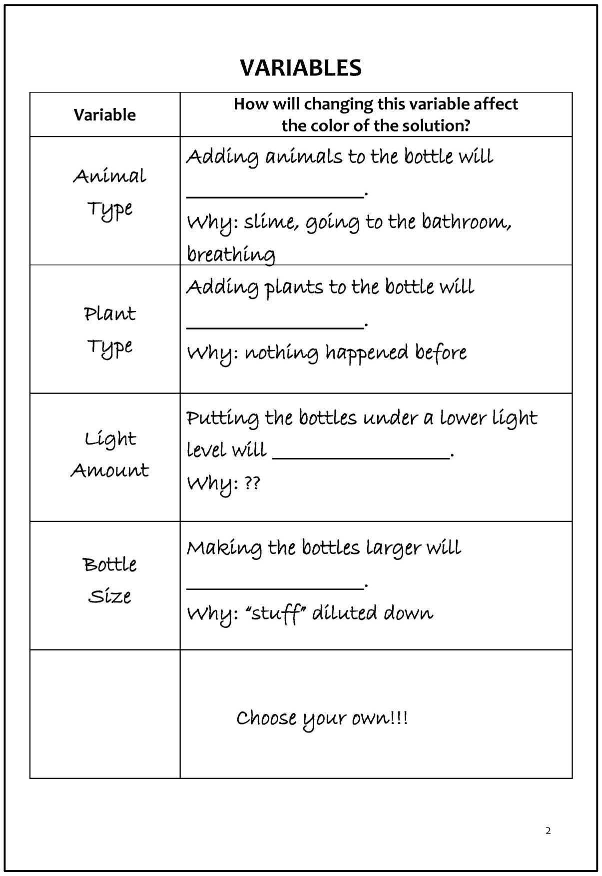
2

Variable Discussion: *(8 minutes – Full Class – SciTrek Lead)*

- Have groups share what they did and learned.
  - After 24 hours, the solution in the bottle with the aquatic snail turned yellow and the bottles with nothing and the aquatic plant stayed blue.
- Ask students, "What is the most interesting thing you observed?" Lead them to decide to investigate the question, "What variables affect the color of the solution?"
  - Write the class question on the front cover of the class notebook and have students copy it onto their notebooks.
- Review the definition of a variable (something in an experiment that can be changed).
- Explore one possible changing variable with the class and have students share how and why they believe this variable might affect the color of the solution.

Variables: *(19 minutes – Groups – SciTrek Volunteers)*

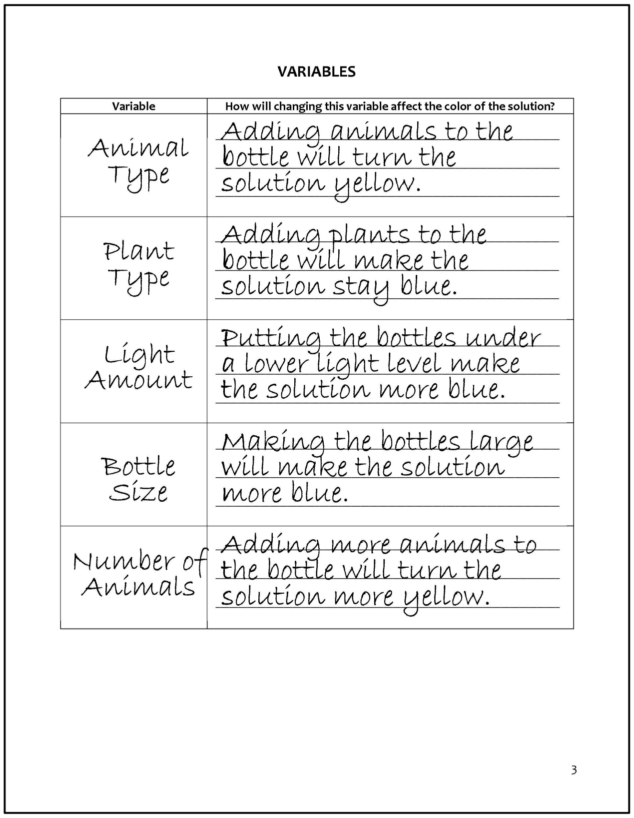
- Walk around and help groups who are struggling.
- Make sure volunteers are having their group come up with four possible variables, as well as how and why they believe these variables might affect the color of the solution.
- Make sure students are generating at least one additional variable by themselves.



VARIABLES

Variable	How will changing this variable affect the color of the solution?
Animal Type	Adding animals to the bottle will ________________. Why: slime, going to the bathroom, breathing
Plant Type	Adding plants to the bottle will ________________. Why: nothing happened before
Light Amount	Putting the bottles under a lower light level will ________________. Why: ??
Bottle Size	Making the bottles larger will ________________. Why: "stuff" diluted down
	Choose your own!!!

2



VARIABLES

Variable	How will changing this variable affect the color of the solution?
Animal Type	Adding animals to the bottle will turn the solution yellow.
Plant Type	Adding plants to the bottle will make the solution stay blue.
Light Amount	Putting the bottles under a lower light level make the solution more blue.
Bottle Size	Making the bottles large will make the solution more blue.
Number of Animals	Adding more animals to the bottle will turn the solution more yellow.

3

Wrap-Up: *(3 minutes – Full Class – SciTrek Lead)*

- Have each group share one variable with the class, as well as how and why they think this variable will (or will not) affect the color of the solution.
- Go over what students will do next session.

Day 2: Question/Materials Page/Experimental Set-Up/Procedure Activity

Schedule: *You are responsible for **BOLD** sections*

Introduction (SciTrek Lead) – 12 minutes
Question (SciTrek Volunteers) – 5 minutes
Materials Page (SciTrek Volunteers) – 5 minutes
Experimental Set-Up (SciTrek Volunteers) – 10 minutes
Procedure Activity (SciTrek Lead) – 26 minutes
Wrap-Up (SciTrek Lead) – 2 minutes

Preparation:

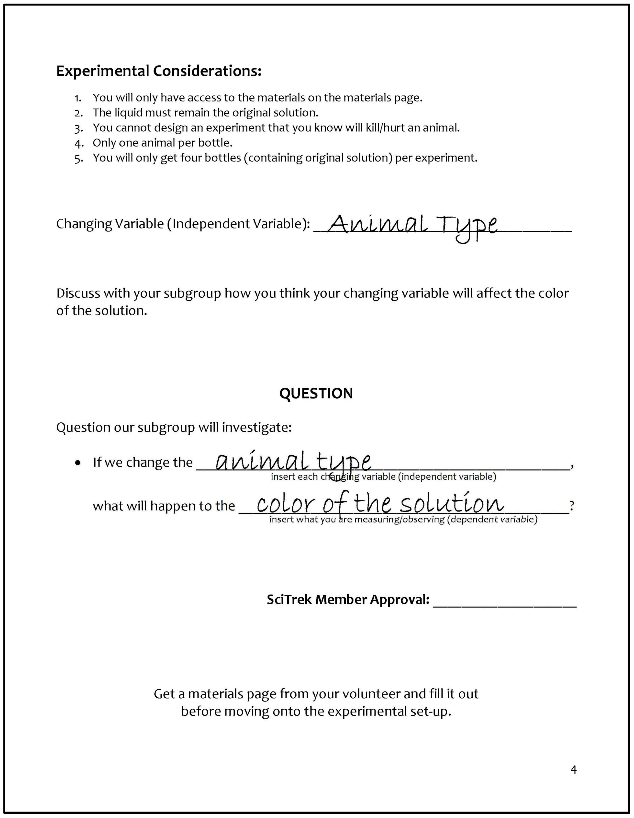
1. Make sure volunteers are setting out notebooks in such a way that allows students within the same subgroup to work together.
2. Set up the document camera for the Day 1 final bottles picture (picture packet, page 2), question (notebook, page 4), lead materials page (picture packet, page 3), experimental plants pictures (picture packet, page 4), experimental set-up (notebook, page 5), and procedure activity (notebook, pages 7-8).

Introduction: *(12 minutes – Full Class – SciTrek Lead)*

- Put the Day 1 final bottle picture (picture packet, page 2) under the document camera.
- Review the class question, as well as what students did and learned last session.
- Have students tell you some of the variables that generated last session. Write these on the board. Make sure that animal type is one of the variables.
- Review the terms: contents and conditions.

2

Picture Packet, Page 2



Experimental Considerations:

1. You will only have access to the materials on the materials page.
2. The liquid must remain the original solution.
3. You cannot design an experiment that you know will kill/hurt an animal.
4. Only one animal per bottle.
5. You will only get four bottles (containing original solution) per experiment.

Changing Variable (Independent Variable): Animal Type

Discuss with your subgroup how you think your changing variable will affect the color of the solution.

QUESTION

Question our subgroup will investigate:

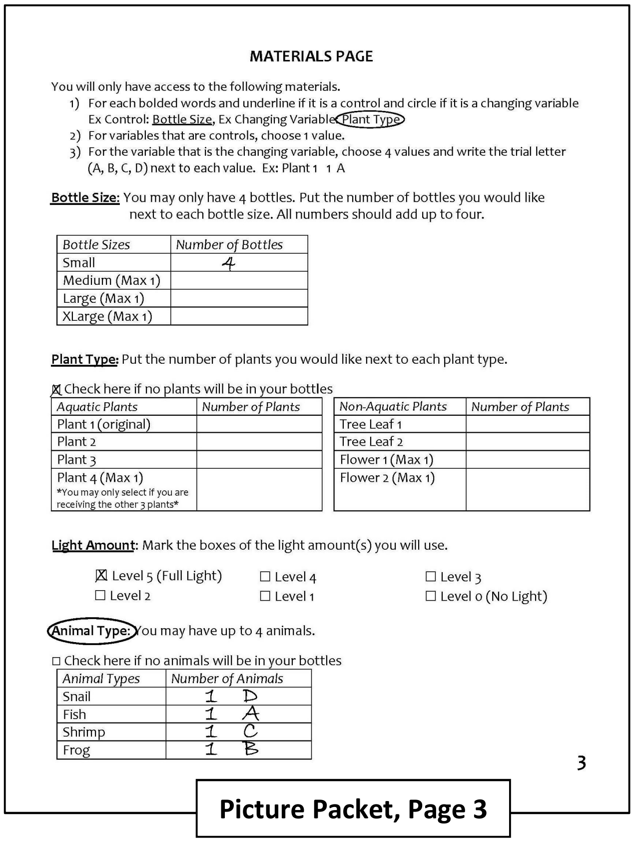
- If we change the animal type (insert each changing variable (independent variable)), what will happen to the color of the solution (*insert what you are measuring/observing (dependent variable)*)?

