

TEACHER GUIDE

9th–12th Grade

Includes Student
Worksheets

Science



Weekly Lesson Schedule



Labs



Supply List



Answer Key

REVISED EDITION

BIOLOGY



MASTERBOOKS®
— CURRICULUM —

THE STUDY OF LIFE FROM
A CHRISTIAN WORLDVIEW



Master's Class Biology



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First printing: April 2019

Seventh printing: March 2023

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Master Books®, P.O. Box 726, Green Forest, AR 72638

Master Books® is a division of the New Leaf Publishing Group, Inc.

ISBN: 978-1-68344-151-9

ISBN: 978-1-61458-705-7 (digital)

Unless otherwise noted, Scripture quotations are from the New King James Version of the Bible.

Printed in the United States of America

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Where Faith Grows!

Scriptural truth woven throughout each course



Course Description






This course provides important training and practice in developing skills involved in the study of biology, including observing and recognizing interactions and interdependencies of organisms in their natural environment, the use of a light microscope, dissection skills, and insights and recent advances in modern biology.

- ✓ Each chapter in the textbook has accompanying worksheets and quizzes in the teacher's guide.
- ✓ Each chapter in the text has a laboratory exercise that teaches particular skills, illustrates insights for the concepts studied and provides experience in preparing laboratory reports.
- ✓ Every 3 or 4 weeks the student is to take an examination.

Life is from God. When God removes life, an organism dies. In Darwin's day, some organisms appeared to be very simple when contrasted to larger, more complex organisms. Along with the blessings of modern tools to study life, it has become obvious that no life is simple. This makes sense because nothing that God creates is simple.

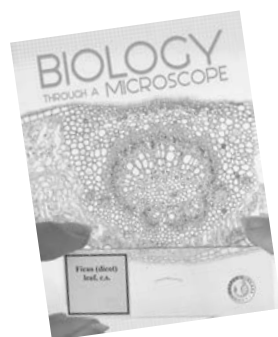
- ✓ The consideration of issues of biological origins and how the approach differs depending upon assumptions of the nature of life and reality. Whether one comes from a theistic or secular point of view makes a huge difference in the interpretation of origins. The course concludes with human origins that have huge implications as to whether or not we were created in God's image with an eternal destiny or the sum product of natural laws acting upon atoms and molecules.

Features

	Target Level	Designed for grades 9–12 1 Credit with Labs
	Flexible 180 Day Schedule	45–60 minutes per day 5 days per week
	Open & Go	Daily Schedule, Lab Supply List, Answer Keys
	Engaging Application	Worksheets, Labs
	Assessments	Quizzes, Exams

Objectives

- ✓ Investigate the core concepts of historical and modern biology
- ✓ Become familiar with the meaning of key terms in biology
- ✓ Explore the fundamental concepts of cell biology and important recent developments
- ✓ Study the development of classical genetics and modern concepts in the expression of DNA and how it varies with age and changing environmental conditions
- ✓ Learn the coordination and maintenance of the parts of an organism



OPTIONAL RESOURCE: While *Biology Through A Microscope* is a book that can be used with any biology course, it also serves as a companion book in the *Biology: The Study of Life from a Christian Worldview* high school course. It contains full-color microscopic images of varied animals, insects, plants and fungi, and microorganisms, as well as detailed information for using the modern microscope in the classroom and discusses examples of stained and unstained slide samples, brightfield, darkfield, and phase-contrast microscopy. **Those who purchase this book would not have to use a microscope in order to fulfill the lab requirements.** A cross-reference sheet for related labs is included in the back of this teacher guide.

Teacher Instructions for this Course

This teacher guide provides additional help in assisting students through the text and the laboratory exercises.

