CURRICULUM GUIDE FOR

Organisms

(Based on the STC *Organisms* 'kit)

Wallingford Public Schools
Second Grade
Science

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Approved by Board of Education on May 15, 2006

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UNIT SUMMARY

In this unit, students explore the similarities and differences between different plants and animals such as fish, insects, and mammals. Students learn to differentiate between living and non-living things. Students grow seeds and observe their growth and changes. They will also explore factors that may effect plant growth such as light, water, and temperature. Students observe classroom aquariums with fish, snails and water plants and also terrariums with insects and plants. The life cycles of different animals are explored along with how different animals obtain food, water, move around, and how animals change during the growth and development from juveniles to adults.

NOTE: Teachers will call the Science Resource Center to schedule the delivery of the live organisms.

STAGE 1- STANDARDS/GOALS

What should students understand, know, and be able to do? Stage one identifies the desired results of the unit including the related state science content standards and expected performances, enduring understandings, essential questions, knowledge and skills.

Enduring Understandings *Insights earned from exploring generalizations via the essential questions (Students will understand THAT…) K-12 enduring understandings are those understandings that should be developed over time, they are not expected to be mastered over one unit or one year.*	**Essential Questions** *Inquiry used to explore generalizations*
Overarching Enduring Understandings: • Science is the method of observation and investigation used to understand our world. (K-12) • Inquiry is the integration of process skills, the application of scientific content, and critical thinking to solve problems. (K-12) *Unit Specific Enduring Understandings:* • All living things (plants and animals) require adequate food, air, water, and shelter to survive in their environment. • Some organisms undergo metamorphosis during their life cycles; other organisms grow and change, but their basic form stays essentially the same. • Living things have different structures and behaviors that allow them to meet their basic needs, thus living in habitats that allow for them to survive. • Plants make their own food from the sun's energy (photosynthesis), animals need to find their food.	• How is inquiry used to investigate the answers to questions we pose? • How do you know if an object is living? • How do changes in light, water and temperature affect the growth of a plant? • How do plants get water? food? • Explain the life cycles of organisms that metamorphose and those that do not. • How do different animals move? • How are adults and their off springs the same and different in how they look and behave? • How are plants, birds, fish, insects and mammals the same and different? • How do different animals obtain water and food?

Knowledge and Skills

What students are expected to know and be able to do

The knowledge and skills in this section have been extracted from Wallingford's K-5 Science Scope and Sequence.

Knowledge

K1. Describe different living and non-living things

K2. Differentiate between living and non-living things(growth, movement, reproduction, and response to stimuli)

K3. Investigate different environmental variables on the growth of plants (amount of light, amount of water, temperature, etc.)

K4. Describe the different structures plants have for obtaining water (roots and stem) and sunlight (photosynthesis occurs in the leaves).

K5. Observe and describe the life cycles of organisms that grow, but do not metamorphose (birds, fish, insects, mammals)

K6. Observe/describe the changes in structure during the life cycles of organisms that metamorphose (frog, butterfly, etc.)

K7. Discuss, draw, and write the ways that animals, including humans, move around (walk, fly, slither, swim, crawl, etc.)

K8. Compare and contrast the appearance and behaviors of adults and their offspring.

K9. Compare and contrast the appearance and behaviors of plants, birds, fish, insects and mammals (including humans).

K10. Identify different ways that animals, including humans, obtain water and food (hunting, farming, fishing, digging, shopping, carnivores/ herbivores/ omnivores, grazers, wild animals compared to domesticated, etc.)

Skills

S1. Generate investigable and non-investigable questions.

S2. Observe and describe commonalities and differences among objects/living things.
- Living/non-living
- Plants/animals
- Life cycle of animals (including metamorphosis)
- Movement of various animals
- Appearance and behaviors of adults and offspring (including humans)

S3. Sort and classify objects based on two or more observable properties.
- Appearance and behavior of plants, birds, fish, insects, and mammals

S4. Predict what might happen.
- Plants are grown under different conditions (amount of light, amount of water, etc.)
- Celery stalk placed in colored water

S5. Design an investigation to help answer an investigable question.
- Plants are grown under different conditions (amount of light, amount of water, etc.)

S6. Conduct simple investigations.
- Celery stalk placed in colored water
- Butterfly metamorphose (optional)

S7. Employ simple equipment and measuring tools, such as
- Rulers

- Magnifying glasses
- Non-standard measuring devises
- Teaspoons/measuring cups
- Etc.

S8. Generate rules for safe use of materials and equipment.

S9. Organize appropriate and accurate measurements and observations using:
- Graphic organizers
- Picture and bar graphs
- Illustrations and diagrams
- Journaling
- Etc.

S10. Draw conclusions based on data, observations and findings.

S11. Communicate results or information in an appropriate manner using:
- Presentations
- Visuals
- Simple reports
- Journals
- Etc.

Content Standard(s) *Generalizations about what students should know and be able to do.*	
CSDE Content Standards (CSDE Science Framework 2004)	**CSDE Primary Expected Performances** (CSDE Science Framework 2004)
Heredity and Evolution – What processes are responsible for life's unity and diversity? **K.2 - Many different kinds of living things inhabit the Earth.** • Living things have certain characteristics that distinguish them from nonliving things, including growth, movement, reproduction and response to stimuli.	A4. Describe the similarities and differences in the appearance and behaviors of plants, birds, fish, insects and mammals (including humans). A5. Describe the similarities and differences in the appearance and behaviors of adults and their offspring. A6. Describe characteristics that distinguish living from nonliving things.
Structure and Function – How are organisms structured to ensure efficiency and survival? **1.2 - Living things have different structures and behaviors that allow them to meet their basic needs.** • Animals need air, water and food to survive. • Plants need air, water and sunlight to survive.	A12. Describe the different ways that animals, including humans, obtain water and food. A13. Describe the different structures plants have for obtaining water and sunlight. A14. Describe the structures that animals, including humans, use to move around.
Structure and Function – How are organisms structured to ensure efficiency and survival? **1.3 - Organisms change in form and behavior as part of their life cycles.** • Some organisms undergo metamorphosis during their life cycles; other organisms grow and change, but their basic form stays essentially the same.	A15. Describe the changes in organisms, such as frogs and butterflies, as they undergo metamorphosis. A16. Describe the life cycles of organisms that grow but do not metamorphose.
Scientific Inquiry *Scientific Literacy*	**A INQ.1** Make observations and ask questions about objects, organisms and the environment. **A INQ.2** Use senses and simple measuring tools to collect data. **A INQ.3** Make predictions based on observed patterns. **A INQ.4** Read, write, listen and speak about observations of the natural world. **A INQ.5** Seek information in books, magazines

Scientific Numeracy	and pictures. **A INQ.6** Present information in words and drawings. **A INQ.7** Use standard tools to measure and describe physical properties such as weight, length and temperature. **A INQ.8** Use nonstandard measures to estimate and compare the sizes of objects. **A INQ.9** Count, order and sort objects by their properties. **A INQ.10** Represent information in bar graphs.

Common Misconceptions Children Have

By identifying misconceptions early, teachers can design appropriate lessons to address and change student misconceptions.

- Humans are not organisms/animals like plants and animals (humans are mammals).
- Animals and plants do not have many similarities (they both reproduce, grow, response to stimuli, etc.)
- Animals and plants do not have specific needs to stay alive (require food, environmental factors, water, etc.).
- The only way to make observations is by looking at something (you can use your five senses to make observations).
- Plants get their food from the soil (they actually make their food through photosynthesis).
- Plants in areas without sun will die quickly (they actually grow taller initially as they search for light).
- People get food from the grocery store (human food sources include plants and animals)

STAGE 2 – DETERMINE ACCEPTABLE EVIDENCE

How will we know if students have achieved the desired results and met the content standards? How will we know that students really understand? Stage two identifies the acceptable evidence that students have acquired the understandings, knowledge, and skills identified in stage one.

