15/14

Norm.?

Environments

[redacted]

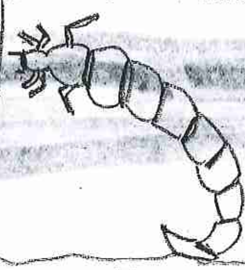
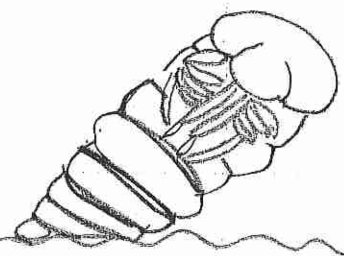
model notebook

GEMS-Net
URI

1.1 How does air temperature (Room Temp/warm; Refridgerator/Cold) affect (relationsh.) the structure and behavior of a mealworm?

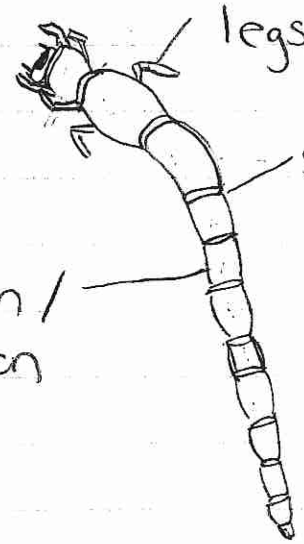
(2x/week for 8 wks)

Tape 8x11 observation sheet here + Bold

DATE:	9/17	9/25	9/29
Room Temp (Drawing)		Drawing	
Room Temp (Notes)	• larva • longer • eating • crawling • fatter	Notes • larva • added potato • molted • white	• pupa • not moving • not eating
COLD TEMP (Drawing)	Drawing	Drawing	Drawing
COLD TEMP (Notes)	• larva • same size • no molts • crawling	• larva • no molts • added new potato • same size	• larva

9/15/14

1.1 What do you notice (observe) about the structures and behaviors of a mealworm?



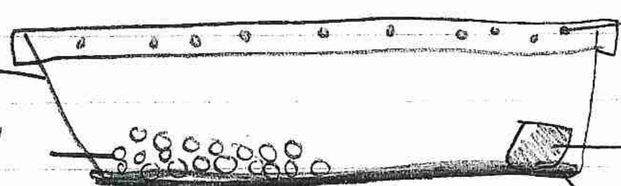
Behaviors:

- Crawls around container
- Clings to paper
- wiggles when touched

What do mealworms need to live and grow?

food

space air water



* added 10 mealworms

1.1

*can do at end or add over time

Air temperature has a large affect on the structure + behavior of a mealworm. In the beginning we made sure that all of our larva or mealworms had shelter, food, moisture and air in order to survive. I observed that both the larvae that were warm and those that were cold ate their food and crawled around in their habitat for 3 days. After 3 days the warm larvae molted and their old exoskeleton was lying in the habitat. I also noticed that they were longer than they were the week before. In contrast the cold larvae did not molt and were the same size as they were before. On September 29, after two weeks, I noticed that the warm larvae had gone into their pupa stage. They were shorter and fatter, whereas the cold larvae had still not even molted. Finally, on October 11 the warm organisms emerged as adult beetles, but the cold organisms had changed very little since the beginning.

Week 2

Week 3

Week 4

In fact, they were still in the larva Stage even after one and a half months. It was interesting that when we left the cold organioms out in the warm room they finally began to grow. They molted and one of them is getting short and fat and I think it will become a pupa soon. It is clear from our invesigation that darkling beetles need a warm environment to go through their life cycle in addition to having moisture, food air and space.

use text images to help w/ discussion

*can write summary (OR) advice column to organism who might live in one or other environment (OR) discuss variety of structures + behaviors different organisms need in each environment.

"Two Terrestrial Environments" p. 3

*use first two ¶ to make organizer of terms.

		Tropical Rainforest	Desert
Living Environmental Factors		• many plants + animals • Trees/plants in layers, canopy, understory, floor	• fewer plants + animals • animals/plants have special ways to keep/get water ex: cactus store water in stem
Nonliving Environmental factors	Temperature	• Hot all the time • small temp. range	• Hot in summer, can be cold in winter, • Large temp range → animals have to keep cool + warm ex. turtle burrows
	Rainfall	• 200 - 450 cm per year	• less than 25 cm/yr.
	Soil	• low nutrients • shallow	• Rocky + Sandy

*Make + discuss observations of isopods structure + behavior, look for differences between pill bugs + sow bugs. (*not focus of lesson, doesn't need to go in NB)

1.2

What do isopods need from their environment

isopods: pill bugs, sow bugs

Living Factors
- food
- plants
- leaves

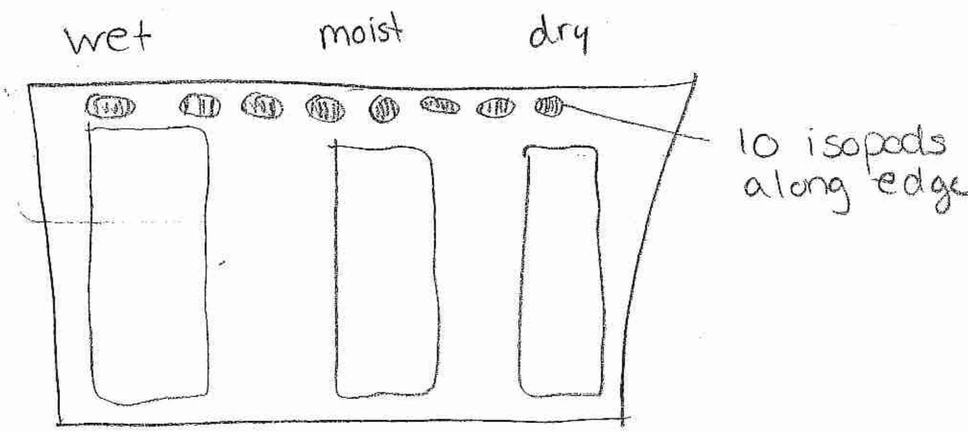
non-livi[ng] factors
- soil
- air
- water
- moistur[e]
- air
- tempera[ture]
- space
- Light

What moisture level do isopods prefer?