- ✓ **Reading:** The required reading in this course is very rigorous and detailed. For students who are having difficulty in reading the chapter or understanding some of the concepts, the second day can be used to either complete the reading and/or worksheet or to focus on specific parts of the chapter that may need review. It is vital that the student understand the concepts within the reading material to complete the course. The glossary, which contains the vocabulary words, begins on page 320 in the student book.
- ✓ **Vocabulary Words:** On the second page of every chapter in the student book, vocabulary words are introduced that are highlighted in that chapter's text and have brief definitions found in the glossary at the back of the book. Students are encouraged to either write these out on 3 x 5 cards or to create another useful means of reviewing these throughout their course of study. Comprehension of sometimes difficult terms and concepts is very important to completing a course in Biology or any other complex science study.
- ✓ **Labs:** Each chapter contains a lab, some of which also utilize a microscope, which is optional if you already have something that includes the microscope images needed for the course such as *Biology Through A Microscope*. See pages 7 and 8 for additional information on the labs and the supply list for items not readily available around the house or in a local store.
- ✓ **Worksheets:** The worksheets are important in indicating what the student needs to remember from the chapters and if they are ready for the quiz. The student needs to answer the questions in the worksheet. This is not a quiz, so the student can look at the answers after attempting them. The student needs to go back over the chapter to see why any questions were not answered correctly.
- ✓ **Quizzes:** After understanding the correct answers to the questions on the worksheet, the student is ready for the chapter's quiz. It should be taken without using the book or the chapter's worksheet. The course builds on concepts as it progresses. It is important for the student to master the concepts in each chapter.
- ✓ **Exams:** Every 3 or 4 weeks, the student will take an exam. In preparation for the exam, the student can choose as needed to reread the chapters covered on the exam or review the questions and answers on the worksheets and chapter quizzes. Copies of the worksheets and quizzes can be made if the student wants to do them again to prepare for the exams. The student is ready for the exam after studying the chapters, worksheets, and quizzes. The teacher should grade the exam and record the grade.

Remember, it is normal to do better in some areas than in others. Learning is more than memorizing. Some of the questions depend upon recall, but some also depend upon reasoning skills. Through practice, these skills are developed. If the student gets discouraged, please be a source of encouragement.

The spiritual insights and Scripture references are important and not just a nice tack-on for this course. These references are deliberately given in context with the subject matter.

Teacher Instructions for the Laboratory

Biology Credits for Transcripts

This is a one-year course with two full semesters, helping the student fulfill one credit of biology, which includes the lab. High school transcripts will list the course as Biology with Labs. If questions arise from state agencies or schools, they can be referred to the course content.

NOTE: *This information is given so that the teacher can come alongside the student in helping line up the necessary materials, overseeing the procedures where necessary, and evaluating the lab reports. Do not hesitate to ask someone with more background in biology or labs for advice in areas where you feel less confident.*

The labs for this course are designed to be done at home. I have not included anything in the labs that I would not want in my home. The specimens for dissection are not preserved in harmful compounds — even though they should still be kept out of the mouth, so be careful that young children are not able to get into the lab supplies.

It is also important to realize that the labs are included to help the student better understand the concepts presented in the course. This is not about perfection; things can and will go awry. It's the nature of scientific study and doing labs. Sometimes the student can do everything right, and for some unknown variable (materials, temperature, etc.), the experiment doesn't end up as intended. Encourage the student to do their best and PREP:

P – Prepare by organizing your lab supplies, so they are easily found to be used. Store them properly.

R – Review by reading the lab in your student book, and the lab pages in this teacher guide, before you begin. Lab pages in the student book also include an important paragraph at the end, giving context to the focus of the lab.

E – Expect to find the answer/process you are trying to find in the lab. Confidence in your process and yourself can help when things are hard to understand.

P – Proceed with a clear understanding of what you want to accomplish and how you need to fill out the lab pages. Be sure that complete sentences are used in the reports except where data are being recorded. This provides added writing experience and is clearer to someone reading the report.

- ✓ Students will use the “Laboratory” pages for taking notes, making general observations, and recording data.
- ✓ The “Laboratory Report” pages (see following examples) are for the student to write out their full observations, data, and conclusions. Any questions asked in the lab instructions are to be answered in the report.
- ✓ If the student completes the lab and does not get the expected result, he or she should write what happened, and also what they think should have happened. The student could also include his or her ideas on why he or she thinks the experiment turned out differently than expected.