Performance Task(s) *Authentic application in new context to evaluate student achievement of desired results designed according to GRASPS. (Goal, Role, Audience, Setting Performance, Standards)*	**Other Evidence** *Other methods to evaluate student achievement of desired results.*
The second graders at your school will be displaying exhibits at the Science Fair that show the life cycles of the frog and the butterfly. Decide which organism you would like to exhibit. Using the pictures provided, design a poster to show the stages of their lives. You must correctly sequence the stages of your organism and write at least one sentence about each stage to explain the process. Be sure to illustrate the appropriate environment for the organism you choose. Write and/or illustrate a letter to your parents that explains the differences and similarities between two living things such as: water plants, land plants, fish, insects, humans, mammals, insects, or birds, etc. Create a poster or diorama that demonstrates the differences in behavior and appearance of a juvenile and adult animal. Animal Clues - See Appendix 9 • Have students make a tri-fold pamphlet or a flip book. Cut out the squares and glue the different descriptions under the animal. OR • Your teacher made animal information cards for you to tell your kindergarten buddy how to handle gerbils, birds and fish. The cards fell on the floor and got all mixed up. Help your teacher by placing or gluing these cards correctly under the picture of each animal.	Look in appendix for sample assessments on: • Plant parts and functions • Frog life cycle • Lady bug life cycle Sequencing cards (pg 27 and 29 of student notebook) for butterfly and frog life cycles. Create simple rubrics to evaluate notebook pages. Observation of process skills. End of unit assessment - Revisit lesson #1 in *STC Organisms* manual (see manual pg 193 for directions). See how student's ideas have changed as a result of the unit. See pages 197-199 in the *STC Organisms* teacher manual for additional assessment ideas

STAGE 3 – LESSON ACTIVITIES

What will need to be taught and coached, and how should it best be taught, in light of the performance goals in stage one? How will we make learning both engaging and effective, given the goals (stage 1) and needed evidence (stage 2)? Stage 3 helps teachers plan learning experiences that align with stage one and enables students to be successful in stage two. Lesson activities are suggested, however, teachers are encouraged to customize these activities, maintaining alignment with stages one and two.

The suggested lesson activities are not sequenced in any particular order. Teachers may select which lesson activities will best meet the needs of their students and the unit objectives. Each lesson activity is coded with the corresponding knowledge (K) and/or skill (S) objectives that are found in stage one.

As you read the lessons below, you will notice that some of the lessons found in the STC Organisms Teachers Manual are not recommended lessons (Lesson 4, 5, 11, 12, 13, &16). These lessons do not relate to or address the content standards and objectives of this unit. Some materials needed for these lessons have been removed from the kit.

Lesson 1 – Sharing What we know about Organisms

Access prior knowledge / pre-assessment - Students should draw and discuss what they know about:

- organisms and what they require to live
- plants and animals are alike and different

* This lesson could be broken down into two lessons
K1, S2, S9
Student Notebook: Page 1

RELATED ESSENTIAL QUESTIONS:

- *How do you know if an object is living? Nonliving?*

Lesson 2 – Observing and Describing Seeds

Students use hand lenses to touch and observe different seeds. Students develop descriptive vocabulary and better understand how to use the sense to describe an object. These skills will be applied throughout this kit.
S3, S9
Student Notebook: Page 2

RELATED ESSENTIAL QUESTIONS:

- *How do we use our senses to help us make observations?*

Lesson 3 – Planting Our Seeds
Lesson 6 – How Have Our Seeds Changed
(Combine lesson 3 & 6)

Use the plastic cups for students to plant their seeds in. Lids are included to help retain moisture in cup until the plant starts to grow. The teacher should plant additional seeds incase a student's plant may not grow.
Additional plants should be used to do a class demonstration on the effect of different amounts of water, sunlight and/or different temperatures (air conditioning/fridge vs natural room temperature)

Spend time discussing student predictions of:

- How long it will take for your plants to grow?
- What will happen to the plants that are growing under different conditions?
- What will it look like when the plant is placed in the dark? (**Teacher Note**: Plants that are in the dark will initially grow taller than plants in the sun as a result of a hormone that is produced by the plant. These plants will also have a "yellowish" color and a thinner stem. Eventually the plant will die because sunlight is required for photosynthesis to make food for the plant. You may want to place this "yellow" plant in the sunlight and watch the plant turn "greener" and grow toward the sun.) How long did it take to turn green?
- What will the plant look like when it is grown in a cooler temperature?
- What will happen if plants get more/less water?

NOTE: Tens rods are included in the kit to be used to measure the growth of the plants (Student Notebook page 10).

*You may want to make a connection between this lesson and the book, *Frog and Toad*.
Possible Literature Connection: *How a Seed Grows*, Helene Jordan
K2, K3, S1, S2, S4, S5, S7, S8, S9, S10, S11
Student Notebook: Page 3-11

RELATED ESSENTIAL QUESTIONS:

- *How do changes in light, water and temperature affect the growth of a plant?*
- *How do plants get water? food?*

See appendix 1 & 2 for sample lesson ideas

Parts of a Plant and their Functions

Identify and discuss the parts of a plant (leaves, stem, roots, and flowers) and their functions.
Possible Literature Connection – *From Seed to Plant*, Gail Gibbons and *A Dandelion's Life*, John Himmelman
K3, S2
See appendix 3 for sample assessment
Student Notebook: Page 12

RELATED ESSENTIAL QUESTIONS:

- *How do plants get water? food?*

Celery in Food Coloring - Stems

Place a few stalks of celery (or carnations) in water with food coloring. The teacher or a student will need to bring in two or more celery stalks. Observe the stem structure by having students look at pieces of celery and "pull" it apart. It will take several days for the food coloring to travel up the stalk. Have students predict what they think might happen. Have the students draw a picture of the celery when it is first placed in food coloring and after a few days. Make observations.

- Note: You might want to separate bottom half (2-3 inches) of a large celery stalk. Put one part in red food coloring and the other part in blue food coloring. Observe the effect on the top of the celery stalk.

K2, K3, K8, S1, S2, S4, S5, S6, S9, S10, S11
Student Notebook: Page 13-14

RELATED ESSENTIAL QUESTIONS:

- *How do plants get water? food?*

Skip Lessons:
Lesson 4 – Observing Woodland Plant
Lesson 5 – Observing Freshwater Plants

Lesson 7 – Observing Freshwater Snails
Lesson 8 – Observing Guppies: How Do They Compare with the Snails? (Combine Lesson 7 and 8)

Discuss:

- How do snails move? How do guppies move? How do other animals move?
- What do snails look like? What are the parts of a snail?
- What doe a guppies look like? What are the parts of guppies?
- What do you think these animals looked like when they were born? (both start as eggs) How do they change as they grow? (life cycle)

Possible Literature Connections – *Snail*, Karen Hartley and Chris Macro
What Is a Fish?, David Eastman
K6, K8, S2, S8, S9
Student Notebook pages 15-18

Note: Fish only need to be fed approximately every 2-3 days. They only need a very small amount of fish food. If your water gets cloudy and/or an odor develops, it may be due to over feeding of your fish. If this happens, replace your water and limit the amount of fish food. Contact the Science Resource Center for additional supplies or organism, if needed.

RELATED ESSENTIAL QUESTIONS:

- *How do different animals move?*

- *How are plants, birds, fish, insects and mammals the same and different?*
- *How do different animals obtain water and food?*

Lesson 9 – Observing Pill Bugs
Lesson 10 – Observing Millipedes: How Do They Compare with the Pill Bugs? (Combine Lesson 9 and 10)

Discuss:

- How do pill bugs move? How do millipedes move? How do other animals move?
- What do pill bugs look like? What are the parts of a pill bug?
- What doe a millipede look like? What are the parts of a millipede?
- What do you think these animals looked like when they were born? (eggs) How do they change as they grow? (life cycle)

Possible Literature Connection – *A Pill Bug's Life*, John Himmelman
K6, K8, S2, S8, S9
Student Notebook pages 19-22

RELATED ESSENTIAL QUESTIONS:

- *How do different animals move?*
- *How are plants, birds, fish, insects and mammals the same and different?*
- *How do different animals obtain water and food?*

> *Note: Insects like to eat raw potatoes, apples or lettuce. In your terrarium include a small piece of food for the insects.*

Skip Lessons:
Lesson 11 – What's Happening in the Aquarium
Lesson 12 – What's Happening to the Terrarium
Lesson 13 – Freshwater and Woodland Plants: How do they Compare?