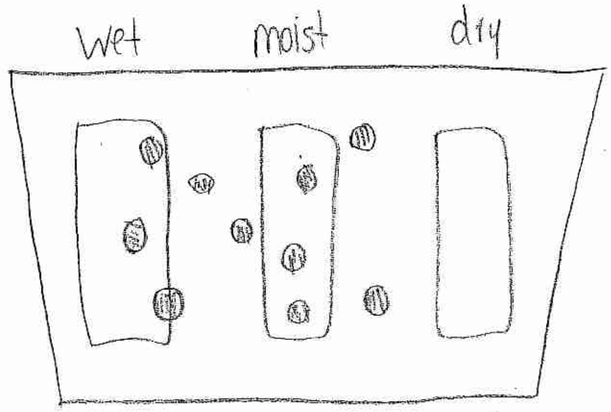
moisture level: wet, moist, dry

prefer: like best

Start

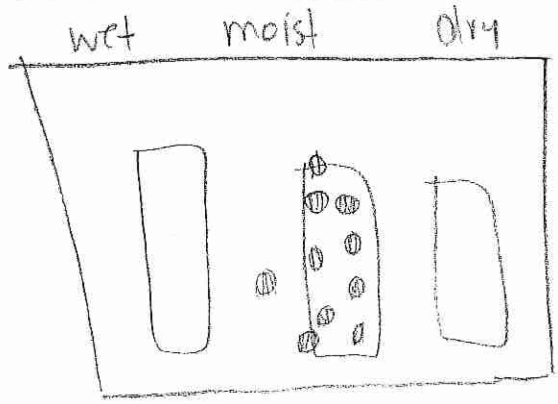


After 10 min.



- most near wet or moist
- none on dry
- 4 burrowed und[er]

After overnight

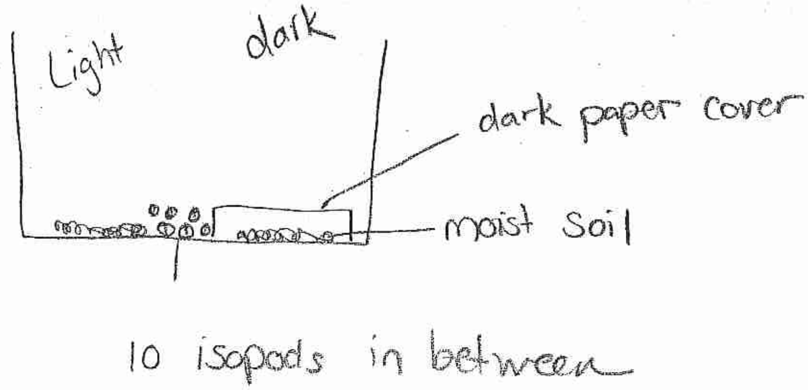


- almost all (9/1[0]) are burrowed under moist

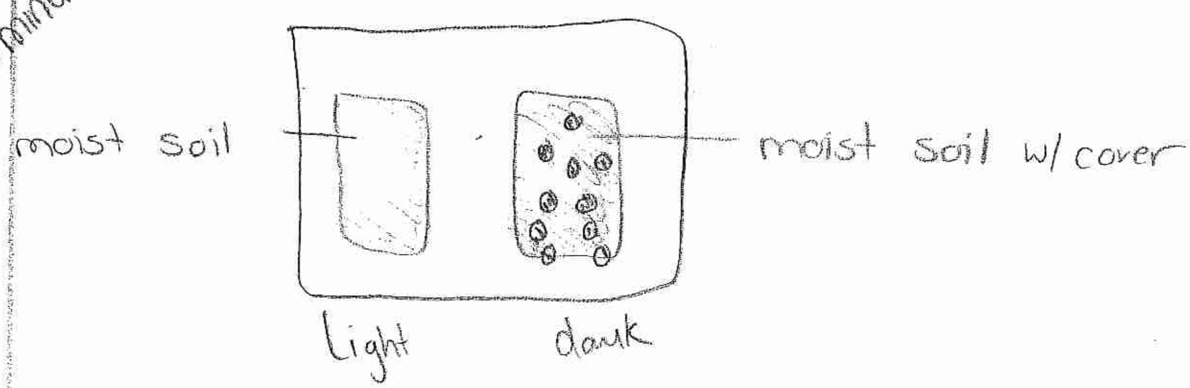
1.2

Do isopods prefer (light) or (dark) environments?