SciTrek Member Approval: ____________________

Get a materials page from your volunteer and fill it out before moving onto the experimental set-up.

4

- Review experimental considerations with the class (notebook, page 4, top):
  - *You will only have access to the materials on the materials page.*
  - *The liquid must remain the original solution.*
  - *You cannot design an experiment that you know will kill/hurt an animal.*
  - *Only one animal per bottle.*
  - *You will only get four bottles (containing original solution) per experiment.*
- Design a class experiment with the students.
  - Have students vote on what variable they are most interested in researching. Make sure they pick **animal type** and write this in the class notebook for the changing variable (notebook, page 4).
  - Show students how to write the question.
    - If we change the <u>animal type</u>, what will happen to the <u>color of the solution</u>?
  - Fill out the materials page for the class experiment (picture packet, page 3).
    - Read step 1 and have students tell you what to do for each bolded word (underline controls and circle the changing variable).



MATERIALS PAGE

You will only have access to the following materials.
1) For each bolded words and underline if it is a control and circle if it is a changing variable
Ex Control: <u>Bottle Size</u>, Ex Changing Variable: Plant Type
2) For variables that are controls, choose 1 value.
3) For the variable that is the changing variable, choose 4 values and write the trial letter (A, B, C, D) next to each value. Ex: Plant 1 1 A

<u>Bottle Size:</u> You may only have 4 bottles. Put the number of bottles you would like next to each bottle size. All numbers should add up to four.

Bottle Sizes	*Number of Bottles*
Small	4
Medium (Max 1)	
Large (Max 1)	
XLarge (Max 1)	

<u>Plant Type:</u> Put the number of plants you would like next to each plant type.

☒ Check here if no plants will be in your bottles

Aquatic Plants	*Number of Plants*
Plant 1 (original)	
Plant 2	
Plant 3	
Plant 4 (Max 1) *You may only select if you are receiving the other 3 plants*	

Non-Aquatic Plants	*Number of Plants*
Tree Leaf 1	
Tree Leaf 2	
Flower 1 (Max 1)	
Flower 2 (Max 1)	

<u>Light Amount</u>: Mark the boxes of the light amount(s) you will use.

☒ Level 5 (Full Light) ☐ Level 4 ☐ Level 3
☐ Level 2 ☐ Level 1 ☐ Level 0 (No Light)

Animal Type: You may have up to 4 animals.

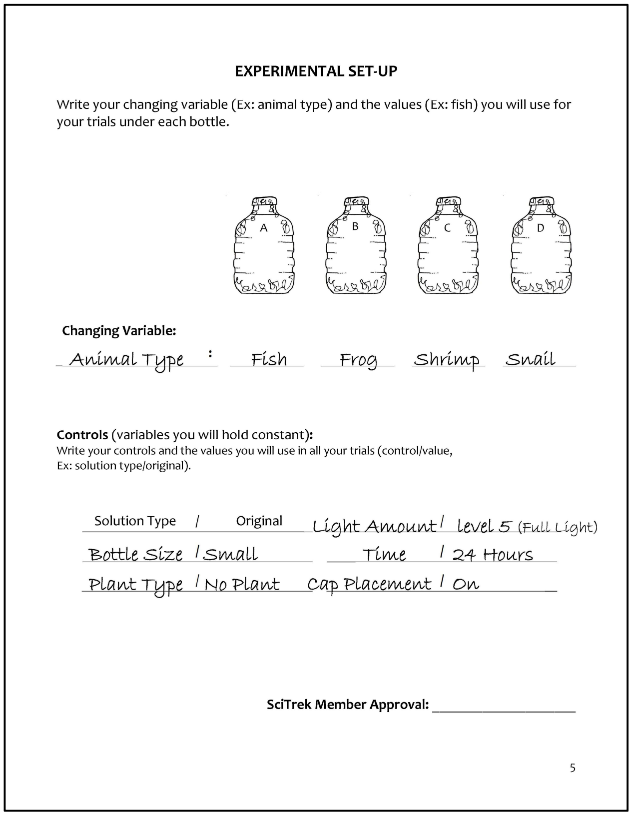
☐ Check here if no animals will be in your bottles

Animal Types	*Number of Animals*
Snail	1 D
Fish	1 A
Shrimp	1 C
Frog	1 B

3

Picture Packet, Page 3

    - Read steps 2 and have the class select values for the controls and changing variable.
        - Try to convince students to pick the following two controls: plant type/no plants (easier to see how animals affect the solution if no plant is present) and light amount/level 5 (if any other light level is chosen, bottles will be in boxes and students will not be able to see the animals).
        - Write trial letters next to the changing variable values (Ex: Frog A).
    - When talking about plants, show students the plants that they will have access to (picture packet, page 4).
  - Fill out the experimental set-up for the class experiment (notebook, page 5).
    - If you have no plants, the control will be *plant type* and the value will be *no plants*. You must do it in this format so that it will fit into the procedure. The format would be similar if you had no animals.
    - There will be two additional blanks for controls. Lead students to come up with "Time/24 hours," and "Cap placement/on."
  - Tell students, "Since the class is changing animal type, no other subgroup will be able to have animal type as a changing variable and the only animals you will have access to are snails."



EXPERIMENTAL SET-UP

Write your changing variable (Ex: animal type) and the values (Ex: fish) you will use for your trials under each bottle.

Changing Variable:

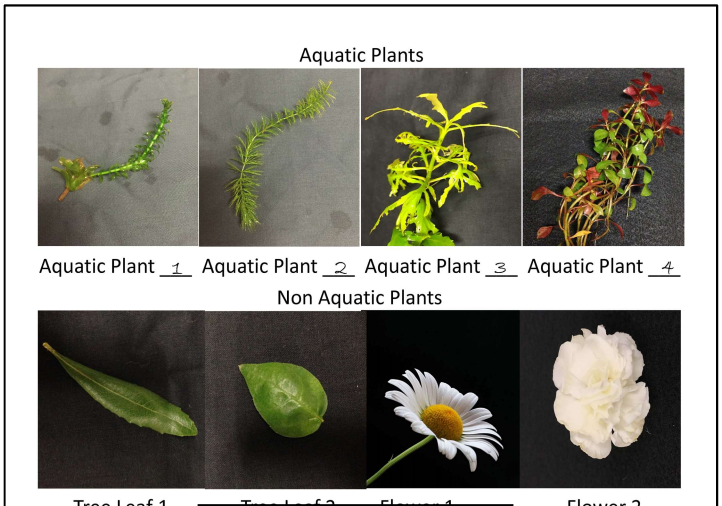
Animal Type : Fish Frog Shrimp Snail

Controls (variables you will hold constant):
Write your controls and the values you will use in all your trials (control/value, Ex: solution type/original).

Solution Type / Original Light Amount / Level 5 (Full Light)
Bottle Size / Small Time / 24 Hours
Plant Type / No Plant Cap Placement / On

SciTrek Member Approval: ___________________

5



Picture Packet, Page 4

Question: *(5 minutes – Subgroups – SciTrek Volunteers)*

- Walk around and help subgroups who are struggling.
- Encourage subgroups to pick different changing variables.
- Make sure, for the second part of the question (what you are measuring/observing), students are specific (they should write, "the color of the solution" not just "the solution").

Materials Page: *(5 minutes – Subgroups – SciTrek Volunteers)*

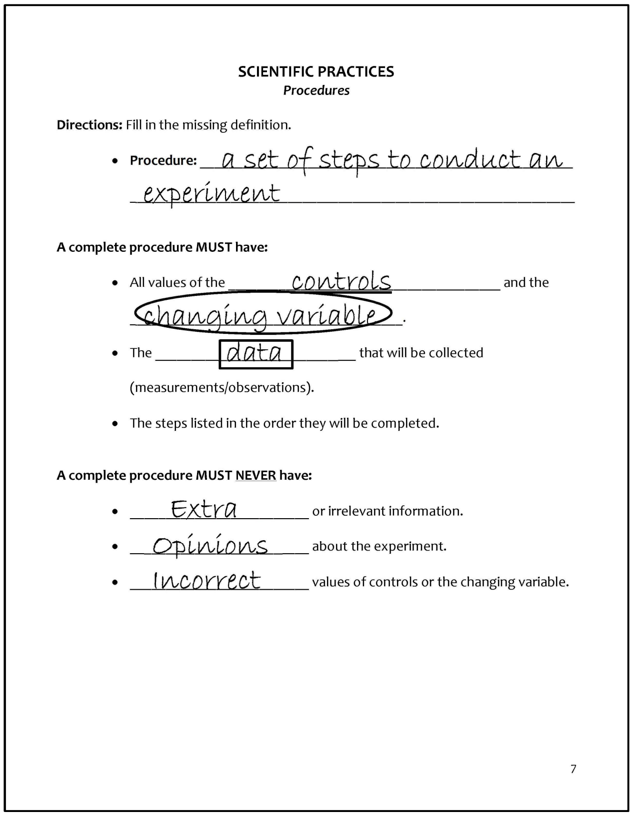
- Walk around and help subgroups who are struggling.
- Make sure subgroups are underlining their controls and circling their changing variable.
- Make sure subgroups are filling out the materials page correctly and completely.
  - Make sure subgroups do not exceed any limits set on the materials page and request the proper number of each item.

Experimental Set-Up: *(10 minutes – Subgroups – SciTrek Volunteers)*

- Walk around and help subgroups who are struggling.
- Make sure within one subgroup, all students have the same order for their changing variable values.
- Make sure all control blanks are filled out.

Procedure Activity: *(26 minutes – Full Class – SciTrek Lead)*

- Review the definition of a procedure (a set of steps to conduct an experiment) (notebook, page 7).
- Go over what procedures should include:
    - *All values of the controls and the changing variable.*
    - *The data will be collected (measurements/observations).*
    - *The steps listed in the order they will be completed.*
- Go over what procedures should not include:
    - *Extra or irrelevant information.*
    - *Opinions about the experiment.*
    - *Incorrect values of controls or the changing variable.*
- Tell students, "We will underline controls, circle changing variables, and box information about data collection." Then do each of these actions, to these words that were filled in.
- Tell students, "On page 8 there is a scientist's question and experimental set-up, you will annotate each possible procedural step, then determine if it could be correct. These steps are not a full procedure for the experiment, and are therefore, not in any order."
- Read the question.
    - Have students circle *ball temperature* and box *height the ball bounces*.
- Read the changing variable and control values.
- Read each statement.
- Ask students, "What should be underlined, circled, and/or boxed?"
    - Have students underline controls, circle changing variables, and box data collection.
- Ask students, "Are there any opinions, incorrect, or extra/irrelevant information in this statement?"
    - If yes
        - Ask them, "Could this be a correct procedural step?"
    - If no
        - Ask them, "What is this step about?"
        - Followed by, "Is there any other information which should have been included in this step?"
        - Conclude by asking, "Could this be a correct procedural step?"



