

HIGH SCHOOL BIOLOGY

Level 250

SCHEDULE PLUS





Thank you for downloading this sample of Sonlight's Science 250 Schedule Plus (referred to as the Science Schedule Plus at this level). In order to give you a full perspective on our Instructor's Guides, this sample will include parts from every section that is included in the full IG.

Here's a quick overview of what you'll find in this sample.

- A Quick Start Guide **START HERE**
- A 3-week Schedule & Detailed Teaching Notes
- Sample Experiment Forms

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Blessings!

Sarita Holzmann,
Co-founder and president
of Sonlight Curriculum

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Science

Biology Schedule Plus

By the Sonlight Team

Sonlight Curriculum® Science 250 “Biology Schedule Plus,” Thirteenth Edition

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“Do to others what you would have them do to you” (Matthew 7:12).

“The worker is worth his keep” (Matthew 10:10).

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Sonlight Curriculum, Ltd.
8042 South Grant Way
Littleton, CO 80122-2705
USA

Phone (303) 730-6292 Fax (303) 795-8668

E-mail: main@sonlight.com

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INSTRUCTOR'S GUIDES

SCIENCE

Special features of Sonlight's Science Schedule Plus Guides:

1 A Weekly Schedule & Detailed Teaching Notes

All your books and experiments are fully scheduled for the entire year. The weekly schedules let you see your entire week at a glance. The first column lists the titles of each book or assignment. The remaining columns include the day-by-day assigned pages or tasks.

2 Organizational Tools to Help You Plan Ahead

See at a glance the supplies you need for experiments this week and the following week. Know what supplies you'll find in the Sonlight Science Kits, and which household items you'll want to have ready.

3 Extra Helps

Immediately following each week's schedule page, you will find vocabulary your children will need to memorize. Your primary task: read the assigned pages in the Textbook listed in the schedule, then memorize the vocabulary terms. You'll find comprehension questions throughout the textbook as well as tests for each module.

4 Experiment Forms

The back section of the Science Schedule Plus includes experiment write-ups to use in conjunction with the labs you complete each week. Use the examples to help your student record pertinent information from their labs. Feel free to copy as many as your student needs. Each experiment is scheduled out for you.

Week 1—Module 1					
Date:	Day 1	Day 2	Day 3	Day 4	Day 5
Discovering Design with Chemistry	pp. 1–5	pp. 6–9 (up to Converting Between Units)	pp. 9–13 (through Comprehension Check)	pp. 13–18 (up to Converting Between Volume Units)	pp. 18 (top)–22 (through Comprehension Check)
Comprehension Check	#1–2	#3–4	#5–6	#7–8	#9–12
Experiments		1.1		1.2	
Vocabulary ¹	☐	☐		☐	☐
Supplies ²	We Provide: 355-05—safety glasses, funnel, graduated cylinder, medicine dropper You Provide: ruler(s) with inches and centimeters, soft covered book, small cylindrical container, like a pill bottle or spice jar (must be able to hold water), water, sink				
Shopping/Planning List	For next week: We Provide: 355-05—safety glasses, graduated cylinder, mass scale ³ , medicine dropper, 250-mL beaker You Provide: water, cooking oil, table salt in a salt shaker				
Other Notes					

Be familiar with all words **bolded** in the text.

Week 1—Module 1

Significant figure: A digit in a measurement that contributes to the measurement's precision. [p. 4]

Rules for determining significant figures: [p. 4]

- All non-zero figures (1, 2, 3, 4, 5, 6, 7, 8, 9) are significant.
- A zero is significant if it is between two significant figures.
- A zero is significant if it's at the end of the number AND to the right of the decimal point.

When adding and subtracting measurements, you must report your answer to the same precision as the least precise number in the problem. [p. 6]

When multiplying and dividing measurements, you must report your answer with the same number of significant figures as the measurement which has the fewest significant figures. [p. 7]

There is always some error in the last significant figure of the measurement. [p. 9]

1 cm³ = 1 mL. [p. 18]

Weight: A measure of how strongly gravity pulls on an object. [p. 20]

Mass: A measure of how much matter exists in an object. [p. 20] ■

Chemistry Experiment Write-Up—Example 1

Date: _____

Experiment: # _____

Title/Purpose: _____

Supplies: _____

Procedure: _____

Hypothesis: _____

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At a Glance

Our goal in teaching science to high school students is to make them aware of the amazing realities around them and how complex and detailed this world is in which we live. You may want to join your children in this adventure, offer support as needed, or allow them to work through their book on their own since it is written to the children. Many of the science concepts he has been exposed to in the past will now come into sharper focus as more detailed study in certain disciplines begin.