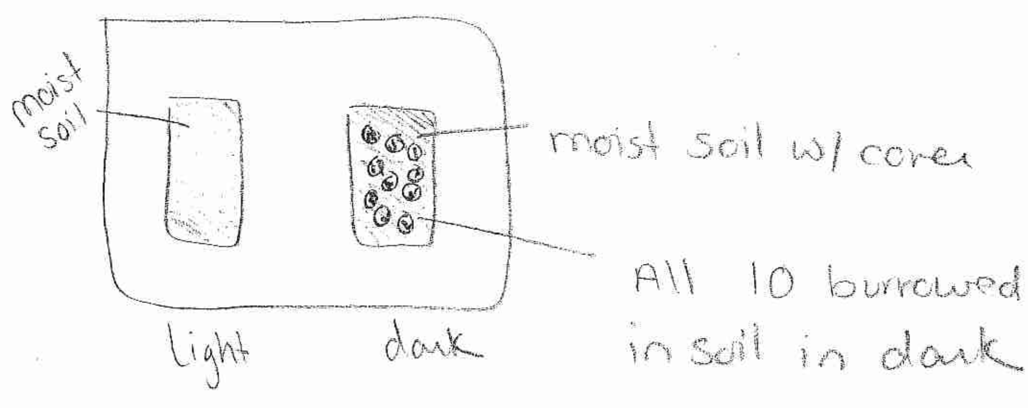
Start



10 minutes

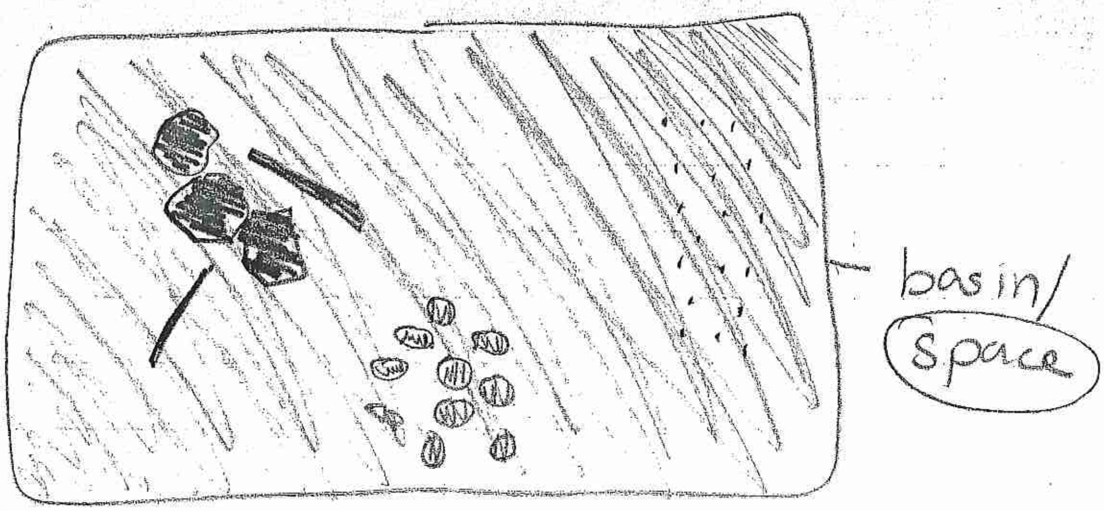


1 hour or overnight



1.2

Isopod Terrarium Map



(moisture + dark) 2cm moist soil — isopod

(food) dead leaves and sticks

(food) Clover seeds

- sprayed surface with water (moisture)
- added 10 isopods (5 pill / 5 sow)
- covered w/ lid with holes (air)
- stored in closet (dark)

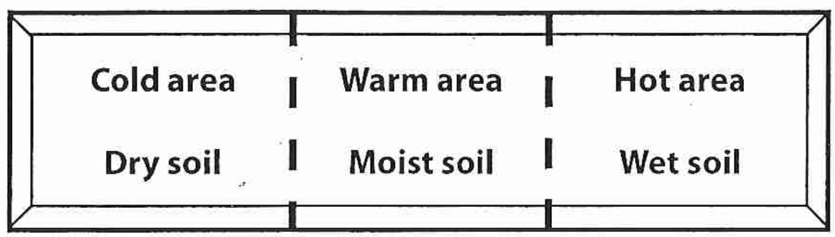
1.2

Isopods prefer a moist and dark environment. My evidence is that when given a choice of wet moist or dry soil, 9 out of 10 isopods preferred the moist soil. In fact, our Class data shows 94% of the isopods prefered moist conditions. In addition, when given the choice of a light environment or a dark environment, all 10 of our isopods chose the dark environment. The class data is consistent with our observations because the class data was 98% of isopods preferred a dark environment. Therefore, if I were designing a habitat for isopods I would be sure to provide a moist and dark environment.

Response Sheet—Investigation 1

A student wanted to find out isopod preferences for temperature. Below is his notebook entry.

We put dry, moist, and wet soil in the basins, just like we did before in class. Next, we put a heating pad under part of the basin to make three areas, each with a different temperature. That way we could find out if isopods like it cold, warm, or hot.



Results

After 10 minutes, we found some isopods in the warm and hot areas. After an hour, we found all of the isopods in the warm area. Inference: Isopods like it warm.

1. Do you agree that the student's investigation supports his inference? Why or why not?
2. What would you do differently to improve his investigation?

1.3 What are the characteristics (similarities) of organisms living in the leaf litter (ground, sticks, dead leaves, soil)?

Critter Record

Your name: ____________________________

Date: __________________

Use the Critter Replicator to help you draw your selected organism.

Head   Thorax   Abdomen

Size: Draw a line as long as the organism.

Where did you find your organism?

____

____

____

____

How did your organism behave?

