NATURE Unhooked

MDC DISCOVER nature SCHOOLS

SCIENCE NOTEBOOK

Scoring Guide for Science Notebook Entry

Score	Description	Criteria
4 points	Exceeds expectations	Data organized in a creative and/or meaningful way that supports a summary statement for the activity and includes questions for further investigation.
3 points	Meets expectations	Standard headings complete. Activity data complete and legibly written.
2 points	Partially meets expectations	Standard headings incomplete. Activity observations and data only partially completed.
1 point	Needs additional support	Many factors missing from standard entries and observations and data from the activity.
NS	Not scorable	Unreadable; no information recorded.

Diving In: Schoolyard Ecosystem Baseline Data

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

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Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Activity 1.2 Number of Drops on a Penny

	Predicted Number of Drops	**Actual Number of Drops**
1.		
2.		
3.		

1. How close were your predictions to the actual number?

2. How might you show the actual number of drops compared to the predicted number of drops?

Activity 1.2 Number of Pennies

Pure Water	**Water and Soap**	
Actual Number of Pennies	**Predicted Number of Pennies**	**Actual Number of Pennies**
Sketch of water surface before water spills over the edge.		
Sketch of water surface when container is partially filled.		

1. Define *cohesion* and *adhesion*.

2. Explain why pure water exhibits these properties.

3. Give an example in nature of how cohesion and adhesion may work together.

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Activity 1.4 Density of Water Data Sheet

Day 1			**Notes**
Mass of Water Sample Filled Cylinder — Empty Cylinder = Mass of Water			
Mass of Filled Graduated Cylinder	**Mass of Empty Graduated Cylinder**	**Mass of Water**	
Volume of Water Sample Read the graduated cylinder to determine the volume of water			
Volume			
Density of Water Sample Density = Mass/Volume			
Mass	**Volume**	**Density**	

Day 2			**Notes**
Mass of Frozen Water Sample (**Note:** Use empty graduated cylinder measurement from Day 1)			
Mass of Filled Graduated Cylinder	**Mass of Empty Graduated Cylinder**	**Mass of Water**	
Volume of Frozen Water Sample Read the graduated cylinder to determine the volume of water			
Volume			
Density of Frozen Water Sample Density = Mass/Volume			
Mass	**Volume**	**Density**	

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Activity 2.2 Transpiration in a Bag Student Data Sheet

Students _____

Investigation Site Location _____

Plant Species _____

Overall Weather Factors _____

	Collection 1	**Collection 2**	**Collection 3**	**Collection 4**	**Collection 5**
Date					
Time					
Temperature					
Amount of Water Collected					
Time Elapsed From Previous Collection					

1. Predict factors (such as recent rain or drought conditions) that will affect the amount of water transpired.

_____
_____
_____

2. Predict the length of time it would take for _____ amount of water to transpire.

_____
_____
_____

3. Use a graph, data table, or paragraph to summarize your data below or on an additional science notebook page.

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Activity 2.3 Water's Impact in the Schoolyard

Size of Water's Impact		
Small	**Medium**	**Large**

Length of Time of Water's Impact		
Short	**Medium**	**Long**

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Activity 2.5 Runoff Study Site Data Sheet

Runoff Study Site 1

At each site, complete a site description and predict how much runoff will occur. Then test your prediction and record the results.

Site 1 Description
Elevation (flat, slight slope, steep slope):
Surface (cement, asphalt, sand, topsoil, etc.):
Vegetation (covered with plants, few plants, no plants):
Location (open/exposed or shaded/protected):

Site 1 Prediction
What do you think happens when heavy rain falls on this site?

Site 1 Observation To test your prediction, pour 2 liters of water over the same spot in your site. Observe and describe what happens.
Observations:
How much water was absorbed by the ground? (some, all, none) This is infiltration.
How much water ran off the surface? (some, all, none) This is runoff.
Was your prediction supported by your findings?

Runoff Study Site 2

At each site, complete a site description and predict how much runoff will occur. Then test your prediction and record the results.

Site 2 Description
Elevation (flat, slight slope, steep slope):
Surface (cement, asphalt, sand, topsoil, etc.):
Vegetation (covered with plants, few plants, no plants):
Location (open/exposed or shaded/protected):

Site 2 Prediction
What do you think happens when heavy rain falls on this site?