- “High School Biology” includes basic study in the field of biology.
- It is a good place to start for students entering high school.
- We stress mastery of concepts and vocabulary at this level.

Your student:

- Will be introduced to the five biological kingdoms, cellular biology, genetics, evolution, as well as other related topics, along with the corresponding vocabulary.
- Will have concepts reinforced through the labs.
- Should become proficient at using a microscope and identifying major organs through dissection.
- Will then be able to use this class as a stepping-stone into Advanced Biology, which includes study in human anatomy and physiology.

We include:

- Worksheets to be used as you work through the scheduled labs.
- Weekly vocabulary lists.
- A weekly planning list to determine the lab materials needed for the coming week, as well as a look ahead to the needed items for the next week.

An Overview of this Year’s Studies

Each of the 16 modules is broken down into daily readings. Most modules are scheduled to be completed in two weeks, with four modules taking three weeks. It is important to read the introductory pages from the text book and the Solution’s Manual.

In each week’s schedule, we have noted the science supplies needed from the various kits used this year.

The kits are the **Microscopy Supplies Kit** (250-25), the **Advanced Dissection Kit with Specimens** (250-30), and the **Biology Supplies Kit 250** (250-25). You will also need a **microscope** (250-40). If you do not already own the non-consumable kit, and are not in need of it for a younger children, you will then need to obtain a magnifying glass (used in several modules), a cork (used in one module), and a thermometer (used in one module).

We also alert you to supplies that you need to provide. To enable you to plan ahead, if there is anything we think you might need to purchase before you do the next week’s experiments (we figure you shouldn’t need to purchase, say, water or dust!), we have also included a list of those materials. That way, we hope, you will be prepared before the time comes. If you shop less often than once a week, or if you live far away from a major shopping area, we **strongly** encourage you to look ahead a few weeks to find those items that you may be needing shortly.

We hope this feature will enable you to feel well-prepared and organized for your science adventure!

You will also find **Microscope Lab Documentation** and **Biology Experiment Write-Up** forms, **The Classification Chart**, and **Frog Dissection Lab** notes at the back of this guide. We have included an example of a write-up form for you. You are also free to use it as an example and come up with your own form.

Testing

There is a test for each of the 16 modules throughout the year. Because of this, we have not scheduled any of the quarterly tests as this would have taken away some of the extra time given for some of the harder modules. You may add a quarterly test after every four modules, if you prefer. One way of scheduling would be to complete the three week modules in two weeks (for example: Week 5 could be a study week for a quarterly test if you complete Module 2 in Weeks 3 and 4).

While we do feel that the quarterly tests are a useful evaluation tool, we don’t feel they are “required.” Certainly the end-of-module study guide questions and tests are sufficient to determine your student’s understanding of the material. If you are concerned about long-term retention, you may find the quarterly tests to be helpful.

Corrections and Suggestions

Since we at Sonlight Curriculum are constantly working to improve our product development, we would love it if we could get you to help us with this process.

Whenever you find an error anywhere in one of our Instructor’s Guides, please check our updates page for the latest information at www.sonlight.com/curriculum-updates. Report new information by sending a short e-mail to: IGcorrections@sonlight.com. It would be helpful if the subject line of your email indicated where the problem is. For instance, “Biology/Section One/Week 1/ Schedule.”

If while going through our curriculum you think of any way we could improve our product, please e-mail your suggestions to: IGsuggestions@sonlight.com. If you know of a different book we should use, or if you have any other ideas, please let us know.

Your efforts will greatly help us improve the quality of our products, and we very much appreciate you taking the time to let us know what you find. Thanks for your help!