WARNING: As with any science course that includes laboratory exercises, some things can be potentially hazardous if not handled properly. Make sure to follow all instructions carefully:

- ✓ Wear proper safety equipment when needed, including safety goggles/glasses.
- ✓ Keep small children away from where the labs are being conducted.
- ✓ Wash hands, surfaces, and equipment properly after each experiment.
- ✓ Make sure clothing and other household items and surfaces are protected from staining.
- ✓ Handle the microscope with care — always carry it with two hands.
- ✓ Do not place anything used for labs in your mouth. Some chemicals can be poisonous.

**Laboratory Report** (20 points possible)*Living Things Observed in the Area*

At the Bozeman ponds (Bozeman, Montana) I see a body of water surrounded by tall willow trees and an occasional path leading down to the water. There are grasses farther on shore from the trees. The water is rippling with mallard ducks swimming across the water and on the shore. There is a lot of leaf litter on the shore and in the water from the trees.

A Keystone Species

The willow trees appear to be a keystone species. They stabilize the shoreline and provide shelter for the ducks. The leaves appear to be discolored perhaps with fungus and bacteria growing on them.

I cannot see any water insects or algae in the water, but the ducks are feeding on something in the water and these are typically fed upon by ducks. The ducks will deposit their waste in the water and on the shore which will provide nutrients for the algae, water insects, and shore plants. The ducks also appear to be a keystone species.

Life Forms That Feed Upon Other Life Forms

The ducks appear to feed on water insects and algae in the water.

Life Forms That Are Eaten by Other Life Forms

Water insects and algae appear to be eaten by the ducks.

What decomposers are in the area?

Bacteria and algae appear to be decomposing the leaf litter on the shore and in the water. This could be shown by the discoloration of the leaves which are slowly coming apart.

Sample Biology Lab Reports Some of the numbers have been changed from what is asked for in the lab so that the students have to do their own work.

**Laboratory Report** (20 points possible)*Procedure and Results**The pH of a solution*

- 1. The pH of the distilled water is 7.*
- 2. After adding 5 drops of vinegar to the distilled water, the pH is 6.*
- 3. After adding 5 more drops of vinegar to the water from step 2, the pH is 4.*
- 4. After adding an additional 5 drops of vinegar to the water from step 3, the pH is 2.*
- 5. As more acid (vinegar) was added to the distilled water, the pH dropped, indicating increased acidity.*
- 6. As ½ teaspoon of sodium bicarbonate was added to the acidic solution from step 4, the water foamed. The pH of the resulting solution was 8, indicating that the sodium bicarbonate decreased the acidity and increased the basic nature of the solution as indicated by the pH increase from 2 to 8.*

Hydrogen bonds between water molecules

- 1. Water was added to a drinking glass carefully using a pipette until there was a slight mound in the middle of the water (meniscus).*
- 2. I carefully laid a sewing needle on top of the water in the middle of the meniscus using a pair of tweezers. The sewing needle floated on top of the water because the hydrogen bonds between the water molecules caused the water molecules to "stick together" under the needle.*
- 3. I added a drop of liquid dish soap to the water and the needle sank. It appeared that the soap disrupted the hydrogen bonds between the water molecules and the needle sank. The top layer of the water flattened out and the meniscus was disrupted.*

Sample Biology Lab Reports Some of the numbers have been changed from what is asked for in the lab so that the students have to do their own work.

Supply List

Here is a list of supplies that need to be available for the labs. These are not readily available outside of a science laboratory and can be ordered online or purchased from a science supply retailer. Kits containing these supplies, slides, and a microscope can be obtained from the Master Books website at www.masterbooks.com/biology-teacher-guide. **PLEASE NOTE:** Some items must be ordered separately.