SCIENTIFIC PRACTICES

Procedures

Directions: Fill in the missing definition.

- **Procedure:** a set of steps to conduct an experiment

A complete procedure MUST have:

- All values of the controls and the changing variable.
- The data that will be collected (measurements/observations).
- The steps listed in the order they will be completed.

A complete procedure MUST NEVER have:

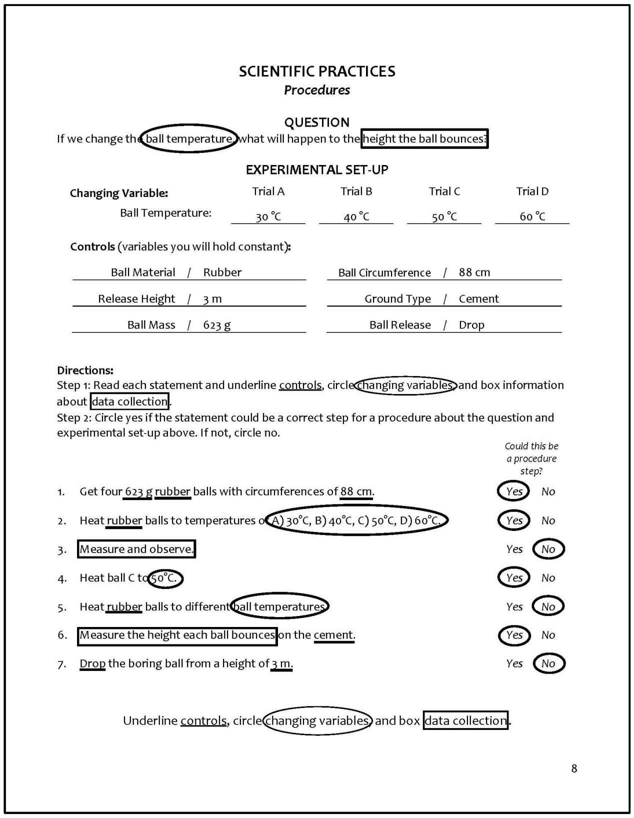
- Extra or irrelevant information.
- Opinions about the experiment.
- Incorrect values of controls or the changing variable.

7

- *1. Get four 623 g rubber balls with circumferences of 88 cm.*
  - Correct
- *2. Heat rubber balls to temperatures of A) 30°, B) 40°C, C) 50°C, D) 60°C.*
  - Correct
- *3. Measure and observe.*
  - Incorrect
- *4. Heat ball C to 50°C.*
  - Correct
- *5. Heat rubber balls to different ball temperatures.*
  - Incorrect
- *6. Measure the height each ball bounces on the cement.*
  - Correct
- *7. Drop the boring ball from a height of 3 m.*
    - Incorrect

Wrap-Up: *(2 minutes – Full Class – SciTrek Lead)*

Go over what students will do next session.



SCIENTIFIC PRACTICES

Procedures

QUESTION

If we change the ball temperature, what will happen to the height the ball bounces?

EXPERIMENTAL SET-UP

Changing Variable:	Trial A	Trial B	Trial C	Trial D
Ball Temperature:	30 °C	40 °C	50 °C	60 °C

Controls (variables you will hold constant)**:**

Ball Material / Rubber

Ball Circumference / 88 cm

Release Height / 3 m

Ground Type / Cement

Ball Mass / 623 g

Ball Release / Drop

Directions:

Step 1: Read each statement and underline controls, circle changing variables, and box information about data collection.

Step 2: Circle yes if the statement could be a correct step for a procedure about the question and experimental set-up above. If not, circle no.

	Could this be a procedure step?
1. Get four 623 g rubber balls with circumferences of 88 cm.	[✓ *Yes*] *No*
2. Heat rubber balls to temperatures of A) 30°C, B) 40°C, C) 50°C, D) 60°C.	[✓ *Yes*] *No*
3. Measure and observe.	*Yes* [✓ *No*]
4. Heat ball C to 50°C.	[✓ *Yes*] *No*
5. Heat rubber balls to different ball temperatures.	*Yes* [✓ *No*]
6. Measure the height each ball bounces on the cement.	[✓ *Yes*] *No*
7. Drop the boring ball from a height of 3 m.	*Yes* [✓ *No*]

Underline controls, circle changing variables, and box data collection.

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Day 3: Procedure Activity/Procedure/Results Table

Schedule: *You are responsible for **BOLD** sections*

Introduction (SciTrek Lead) – 3 minutes
Procedure Activity (SciTrek Lead) – 15 minutes
Procedure Discussion/Procedure (SciTrek Lead/SciTrek Volunteers) – 35 minutes
Results Table (SciTrek Volunteers) – 5 minutes
Wrap-Up (SciTrek Lead) – 2 minutes

Preparation:

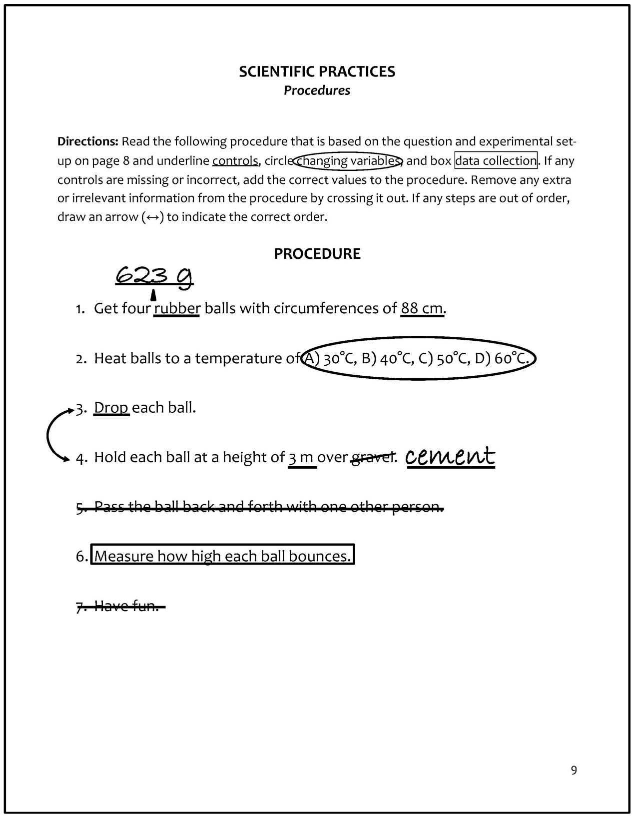
1. Make sure volunteers are passing out notebooks.
2. Set up the document camera for the procedure activity (notebook, page 9; picture packet, page 5), procedure (notebook, page 6), and results table (notebook, page 10).
3. Put the supplies (boxes, lamps, and bottles) for Day 3.5 in a convenient spot. Teacher Leads: If you do not know when Day 3.5 is, email: scitrekelementary@chem.ucsb.edu. SciTrek Leads: Verify the teacher knows when Day 3.5 will occur.
4. Get a small bottle to show students during the procedure discussion/procedure.

Introduction: *(3 minutes – Full Class – SciTrek Lead)*

- Review the class question, as well as what students did and learned last session.
- Review the definition of a procedure (set of steps to conduct an experiment).
- Review what should and should not be in a procedure.

Procedure Activity: *(15 minutes – Full Class – SciTrek Lead)*

- Tell students, "Last session, you were given a scientist's question and experimental set-up then you decided whether statements represented possible procedural steps for the given set-up. Today, we will examine a full procedure for the same question and experimental set-up then determine whether it represents a possible procedure" (notebook, page 9).
- Have students open their notebook to page 9.
    - A copy of the experimental set-up from page 8 is in the picture packet on page 5, which can be put under the document camera, if needed.
- Read through the procedure and have students underline controls, circle changing variables, and box information about data collection.
    - After each step, have students tell you what they underlined/circled/boxed and fill out the class notebook with this information.
- Have students tell you what should and should not be in a procedure and correct the procedure accordingly.



SCIENTIFIC PRACTICES
Procedures

Directions: Read the following procedure that is based on the question and experimental set-up on page 8 and underline controls, circle changing variables, and box data collection. If any controls are missing or incorrect, add the correct values to the procedure. Remove any extra or irrelevant information from the procedure by crossing it out. If any steps are out of order, draw an arrow (↔) to indicate the correct order.

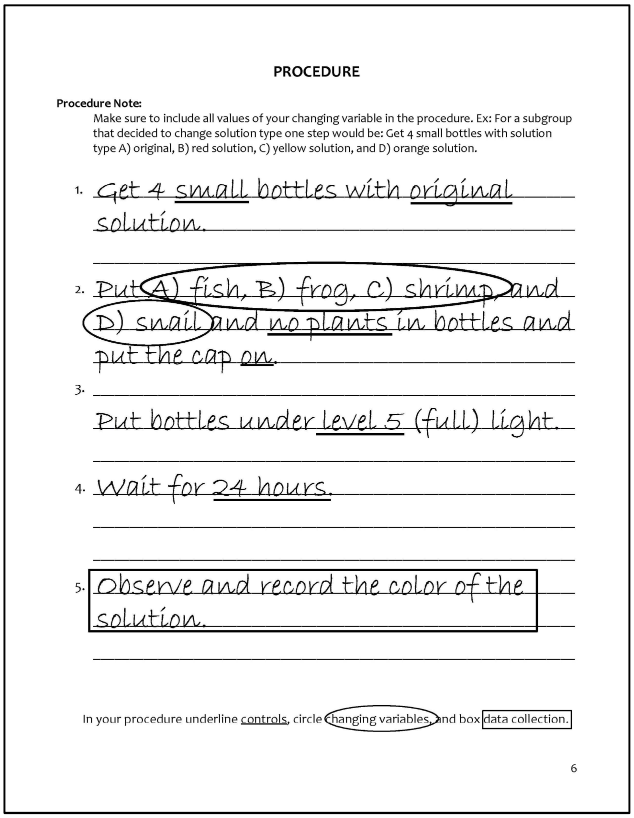
PROCEDURE

623 g
1. Get four rubber balls with circumferences of 88 cm.
2. Heat balls to a temperature of A) 30°C, B) 40°C, C) 50°C, D) 60°C.
3. Drop each ball.
4. Hold each ball at a height of 3 m over ~~gravel~~. cement
5. ~~Pass the ball back and forth with one other person.~~
6. Measure how high each ball bounces.
7. ~~Have fun.~~

9

Procedure Discussion/Procedure: *(35 minutes – Full Class/Subgroups – SciTrek Lead/SciTrek Volunteers)*

- Remind students of the experimental set-up for the class question: If we change the animal type, what will happen to the color of the solution?"
- Show students the example bottles and explain the bottles will come with solution in them and be labeled.
- Have students determine step one for the class experiment and write it in the class notebook, remembering to underline controls, circle changing variables, and box information about data collection. Once each step is done, allow students to write that step for their experiment, in their notebook.
    - Volunteers should make sure students do not get ahead of you.
- Repeat this process for each procedure step.
    - Step 1: Information about getting bottles.
        - After determining step 1 for the class experiment, show students the example step at the top of the procedure page (notebook, page 6) and tell them, "This step shows you how you will incorporate your changing variable into the procedure by using the trial letters."
    - Step 2: Information about putting animals and plants in bottles and then capping them.
    - Step 3: Information about the light amount bottles will be under.
    - Step 4: Information about how long bottles should sit.
    - Step 5: Information about data collection.