____

____

____

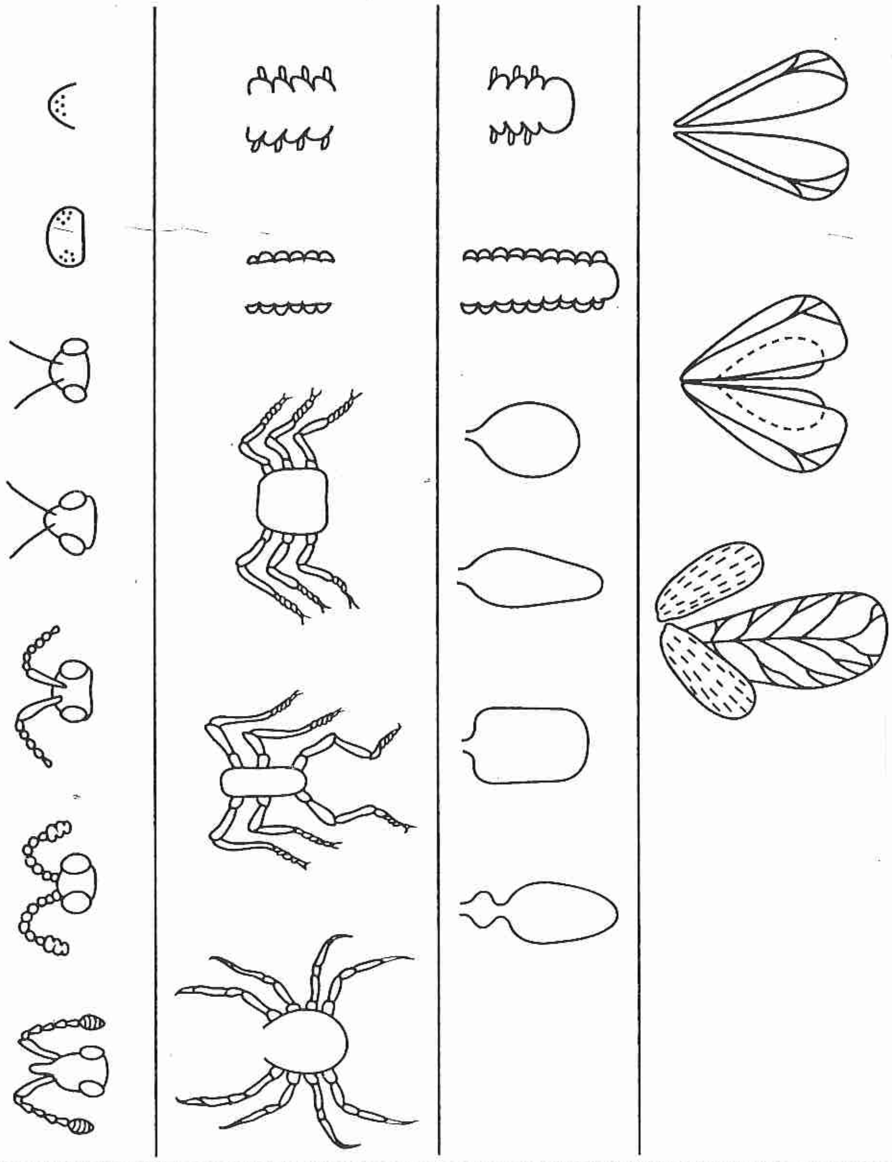
____

Class critter characteristics: (from sort)

1.3

Critter Body Parts

HEAD | THORAX | ABDOMEN | WINGS



1.3

under leaves

moist

inference

color

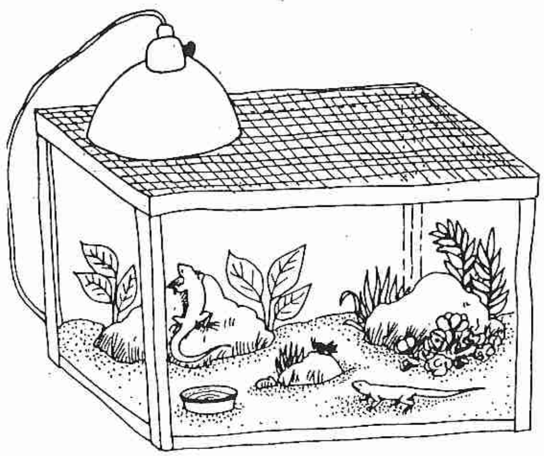
reasoning

contrast to emphasize similar characteristics

I noticed that most of the organisms we found were underneath the dead leaves on the moist soil underneath. In addition, they were all found where it was pretty wet, not in the dry grass. These observations suggest that many of the leaf litter critters prefer dark moist environments just below the surface, not just our isopods. Furthermore, I noticed that all of our critters were dark brown or black. I think this is because the dark color helps them blend in with the dark soil and dead leaves and hide from predators. Even though we found many different organisms in the leaf litter such as, isopods, worms, spiders and ants, they all seem suited for dark moist conditions.

2.1

Living and Nonliving Factors



salamanders L
cricket L
rocks
pan of water
broad-leaved plants L
light L
grassy plants L
glass terrarium
thin-leaved plants L
soil L
flowering plants L
temperature

A student used the picture above to make a list of all the environmental factors she saw in this terrestrial environment. She put an *L* next to each factor she identified as a living factor. The list the student made appears above.

1. Do you agree that all the factors she marked with an *L* are living? If not, tell which ones you don't agree with and explain why you don't agree.
2. Describe how two of the nonliving factors might influence the living factors in this terrarium.

2.1

Aquarium Observation Log

Week	Date	Time	Water temp.	Observations
1				
2				
3				
4				
5				
6				
7				

2.1

Additional Observations / Changes in aquatic system:

2.2 What are the (roles) of (organisms) in a (food chain)?

- roles: producer, consumer, decomposer, jobs
- organisms: plants, animals, bacteria
- food chain: feeding relationship, predator/prey

Food chain example:

grass (producer) → chipmunk (consumer) → hawk (consumer)

grass, chipmunk, hawk → Bacteria (decomposer)

Woodland Ecosystem

producers	consumers	decomposers
gamma grass	black bear (O)	earthworm
green algae	brook trout (c)	bacteria
pine trees	chipmunk (h)	
wild blueberry	coyote (c)	
	great blue heron (c)	
	grouse	
	hare (h)	
	mayfly (o)	
	red-tailed hawk (c)	

(h) – herbivore
(o) – omnivore
(c) – carnivore

* make their own food using energy from sun (producers)

* depend on other organisms for food (consumers)

2.2

Practice with Food Chains

Make several food chains of at least three organisms. Use arrows to show how food moves from organism to organism.