Summary

We hope that you enjoy your adventure this year and that it helps you learn more about the world we live in. If we can be of any assistance, please do not hesitate to e-mail us at main@sonlight.com, call us at (303) 730-6292, or better yet, join our Sonlight Connections Community (sonlight.com/connections), where you can chat with others who are going through this same program. You can ask questions, learn new ideas, share with others what you have learned, problem-solve, or just talk. Happy exploring! ■

Biology—Science Supplies

Microscopy Supplies Kit (250-25)	Week(s) Used
Lens paper	2, 8
Glass slides	2, 8, 22, 23, 24, 26
Slide covers (coverslips)	2, 8, 22, 23, 24, 26
Glass eyedroppers	2, 3, 4, 8, 14, 22, 23, 24, 26
1 bottle Methylene Blue	2, 8, 22
16 prepared slides	2, 13, 22, 26, 29
Magnifying glass	14, 22, 23, 29, 30, 33
1 bottle Iodine	8
Cork	26
Toothpicks	8, 12

Advanced Dissection Kit with Specimens (250-30)	Week(s) Used
Gloves	23, 29, 30, 33
Thermometer	6
3 disposable dissection trays	29, 30, 33
Dissection tools	8, 9, 22, 23, 24, 29, 30, 33
Worm specimen	29
Crayfish specimen	30
Yellow perch specimen	33
Frog specimen	33

Biology Supplies Kit 250 (250-55)	Week(s) Used
Aluminum foil	10
Balloons	11
Beans	7
Coffee filters	3, 10
Concave slide with coverslip	8, 9
Cotton balls	22
Funnel	11
Graduated cylinder 10 mL	3
Graduated cylinder 50 mL	4, 11
Peat pots	7
pH test paper	4
Potting soil	7, 14, 21
Radish seeds	14
Rubber bands	10
Travel bottle, 2 oz.	11

Sonlight Ultra Microscope (250-40)	Week(s) Used
Microscope	2, 8, 9, 13, 22, 23, 24, 26, 28, 29

Section Two

Schedule and Notes

Week 1—Module 1

Date:	Day 1 ¹	Day 2 ²	Day 3 ³	Day 4 ⁴	Day 5 ⁵
Exploring Creation with Biology	pp. 1–6 (top one third)	pp. 6–10 (top one third)	pp. 10–15 (bottom)	pp. 16–23 (bottom)	pp. 24–27 (bottom)
On Your Own		1.1-1.4	1.5–1.6	1.7-1.9	
Experiments					
Vocabulary¹	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supplies²	There are no experiments scheduled this week.				
Shopping/Planning List	For next week: You Provide: cotton swabs, water, small piece of bright thread.				
Other Notes					

1. Define vocabulary terms and names found in each day's reading, then place a check in the box.

2. When supplies are listed as "**We provide:**" they are materials found in either your **Microscopy Supplies Kit** (250-25), the **Advanced Dissection Kit with Specimens** (250-30), the **Biology Supplies Kit 250** (250-55), or the **Sonlight Ultra Microscope** (250-40). When supplies are listed as "You provide:" they are materials you can generally find around your home.

Vocabulary | Terms and Names

Evidence: The collected body of data from experiments and observations. [p. 2]

Qualitative observation: Observations that are not easily counted or measured, such as color or texture. [p. 3]

Quantitative observation: Observations involving numbers, such as counting or measuring. [p. 3]

Inference: Logical interpretation based on prior knowledge, experience, or evidence. [p. 3]

Variable: A factor that changes in an experiment. [p. 4]

Hypothesis: A suggested, testable answer to a well-defined scientific question of a possible, testable explanation of observations. [p. 4]

Theory: An explanation of some part of the natural world that has been thoroughly tested and is supported by a significant amount of evidence from observations and experiments. [p. 5]

Scientific law: A description of a natural relationship or principle, often expressed in mathematical terms, and supported by a significant amount of evidence. [p. 5]

Experimental group: The group in an experiment that is manipulated (contains the independent variable). [p. 5]

Control group: The group in an experiment that experiences no manipulation (does not contain the independent variable). [p. 5]

Microorganisms: Living creatures that are too small to see with the naked eye. [p. 12]

Abiogenesis: The idea that long ago, very simple life forms spontaneously appeared through chemical reactions. [p. 14]

Anabolism: The sum total of all processes in an organism which use energy and simple chemical building blocks to produce large chemicals and structures necessary for life. [p. 18]