PROCEDURE

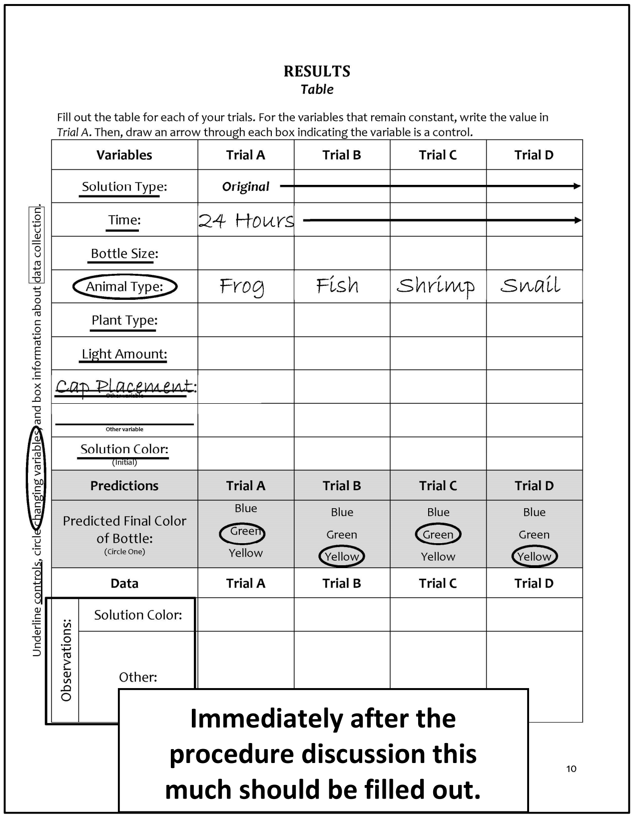
Procedure Note:
Make sure to include all values of your changing variable in the procedure. Ex: For a subgroup that decided to change solution type one step would be: Get 4 small bottles with solution type A) original, B) red solution, C) yellow solution, and D) orange solution.

1. Get 4 small bottles with original solution.
2. Put A) fish, B) frog, C) shrimp, and D) snail and no plants in bottles and put the cap on.
3. Put bottles under level 5 (full) light.
4. Wait for 24 hours.
5. Observe and record the color of the solution.

In your procedure underline controls, circle changing variables, and box data collection.

6

- When writing each procedure step, make sure volunteers are helping their subgroups who have a changing variable in the step, before helping subgroups who only have controls in the step.
- Show students how to fill out the results table (notebook, page 11).



RESULTS
Table

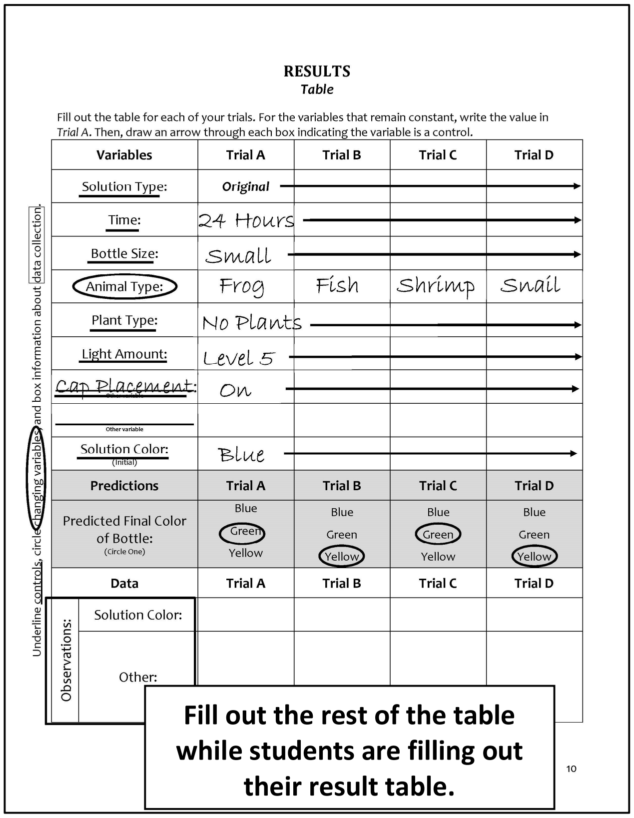
Fill out the table for each of your trials. For the variables that remain constant, write the value in *Trial A*. Then, draw an arrow through each box indicating the variable is a control.

Underline controls, circle changing variables, and box information about data collection.

Variables	Trial A	Trial B	Trial C	Trial D
Solution Type:	*Original* →	→	→	→
Time:	24 Hours →	→	→	→
Bottle Size:				
Animal Type:	Frog	Fish	Shrimp	Snail
Plant Type:				
Light Amount:				
Cap Placement: Other variable				
Other variable				
Solution Color: (Initial)				
Predictions	**Trial A**	**Trial B**	**Trial C**	**Trial D**
Predicted Final Color of Bottle: (Circle One)	Blue [✓ Green] Yellow	Blue Green [✓ Yellow]	Blue [✓ Green] Yellow	Blue Green [✓ Yellow]
Data	**Trial A**	**Trial B**	**Trial C**	**Trial D**
Observations: Solution Color:				
Other:				

Immediately after the procedure discussion this much should be filled out.

10



RESULTS
Table

Fill out the table for each of your trials. For the variables that remain constant, write the value in *Trial A*. Then, draw an arrow through each box indicating the variable is a control.

Underline controls, circle changing variables, and box information about data collection.

Variables	Trial A	Trial B	Trial C	Trial D
Solution Type:	*Original* →	→	→	→
Time:	24 Hours →	→	→	→
Bottle Size:	Small →	→	→	→
Animal Type:	Frog	Fish	Shrimp	Snail
Plant Type:	No Plants →	→	→	→
Light Amount:	Level 5 →	→	→	→
Cap Placement: Other variable	On →	→	→	→
Other variable				
Solution Color: (Initial)	Blue →	→	→	→
Predictions	**Trial A**	**Trial B**	**Trial C**	**Trial D**
Predicted Final Color of Bottle: (Circle One)	Blue [✓ Green] Yellow	Blue Green [✓ Yellow]	Blue [✓ Green] Yellow	Blue Green [✓ Yellow]
Data	**Trial A**	**Trial B**	**Trial C**	**Trial D**
Observations: Solution Color:				
Other:				

Fill out the rest of the table while students are filling out their result table.

10

Results Table: *(5 minutes – Subgroups – SciTrek Volunteers)*

- Walk around and help subgroups who are struggling.
- Make sure students are underlining controls, circling the changing variable, and boxing data collection boxes.
- Make sure control values are written in the *Trial A* box with an arrow through the rest of the trials' boxes while changing variable values are written in each trial's box.
- Make sure students are making predictions for which trial they think will produce which color solution.

Wrap-Up: *(2 minutes – Full Class – SciTrek Lead)*

- Go over what students will do next session.
- **Make sure you leave the classroom teacher the class notebook, students' notebooks, respiration picture packet, and Day 3.5 instructions.**

Day 3.5: Experiment

Schedule: *You are responsible for **BOLD** sections*

Introduction (SciTrek Staff Member/Classroom Teacher) – 15 minutes

Preparation:

1. Verify the variable section of the class results table is completely filled in.
2. Set up the light level boxes (levels 0-4) in ascending order with the light turned on sitting on top of the boxes with the front lids removed (see picture right). Set-up two additional lamps for level 5 lighting (this will not be in a box). Do not plug extension cords into other extension cords.
3. Set out the bottles, organized by subgroup, in an area that is easy for students to access.
4. Have the plant and animal Tupperwares ready to pass out plants and animals to students.
5. Have notebooks in stacks by subgroups. Students will not need these until they fill their bottles.

Experiment: *(15 minutes – Full Class – SciTrek Staff Member/Classroom Teacher)*

- As a class, set up the class experiment.
  - Read through each step of the procedure and follow the steps.
    - Get 4 small bottles with original solution.
      - Show students the bottles labeled class A, class B, class C, and class D.
    - Put A) fish, B) frog, C) shrimp, and D) snail (or whatever order the class chose in the experimental set-up) and no plants (or whatever plant the class chose in the experimental set-up) in bottles and put the cap on.
      - Put the animals into the bottles and seal the bottles with the caps with holes.
    - Put bottles under level 5 (full) light (or whatever level the class chose)
      - Show students were the light level boxes are and put the bottles under level 5 light.
- Tell students, “I will now call groups back one by one to start your experiments.”
  - Have subgroups who are not working on filling their bottles, work on an independent activity.
- Have groups set up their experiment.
  - Assign each student a bottle to be in charge of.
  - Have students read each step and then follow them.
  - Make sure all bottles that need caps have caps with holes on them (any bottle containing a snail must have a cap on it).