Site 2 Observation To test your prediction, pour 2 liters of water over the same spot in your site. Observe and describe what happens.
Observations:
How much water was absorbed by the ground? (some, all, none) This is infiltration.
How much water ran off the surface? (some, all, none) This is runoff.
Was your prediction supported by your findings?

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Activity 2.5 Erosion and Runoff Model Data Table

	Land Surface Type		
Data	**Bare Soil**	**Soil with Vegetation**	**Impermeable Surface**
Water Input (mL)			
Soak-in Time (seconds)			
Runoff Time (seconds)			
Water Output (mL)			
Soil Erosion (none, a little, a lot)			

1. Which of these surfaces had the most erosion? _____
   Describe how you know. _____
   _____
   _____
   _____

2. Figure out how much water each of the surfaces held by comparing how much water you put in with how much water came out. Which of these surfaces held the most water?
   _____
   _____
   _____

3. Which of these surfaces held the least water? _____
   _____
   _____
   _____

4. For the next two questions, calculate the runoff rate and enter it in the table below. The runoff rate is the water output (volume) divided by the time of runoff. Units are milliliters/seconds.

Bare Soil	**Soil with Vegetation**	**Impermeable Surface**

5. Which of these surfaces had the fastest runoff rate (greatest volume of water/second)?
   _____
   _____

6. Which of these surfaces had the slowest runoff rate (least volume of water/second)?
   _____
   _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Activity 3.2 Photosynthesis Data Worksheet

	Number of Bubbles per Minute	**Number of Bubbles per Minute**	**Average Number of Bubbles per Minute**
	Trial 1	*Trial 2*	*Average*
Test 1 Low light			
Test 2 Lamp distance from plant 60 cm			
Test 3 Lamp distance from plant 30 cm			
Test 4 Lamp distance from plant 6 cm			

Q: In which test were the most oxygen bubbles produced? The least?
A: Trials in test 4 should have produced the most bubbles. Trials in test one should have produced the least bubbles.

Q: Besides light, what else may have caused the difference in the number of bubbles produced between the tests?
A: Different amounts of carbon dioxide in the groups' beakers or soda bottles; different temperatures of the water; length of time required between the plant's exposure to light and its production of oxygen; etc.

Q: Where did the oxygen atoms originate?
A: From the water and carbon dioxide

Q: Besides water and light, what else is required for photosynthesis to occur?
A: Carbon dioxide

Q: Besides oxygen, what else is produced in photosynthesis?
A: Sugar

Q: How are sugars used by the plant?
A: They can be used immediately or stored for growth or later use.

Q: How are sugars used by other organisms?
A: When one organism eats another, the energy stored in the tissues is passed on to the consumer. This energy can be used immediately or stored for growth or other use.

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Activity 3.3 Aquatic Food Chains and Food Webs Student Worksheet

1. Work in pairs to select an aquatic habitat and discuss conditions that affect the plants and animals that live there. List one producer, primary consumer, secondary consumer, and decomposer to make a single food chain of organisms that live in that habitat.

   Habitat _____

   a. Producer _____

   b. Primary consumer _____

   c. Secondary consumer _____

   d. Decomposer _____

   e. Give an example of a species that could fit in more than one level.

2. Sketch your food chain on a blank sheet of your science notebook. Add arrows to show the flow of energy from one organism to the next. Label the organisms with common names. Refer to pages 20–21 in the *Nature Unhooked* student book.

3. Find another pair of students who have selected a habitat similar to yours. Work with the other two students to combine your food chains into a food web.

4. Sketch your food web on a blank sheet of your science notebook. Add arrows to show the flow of energy between organisms. Label the organisms with common names.

5. Add nonliving components to your food web. Label these components and show how atoms get reused, rearranged, and recombined over and over again among living and nonliving parts of your food web.

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Activity 3.4 Go with the Flow — Student Worksheet

Students _____
Names of team members

Part A

1. Draw a food chain below using these four organisms: bullfrog, small fish, river otter, algae

2. Draw a model to show energy transfer with these same organisms.

3. Assume that 10 percent of energy is passed from one trophic to the next. If the algae captured 20,000 calories of energy from the sun, how much energy would be available at each level above? Label these energy values on your model.