Lesson 14 – Freshwater and Woodland Animals: How do They Compare?

- Compare how different animals move.
- Compare the life cycles of these organisms.
- Compare and contrast the behavior of adults and their young.
- Compare and contrast their appearance(s), what they eat, and how they get food, and where they live.
- Review what different animals need to live to be healthy

Possible Literature Connection - *A Slug's Life*, John Himmelman
K6, K8, S2, S7, S9
Student Notebook page – none – Create a class chart looking at similarities and differences.

RELATED ESSENTIAL QUESTIONS:

- *How do different animals move?*
- *How are plants, birds, fish, insects and mammals the same and different?*
- *How do different animals obtain water and food?*

Lesson 15 - How Are Our Plants and Animals Alike and Different?

Summarize the similarities and difference between different types of animals and plant.
Review the characteristics of a living organism vs non-living object.
K3, K4, K6, K7, K8, K9, S2, S9, S10
Student Notebook pages 23-24 (page 24 is a blank Venn Diagram that is optional)

RELATED ESSENTIAL QUESTIONS:

- *How do different animals move?*
- *How are plants, birds, fish, insects and mammals the same and different?*
- *How do different animals obtain water and food?*

Skip Lesson:
Lesson 16 – Take A Look at Ourselves

Life Cycle of Butterflies, Frogs, and Ladybug (This will be more than one lesson)

Using the models and poster(s) in the kit, discuss the changes in structure during the life cycles of animals that metamorphose (butterfly, frog, and ladybug).
Lesson Ideas include:

- Have students keep a journal that depicts their observations of each stage, how the stages differ, labeled pictures of each stage.
- Possible Literature Connection – *Frog and Toad* series, A *Monarch Butterfly's Life and A Luna Moth's Life*, John Himmelman
- See appendix 4 & 5 for sample assessment - frog life cycle and ladybug life cycle
- See appendix 6-8 for lesson ideas related to the life cycle of lady bug, frog and butterfly
- Wallingford has a few *Butterfly Life Cycle Science Kits*. If you are interested in hatching butterflies in your classroom, please contact the Science Resource Center or Science Resource Teacher for more information.
- Contact the Science Resource teacher for information on hatching chicks in your classroom.
- Other lesson ideas can be found at http://www.bcps.org/offices/lis/models/lifecyc/index.htm

* Note – You may want to cover this objective (K5) at a different time of year. For example, you may want to observe the life cycle of a butterfly by watching the eggs of a Painted Lady Butterfly metamorphose into a butterfly, or as a science connection with the *Frog and Toad* series.
K5, K6, S2
Student Notebook pages 25 - 30

RELATED ESSENTIAL QUESTIONS:

- *Explain the life cycles of organisms that metamorphose and those that do not.*
- *How are adults and their off springs the same and different in how they look and behave?*

Appearance and Behavior of Juvenile and Adult Animals

Compare and contrast the appearance **and** behavior of animals such as:

- Humans
- Dogs/cats
- Chicks
- Penguins

Note: this objective could be reviewed throughout the year as you touch upon different animals
Possible Literature Connections – *Amazing Animal Babies,* Eyewitness Juniors
Suggestion – Check your library media center for an appropriate video to make observations about the appearance and behavior of different animals.
K7, S2
Student Notebook page 31

RELATED ESSENTIAL QUESTIONS:

- *Explain the life cycles of organisms that metamorphose and those that do not.*
- *How are adults and their off springs the same and different in how they look and behave?*

LITERATURE RESOURCES

These literature resources have been purchased to supplement the kit and are housed in each elementary school library.

Guided Reading Sets (6 copies in each school)

In The Desert, Diane Brantley
Here Come the Bison, Elizabeth Savage
Animal Inventions, Diana Noonan
Why the Rooster Crows at Sunrise, Sharon Fear
Animal Mix-Ups, Linda Johns
Chameleons, Nic Bishop
Prairie Dogs, Bobbi Chukran
Night Gliders, Joanne Ryder
About Mammals – A Guide for Children, Cathryn Sill
What Makes An Amphibian, Lynn Stone
What Makes A Reptile?, Lynn Stone
A Pill Bug's Life, John Himmelman
What Is a Reptile?, Susan Kuchalla
What Is a Fish?, David Eastman
Now I Know Birds, Susan Kuchalla

Big Books (1 copy per school)

The Reason For A Flower, Ruth Heller
Plants That Never Ever Bloom, Ruth Heller

Related Materials that May Be Found in Your Library

Frogs, Toads, Lizards, and Salamanders, Parker & Wright
Underground, Klingel & Noyed
Sky Tree, Thomas Locker
Amazing Fish, Mary Ling
ABC of Birds, Linda Westervelt
Insects and Other Invertebrates, Carol Greene
Where's That Insect?, Brenner & Chardiet
Have You Seen Trees?, Joanne Oppenheim
A Dandelion's Life, John Himmelman
Sea Elf, Joanne Ryder
A Tree Is Growing, Arthur Doros
Amazing Mammals, Alexandra Parsons
Butterfly, Mary Ling
The Yucky Reptile Alphabet Book, Jerry Pallotta
A Log's Life, Wendy Pfeffer
The Bird Alphabet Book, Jerry Pallotta
Once There Was A Tree, Natalia Romanova
Birds We Know, Margaret Friskey
Reptiles, MacLeod & Stevens
How a Plant Grows, Bobbie Kalman

Discovering Reptiles & Amphibians, Stephen Caitin
Wonders of Plants & Flowers, Laura Damon
Animal Tracks, Arthur Dorros
Biggest, Strongest, Fastest, Steve Jenkins
From Seed to Plant, Gail Gibbons
How Do Apples Grow?, Betsy Maestro
I See Animals Hiding, Jim Arnosky
From Seed to Sunflower, Gerald Legg
Magic School Bus – Plants Seeds, Patricia Relf
Nature Up Close Series:
- *A Dandelion's Life*, John Himmelman
- *An Earthworm's Life*, John Himmelman
- *A House Spider's Life*, John Himmelman
- *A Hummingbird's Life*, John Himmelman
- *A Ladybug's Life*, John Himmelman
- *A Luna Moth's Life*, John Himmelman
- *A Monarch Butterfly's Life*, John Himmelman
- *A Pill Bug's Life*, John Himmelman
- *A Salamander's Life*, John Himmelman
- *A Wood Frog's Life*, John Himmelman

Prairie Dogs Kiss and Lobsters Wave: How Animals Say Hello
Is Your Mama a Llama?, Deborah Guarino
A House for Hermit Crab, Eric Carle
Fish is Fish, Leo Lionni
Each Living Thing, Joanne Ryder
Amazing Animal Babies, Eyewitness Juniors 25
What I like about Toads, Judy Hawes
Watch Me Grow Frog, DK
Frogs, Gail Gibbons
How Plants Survive, Kathleen Kudlinski
Who Eats What?, Patricia Lauber

Materials List
Organisms – Grade 2

Revised Jan. 2006
(Based on the STC Organisms Kit)

Expendable Materials
25 copies of student notebook – from central production (Organisms)
60 red kidney beans
60 pumpkin seeds
60 sunflower seeds
60 little marvel peas
1 box disposable plastic gloves
2 - 4 x 6 post-it note pads
Assorted dots- 0.5" diameter (8 each red, blue, white, yellow)
1 big bag - **seed starter potting soil** (enough for 30 planting cups)
30 skewer (to support plant growth)
30 – 9 oz. plastic cups (for planting seeds)
30 – lids for 9 oz cups
30- 1-qt. Ziploc bags (for placing over plants)
1 – 30 gal. trash bag
5 qts. **woodland terrarium** soil (enough for 5 terrariums)
1 qt. Ziploc bag of dead leaf matter
2 -5 lb. aqua gravel (split between 5 aquarium and 5 terrariums)
1 bottle tap water conditioner
1 container flake fish food