Day 4: Experiment/Results Summary/Poster Making

Schedule: *You are responsible for **BOLD** sections*

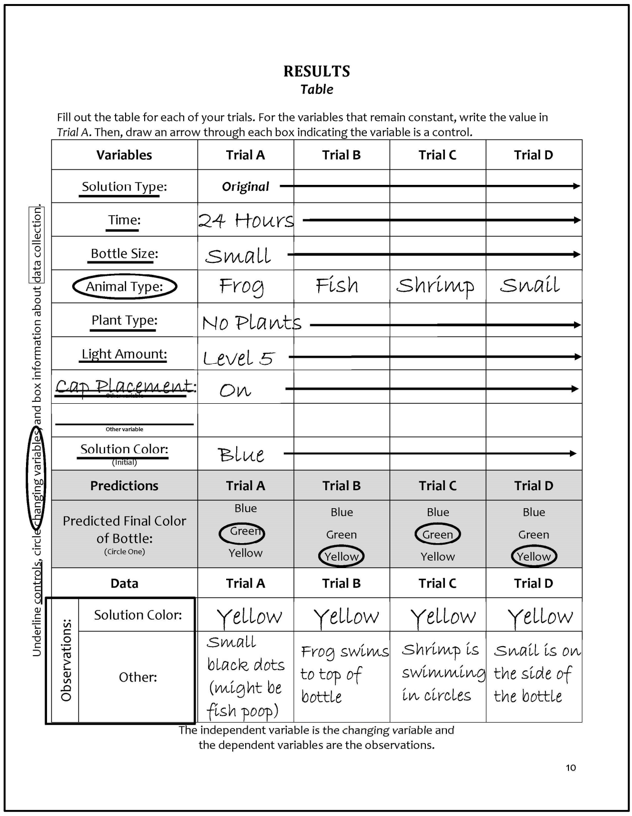
Introduction (SciTrek Lead) – 7 minutes
Experiment (SciTrek Volunteers) – 5 minutes
Results Summary (SciTrek Volunteers) – 10 minutes
Poster Making (SciTrek Volunteers) – 33 minutes
Wrap-Up (SciTrek Lead) – 5 minutes

Preparation:

1. Get students' notebooks and give them to the volunteers to separate into their subgroups, attach nametags, and set out.
2. Make sure volunteers get bottles for their subgroups and replace the caps with holes with caps without holes.
3. Find a place to leave student posters.
4. Set up the document camera for the results table (notebook, page 10) and results summary (notebook, page 11).

***Introduction:** (7 minutes – Full Class – SciTrek Lead)*

- Review the class question as well as, what students did and learned last session.
- Review the class experimental question.
- Show students the four bottles from the class experiment and record the color of the solutions, as well as any additional observations.
- Have students generate a results summary from the result table (notebook, page 11).
    - My experiment shows when an animal is present the solution turns yellow regardless of the type of animal, because we observed that the snail and the shrimp turned the solution yellow.
    - Remind students that their data statement must contain the words "we observed."



RESULTS
Table

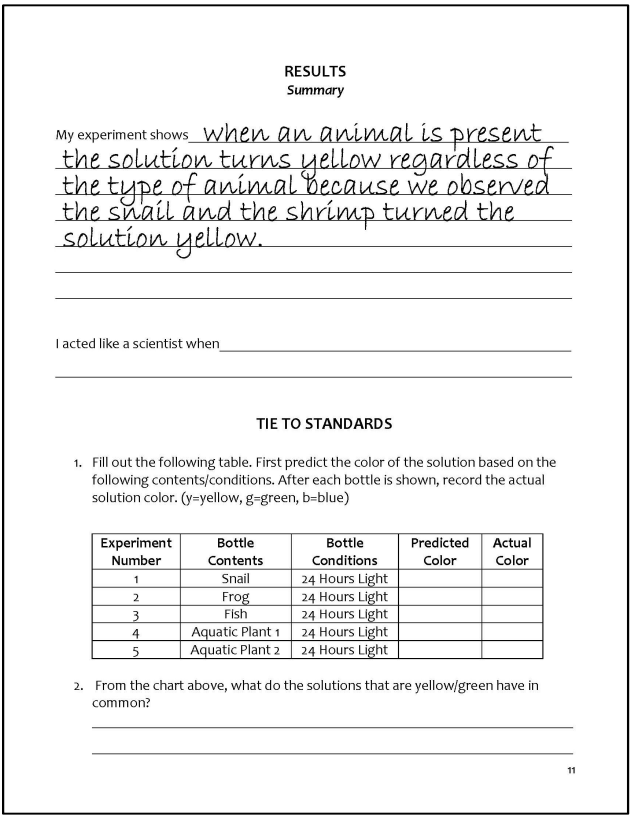
Fill out the table for each of your trials. For the variables that remain constant, write the value in *Trial A*. Then, draw an arrow through each box indicating the variable is a control.

Underline controls, circle changing variables, and box information about data collection.

Variables	Trial A	Trial B	Trial C	Trial D
Solution Type:	*Original* →	→	→	→
Time:	24 Hours →	→	→	→
Bottle Size:	Small →	→	→	→
Animal Type:	Frog	Fish	Shrimp	Snail
Plant Type:	No Plants →	→	→	→
Light Amount:	Level 5 →	→	→	→
Cap Placement: ~~Other variable~~	On →	→	→	→
Other variable				
Solution Color: (Initial)	Blue →	→	→	→
Predictions	**Trial A**	**Trial B**	**Trial C**	**Trial D**
Predicted Final Color of Bottle: (Circle One)	Blue [✓ Green] Yellow	Blue Green [✓ Yellow]	Blue [✓ Green] Yellow	Blue Green [✓ Yellow]
Data	**Trial A**	**Trial B**	**Trial C**	**Trial D**
Observations: Solution Color:	Yellow	Yellow	Yellow	Yellow
Observations: Other:	Small black dots (might be fish poop)	Frog swims to top of bottle	Shrimp is swimming in circles	Snail is on the side of the bottle

The independent variable is the changing variable and the dependent variables are the observations.

10



RESULTS
Summary

My experiment shows when an animal is present the solution turns yellow regardless of the type of animal because we observed the snail and the shrimp turned the solution yellow.

I acted like a scientist when

TIE TO STANDARDS

1. Fill out the following table. First predict the color of the solution based on the following contents/conditions. After each bottle is shown, record the actual solution color. (y=yellow, g=green, b=blue)

Experiment Number	Bottle Contents	Bottle Conditions	Predicted Color	Actual Color
1	Snail	24 Hours Light		
2	Frog	24 Hours Light		
3	Fish	24 Hours Light		
4	Aquatic Plant 1	24 Hours Light		
5	Aquatic Plant 2	24 Hours Light		

2. From the chart above, what do the solutions that are yellow/green have in common?

11

***Experiment:** (5 minutes – Subgroups – SciTrek Volunteers)*

- Help subgroups get their experiment bottles.
- Walk around and help subgroups who are struggling.
- Make sure all students within the same subgroup are recording the same color for each trial.

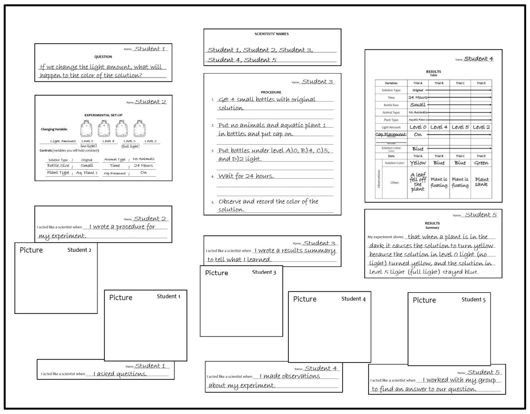
Results Summary: *(10 minutes – Subgroups – SciTrek Volunteers)*

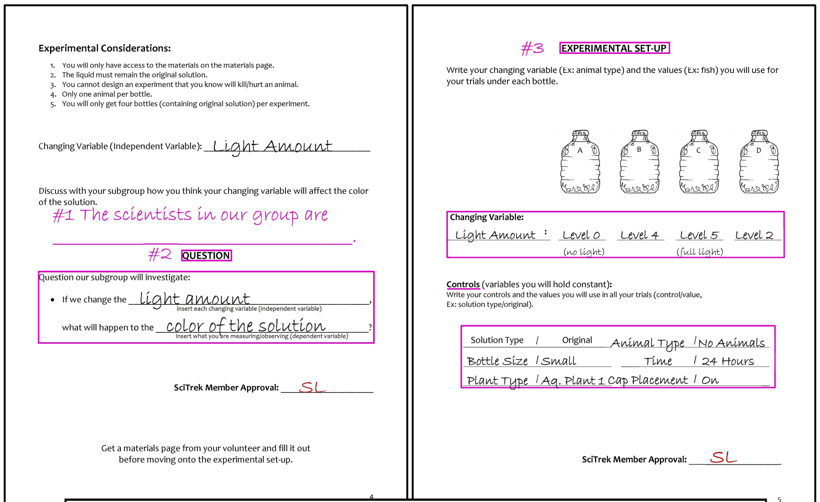
- Walk around and help subgroups who are struggling.
- Make sure subgroups are generating a claim (ideally the claim will allow them to make a prediction about future experiments) and use at least two specific data points to support it.
    - The data statement must include "we observed."
    - Do not let subgroups reference trial letters in their results summary.
- Volunteers struggle with results summaries, so you should check at least one results summary from each group.
- Make sure students fill out the sentence frame, *I acted like a scientist when* (notebook, page 11, middle).

Poster Making: *(33 minutes – Subgroups – SciTrek Volunteers)*

- Help volunteers glue poster pieces onto the posters. When gluing, make sure **you** or the **volunteers** (not the students) are gluing the poster in the **exact** order that is shown on the diagram and the poster has a landscape orientation.
- Make sure the student in each subgroup who is presenting the results table, has the appropriate sentence frame sticker in their notebook and a volunteer has gone over how to present the four sentences with the student several times.
- Each student should have the part(s) they are presenting highlighted and numbered in their notebook: 1) scientists' names, 2) question, 3) experimental set-up, 4) procedure, 5) results table, and 6) results summary (see pictures below).
    - Remind volunteers if a student is presenting multiple parts, they should have multiple sections highlighted and numbered in their notebook and the sections should be paperclipped together.
- Volunteers often forget to highlight notebooks, so make sure this gets done before Day 5.

A larger version of this poster is in your lead box.





Experimental Considerations:

1. You will only have access to the materials on the materials page.
2. The liquid must remain the original solution.
3. You cannot design an experiment that you know will kill/hurt an animal.
4. Only one animal per bottle.
5. You will only get four bottles (containing original solution) per experiment.

Changing Variable (Independent Variable): Light Amount

Discuss with your subgroup how you think your changing variable will affect the color of the solution.

#1 The scientists in our group are

#2 **QUESTION**

Question our subgroup will investigate:

- If we change the light amount (insert each changing variable (independent variable)),
  what will happen to the color of the solution (insert what you are measuring/observing (dependent variable))?

SciTrek Member Approval: SL

Get a materials page from your volunteer and fill it out before moving onto the experimental set-up.

#3 **EXPERIMENTAL SET-UP**

Write your changing variable (Ex: animal type) and the values (Ex: fish) you will use for your trials under each bottle.