Part B
Group Data

Initial Amount of Water: 9,000 mL

Amount of Water Remaining: _____

Amount of Water Lost: _____

Formula to Determine Percent Efficiency:

Your Efficiency — Show Work Here

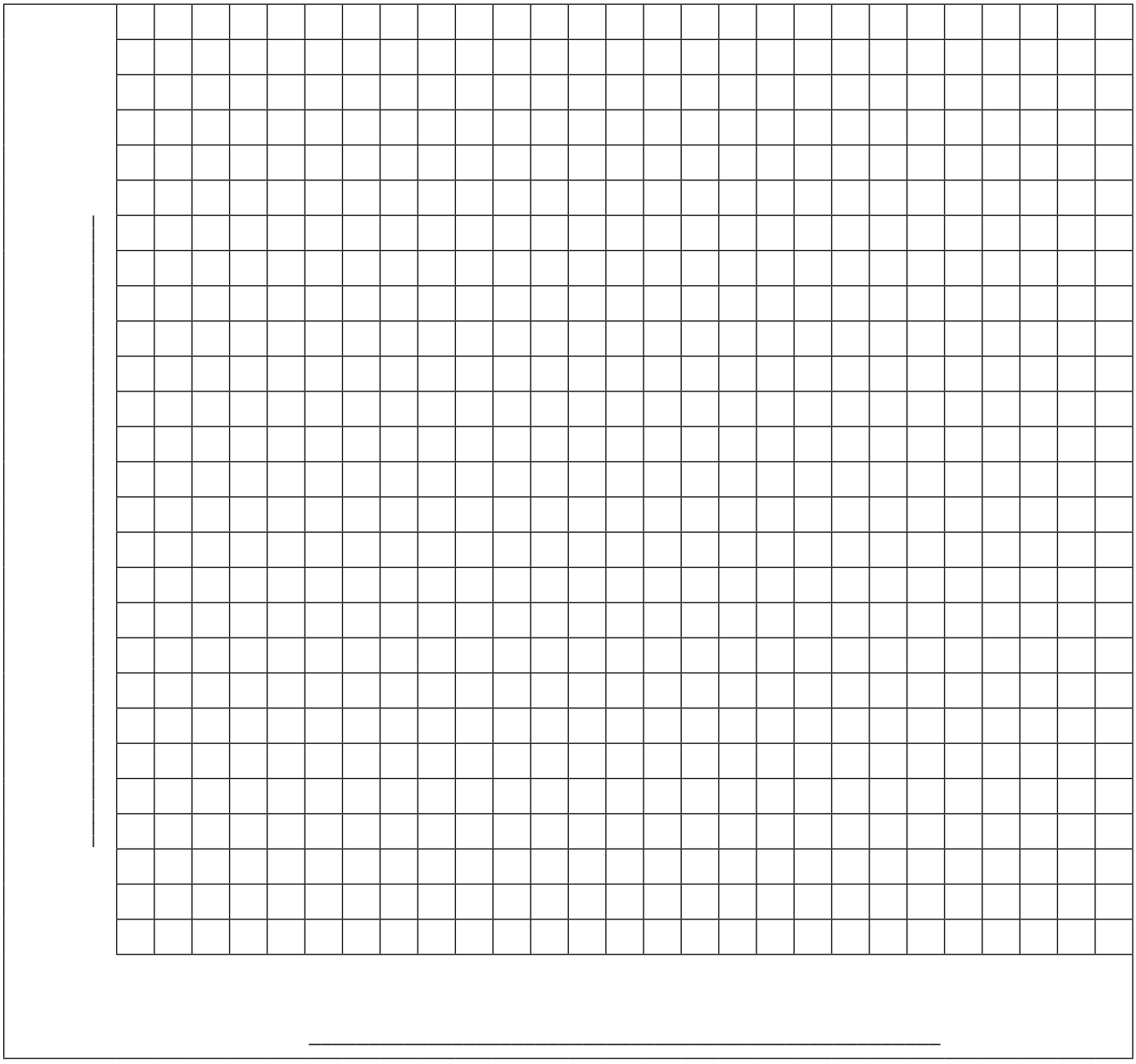
$$\textit{Percent Efficiency} = \frac{\textit{Amount of Water Remaining}}{\textit{Initial Amount of Water}} \times 100 = \_\_\_\_\_ \textit{ Percent}$$

Class Data

No. of Links	Amount of Water Remaining (mL)	Percent Efficiency	Average Efficiency if More Than One Group
3			
4			
5			
6			
7			
8			

Activity 3.4 Go with the Flow — Class Data Graph

Graph: Make a line graph below showing the number of links on the **x** axis (independent variable) and percent efficiency on the **y** axis (dependent variable). Extrapolate the line to show the maximum number of links in your food chain.