Basic Supplies

- Pencil
- Paper
- Notepad (something to write on or computer)
- Phone or camera to take pictures

Laboratory 2

- Distilled water (local from grocery store)
- Vinegar
- Baking soda
- Drinking glass with a smooth rim
- Tweezers
- Sewing needle
- Liquid soap
- Three 100 ml beakers (from the supply kit)
- 50 ml graduated cylinder (from the supply kit)
- pH indicator paper (from the supply kit)
- Eyedropper (from the supply kit)

Laboratory 3

- Corn starch
- Sucrose (table sugar)
- Distilled water
- Stopper (from the supply kit)
- Iodine solution (from the supply kit)
- Eyedropper (from the supply kit)
- Test tubes (from the supply kit)
- Metric ruler (from the supply kit)
- Wax pencil (from the supply kit)
- Food items (potato, apple, banana, and corn kernel)

Laboratory 4

- A piece of potato or apple 2 cm x 2 cm x 2 cm
- Detergent
- 50 ml graduated cylinder (from the supply kit)
- 100 ml beaker (from the supply kit)
- Blender
- Nitrile gloves
- Distilled water
- Ice bath
- Meat tenderizer (liquid or powder)

- Large test tube (from the supply kit)
- Filter funnel (from the supply kit)
- Filter paper (from the supply kit)
- Stirring rod (from the supply kit)
- Eyedropper (from the supply kit)
- 95% ethanol, chilled in freezer (from the supply kit)

Laboratory 5

- Microscope (from the supply kit)
- 2 blank microscope slides (from the supply kit)
- 1 microscope slide coverslip (from the supply kit)
- 3½-inch long pieces of thread
- Fine tip marker

Laboratory 6

- Methylene blue stain (from the supply kit)
- Distilled water (available from grocery store)
- Microscope (from the supply kit)
- Microscope slide and cover slip (from the supply kit)
- Eyedropper (from the supply kit)
- Prepared slide *Spirogyra* (from the supply kit)
- Prepared slide *Paramecium* (fission) (from the supply kit)
- Prepared slide of bacteria cells (from the supply kit)
- Toothpicks

Laboratory 7

- Fresh apple
- Fresh potato
- Distilled water (available from grocery store)
- NaCl (salt from grocery store)
- Knife to cut the potato and apple
- Teaspoon
- 100 ml beakers (3) (from the supply kit)
- Metric ruler (from the supply kit)
- 50 ml graduated cylinder (from the supply kit)
- Wax pencil (from the supply kit) or a non-permanent marker

Laboratory 8

- Microscope (from the supply kit)
- Prepared microscope *Paramecium* slide (from the supply kit)
- Prepared microscope *Amoeba* slide (from the supply kit)
- Prepared microscope human blood smear slide (from the supply kit)
- Prepared microscope frog blood smear slide (from the supply kit)

Laboratory 9

- Microscope (from the supply kit)
- Microscope Prepared Slide Onion Root Tip Mitosis (from the supply kit)
- Prepared Slide of *Ascaris* (roundworm) Mitosis (from the supply kit)

Laboratory 10

- A notepad (something to write on) and a pencil
- 1 square foot of earth — **Optional**
- 1 square foot of screening or chicken wire — **Optional**
- Small bone (chicken wing or drumstick) — **Optional**

Laboratory 12

- 5 2-inch-long segments of water plant (from pet shop or aquarium section of other stores, strands of algae found along a pond or stream will also work)
- 5 large test tubes (22 ml) (from the supply kit)
- 1 beaker (100 ml) (from the supply kit)
- Bright light source
- Distilled water
- Green, yellow, and red food coloring
- Phenol red pH indicator (from the supply kit)
- 1 drinking straw
- Timer — perhaps your smart phone
- Wax pencil (from the supply kit)

Laboratory 13

- Distilled water
- 3 large test tubes (from the supply kit)
- 3 small test tubes (from the supply kit)
- 3 100 ml beakers (from the supply kit) of warm water
- Yeast (1 package of baker's yeast)
- ¼ teaspoon measuring spoon
- ½ cup measuring cup

- Glucose (also called dextrose) (from the supply kit)
- Sucrose (table sugar)
- Ruler (to measure mm, millimeters) (from the supply kit)
- Wax pencil (from the supply kit)