- American robin
- Aquatic snail
- Bacteria
- Black bear
- Brook trout
- Chipmunk
- Coyote
- Dead plants and animals
- Earthworm
- Grama grass
- Great blue heron
- Green algae
- Grouse
- Hare
- Mayfly
- Pine trees
- Red-tailed hawk
- Scuds
- *Tubifex* worm
- Wild blueberry

2.2

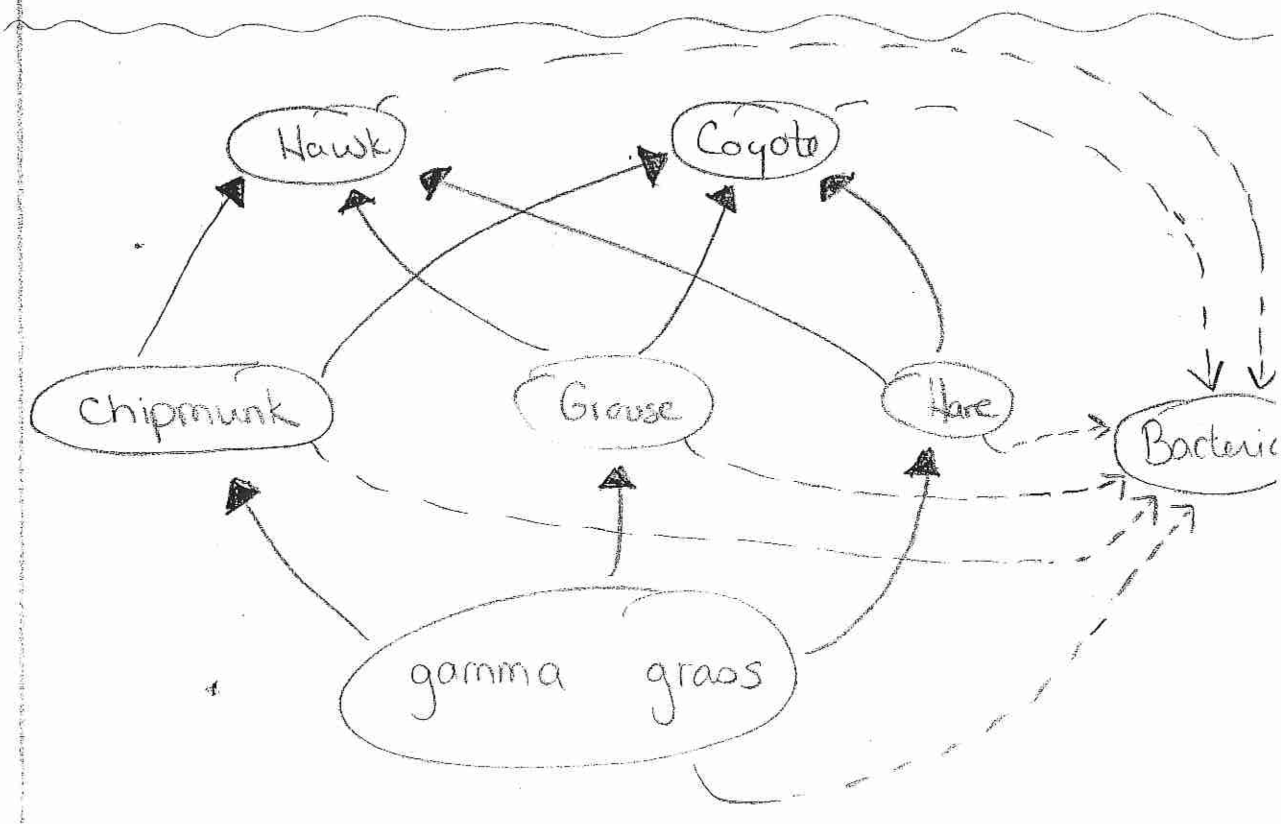
examples:

1. green algae (producer) → aquatic snail (consumer) → trout (consumer)

2. grass (P) → hare (C) → hawk (C)

3. blueberry (P) → Robin (C) → bear (C)

Food web.



Response Sheet—Investigation 2

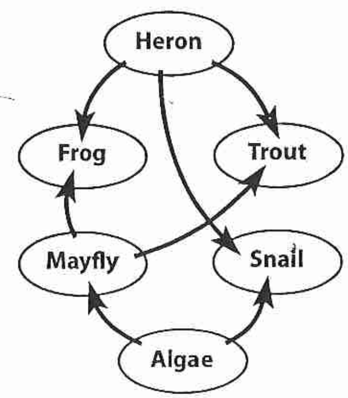
Here is a description of the organisms that live in a pond.

Aquatic snails and mayflies eat algae.

Frogs and trout eat mayflies.

Herons eat frogs, trout, and snails.

Bacteria decompose the dead organisms.



A student read the information about organisms living in a pond. Then she drew a food web.

Is this food web accurate? You can draw a new food web if needed.

Write your comments and draw on the facing blank notebook page.

2.3

amount relationship

How does (food) (affect) the size of a (deer population) in its (home range)?

\# of deer territory / space

Population Simulation Results

Year	# of deer at start	# of deer at end	Survival predictions
1	17	17	
2	34	34	
3	68	46	60, 65, 68
4	92	36	46, 68, 82
5	72	43	36, 40, 46

In year 2, we started with _____ deer and ended with _____.

The number of deer ______________________________ because

____

____

In year 4, we started with _____ deer and ended with _____.

The number of deer ______________________________ because

____

____

In year 5, we started with _____ deer and ended with _____.