Reusable Materials
1 *Organisms* teacher's manual
1 curriculum guide
25 hand lenses (magnifying glasses)
2 plant misters
5 cafeteria trays (or 2 red, 2 yellow, 2 blue, & 2 white plastic plates) – to hold cups with plants
1 small bottle red food coloring
1 small bottle blue food coloring
5 terrariums - plastic flex tanks and lids (1 1/2 gal.) (number 1-5)
3 plastic pails and lids (1 gal.) (for storing extra water)
2 aquarium dip nets
1 aquarium thermometer
1 plastic ladle
5 aquariums - plastic flex tanks and lids (1 gal.) (numbered 1-5)
1 colander (for washing gravel for aquarium)
30 plastic spoons
25 - 10 rods
2 Models of tadpole life cycle – 5 pcs
2 Models of butterfly life cycle – 4 pcs
2 Models of ladybug life cycle – 4 pcs
Poster life cycle of frog
Poster butterfly life cycle
1 set of 12 cards for life cycle of frog, butterfly, and chick

Live Organisms on Next Page ➡

Live Organisms
Aquarium
5-10 pond snails (1-2 per aquarium)
30 guppies (5 bags of 6 fish each)
5 pieces of a freshwater plant for snails to eat
Terrarium
5 millipedes
5 pieces moss mats (1 piece per terrarium for bugs to hide under)
5 tree seedlings (1 per terrarium)
25 pill bugs (put 5 bugs into 5 small containers for delivery)

Note: Please e-mail the Science Resource Center or Science Resource Teacher to schedule the deliver of your live organisms. For planning purposes, please give a few days advance notice. When you are near the end of the unit, you will also need to e-mail to schedule the pick up of your live organisms.

Note: Insects like to eat raw potatoes, apples or lettuce. In your terrariums, include a small piece of food for the insects.

Note: Fish only need to be fed approximately every 2-3 days. They only need a very small amount of fish food. If your water gets cloudy and/or an odor develops, it may be due to over feeding of your fish. If this happens, replace your water and limit the amount of fish food.

Teacher Background Notes

These science content background notes were created to provide you, the teacher, with some useful background information related to new objectives in this kit. These notes are not meant to be an overview of the unit, but as background information for you that go beyond the content of this particular unit. ***The STC Organisms Teacher Guide also contains useful background information for the teacher.***

Butterfly and Moth Life Cycle

The butterfly life cycle includes four stages: egg, caterpillar (or larva), pupa, and adult. After courtship and mating, female butterflies deposit their eggs, often on the undersides of leaves. Many lay their eggs on plants that will provide food for the caterpillars when they hatch.

The caterpillar is the main eating and growth stage. A caterpillar will eat until it grows too big for its skin! When this happens, it sheds its skin for a new one, and will do this four to six times as it grows.

The pupa is the transformation stage where the caterpillar turns into an adult. A butterfly's pupa is called a chrysalis. Moths, unlike butterflies, usually enclose their pupa in a silk cocoon spun from special glands.

Flight

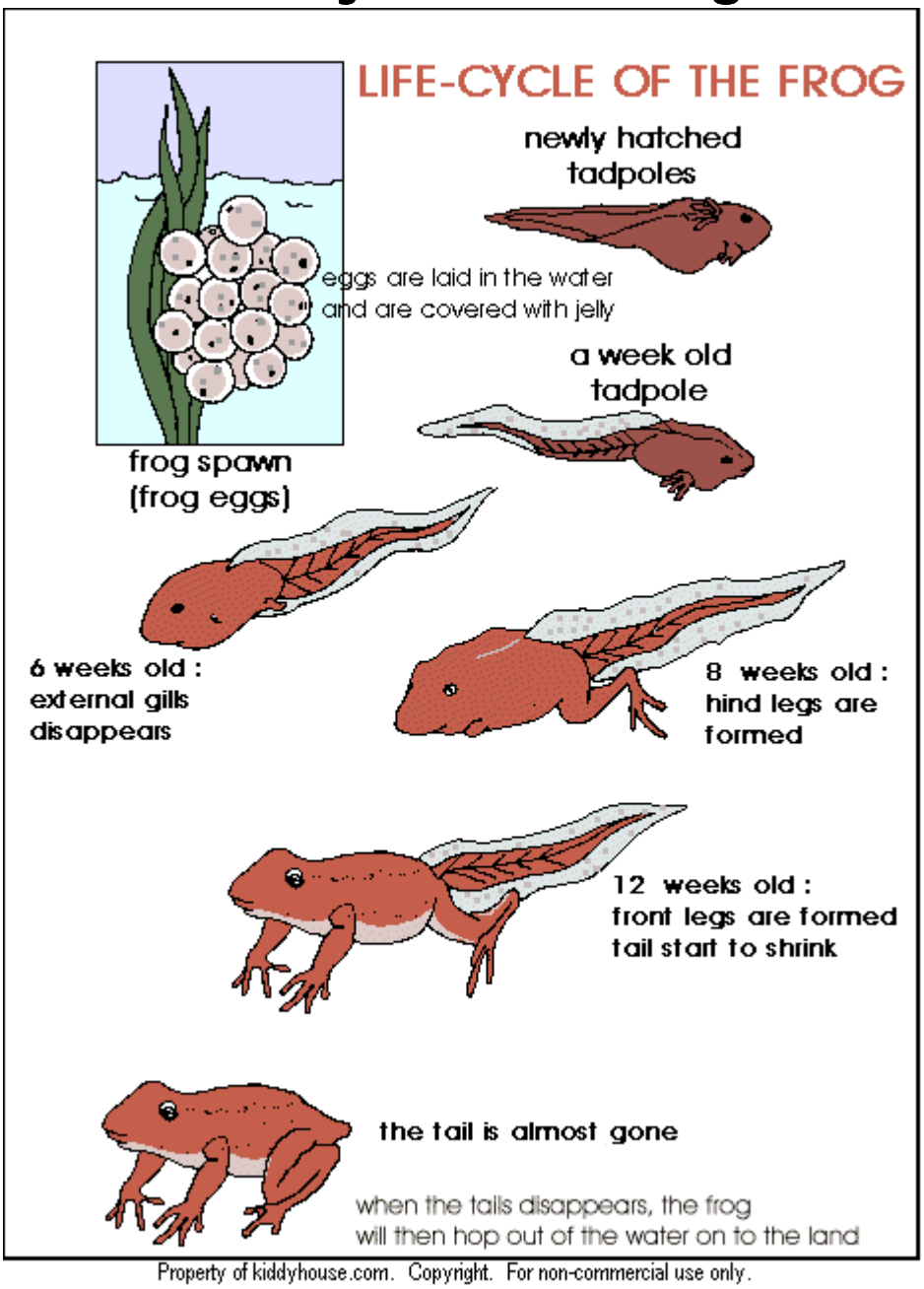
Butterflies are creatures of the sun and fly best when they're warm. On cool days, they perch on rocks or bask in the sun to absorb heat and rev up their metabolism.

Monarch butterflies migrate thousands of miles between Canada or the northern United States and Mexico each winter. While a single generation makes the trip south, monarchs returning north are shorter-lived, and it takes several generations to complete the trip north the next year.

Feeding

Adult butterflies don't eat--they only drink. They drink liquids from flowers, juice from rotten fruit, or even sweat or liquid animal waste. Caterpillars, on the other hand, do very little but eat--leaves or other plant parts for most species. Some moths, including the luna, have no mouth parts at all as adults and cannot eat. They live just a few days, reproduce, and die.
http://www.fieldmuseum.org/butterfly/life_basic.htm

Life Cycle of the Frog



http://www.kiddyhouse.com/Themes/frogs/lifecycle.html

The Egg

Frogs lay their eggs in water or wet places. A floating clump of eggs is called frog spawn. The large and slippery mass of eggs are too big to be eaten. This is nature's way of protecting them. But, the smaller clumps of eggs will be eaten by the creatures living near or in the pond. The egg begins as single cell. Several thousand are sometimes laid at once. It becomes surrounded by a jellylike covering, which protects the egg. The female may or may not stay with the eggs to take care of the young after she has laid them. The egg slowly develops. But, only a few develop into adults. Ducks, fish, insects, and other water creatures eat the eggs.