Catabolism: The sum total of all processes in an organism which break down chemicals to produce energy and simple chemical building blocks. [p. 18]

Photosynthesis: The process by which green plants and some other organisms use the energy of sunlight and simple chemicals to produce their own food. [p. 18]

Autotrophs: Organisms that are able to make their own food. [p. 18]

Metabolism: The sum total of all processes in an organism that convert energy and matter from outside sources and use that energy and matter to sustain the organism's life functions. [p. 18]

Herbivores: Organisms that eat only plants. [p. 19]

Carnivores: Organisms that eat only organisms other than plants. [p. 19]

Omnivores: Organisms that eat both plants and other organisms. [p. 19]

Heterotrophs: Organisms that depend on other organisms for their food. [p. 19]

Endotherm: Organism that is internally warmed by a heat-generating metabolic process. [p. 20]

Ectotherm: Organism that lacks an internal mechanism for regulating body heat. [p. 20]

Homeostasis: The maintenance of stable internal conditions. [p. 20]

Receptors: Special structures that allow living organisms to sense the conditions of their internal or external environment. [p. 21]

Asexual reproduction: Process by which a single organism produces genetically identical offspring (offspring receives all DNA from one parent). [p. 21]

Sexual reproduction: Process by which two parents produce genetically different offspring (offspring receives a combination of DNA from two parents). [p. 22]

Inheritance: The process by which physical and biological characteristics are transmitted from the parent (or parents) to the offspring. [p. 22]

Mutation: An abrupt and marked change in the DNA of an organism compared to that of its parents. [p. 22]

International System of Units: The metric system (abbreviated SI), which is the most widely used system of measurement in science. [p. 24]

Compound light microscope: A microscope that shines light through a specimen using two lenses to magnify an image. [p. 26]

Transmission electron microscope: A microscope that transmits a beam of electrons through a thinly sliced specimen. [p. 27]

Scanning electron microscope: A microscope that passes a beam of electrons over the surface of a specimen. [p. 27] ■

Week 2—Module 1

Date:	Day 1 <small>6</small>	Day 2 <small>7</small>	Day 3 <small>8</small>	Day 4 <small>9</small>	Day 5 <small>10</small>
Exploring Creation with Biology	pp. 28-32 (bottom two third)	pp. 32-33 (bottom)	Study Guide pp. 35-36 #1(a-p); 2-7 (Review)	Study Guide pp. 35-36 #1 (q-ff); 8-15 (Review)	Module 1 Test
On Your Own		1.10-1.12			
Experiments	Experiment 1.1 Introduction to the microscope				
Vocabulary		□			
Supplies	We Provide: Sonlight Ultra Microscope Microscopy Supplies Kit —lens paper, slides, coverslips, eyedropper, methylene blue stain and Zea mays or Ranunculus root prepared slide. You Provide: cotton swabs, water, small piece of bright thread.				
Shopping/Planning List	For next week: You Provide: penny, clear plastic or glass cup, detergent, wax paper, felt-tip marker, stopwatch or clock, metric ruler.				

Other Notes

Week 3—Module 2

Date:	Day 1 ¹¹	Day 2 ¹²	Day 3 ¹³	Day 4 ¹⁴	Day 5 ¹⁵
Exploring Creation with Biology	pp. 37–40 (mid-page)	pp. 40–43 (bottom)	pp. 44–48 (mid-page)	pp. 48–51 (mid-page)	pp. 51–55 (bottom)
On Your Own	2.1–2.2		2.3–2.7		2.8–2.10
Experiments				Experiment 2.1 Investigating water's properties	
Vocabulary	☐	☐	☐	☐	☐
Supplies	We Provide: Biology Supplies Kit 250 —graduated cylinder (10ml), coffee filter. Microscopy Supplies Kit —glass eyedropper. You Provide: penny, clear plastic or glass cup, detergent, wax paper, felt-tip marker, stopwatch or clock, metric ruler.				
Shopping/Planning List	For next week: You provide: 2 different antacids (tablet form, try to find white tablets like Tums, Roloids or generic), self-sealing plastic sandwich bag, mallet or hammer, 2 clear plastic cups or beakers, water, 2 plastic spoons, white vinegar (weak acid).				
Other Notes					

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Vocabulary | Terms and Names