Laboratory 14

- Microscope (from the supply kit)
- Microscope Prepared Slide Onion Root Tip Mitosis (from the supply kit)
- Microscope Prepared Slide Roundworm *Ascaris* (from the supply kit)
- 3 lengths of thick string 30 inches long
- 81 paper clips
- 14 strips of red colored paper ½ inch x 1 inch
- 16 strips of blue colored paper ½ inch x 1½ inch
- 14 strips of green colored paper ½ inch x 1 inch
- 16 strips of yellow colored paper ½ inch x 1½ inch
- 16 strips of white paper ½ inch x 1 inch
- Other colors of paper can be used, as long as you have 5 different colors

Laboratory 15

- The 3 strands of string with the bases attached from laboratory 14
- 6 paper clips
- The 6 paper strips you set aside in laboratory 14 (AUGUGA) to attach to the paper clips for the third strand (mRNA)

Laboratory 17

- Microscope (from the supply kit)
- Prepared slide of Muscle Types (from the supply kit)
- Prepared slide of Motor Neurons (from the supply kit)
- Antibiotic discs (ampicillin, erythromycin, neomycin, and penicillin) **Optional — for next week**
- E. coli* live cultures — **Optional**
- Prepared Tryptic Soy agar media plates — **Optional**
- Sterile swab applicators — **Optional**
- Bleach — **Optional**
- Wax pencil (from the supply kit) — **Optional**
- 100 ml beaker about half full of bleach (from the supply kit) — **Optional**

Laboratory 18

- Microscope (from the supply kit)
- Prepared slide of Fern Life Cycle (from the supply kit)
- Prepared slide of Moss Life Cycle (from the supply kit)
- Petri dishes with *E. coli* cultures from Laboratory 17 — **Optional**
- Petri dishes with other samples that you may have chosen to do — **Optional**
- Antibiotic discs (ampicillin, erythromycin, neomycin, and penicillin) (from the supply kit) — **Optional**
- Tweezers — **Optional**
- 100 ml beaker — **Optional**

Laboratory 19

- PTC taste test paper (from supply kit)

Laboratory 20

- Image of corn cob with kernels (seeds) produced from a cross of R/r Su/su x r/r su/su

Laboratory 21

- Access to insects or pictures of insects

Laboratory 22

- Microscope (from the supply kit)
- Prepared slide of *Ranunculus* root cross section (from the supply kit)
- Prepared slide of *Ranunculus* stem cross section (from the supply kit)
- Prepared slide of *Ficus* leaf cross section (from the supply kit)

Laboratory 23

- Microscope (from the supply kit)
- Prepared slide of *Amoeba* (from the supply kit)
- Prepared slide of diatoms (from the supply kit)
- Prepared slide of *Euglena* (from the supply kit)
- Prepared slide of *Volvox* (from the supply kit)
- Sterile toothpicks (from grocery store)
- Yeast soaked in red food coloring (from grocery store)
- Mold (grown at home as prepared last week)
- Clean blank microscope slides (from the supply kit)

Laboratory 24

- Microscope (from the supply kit)

- Prepared slide of earthworm cross section (from the supply kit)
- Prepared slide of *Planaria* (from the supply kit)
- Nitrile gloves (from the supply kit)
- Scissors with fine sharp tip (from the supply kit)
- Styrofoam dissection tray (from the supply kit)
- Safety scalpel #11 (from the supply kit)
- T-pins (from the supply kit)
- Earthworm dissection guide (from the supply kit)
- Earthworm specimen (from the supply kit)
- Grasshopper dissection guide (from the supply kit) — **Optional**
- Grasshopper specimen (from the supply kit) — **Optional**

Laboratory 25

- Microscope (from the supply kit)
- Prepared slide of frog ovary (from the supply kit)
- Prepared slide of frog sperm (from the supply kit)
- Prepared slide of human skin (from the supply kit)
- Nitrile gloves (from supply kit or locally)
- Scissors with fine sharp tip (from the supply kit)
- Styrofoam dissection tray (from the supply kit)
- Safety scalpel #11 (from the supply kit)
- T-pins (from the supply kit)
- Frog dissection guide (from the supply kit)
- Frog specimen (from the supply kit)

Laboratory 26

- A partially eaten chicken leg or similar piece of meat — **Optional**
- A piece of screen or chicken wire about 1½ feet x 1½ feet — **Optional**
- A plot of ground 1 foot x 1 foot and 2 inches deep — **Optional**
- Wet soil — **Optional**

Note: You may want to reference Lab 10, which utilized these same materials.