The Cell Splits

The single cell in the egg eventually splits into two. These two split making four cells, and so on. Eventually, there are many cells in the egg.

The Embryo

The mass of cells in the egg come to form an embryo. Organs and gills begin to form, and in the meantime, the embryo lives off of its internal yolk. This supplies it with nutrients for 21 days.

The Tadpole

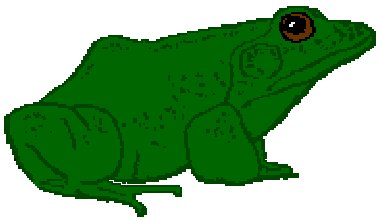
After its 21 day development period, the embryo leaves its jelly shell, and attaches itself to a weed in the water. This quickly becomes a tadpole, a baby frog. The tadpoles grow until they are big enough to break free into the water. This can take from 3 days to 3 weeks, depending on what kind of frog they will become. They eat very small plants that stick to larger plants in the water. These tiny plants are called algae. The tadpole has a long tail, and lives in the water. It is extremely vulnerable, and must rely on its camouflage to protect it.
The tadpole has a long tail, and lives in the water. It is extremely vulnerable, and must rely on its camouflage to protect it. The tadpoles also face danger by being eaten by other water animals. Sometimes the pond dries up. As a result the tadpoles die.

The Tadpole Begins To Change

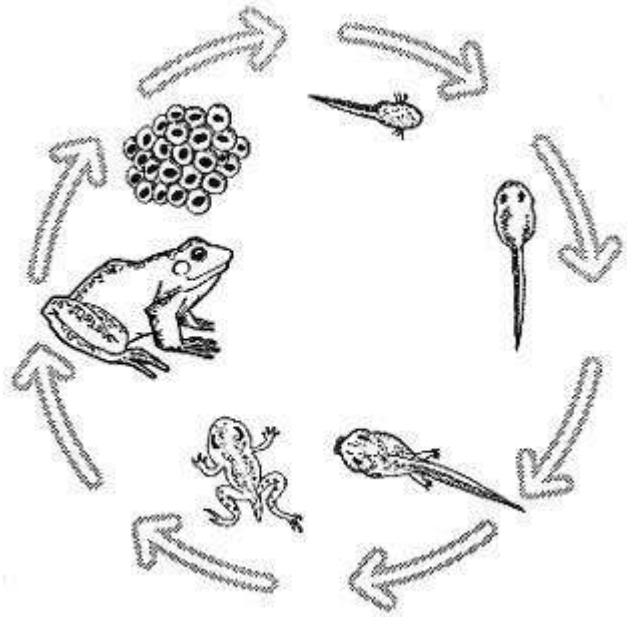
After about five weeks, the tadpole begins to change. It starts to grow hind legs, which are soon followed with forelegs. Behind their heads bulges appear where their front legs are growing. Their tails become smaller. Lungs begin to develop, preparing the frog for its life on land. Now and then, they wiggle to the surface to breathe in air. The tail becomes larger and makes it now possible for the tadpole to swim around and catch food. They eat plants and decaying animal matter. Some tadpoles eat frog eggs and other tadpoles.

Over time, the tadpole becomes even more froglike. They have shed their skin and lips. Its mouth widens, and it loses its horny jaws. The tail becomes much smaller, and the legs grow. The lungs are almost functioning at this point.

The Frog



Eleven weeks after the egg was laid, a fully developed frog with lungs, legs, and no tail emerges from the water. This frog will live mostly on land, with occasional swims. The tiny frogs begin to eat insects and worms. Eventually, it will find a mate. The way this is done varies depending on the species. The female lays the eggs, the male fertilizes them, and the whole process begins again.



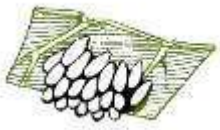
http://www.tooter4kids.com/Frogs/life_cycle_of_frogs.htm

Life Cycle of a Lady Bug

Ladybugs aren't so cute when they're born--you may not even recognize them. They hatch from eggs and look like tiny alligators. The new bug is called a ***larva***, and it takes about **21 days** for it to grow up to be a ladybug beetle.

Eggs

Mother ladybugs lay ten to fifteen eggs on the underside of a leaf. They look like tiny, elongated, yellow jelly beans.



Larva

Larvae crawl out of their eggs and begin to look for food. Mother bugs make sure there are lots of aphids or mites nearby because the larvae will eat a lot of them before they become adults. They look like tiny alligators--and they bite!

Bigger Larva

After a few days, the little larvae begin to grow, and soon they shed their skins. This is called "moulting" and it happens several times. If you look closely you can see old skins clinging to leaves or to the grass in your ladybug jar.

Pupa

In about two weeks, the bigger larvae begin to look a little different, something like a lobster without legs and claws. They attach themselves to a leaf and hardly move at all. They are doing something extraordinary under their skins.

Imago or Adult Ladybug

In another few days the ladybug splits its pupa and emerges looking very different. For the first few hours it's pale and soft. Its shell quickly hardens. Its color becomes a bright color. Now it looks just like its mother--a perfect adult ladybug. What seems like amazing magic is one wonderful way the natural world works: ladybug metamorphosis.

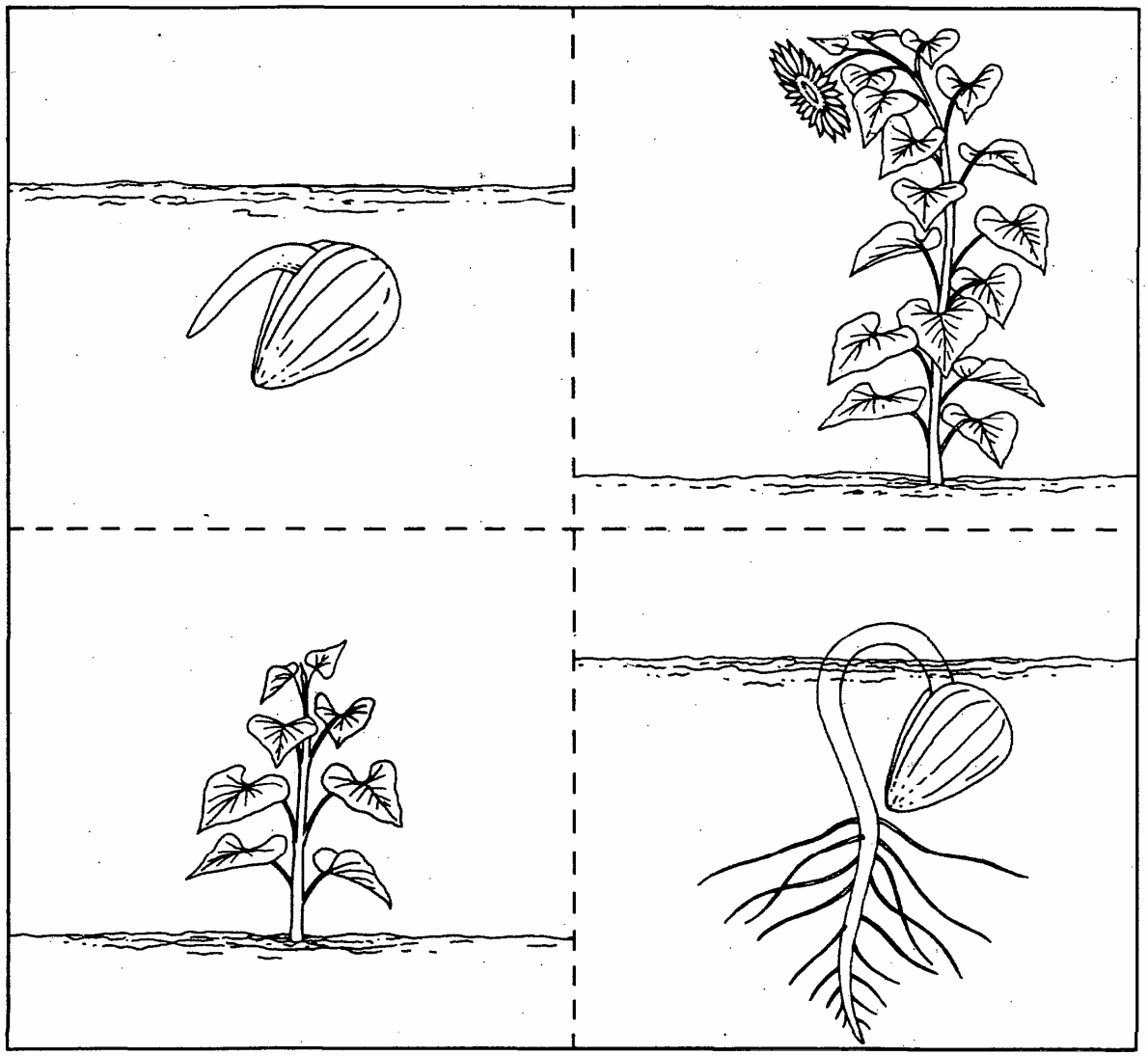
http://www.earthsbirthday.org/butterflies/ladybugs/lifecycle.asp