Matter: Anything that has mass and takes up space (has volume). [p. 38]

Atomic number: The number of protons and neutrons in an atom—unique to each type of atom. [p. 40]

Elements: A collection of atoms that all have the same number of protons. [p. 40]

Periodic table: A table of the chemical elements arranged in order of atomic number. [p. 40]

Isotopes: One of several forms of an element, each containing the same number of protons but a different number of neutrons. [p. 42]

Atomic mass: The sum of the protons and neutrons in an atom. [p. 42]

Molecule: Chemicals that result when two or more atoms join together chemically. [p. 43]

Compound: A molecule that contains atoms of at least two different elements. [p. 43]

Ionic bond: A chemical bond formed when one or more electrons are transferred from one atom to another. [p. 46]

Ion: Positively or negatively charged atoms resulting from the transfer of electrons. [p. 46]

Covalent bond: Chemical bond formed by the sharing of electrons between two or more atoms. [p. 47]

Polar compound: A molecule in which there is an unequal distribution of the negatively charged electrons causing a partial positive charge at one end and a partial negative charge at the other. [p. 50]

Hydrogen bond: A weak electrical attraction between a partially positive hydrogen and a partially negative atom of another molecule (usually oxygen or nitrogen). [p. 51]

Solvent: Any substance in which other substances are dissolved. [p. 51]

Solute: A dissolved substance. [p. 51]

Solution: A mixture of solutes dissolved in a solvent. [p. 51]

Aqueous solution: A solution in which water is the solution. [p. 51]

Week 3—Module 2

Cohesion: An attractive force that holds molecules of the same substance together. [p. 52]

Adhesion: An attractive force that holds molecules of different substances together. [p. 52]

Heat capacity: The amount of heat energy required to increase the temperature. [p. 53] ■

Section Three

Forms

Microscope Lab Documentation

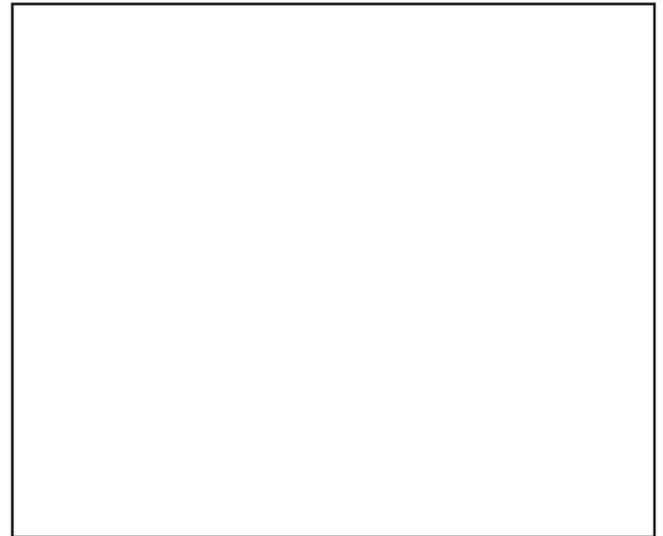
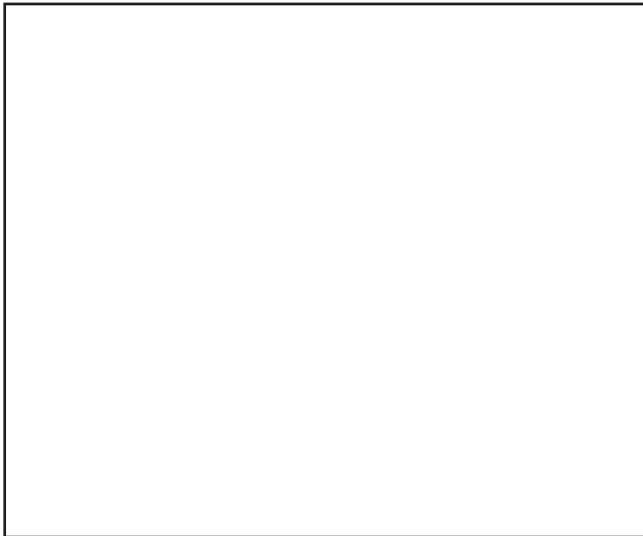
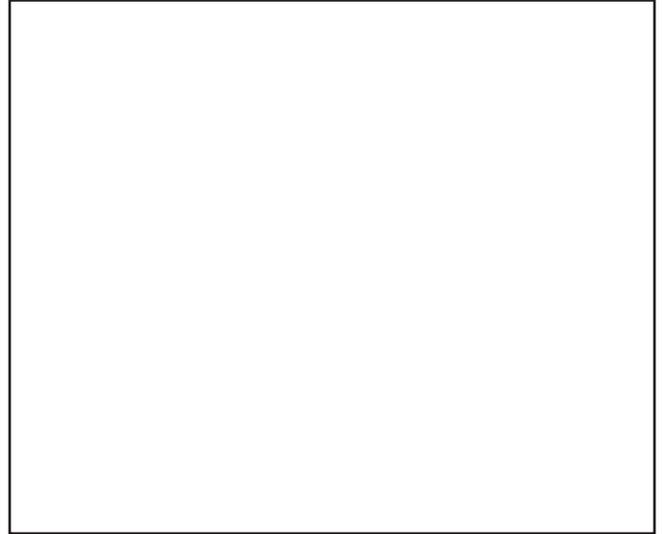
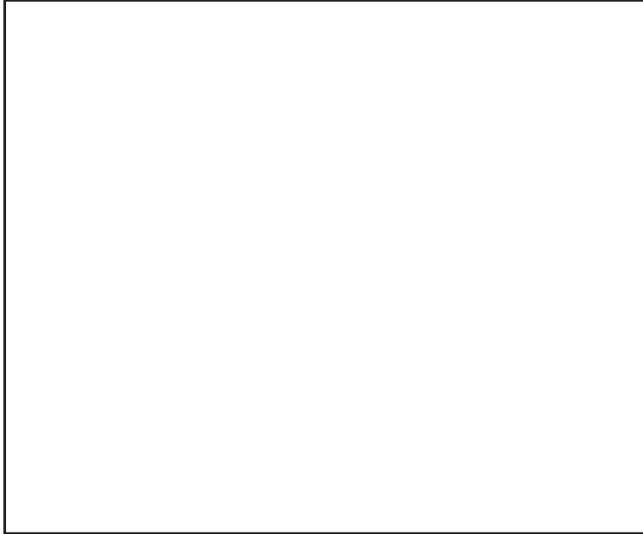
Date: _____