Laboratory 27

- These depend upon what you have available. Be creative and adventurous.

Laboratory 28

- Pictures of Neanderthal, Cro-Magnon, *Australopithecus afarensis* (Lucy), chimpanzee, and human skulls and skeletons as provided below.

Teacher Instructions for Quizzes and Examinations

Quizzes: These are to be given at the end of the chapter study per the schedule of the lessons. The student should review the text of the lesson and the worksheets.

- ✓ Quiz answer keys are included in the back of this teacher guide.
- ✓ Have the student look up any questions that were missed and explain to you what the correct answer should be and why. This helps the student master the concepts that impact future chapters.
- ✓ The quizzes are multiple choice and matching (with few exceptions) to make grading easier.
- ✓ There are 28 quizzes with 15 points possible for each quiz. This gives a possible total of 420 points.

In science studies, an A and B are very good. C is average. D or F indicates the need for more focus, more practice, or more study. Future success is always possible with focus, study, and practice.

The customary grading scale is:

90%–100% is an A 80%–89% is a B 70%–79% is a C 60%–69% is a D 59% and lower is an F

This applies to each individual quiz. At the end of the course, the average of the quizzes is to be added to the average of the exams to give a final score graded according to this scale.

If a student misses more than 50% on a quiz, the quiz should be retaken after careful study. As always, how you decide to award points and the grading scale used is your choice.

One suggestion is to give the student back $\frac{1}{2}$ point for each answer gotten correct the second time that was missed the first time. This could be done for up to 5 quizzes. This can be very helpful for students that get off to a slow start.

Also, a student's readiness for a study of this nature may depend more upon maturity rather than age. Always encourage your student but still hold the standard and try not to cut corners. That way, the student will have the assurance of being able to go on to further scientific studies and succeed.

There is no midterm or final examination because, by its very nature, Biology is comprehensive. The concepts learned earlier are used in the later lessons and labs throughout the course.

Administering the Examinations

In the week of an examination, the student is to study the previous quizzes and the worksheets for the lessons covered on the exam. The exam is like an expanded version of a quiz. Each exam consists of 30 multiple choice or matching questions (with few exceptions). An examination is a sampling of the material and does not include every point covered in the lessons.

Biology Credits for Transcripts

This is a one-year course with two full semesters, helping the student fulfill half a credit per semester of biology, which includes the lab. High school transcripts will list the course as Biology with Labs. If questions arise from state agencies or schools, they can be referred to the course content.

A high school transcript usually has 1 grade for science courses (lab and lecture combined), and so this would appear as 1 credit with labs in Biology. (Note that some states may calculate credits in a different manner.) This can be determined by making the quizzes and exams 75 percent of the grade and the lab 25 percent of the grade if you so choose. To find the lab grade take the total points earned from all of the labs divided by the total possible times 100. An example of finding the total grade is if the average of the quizzes and exams are 85 percent and the labs are 97 percent:

Quiz/Exam Average 85 x 3 = 255 + Lab 97 = 352 / 4 x 100 = 88% (B+) Final Grade

Grading Sheet

Lesson	Quiz	Exam	Lab
Lesson 1	_____ / 15		_____ / 20
Lesson 2	_____ / 15		_____ / 20
Lesson 3	_____ / 15		_____ / 20
Lesson 4	_____ / 15	Examination 1 _____ / 30	_____ / 20
Lesson 5	_____ / 15		_____ / 20
Lesson 6	_____ / 15		_____ / 20
Lesson 7	_____ / 15		_____ / 20
Lesson 8	_____ / 15		_____ / 20
Lesson 9	_____ / 15	Examination 2 _____ / 30	_____ / 20
Lesson 10	_____ / 15		_____ / 20
Lesson 11	_____ / 15		_____ / 20
Lesson 12	_____ / 15	Examination 3 _____ / 30	_____ / 20
Lesson 13	_____ / 15		_____ / 20
Lesson 14	_____ / 15		_____ / 20
Lesson 15	_____ / 15		_____ / 20
Lesson 16	_____ / 15	Examination 4 _____ / 30	_____ / 20
Lesson 17	_____ / 15		_____ / 20
Lesson 18	_____ / 15		_____ / 20
Lesson 19	_____ / 15	Examination 5 _____ / 30	_____ / 20
Lesson 20	_____ / 15		_____ / 20
Lesson 21	_____ / 15		_____ / 20
Lesson 22	_____ / 15	Examination 6 _____ / 30	_____ / 20
Lesson 23	_____ / 15		_____ / 20
Lesson 24	_____ / 15		_____ / 20
Lesson 25	_____ / 15	Examination 7 _____ / 30	_____ / 20
Lesson 26	_____ / 15		_____ / 20
Lesson 27	_____ / 15		_____ / 20
Lesson 28	_____ / 15	Examination 8 _____ / 30	_____ / 20
Total Score / Percent	_____ / 420 = _____ %	_____ / 240 = _____ %	_____ / 560 = _____ %
	Quizzes _____ % + Examinations _____ % / 2 = _____ %		_____ %
Quiz/Exam Average _____ x 3 = _____ + Lab _____ = _____ / 4 x 100 = _____ Final Grade			