Changing Variable:

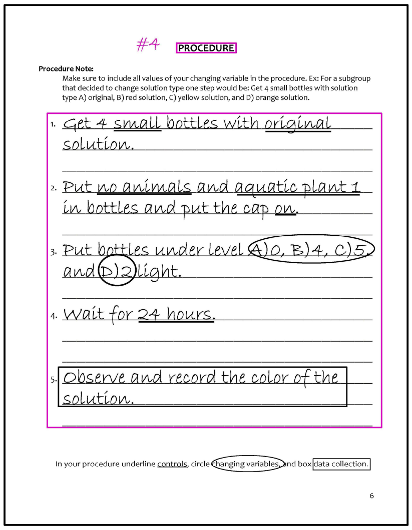
Light Amount :	Level 0 (no light)	Level 4	Level 5 (full light)	Level 2

Controls (variables you will hold constant)**:**
Write your controls and the values you will use in all your trials (control/value, Ex: solution type/original).

Solution Type / Original
Animal Type / No Animals
Bottle Size / Small
Time / 24 Hours
Plant Type / Aq. Plant 1
Cap Placement / On

SciTrek Member Approval: SL

Ex: Highlighted and Numbered Notebook Pages



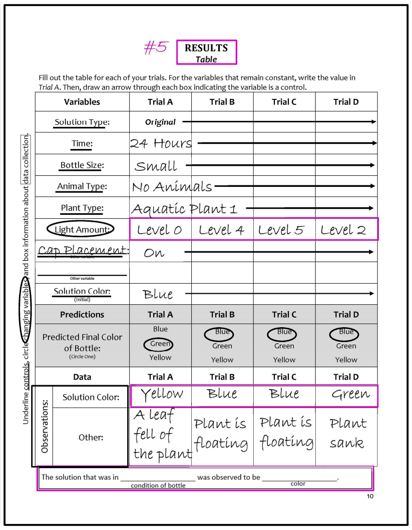
#4 **PROCEDURE**

Procedure Note:
Make sure to include all values of your changing variable in the procedure. Ex: For a subgroup that decided to change solution type one step would be: Get 4 small bottles with solution type A) original, B) red solution, C) yellow solution, and D) orange solution.

1. Get 4 small bottles with original solution.
2. Put no animals and aquatic plant 1 in bottles and put the cap on.
3. Put bottles under level A)0, B)4, C)5, and D)2 light.
4. Wait for 24 hours.
5. Observe and record the color of the solution.

In your procedure underline controls, circle changing variables, and box data collection.

6



#5 **RESULTS** *Table*

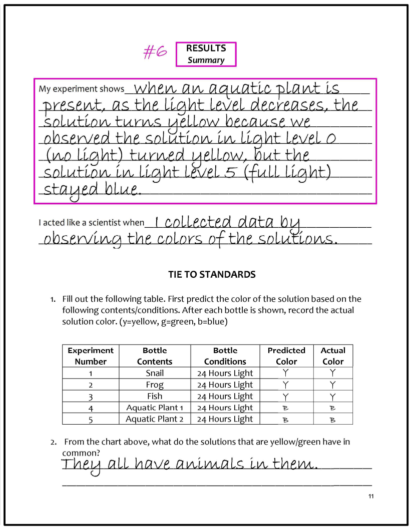
Fill out the table for each of your trials. For the variables that remain constant, write the value in *Trial A*. Then, draw an arrow through each box indicating the variable is a control.

Underline controls, circle changing variables, and box information about data collection.

Variables	Trial A	Trial B	Trial C	Trial D
Solution Type:	*Original*	→	→	→
Time:	24 Hours	→	→	→
Bottle Size:	Small	→	→	→
Animal Type:	No Animals	→	→	→
Plant Type:	Aquatic Plant 1	→	→	→
Light Amount:	Level 0	Level 4	Level 5	Level 2
Cap Placement: Other variable	On	→	→	→
Other variable				
Solution Color: (Initial)	Blue	→	→	→
Predictions	**Trial A**	**Trial B**	**Trial C**	**Trial D**
Predicted Final Color of Bottle: (Circle One)	Blue [✓ Green] Yellow	[✓ Blue] Green Yellow	[✓ Blue] Green Yellow	[✓ Blue] Green Yellow
Data	**Trial A**	**Trial B**	**Trial C**	**Trial D**
Observations: Solution Color:	Yellow	Blue	Blue	Green
Observations: Other:	A leaf fell of the plant	Plant is floating	Plant is floating	Plant sank

The solution that was in ____________ was observed to be ____________.
condition of bottle — color

10



#6 **RESULTS** *Summary*

My experiment shows when an aquatic plant is present, as the light level decreases, the solution turns yellow because we observed the solution in light level 0 (no light) turned yellow, but the solution in light level 5 (full light) stayed blue.

I acted like a scientist when I collected data by observing the colors of the solutions.

TIE TO STANDARDS

1. Fill out the following table. First predict the color of the solution based on the following contents/conditions. After each bottle is shown, record the actual solution color. (y=yellow, g=green, b=blue)

Experiment Number	Bottle Contents	Bottle Conditions	Predicted Color	Actual Color
1	Snail	24 Hours Light	Y	Y
2	Frog	24 Hours Light	Y	Y
3	Fish	24 Hours Light	Y	Y
4	Aquatic Plant 1	24 Hours Light	B	B
5	Aquatic Plant 2	24 Hours Light	B	B

2. From the chart above, what do the solutions that are yellow/green have in common?
They all have animals in them.

11

Wrap-Up: *(5 minutes – Full Class – SciTrek Lead)*

- Ask students the following questions:
    - How did you act like a scientist during this project?
    - What did you do that scientists do?

Day 5: Poster Presentations

Schedule: *You are responsible for **BOLD** sections*

Introduction (SciTrek Lead) – 2 minutes
Practice Posters (SciTrek Volunteers) – 10 minutes
Poster Presentations (SciTrek Volunteers/SciTrek Lead) – 46 minutes
Wrap-Up (SciTrek Lead) – 2 minutes

Preparation:

1. Make sure volunteers are passing out notebooks.
2. Set up the document camera for the *Notes on Presentations* (picture packet, pages 6 and 7).
3. Organize posters so experiments featuring the same changing variable will be presented back-to-back and posters are presented from simplest to understand, to most difficult to understand [suggested order: bottle size, plant type, light amount (animal), light amount (plant), light amount (animals and plants)].

Introduction: *(2 minutes – Full Class – SciTrek Lead)*

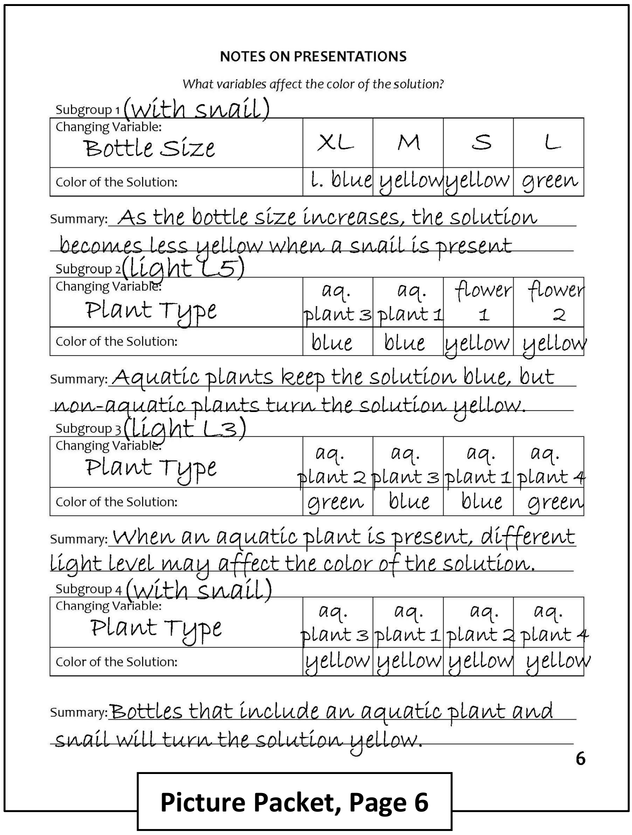
- Review the class question, as well as what students did and learned last session.

Practice Posters: *(10 minutes – Subgroups – SciTrek Volunteers)*

- **Do not give students more than 10 minutes to practice or you will run out of time for presentations.**
- Make sure students are reading from their notebooks and practicing the posters in the following order: 1) scientists' names, 2) question, 3) experimental set-up, 4) procedure, 5) results table, and 6) results summary. They will **not** read the *I acted like a scientist when* from their posters.

Poster Presentations: *(46 minutes – Full Class – SciTrek Volunteers/SciTrek Lead)*

- Inform students if they ask a scientific question (a question that helps summarize what the subgroup did/learned or requires them to make a prediction based on their data) they will receive a SciTrek pencil after the presentations are done.
- Have students present their posters.
- While posters are being presented, record each subgroup's changing variable values and their data (picture packet, pages 6 and 7).
    - After a subgroup reads their question, stop the presentation and have the class identify the changing variable. Then, record it in the picture packet.
    - When a subgroup reads their experimental set-up, record the values of the changing variable.
    - When a subgroup reads their results table, record the solution color.
- After each presentation, ask students:
    - What questions do you have for this subgroup?
- Once students have asked their questions (make sure each student answers a question; you should ask at least one question per presentation), have the whole class summarize what they learned and record it (picture packet, pages 6 and 7).
    - If students are unable to do this, encourage them to ask more questions.
- After all presentations are over, have students tell you the variable values they would select to make the solution the most yellow.



NOTES ON PRESENTATIONS

What variables affect the color of the solution?

Subgroup 1 (with snail)

Changing Variable: Bottle Size	XL	M	S	L
Color of the Solution:	l. blue	yellow	yellow	green

Summary: As the bottle size increases, the solution becomes less yellow when a snail is present

Subgroup 2 (light L5)

Changing Variable: Plant Type	aq. plant 3	aq. plant 1	flower 1	flower 2
Color of the Solution:	blue	blue	yellow	yellow

Summary: Aquatic plants keep the solution blue, but non-aquatic plants turn the solution yellow.

Subgroup 3 (light L3)

Changing Variable: Plant Type	aq. plant 2	aq. plant 3	aq. plant 1	aq. plant 4
Color of the Solution:	green	blue	blue	green

Summary: When an aquatic plant is present, different light level may affect the color of the solution.