Experiment Title and Number: _____

Supplies Used: _____

Object: _____

Observation: (illustrate with colored pencils)



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Remember: Answer lab questions from your book on a separate piece of paper. Be sure to clearly identify the question and answer.

Frog Dissection Lab

Module 15

Before you begin the dissection, please search online for a frog dissection demo that will help you to become familiar with the structures that you will encounter during your own dissection of the frog. Please refer to *Nasco's Dissection Guide for the Frog* to direct you in the details of beginning the internal dissection.

External Structures

Identify each of the following structures on your frog before moving to the dissection.

1. **Eyes:** Find the **upper lid**, **lower lid** and the **nictitating membrane**. What purpose does the nictitating membrane serve?
2. **Ears:** Locate the tympanic membrane
3. **Nostrils:** Locate the **external** and **internal nares** (located in the mouth)
4. **Mouth: (Buccal Cavity)**
 - a. Maxillary teeth
 - b. Vomerine teeth
 - c. Tongue
 - d. Opening of the Eustachian tube
 - e. Glottis
 - f. Opening
5. **Trunk:** the frog has no neck, so the trunk follows directly after the head.
Note the soft, fleshy area below the sternum. Note the absence of the ribs laterally. Locate the **anus** on the trunk (located at the posterior end of the trunk).
6. **Limbs:** Find the **forelimbs**. How many toes on each? Are they webbed? Locate the **digit of the forelimb**. Locate the **hind legs**. How many toes on each? Are they webbed? Why?
7. Locate the **digit of the hind limb** and the **reduced digit (vestigial)** on the hind limb. Also find the **chromatophore** on the hind limb.
8. **Male or Female?** What limb structure is different between the male and female? Why would the male have this additional thickening on the thumb pad? There is a second structure differentiating male and female. What is it? Many male frogs use additional air trapped in the skin below the lower jaw to magnify the sounds they make.