Analysis: Explain the meaning of your graph in three sentences below:

1.

2.

3.

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

Date _____ Outdoor Air Temperature _____

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Location _____ _____

Activity 5.1 Data Sheet 1 — Abiotic Factors in Study Site

Study Site No. _____ Group members _____

Ecosystem Type _____

Air Temperature	
Soil Temperature	
Average Rainfall	
Site includes: (*Check all that apply*) _____ exposed rock or gravel _____ soil _____ pavement _____ ground cover (grass, forbs, shrubs, etc.)	The site has (estimated) _____ percent exposed rock or gravel _____ percent soil _____ percent pavement _____ percent ground cover
Soil Color/Appearance	Soil is _____ sandy _____ clay _____ loam _____ silt
Wind Speed and Direction	
Is the ground sloping, flat, or hilly, etc.? What is the aspect? (If sloping, does the land slope to the N, S, E, or W?)	
Water Source Present (Yes or No)	
If yes, what is the evidence of water present?	
Water Temperature	

Activity 5.1 Data Sheet 2 — Biotic Factors in Study Site — Wildlife

Study Site No. _____ Group members _____

Wildlife Present — Include name or description and the number of individuals found. Descriptions should include size, color, shape, and number of legs.

Insects	**Non-Insect Invertebrates**	**Evidence of Other Wildlife**

Activity 5.1 Data Sheet 3 — Biotic Factors in Study Site — Plants

Study Site No. _____ Group members _____

Plants Present — Include name or description and the number of individuals found. Descriptions should include shape and arrangement of leaves, flowers, and/or fruits.

Grasses/Forbs	**Shrubs**	**Trees**

Activity 5.1 Compiled Class Data

Study Site No.	Ecosystem Type	Total Number of Wildlife Species	Total Number of Plant Species	Total Number of All Species

Activity 5.2 Aquatic Invertebrate Sampling — Water Quality Investigation Data Sheet

Group _____
(names)

Date _____ Location _____

Invertebrate Occurrence

Sensitive	**Somewhat Sensitive**	**Tolerant**
_____ caddisfly larvae _____ dobsonfly larva _____ mayfly nymphs _____ gilled snails (right) _____ riffle beetle adults _____ stonefly nymphs _____ water penny larvae	_____ beetle larvae _____ clams/mussels _____ crane fly larvae _____ crayfish _____ damselfly nymphs _____ dragonfly nymphs _____ scuds _____ sowbugs _____ fishfly larvae _____ alderfly larvae _____ watersnipe flies	_____ aquatic worms _____ blackfly larvae _____ leeches _____ midge larvae _____ pouch snails (left) _____ other snails (flat)
Count the number of types (not number of individuals) _____ × 3 = _____ index value	Count the number of types (not number of individuals) _____ × 2 = _____ index value	Count the number of types (not number of individuals) _____ × 1 = _____ index value
Now add together the three index values from each column for your total index value. Total index value = _____		

Compare this total index value to the following ranges of numbers to determine the water quality of your stream. Good water quality is indicated by a variety of different kinds of organisms and the sensitivity of the organisms, not the number of individual organisms found.

Water Quality Rating

_____ Excellent (>22) _____ Good (17–22) _____ Fair (11–16) _____ Poor (<11)

Note: This water quality rating is only valid for gravel bottom streams. Other bodies of water, such as ponds, will have lower index values but not necessarily lower water quality.

Activity 5.2 Aquatic Invertebrate Sampling — Water Quality Investigation Data Sheet

Group _____
(names)

Date _____ Location _____

Invertebrate Occurrence

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_____ caddisfly larvae _____ dobsonfly larva _____ mayfly nymphs _____ gilled snails (right) _____ riffle beetle adults _____ stonefly nymphs _____ water penny larvae	_____ beetle larvae _____ clams/mussels _____ crane fly larvae _____ crayfish _____ damselfly nymphs _____ dragonfly nymphs _____ scuds _____ sowbugs _____ fishfly larvae _____ alderfly larvae _____ watersnipe flies	_____ aquatic worms _____ blackfly larvae _____ leeches _____ midge larvae _____ pouch snails (left) _____ other snails (flat)
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Activity 5.2 Aquatic Invertebrate Sampling — Water Quality Investigation Data Sheet

Group _____
(names)

Date _____ Location _____

Invertebrate Occurrence

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Date _____ Outdoor Air Temperature _____

Time of Day _____ Weather _____

Location _____ _____

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