Appendix 1

The Stages in the Growth of a Sunflower

Directions:

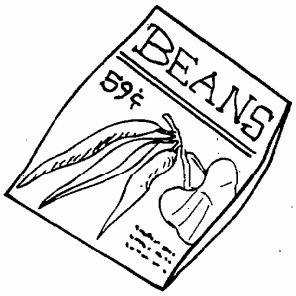
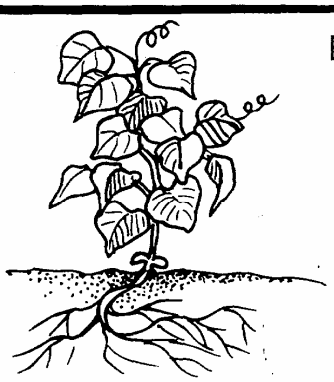
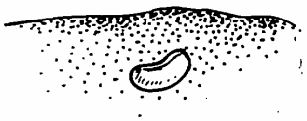
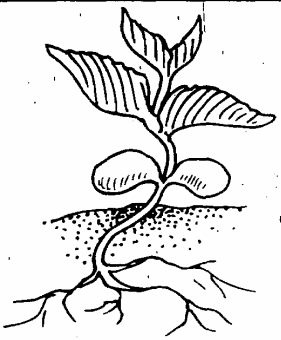
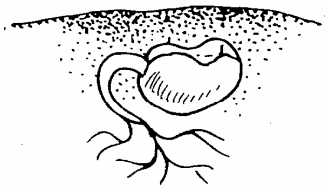
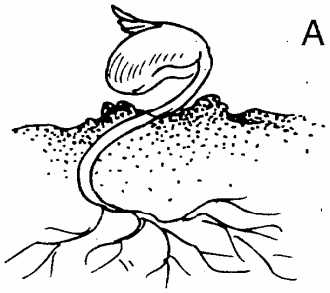
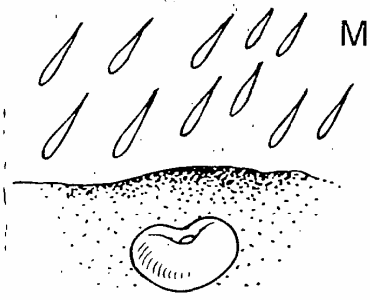
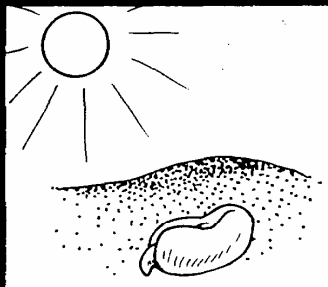
1. Color the pictures about the stages of the growth of a sunflower.
2. Cut out the stages and paste them in order on a separate piece of paper.
3. Write one or two sentences describing each stage.



Appendix 2

From Seed to Plant

Directions: Color the pictures and illustrate the title box. Cut out the pictures and arrange them in order, starting with the title. The letters in the corners spell a word that means ***begin to grow***. Staple the pictures into a booklet.

From Seed to Plant G	E  The seed does not begin to grow until conditions are right.	E  The plant is full-grown.
R  The seed gets planted in soil.	T  Leaves form that make food for the plant.	N  Part of the new plant grows downward and becomes the roots.
A  Part of the new plant grows up through the ground.	M  The seed swells when it gets water, warmth, and air.	I  The seed coat splits and the new plant sprouts.

Plant Parts

Matching

Directions: Write the letter that describes the function of each plant part.

1. Stem _____

2. Leaves _____

3. Roots _____

4. Flowers _____

A. This part keeps the plant in the soil. It also collects water (moisture) from the soil.

B. This part helps the plant stand up. It carries water (moisture) and food to all parts of the plant.

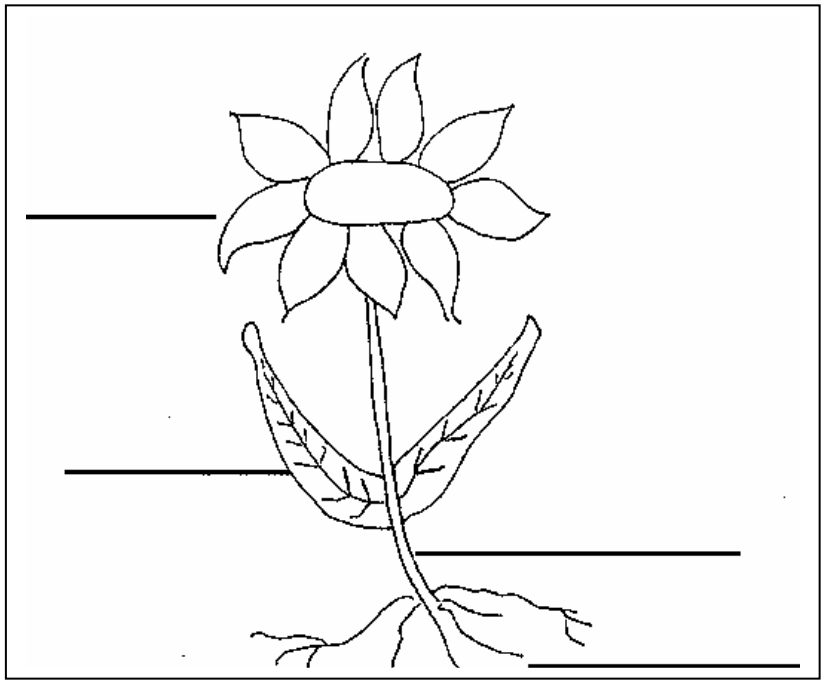
C. This part makes seeds so we can grow new plants.