Internal Structures

After opening the body cavity, and before removing any organs, locate the following structures:

- a. **right atrium** of the heart
- b. **left atrium** of the heart
- c. **ventricle** of the heart
- d. **conus arteriosus** (this is a large vessel arising from the ventricle and forming a "Y" at the top of the heart)
- e. **liver** (reddish brown in color, just posterior to the heart) (note the number of lobes)
- f. **stomach** (found under the liver to the left, it is whitish in color) (note the narrowing end as it joins the small intestine; this narrowing is the pylorus)
- g. **gall bladder** (found on the dorsal side, it is greenish in color)

- h. **bile duct** (use a magnifying glass, this thin tube leads from the gall bladder to the duodenum [the first portion of the small intestine])
- i. **pancreas** (a flat and narrow organ, usually pinkish in color, lying between the inner surface of the stomach and the small intestine)
- j. **colon** (large intestine)
- k. **mesentary** (this is a supporting membrane that holds the digestive tract and abdominal organs in place; overlies the abdominal cavity)
- l. **spleen** (small, reddish, pea-shaped organ, attached to the mesentary, anterior, and dorsal to the large intestine) (What system does it belong to? What is its function?)
- m. **kidneys** (a flat, reddish, oval organ, located dorsally near the body wall on either side of the vertebral column)
- n. **adrenal glands** (found on the ventral surface of the kidney, a light, slender band of yellowish tissue)
- o. **fat bodies** (shiny, yellow, finger-like projections extending from the mesentary)
- p. **ovaries or testes** (If you have a female, the dark well-developed eggs may occupy a large area of the abdominal cavity, so carefully remove them so that you can view the other structures. If you have a female, locate the **oviducts**, white coiled tubes that are attached to the dorsal body wall on each side of the midline. If you have a male, the light colored, bean-shaped testes will be on the posterior end of the kidney, the adrenals are directly below.)
- q. **urinary bladder** (this is a 2-lobed sac that empties into the cloaca)

Respiratory System

Frogs have 3 surfaces that participate in gas exchange: the lungs and capillaries that cover the outer surface, their moist skin, and their moist membranes in their mouth (gases are exchanged through the surface linings). Locate the following structures below:

1. **Nostrils**
2. **Nasal Cavity**
3. **Gullet**
4. **Lungs** (branch off from the gullet)
5. **Larynx**

Circulatory System

Blood flow in the frog has two loops.

- ∞ The **pulmonary loop** carries circulation between the heart and lungs.
- ∞ The **systemic loop** is between the heart and the rest of the body.
- ∞ The frog has 2 atria and a single ventricle.

The following is a brief explanation of the blood flow through the circulatory system.

Deoxygenated blood from the body cells returns to the heart through the **venae cavae**. The **venae cavae** empty into a large collecting area in the back of the heart called the **sinus venosus**. Blood then flows into the **right atrium** of the heart. The **right atrium** pumps blood into the **ventricle**. The **ventricle** pushes blood upward allowing some blood to enter the **pulmonary artery**, which carries blood towards the lungs. In the lungs, blood is oxygenated and returns to the heart via **pulmonary veins** and enters the **left atrium**. Oxygenated blood from the **left atrium** is pumped into the **ventricle**. Blood leaving the ventricle passes through the **conus arteriosus** and can enter the **pulmonary artery** and go to the lungs; or it can enter the **aorta** and travel throughout the body.

Deoxygenated blood from the right atrium and oxygenated blood from the left atrium mix together since a frog's heart has a single ventricle. Some deoxygenated blood will enter into the aorta and out to the body cells. Sending some deoxygenated blood to body cells is not harmful to the frog. Because frogs are cold-blooded animals, their body temperature is close to the temperature of their surroundings. As a result, frog cells do not use as much oxygen for respiration as cells of animals that maintain a higher body temperature, thus blood leaving a frog's heart does not have to be fully oxygenated.

Nervous System

Locate the 5 lobes, listed in order from anterior to posterior.

1. **olfactory lobe**
2. **cerebrum**
3. **optic lobe**
4. **cerebellum**
5. **medulla oblongata**
6. **spinal cord extending throughout the trunk**

Sketch a drawing of the frog and label all of the organs described in *Nasco's Dissection Guide for the Frog*.



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