The number of deer ______________________________ because

____

____

2.3 At first our deer population had plenty of food. For example in year 1 and 2 all of our deer found enough food to survive, even when we doubled our population by reproducing. After year 3, however, our population fell from 68 dear to 46 deer. I think this happened because the food source was not big enough to feed us all. In fact, since we overgrazed our population suffered even more in year 4 dropping from 92 to 36. Finally, in year 5 our population of 72 found new ranges to look for food and 43 of us survived. I think our carrying capacity of our home range was about 46 deer because with all of the available food that was the most deer that survived, in year 3, before the food supply was damaged from overgrazing. With all of the food source available only 46 survived even though 68 of us started out. That population was too large for the available food. The amount of food limited

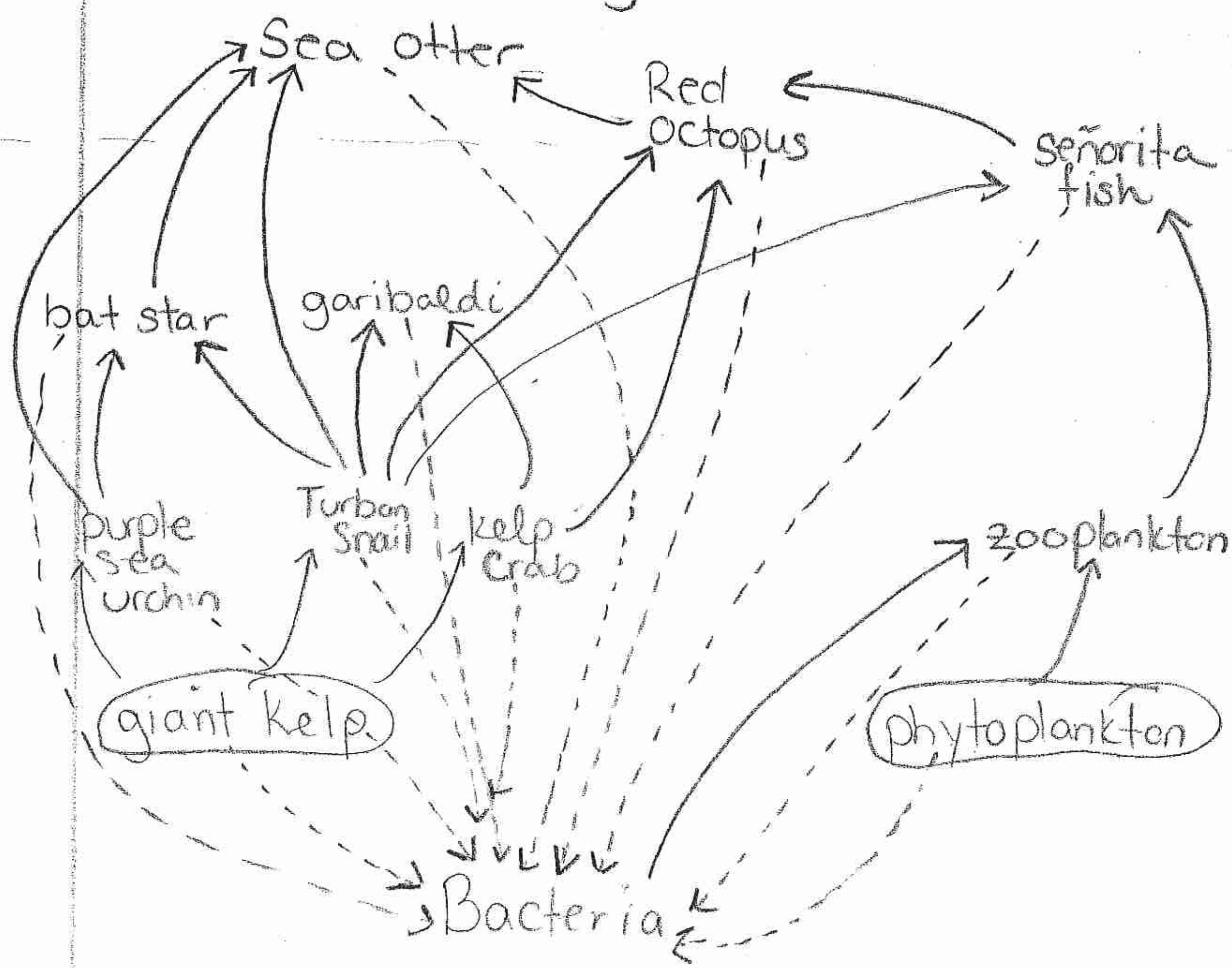
2, 3

our population. the most.

2,4

How can we build a model to show what organisms are both predator and prey in a kelp forest?

represent relationships



2.4 A purple sea urchin is both a predator and prey because it will eat the giant kelp, but is hunted by bat stars and Sea otters. In addition, a Red octopus is the predator of a Turban snail, kelp crab and Señorita fish, but the prey of a Sea otter. Food webs show how complex the feeding relationships can get in an ecosystem where many organisms are food for many others, while eating a wide variety of organisms themselves. And no matter who eats who, decomposers digest us all.

(note)

Rd. "Comparing Aquatic and terrestrial ecosystems.
Could we as model . . . . .

Choose one set of ecosystem cards
- woodland
- monterey Bay
- kelp forest

do box and T to compare + contrast it to our model aquarium system.

Both

- have algae (phytoplankton) ← Producers
- have plants ← Producers
- have fish \ consumers
- have snails / consumers
- have water
- have warmth } Non-Living
- have sunlight } Non-Living
- have dead animals (decomposing) — bacteria
- have rocks/ soil on bottom

model Aquatic System	kelp forest
Small space	larger space
few organisms	many organisms
water stays same	water changes
Shallow	deep
warm	cold