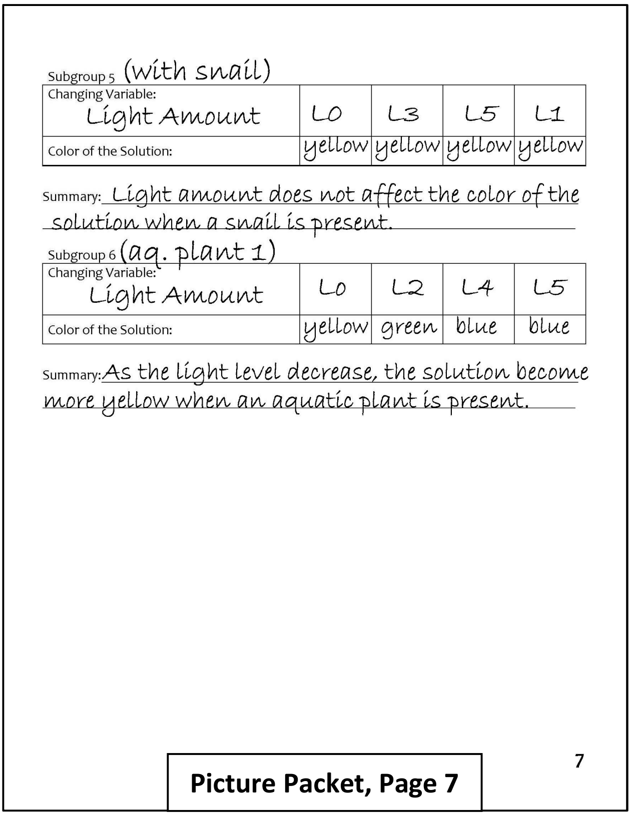
Subgroup 4 (with snail)

Changing Variable: Plant Type	aq. plant 3	aq. plant 1	aq. plant 2	aq. plant 4
Color of the Solution:	yellow	yellow	yellow	yellow

Summary: Bottles that include an aquatic plant and snail will turn the solution yellow.

6

Picture Packet, Page 6



Subgroup 5 (with snail)

Changing Variable: Light Amount	L0	L3	L5	L1
Color of the Solution:	yellow	yellow	yellow	yellow

Summary: Light amount does not affect the color of the solution when a snail is present.

Subgroup 6 (aq. plant 1)

Changing Variable: Light Amount	L0	L2	L4	L5
Color of the Solution:	yellow	green	blue	blue

Summary: As the light level decrease, the solution become more yellow when an aquatic plant is present.

7

Picture Packet, Page 7

Wrap-Up: *(2 minutes – Full Class – SciTrek Lead)*

- Tell students, “The mentors who have been working with you are undergraduate and graduate students who volunteer their time so you can do experiments. This is the last day you will see your volunteers, so we should say thank you and goodbye.”
- Have volunteers give students SciTrek pencils.
- Have students remove the paper parts of their nametags (which they can keep) from the plastic holders and return the plastic holders to their volunteers.

Day 6: Procedure Assessment/Tie to Standards

Schedule: *You are responsible for* ***BOLD*** *sections*

Procedure Assessment (SciTrek Lead) – 10 minutes
Tie to Standards (SciTrek Lead) – 50 minutes

Preparation:

1. If the teacher is not leading the tie to standards activity, do the following:
    a. Give the teacher an extra notebook and have them fill it out with their students, to follow along during the tie to standards activity.
    b. Collect the teacher’s lab coat and put it in the lead box.
2. Pass out the procedure assessments and notebooks.
3. Set up the document camera for the tie to standards activity (notebook, pages 11-14).
4. Make sure the only bottles with the solution color still blue are B0, B00, B000, B4, and B5. These are the bottles with nothing in them and the bottles with plants in the light.
5. Have the cardboard box with bottles ready with easy access to grab bottles after students make predictions.
6. Put your lab coat in the lead box at the end of the day.

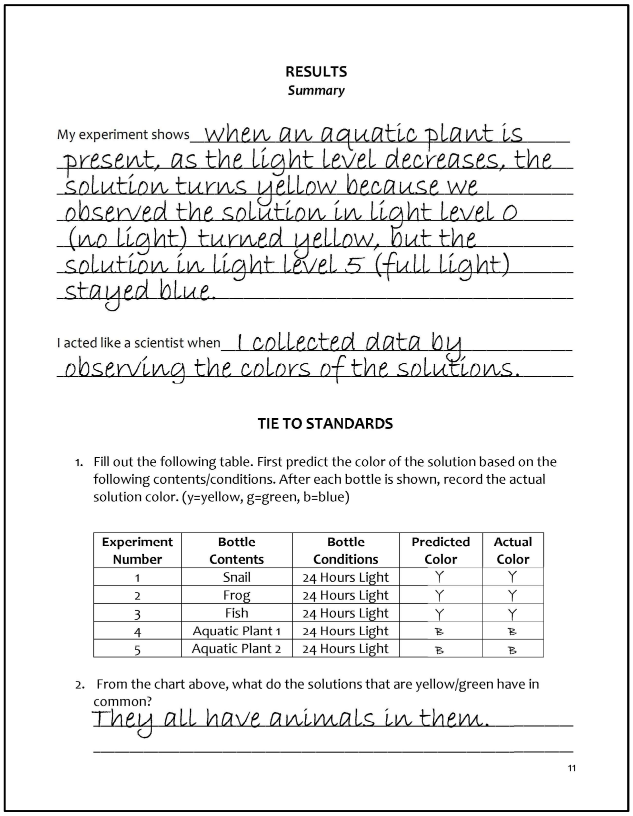
Procedure Assessment: *(10 minutes – Full Class – SciTrek Lead)*

- Question *1*: Have students write in their own words what they think the definition is of a procedure.
- Read step 1 of the directions. Then read the question, changing variable (Ex: the changing variable was solid amount), and controls (Ex: the controls were liquid type, time, container type…). Do not read values of the changing variable or controls.
- Read step 2 of the directions. Then read the statement in question 2 and have students underline controls, circle changing variables, and box information about data collection.
- Read step 3 of the directions. Then have students circle if the statement, in question 2, could be an appropriate procedure step.
- Read the statement in question 3 and have students underline controls, circle changing variables, and box information about data collection.
- Have students circle if the statement, in question 3, could be an appropriate procedure step.
- Repeat the process for questions 4-8
- Collect assessments.

Tie to Standards: *(50 minutes – Full Class – SciTrek Lead)*

Predictions of Experimental Bottles in the Light: Bottles B1, B2, B3, B4, and B5 (12 minutes)

- Tell students, "We have been working on observing the color of the solution and trying to determine why it is changing color. Yesterday I did some more experiments and I brought the bottles to help us figure out what is going on."
- On their own, have students predict the color of the solution in each bottle.
    - Have one student share what they think the color will be and explain why.
    - Use thumbs up/thumbs down to see if the rest of the class agrees or disagrees.
        - Record "Y" for yellow
        - Record "G" for green
        - Record "B" for blue
- After each prediction, show the experimental bottle for that prediction and have students record the actual color on their chart.
- Ask students, "What do all of solutions that turned yellow/green have in common?" Possible student response: they all contained animals.
- Fill in question *2*.
  Ask students, "Did all of solutions, which were under the light for 24 hours, change color?" Students should reply, "No."
- Check *No* for question *3*.
- Lead students to understand the solutions that remained blue did so because they did not have animals in them.
- Fill in question *4*.



RESULTS
Summary

My experiment shows when an aquatic plant is present, as the light level decreases, the solution turns yellow because we observed the solution in light level 0 (no light) turned yellow, but the solution in light level 5 (full light) stayed blue.

I acted like a scientist when I collected data by observing the colors of the solutions.

TIE TO STANDARDS

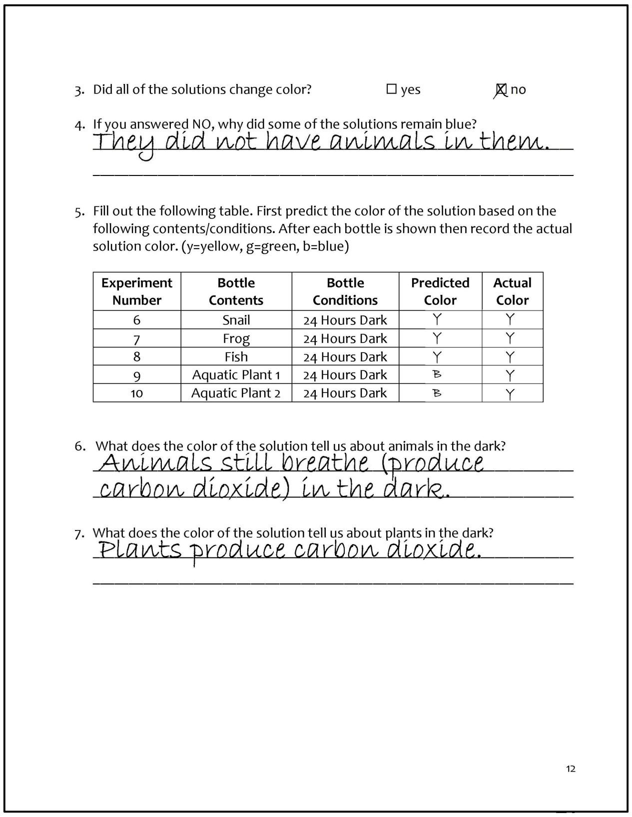
1. Fill out the following table. First predict the color of the solution based on the following contents/conditions. After each bottle is shown, record the actual solution color. (y=yellow, g=green, b=blue)

Experiment Number	Bottle Contents	Bottle Conditions	Predicted Color	Actual Color
1	Snail	24 Hours Light	Y	Y
2	Frog	24 Hours Light	Y	Y
3	Fish	24 Hours Light	Y	Y
4	Aquatic Plant 1	24 Hours Light	B	B
5	Aquatic Plant 2	24 Hours Light	B	B

2. From the chart above, what do the solutions that are yellow/green have in common?
They all have animals in them.

Determination of what Caused the Color Change: Bottles B0 and B00 (12 minutes)

- Lead students to generate the idea the solution is changing colors because the animals are breathing and make sure they know carbon dioxide is released in this process.
    - Students may suggest the color is changing because animals going to the bathroom. If they do, tell students, "I have put urine into the solution without an animal and I did not observe a color change."
- Ask students, "Is there a way to test if carbon dioxide is causing the color change?"
    - Lead students into generating the idea of putting dry ice in the solution.
- Put the piece of dry ice into the solution to verify for students that carbon dioxide is changing the color.
- Ask students, "Do you think I could change the solution color if I blew into it with a straw?"



3. Did all of the solutions change color? ☐ yes ☒ no

4. If you answered NO, why did some of the solutions remain blue?
They did not have animals in them.

5. Fill out the following table. First predict the color of the solution based on the following contents/conditions. After each bottle is shown then record the actual solution color. (y=yellow, g=green, b=blue)

Experiment Number	Bottle Contents	Bottle Conditions	Predicted Color	Actual Color
6	Snail	24 Hours Dark	Y	Y
7	Frog	24 Hours Dark	Y	Y
8	Fish	24 Hours Dark	Y	Y
9	Aquatic Plant 1	24 Hours Dark	B	Y
10	Aquatic Plant 2	24 Hours Dark	B	Y

6. What does the color of the solution tell us about animals in the dark?
Animals still breathe (produce carbon dioxide) in the dark.