D. This part makes food for the plant from the sun's rays and carbon dioxide. This is called

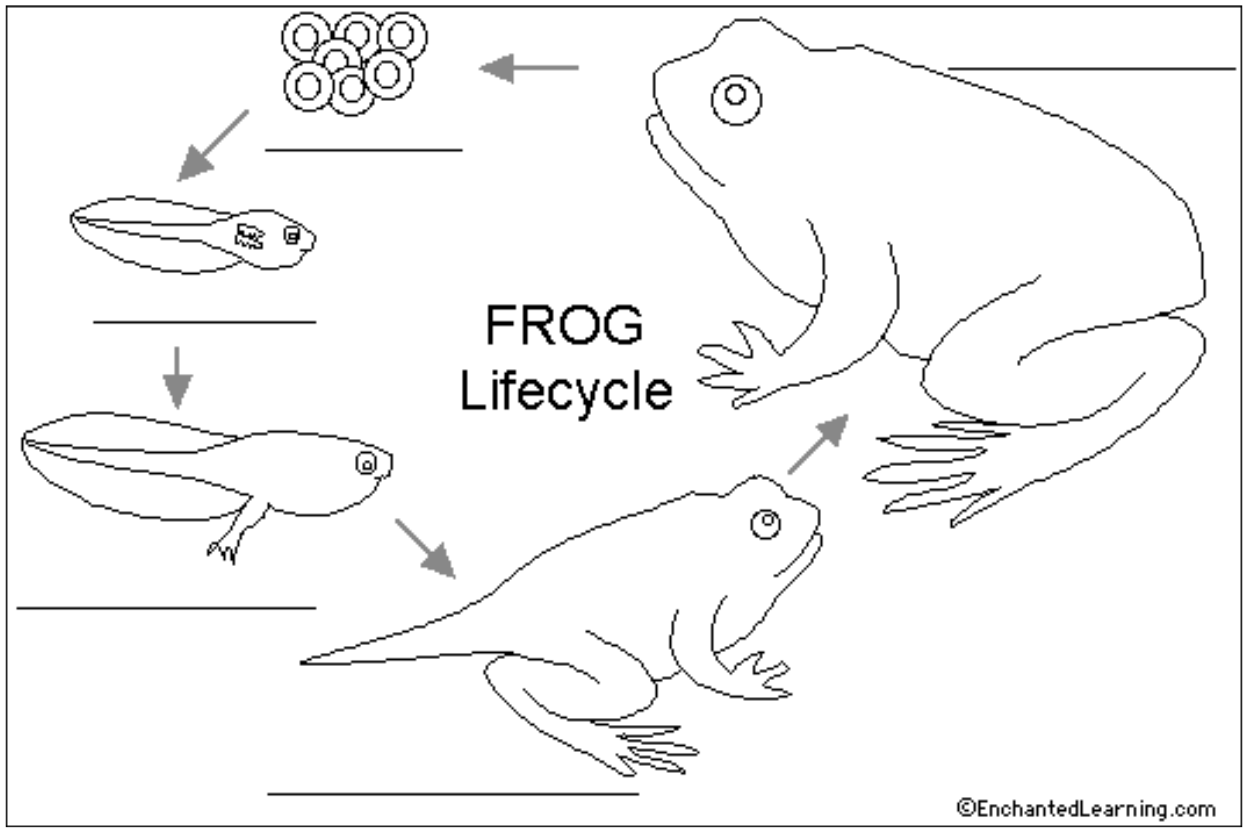
Fill in the blank

Directions: Use the correct word in the box to label each plant part

Flowers	Leaves
Roots	Stems



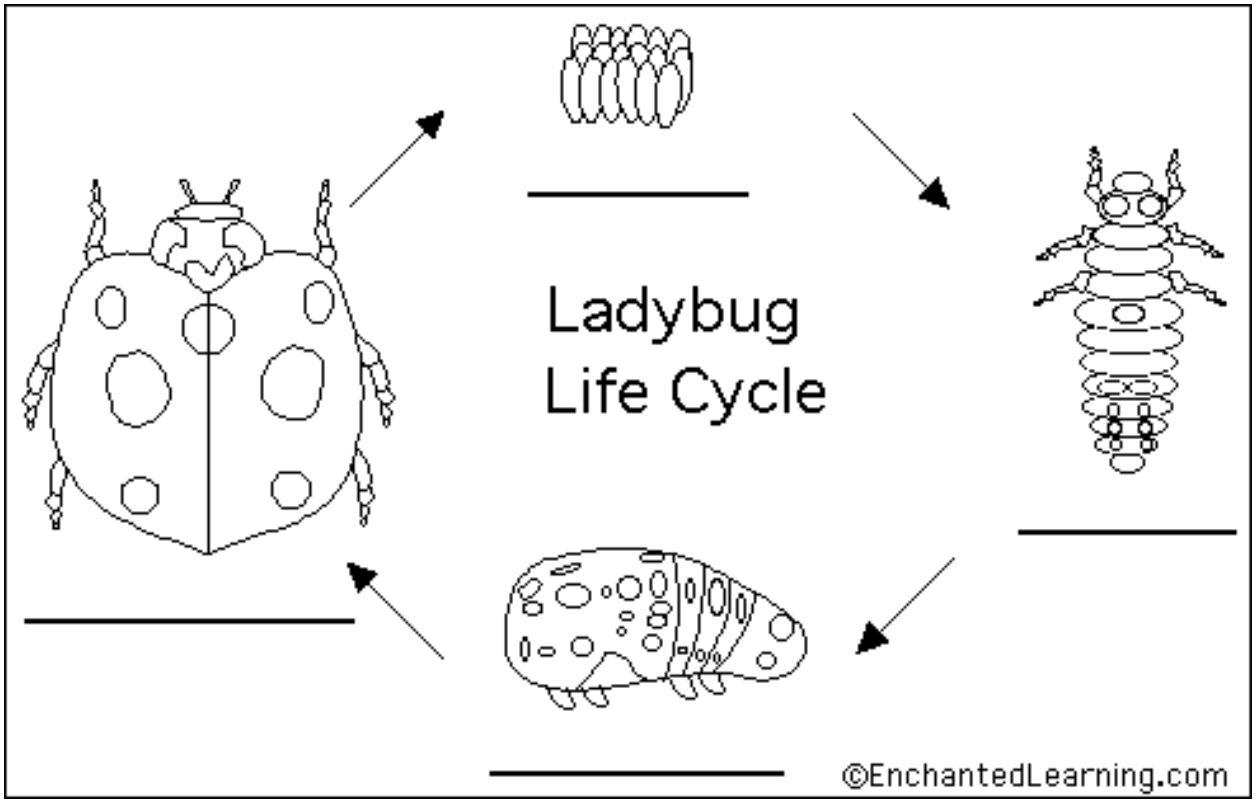
Appendix 4



FILL IN THE BLANKS

tadpole	froglet	eggs
adult frog	tadpole with legs	

Appendix 5



FILL IN THE BLANKS

larva eggs adult pupa

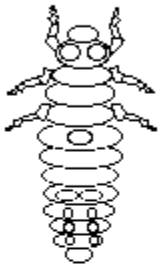
Appendix 6

Ladybug Sequencing Cards

Directions: Cut out each card and glue in correct order on separate sheet of paper.

Larva

The larva molts (sheds its skin) many times as it grows. The larval stage lasts 2 to 4 weeks

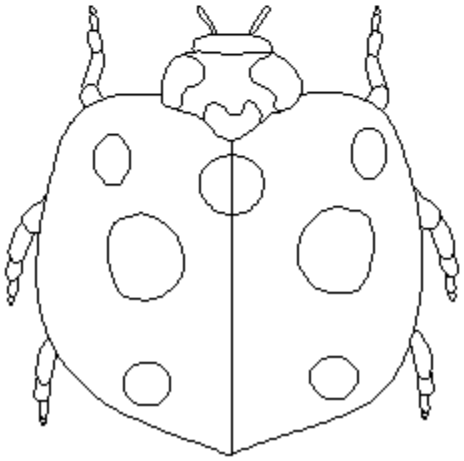


Eggs

Tiny yellow eggs are laid on leaves. They hatch in 3-7 days.

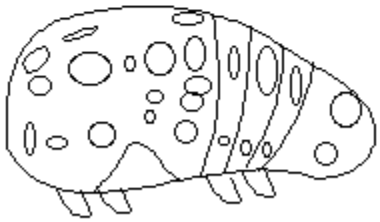
Adult

Adults live for a few months.