example

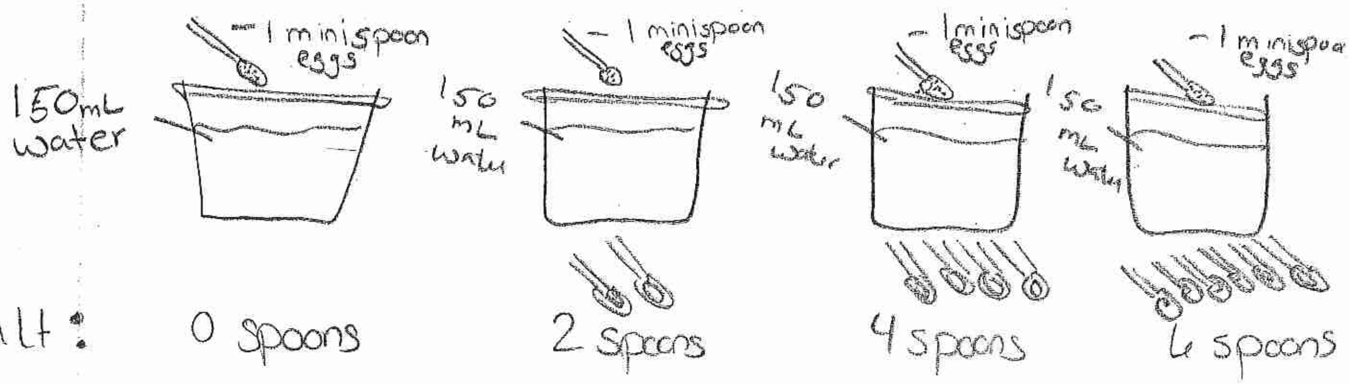
TS The model aquatic system and the kelp forest may seem very different at first, but are similar in some very important ways. The two systems appear different because the model takes up a very small space and a kelp forest can be very large. For example, the model is very shallow, only 12 cm deep, whereas a kelp forest can be 100m deep as described on page 47 of the Article "Monteray Bay National marine Sanctuary." In addition, the model has only a few animals and only one plant, but the kelp forest has thousands of organisms (p.46).

TS new ¶ Despite the fact that these ecosystems have different characteristics their similarities are even more important. The model has eloda and the kelp forest has kelp which are both producers. Producers make their own food from sunlight and are extremely important to feed the other organisms in any ecosystem. Furthermore, both ecosystems have consumers which eat the producers and each other. Finally, when the guppies or a Garibaldi die in each system, there will be bacteria there to decompose it or break it down. Therefore, even though our model aquatic system and the kelp forest look very different they both have organisms to fill the critical roles that make any ecosystem healthy.

fairtest
controlled investigation.

3.1 How can we design an investigation to find out how salinity affects brine shrimp hatching?

less salty / more salty
relationship



	Day 1	Day 2	Day 3	Day 4
observations				

less → more
0 2 4 6

3.2 How does salinity affect the hatching of brine shrimp eggs?

more less

Day 4

	# spoons of salt			
	0	2	4	6
Most		XXX	(X)XX XXX	
Some		(X)XX XX	XX	
None	(X)XXX XXXX			(X)XXX XXXX

(* add class data to individual data)

TS [Salinity does have an affect on the hatching of brine shrimp eggs.] Our data shows that brine shrimp eggs will not hatch if there is too little or too much salt. For example, no eggs hatched in 0 or 6 spoons of salt. I think this happened because these amounts are outside the range of tolerance. The optimum conditions for hatching brine shrimp are between 2 and 4 spoons of salt. This

→

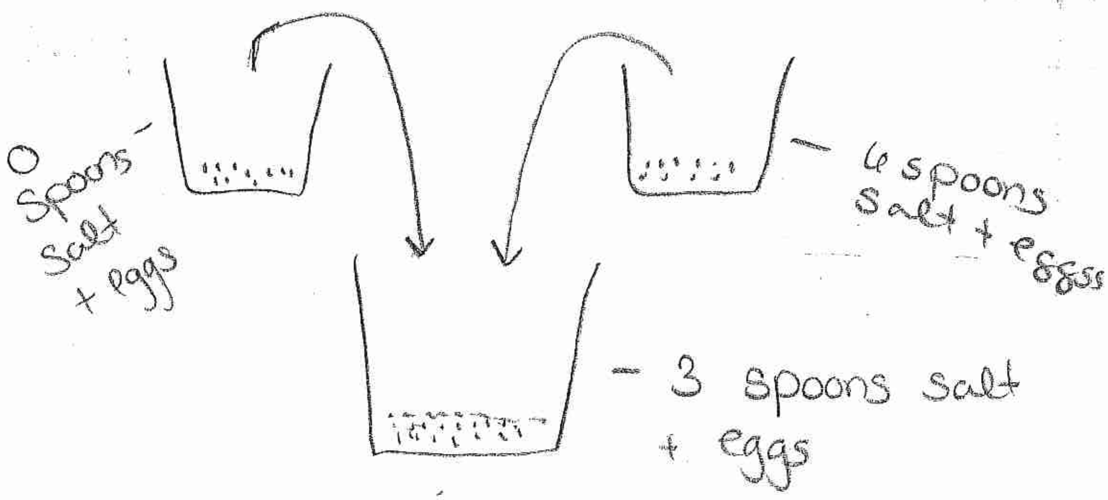
3.2

is the range where most of the eggs hatched. Therefore, we should monitor the salinity of mono Lake because if it is not in the brine shrimp's range of tolerance the brine shrimp won't hatch and none of its predators will have food and the food web will collapse.

3.2

more or less salt — range of tolerance

3.3 Does (Changing the environment) allow the brine shrimp eggs to hatch?



Observations:

Day 1	Day 3

I think ________ because ______.

I observed that when we put unhatched eggs that were in water outside the brine shrimp range of tolerance into water within the ronge of tolerance, they hatched. My evidence is that the eggs from the 0 and 6 spoons of salt cups that didn't hatch, did finally hatch when we put them in a cup with 3 spoons of salt which is within their range of tolerance. I think this means that the eggs will still be viable even if they are in poor conditions. They will wait until they have better conditions and then hatch.

33

Response Sheet A—Investigation 3

A student set up a science fair project to find out how temperature affects mealworms. She knew that insects go through different stages in their life cycles. She wanted to know if temperature affected the speed in which the mealworm would go from larva to adult. Below is her lab report.