7. What does the color of the solution tell us about plants in the dark?
Plants produce carbon dioxide.

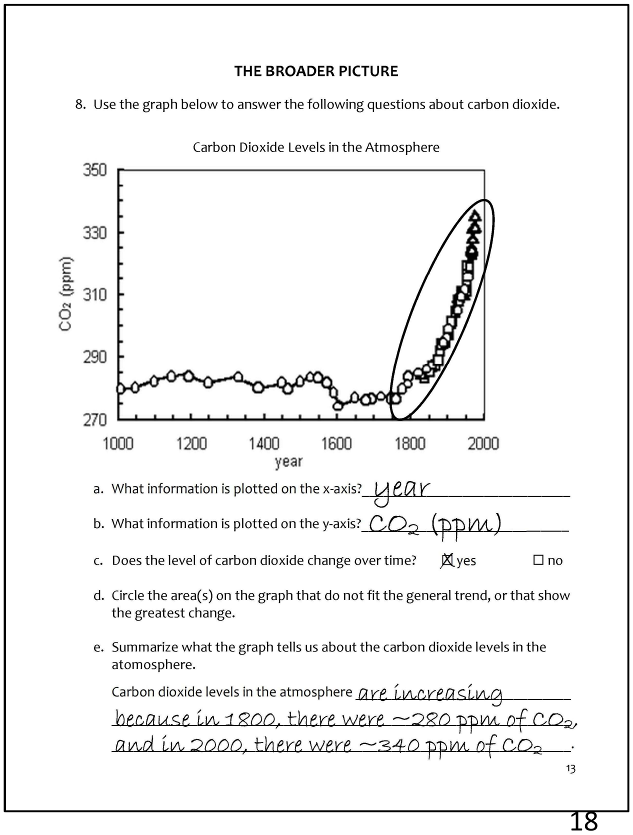
- Get a straw and blow into the solution, proving breathing changes the color of the solution.
    - Discuss why you could change the solution color faster than the animals. (You are much larger than the animals.)
- Ask students, “Why did the solution in the bottles with plants, not change color?” Possible student response: plants take in light and carbon dioxide and give off oxygen in a process called photosynthesis.
- Ask students, “How could we change a solution that was yellow, back to blue?” Possible student response: we can put a plant in it and leave it under light.

Prediction of Experimental Bottles in the Dark: Bottles B6, B7, B8, B9, and B10 (12 minutes)

- Tell students, “I did an additional experiment with the same contents, but this time I put them in the dark for 24 hours.”
- On their own, have students predict the color of the solution in each bottle.
    - Have one student share what they think the color will be and explain why.
        - Record “Y” for yellow
        - Record “G” for green
        - Record “B” for blue
- After each prediction, show the experimental bottle for that prediction and have students record the actual color on their chart.
- Ask students, “What does the color of the solution tell us about animals in the dark?” Possible student response: animals still breathe in the dark. Then fill in question *6*.
- Ask students, “What does the color of the solution tell us about plants in the dark?” Possible student response: plants can produce carbon dioxide. Then fill in question *7*.
- Ask students, “What is the process is called where plants turn carbon dioxide into oxygen?” Students should reply, “Photosynthesis.”
    - Have a discussion about photosynthesis with students. Make sure by the end they understand that light is needed for plants to do photosynthesis; therefore, at night plants cannot do photosynthesis. In addition, plants must undergo respiration (like animals) but during the day they take in more carbon dioxide than they give off.

The Broader Picture: Bottle B000 (14 minutes)

- Have students look at the graph and answer questions *8a-d*.
- Have students summarize what the graph tells us about carbon dioxide levels in the atmosphere.
- Fill in question *8e*.
- Have students discuss what is different now than in the 1800’s and before.
    - Lead students to understand that cars did not exist yet.
    - Note: Students may also respond there were less people, less buildings, and more farmland. While these are correct responses, focus on cars first and use these answers as reminders when you get to question *9*.
- Ask students, “Do cars produce carbon dioxide?”
- Bubble car exhaust through a straw into the bottle to show that car exhaust contains carbon dioxide.



THE BROADER PICTURE

8. Use the graph below to answer the following questions about carbon dioxide.

a. What information is plotted on the x-axis? year

b. What information is plotted on the y-axis? CO_2 (ppm)

c. Does the level of carbon dioxide change over time? ☒ yes ☐ no

d. Circle the area(s) on the graph that do not fit the general trend, or that show the greatest change.

e. Summarize what the graph tells us about the carbon dioxide levels in the atmosphere.

Carbon dioxide levels in the atmosphere are increasing because in 1800, there were ~280 ppm of CO_2, and in 2000, there were ~340 ppm of CO_2.

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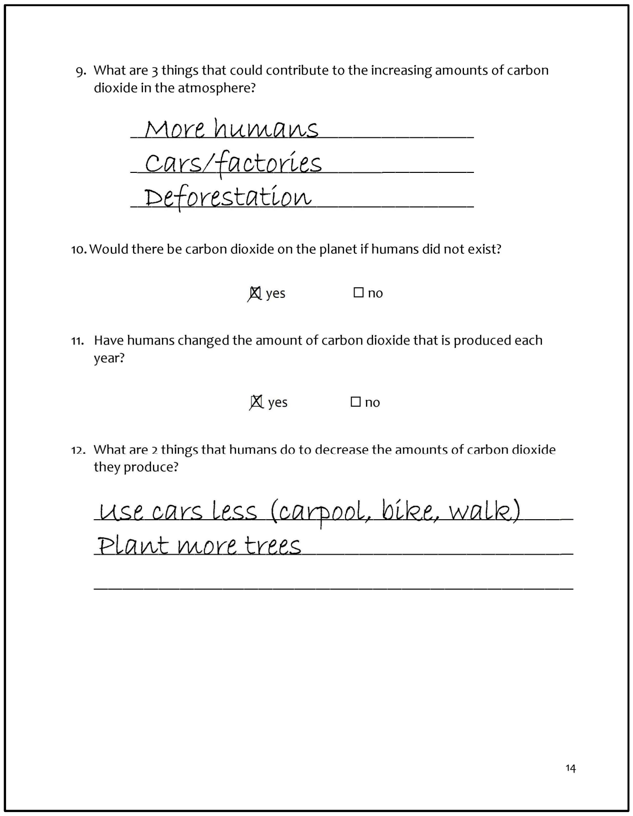
  - If you do not use all of the car exhaust, replace the binder clip on the balloon to reseal the balloon.
  - Students should observe the car exhaust turns the solution yellow faster than you did, so the car exhaust produces much more carbon dioxide than is produced in respiration.
- Have students generate three things that contribute to increasing amounts of carbon dioxide in the atmosphere and fill in question *9*.
- Discuss if there would be carbon dioxide on the planet if humans did not exist and fill in question *10*.
- Discuss if humans have changed the amount of carbon dioxide produced each year and fill in question *11*.
- Have students generate several ways to decrease the amounts of carbon dioxide humans produce, and record two of them in question *12*.



9. What are 3 things that could contribute to the increasing amounts of carbon dioxide in the atmosphere?

More humans

Cars/factories

Deforestation

10. Would there be carbon dioxide on the planet if humans did not exist?

☒ yes ☐ no

11. Have humans changed the amount of carbon dioxide that is produced each year?

☒ yes ☐ no

12. What are 2 things that humans do to decrease the amounts of carbon dioxide they produce?

Use cars less (carpool, bike, walk)

Plant more trees

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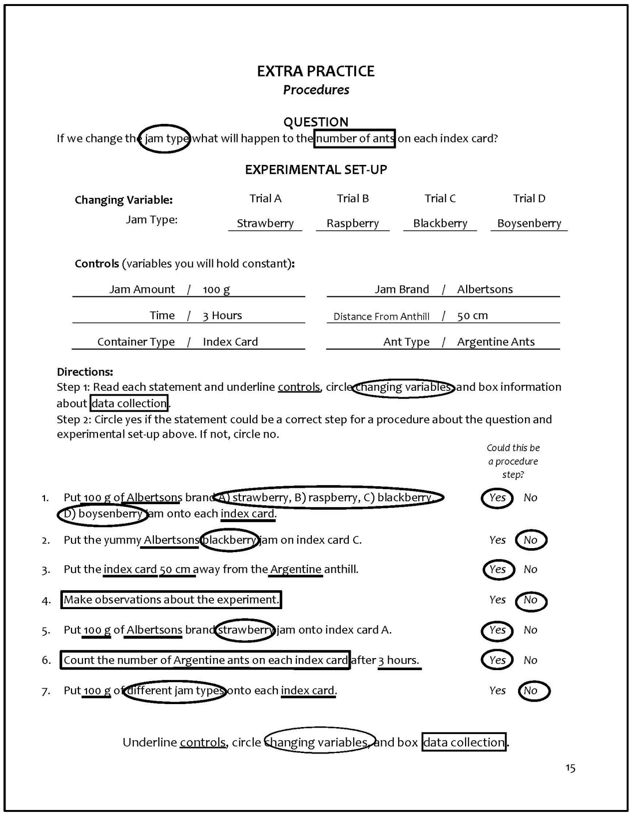
Extra Practice Solutions:



EXTRA PRACTICE

Procedures

QUESTION

If we change the jam type what will happen to the number of ants on each index card?

EXPERIMENTAL SET-UP

Changing Variable:	Trial A	Trial B	Trial C	Trial D
Jam Type:	Strawberry	Raspberry	Blackberry	Boysenberry

Controls (variables you will hold constant)**:**

Jam Amount / 100 g

Jam Brand / Albertsons

Time / 3 Hours

Distance From Anthill / 50 cm

Container Type / Index Card

Ant Type / Argentine Ants

Directions:
Step 1: Read each statement and underline controls, circle changing variables, and box information about data collection.
Step 2: Circle yes if the statement could be a correct step for a procedure about the question and experimental set-up above. If not, circle no.

		Could this be a procedure step?
1.	Put 100 g of Albertsons brand A) strawberry, B) raspberry, C) blackberry, D) boysenberry jam onto each index card.	[✓ *Yes*] *No*
2.	Put the yummy Albertsons blackberry jam on index card C.	*Yes* [✓ *No*]
3.	Put the index card 50 cm away from the Argentine anthill.	[✓ *Yes*] *No*
4.	Make observations about the experiment.	*Yes* [✓ *No*]
5.	Put 100 g of Albertsons brand strawberry jam onto index card A.	[✓ *Yes*] *No*
6.	Count the number of Argentine ants on each index card after 3 hours.	[✓ *Yes*] *No*
7.	Put 100 g of different jam types onto each index card.	*Yes* [✓ *No*]

Underline controls, circle changing variables, and box data collection.

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