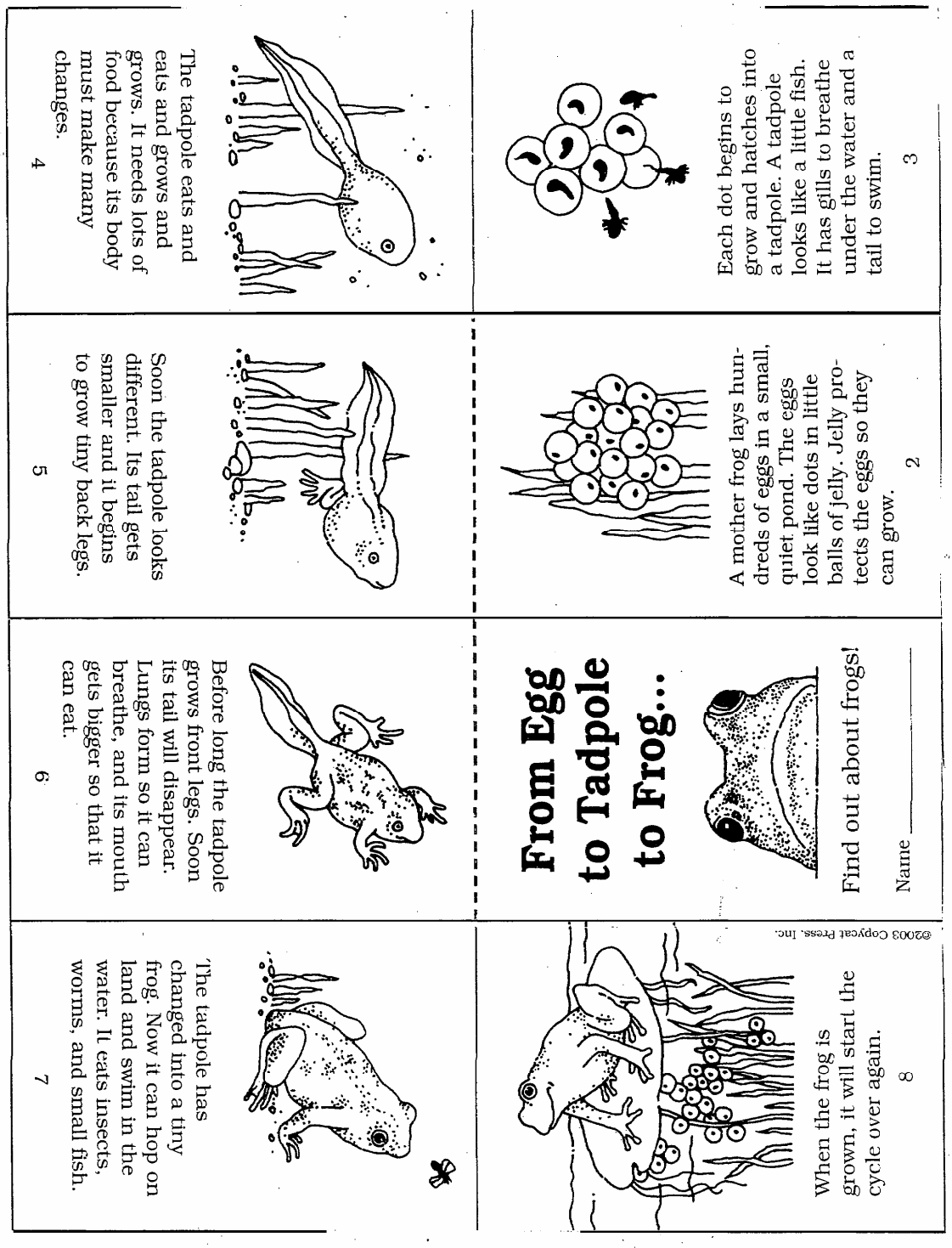
Pupa

This stage lasts 5 to 7 days.



Appendix 7

Directions: Cut out the large rectangle and along the dotted line in the center. Fold the book so the page numbers are in the correct order.



From Egg to Tadpole to Frog...

Find out about frogs!

Name _____

A mother frog lays hundreds of eggs in a small, quiet pond. The eggs look like dots in little balls of jelly. Jelly protects the eggs so they can grow.

2

Each dot begins to grow and hatches into a tadpole. A tadpole looks like a little fish. It has gills to breathe under the water and a tail to swim.

3

The tadpole eats and eats and grows and grows. It needs lots of food because its body must make many changes.

4

Soon the tadpole looks different. Its tail gets smaller and it begins to grow tiny back legs.

5

Before long the tadpole grows front legs. Soon its tail will disappear. Lungs form so it can breathe, and its mouth gets bigger so that it can eat.

6

The tadpole has changed into a tiny frog. Now it can hop on land and swim in the water. It eats insects, worms, and small fish.

7

When the frog is grown, it will start the cycle over again.

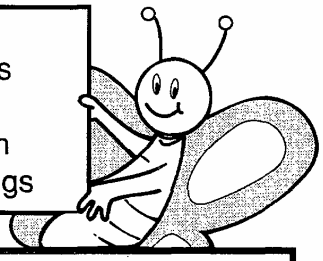
8

Butterfly Stages

Use the word bank to complete each booklet page.
Draw a picture to match each page.
Number each ○ to show the order of the butterfly stages.

Word Bank

caterpiller	four	legs
chrysalis	gone	six
eat	hard	skin
egg	leaf	wings



○

A butterfly's life has _____ stages. The first stage is as a tiny _____ resting on a _____.

EGG

○

The second stage begins when the egg hatches. The tiny _____ looks like a worm with many short _____. It eats its eggshell first, then eats leaves and other things. Caterpillars _____ all the time!

LARVA

○

When the chrysalis breaks open, the caterpillar is _____. A butterfly comes out with _____ thin legs and two beautiful _____.

ADULT

○

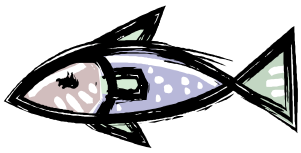
After growing and shedding its _____ several times, the caterpillar forms a _____ shell around itself called a _____. The caterpillar grows and changes inside.

PUPA

Appendix 9

ANIMAL CLUES

Directions: Your teacher made animal information cards for you to tell your kindergarten buddy how to handle gerbils, birds and fish. The cards fell on the floor and got all mixed up. Help your teacher by placing or gluing these cards correctly under the picture of each animal.

Gerbil	Bird	fish
Turn its eggs twice a day. Keep them warm.	It may run away. Close the room's door!	Do not let it fly around the room. It may hurt its wings.
Add fresh water to its tank. Make sure the water is aged.	Give its babies a place to swim and hide. Put plants in the tank.	
Hold a hand over the net. It may flip out of the net.	Pet its fur. It will get used to you.	
It may have a litter of babies. Don't hold them for three weeks. Their eyes will be open then.		Put a cover on its cage. It will stop chirping or singing and go to sleep.

A DESCRIPTION OF INQUIRY

At the *Exploratorium Institute for Inquiry* our work in science education is deeply rooted in the belief that human beings are natural inquirers and that inquiry is at the heart of all learning. The work that we do with educators is designed to give them an opportunity to personally experience the process of learning science through inquiry. Our hope is that this experience will stimulate their thinking about how to create classrooms that are supportive environments for children's inquiry.

Inquiry is an approach to learning that involves a process of exploring the natural or material world, that leads to asking questions and making discoveries in the search for new understandings. Inquiry, as it relates to science education, should mirror as closely as possible the enterprise of doing real science.

The inquiry process is driven by one's own curiosity, wonder, interest or passion to understand an observation or solve a problem.

The process begins when the learner notices something that intrigues, surprises, or stimulates a question—something that is new, or something that may not make sense in relationship to the learner's previous experience or current understanding.

The next step is to take action—through continued observing, raising questions, making predictions, testing hypotheses and creating theories and conceptual models.

The learner must find her or his own pathway through this process. It is rarely a linear progression, but rather more of a back and forth, or cyclical, series of events.

As the process unfolds, more observations and questions emerge, giving occasion for deeper interaction and relationship with the phenomena—and greater potential for further development of understanding.

Along the way, the inquirer collects and records data, makes representations of results and explanations, and draws upon other resources such as books, videos and the expertise or insights of others.

Making meaning from the experience requires reflection, conversations and comparison of findings with others, interpretation of data and observations, and the application of new conceptions to other contexts. All of this serves to help the learner construct new mental frameworks of the world.

Teaching science using the inquiry process requires a fundamental reexamination of the relationship between the teacher and the learner whereby the teacher becomes a facilitator or guide for the learner's own process of discovery and creating understanding of the world.