Prediction

I think temperature will make the mealworm life cycle go faster. I think that is true because it seems like there are a lot more insects around in the summer when it is warm, than in the winter when it is cold.

Materials

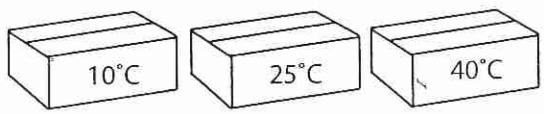
30 Mealworms

1 Box of wheat bran

3 Cardboard boxes

1 Thermometer

1 Apple



Procedure

1. Label three boxes: 10°C, 25°C, and 40°C.
2. Put equal amounts of wheat bran in each box (food for the mealworms).
3. Put equal amounts of apple in each box (for moisture).
4. Place 10 mealworms in each box and close the lid.
5. Place each box in an area where you can keep the temperature at the level shown on the box.
6. Check the boxes each day to make sure the mealworms have plenty of wheat bran and apple.
7. Record observations after 2 weeks, 4 weeks, and 6 weeks.

Data

After 2 Weeks

	10°C	25°C	40°C
Adults			
Pupae		2	7
Larvae	10	8	3

After 4 Weeks

	10°C	25°C	40°C
Adults			5
Pupae		4	5
Larvae	10	6	0

After 6 Weeks

	10°C	25°C	40°C
Adults			10
Pupae		8	0
Larvae	10	2	0

33

Response Sheet B—Investigation 3

1. What is the optimum temperature for the mealworms?

   (Circle the one best answer.)

   A. 10°C

   B. 25°C

   C. 40°C

2. What inference can Laura make from her observations?

   (Circle the one best answer.)

   A. The warmer the temperature, the faster mealworms move through their life cycle.

   B. All of the mealworms in the 40°C box changed to adults in 6 weeks.

   C. Mealworms in the 10°C box will probably never change into the adult stage.

Record your answers to questions 3 and 4 on the next blank page in your notebook.

3. How do the data show that the student's prediction is right or wrong?

4. Do you think the student should try testing mealworms in temperatures higher than 40°C? Why or why not?

33

Answers to response sheet:

3.4

How does color affect the number of organisms that survive in different habitats?

	Grassy Field		Gravel	
	Start	End	Start	End
Brown	32	23	32	27
gray	32	8	32	18
Green	32	16	32	8
red	32	1	32	14

3.4 I noticed that the brown and green organisms survived better than the gray and red in the grassy field. For example, there were 23/32 brown organisms left, as opposed to 1/32 red organisms. I think this happened because the red ones were easier to see, while the brown ones blended in with the field material. Their color protected them in their environment. I observed a similar pattern in the gravel habitat. The Brown and gray organisms survived better than green and red. While 27/32 brown organisms survived, only 8/32 green survived. In this habitat a green color was a disadvantage rather than an advantage. Brown was an advantage in both habitats. When a population has variation among individuals, some of the individuals will survive under conditions where the others will die. This helps the population survive if they have to go to a new area, for example, and different colored organisms get eaten. At

3.4 least they won't all get eaten. Then the color that is hidden will reproduce more of that color and they might do well in their new environment.

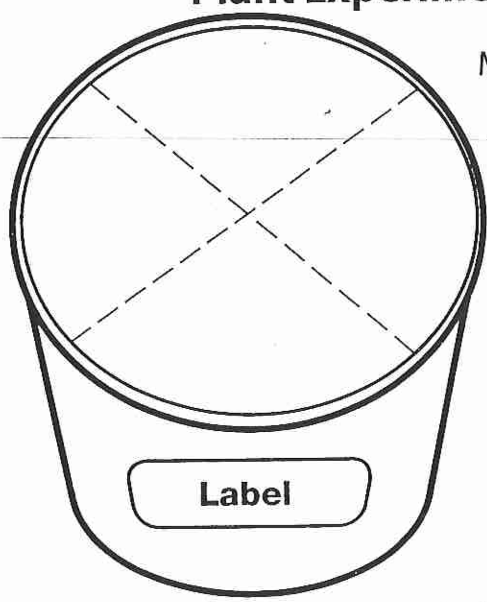
4.1

Groups A — How much water is preferred by different kinds of plants?

Groups B — What is the salt tolerance for different farm crops?

WARNING — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

Plant Experiment Setup



Map where each seed is.

Key

- ☐ Barley
- ☐ Corn
- ☐ Pea
- ☐ Radish

Plant all four containers exactly the same.

Environmental factor tested:

Controlled environmental factors:

Number of each seed planted on this date ________:

Barley ____________________

Corn ____________________

Pea ____________________

Radish ____________________

Plant Observations A

Environmental factor tested ____________________

Planting date ____________________

Seed type ____________________

Number of seeds of this kind planted ____________

Part 1. Number of days after planting __________

Environment	How many plants came up	Height of tallest plant

Part 2. Number of days after planting __________

Environment	How many plants came up	Height of tallest plant	Most leaves on one plant

Plant Observations B

Part 3. Number of days after planting ___________

Environment	How many plants came up	Height of tallest plant

Most leaves on one plant	Length of longest leaf	Length of longest root

Part 4. Use this table to determine the range of tolerance. Label the columns. Mark an X where each plant grew.

	Environment			
Peas				
Corn				
Barley				
Radishes				

Plant Profile

Plant type ________ Environmental factor ________

Days of growth ________

Label the columns with the environments being studied.

Draw the plants in place.

Dry				
		Shoot above		
		Root below		

* Students can write about their assigned plant and their environmental factor

My data shows that the optimum Soil condition for corn is ______.
My evidence is that in ______ soil ______ plants grew, whereas in ______ Soil ______ plants grew. In fact, ______.
This is important because ______.

* Can write about the other factor or more plants.