First Semester Suggested Daily Schedule

Date	Day	Assignment	Due Date	✓	Grade
First Semester-First Quarter					
Week 1	Day 1	Begin Chapter 1, Chemical Principles in Biology • Read Pages 4–8 • <i>Biology</i> • (BIO) Complete Lesson 1 Worksheet 1 Page 25 • <i>Teacher Guide</i> • (TG)			
	Day 2	Finish reading Chapter 1 • Pages 9–15 • (BIO) Complete Lesson 1 Worksheet 2 Page 26 • (TG)			
	Day 3	Read Laboratory 1, Biology — The Study of Life • Pages 16–17 • (BIO) • Start Laboratory 1 Page 27 • (TG)			
	Day 4	Conclude Laboratory 1 and Prepare Lesson 1 Lab Report Page 29 • (TG) • Review Chapter 1 for quiz			
	Day 5	Complete Quiz 1 Pages 237–238 • (TG)			
Week 2	Day 6	Begin Chapter 2, Water • Read Pages 18–21 • (BIO) Complete Lesson 2 Worksheet 1 Page 31 • (TG)			
	Day 7	Finish reading Chapter 2 • Pages 22–23 • (BIO) Complete Lesson 2 Worksheet 2 Page 32 • (TG)			
	Day 8	Read Laboratory 2, pH and Hydrogen Bonding of Water Molecules Pages 24–25 • (BIO) Start Laboratory 2 Pages 33–34 • (TG)			
	Day 9	Conclude Laboratory 2 and Prepare Lesson 2 Lab Report Page 35 • (TG) • Review Chapter 2 for quiz			
	Day 10	Complete Quiz 2 Pages 239–240 • (TG)			
Week 3	Day 11	Begin Chapter 3, Carbohydrates and Lipids • Read Pages 26–28 • (BIO) • Complete Lesson 3 Worksheet 1 Page 37 • (TG)			
	Day 12	Finish reading Chapter 3 • Pages 29–31 • (BIO) • Complete Lesson 3 Worksheet 2 Page 38 • (TG)			
	Day 13	Read Laboratory 3, Carbohydrates Pages 32–33 • (BIO) Start Laboratory 3 Pages 39–40 • (TG)			
	Day 14	Conclude Laboratory 3 and Prepare Lesson 3 Lab Report Pages 41–42 • (TG) • Review Chapter 3 for quiz			
	Day 15	Complete Quiz 3 Pages 241–242 • (TG)			
Week 4	Day 16	Begin Chapter 4, Proteins and Nucleic Acids • Read Pages 34–36 • (BIO) • Complete Lesson 4 Worksheet 1 Page 43 • (TG)			
	Day 17	Finish reading Chapter 4 • Pages 37–41 • (BIO) • Complete Lesson 4 Worksheet 2 Page 44 • (TG)			
	Day 18	Read Laboratory 4, Nucleic Acids Pages 42–43 • (BIO) Start Laboratory 4 Pages 45–46 • (TG)			
	Day 19	Conclude Laboratory 4 and Prepare Lesson 4 Lab Report Page 47 • (TG) • Review Chapter 4 for quiz			
	Day 20	Complete Quiz 4 Pages 243–244 • (TG)			
Week 5	Day 21	Review Lesson 1 and Lesson 1 Quiz			
	Day 22	Review Lesson 2 and Lesson 2 Quiz			
	Day 23	Review Lesson 3 and Lesson 3 Quiz			
	Day 24	Review Lesson 4 and Lesson 4 Quiz			
	Day 25	Take Exam 1 (Lessons 1–4) Pages 295–296 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Week 6	Day 26	Begin Chapter 5, Nature of Cells • Read Pages 44–47 • (BIO) Complete Lesson 5 Worksheet 1 Page 49 • (TG)			
	Day 27	Finish reading Chapter 5 • Pages 48–51 • (BIO) Complete Lesson 5 Worksheet 2 Page 50 • (TG)			
	Day 28	Read Laboratory 5, Use of the Microscope Pages 52–55 • (BIO) Start Laboratory 5 Pages 51–53 • (TG)			
	Day 29	Conclude Laboratory 5 and Prepare Lesson 5 Lab Report Page 55 • (TG) • Review Chapter 5 for quiz			
	Day 30	Complete Quiz 5 Page 245 • (TG)			
Week 7	Day 31	Begin Chapter 6, Cell Membranes and Nucleus • Read Pages 56–58 • (BIO) Complete Lesson 6 Worksheet 1 Page 57 • (TG)			
	Day 32	Finish reading Chapter 6 • Pages 59–61 • (BIO) Complete Lesson 6 Worksheet 2 Page 58 • (TG)			
	Day 33	Read Laboratory 6, Cells Pages 62–65 • (BIO) Start Laboratory 6 Pages 59–61 • (TG)			
	Day 34	Conclude Laboratory 6 and Prepare Lesson 6 Lab Report Page 63 • (TG) • Review Chapter 6 for quiz			
	Day 35	Complete Quiz 6 Pages 247–248 • (TG)			
Week 8	Day 36	Begin Chapter 7, Movement Through Cell Membranes • Read Pages 66–69 • (BIO) Complete Lesson 7 Worksheet 1 Page 65 • (TG)			
	Day 37	Finish reading Chapter 7 • Pages 70–71 • (BIO) Complete Lesson 7 Worksheet 2 Page 66 • (TG)			
	Day 38	Read Laboratory 7, Osmosis Pages 72–73 • (BIO) Start Laboratory 7 Pages 67–68 • (TG)			
	Day 39	Conclude Laboratory 7 and Prepare Lesson 7 Lab Report Pages 69–70 • (TG) • Review Chapter 7 for quiz			
	Day 40	Complete Quiz 7 Pages 249–250 • (TG)			
Week 9	Day 41	Begin Chapter 8, Cell Organelles • Read Pages 74–78 • (BIO) Complete Lesson 8 Worksheet 1 Page 71 • (TG)			
	Day 42	Finish reading Chapter 8 • Pages 79–81 • (BIO) Complete Lesson 8 Worksheet 2 Page 72 • (TG)			
	Day 43	Read Laboratory 8, Cell Structures Pages 82–85 • (BIO) Start Laboratory 8 Pages 73–74 • (TG)			
	Day 44	Conclude Laboratory 8 and Prepare Lesson 8 Lab Report Pages 75–76 • (TG) • Review Chapter 8 for quiz			
	Day 45	Complete Quiz 8 Pages 251–252 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
First Semester-Second Quarter					
Week 1	Day 46	Review Lesson 5 and Lesson 5 Quiz			
	Day 47	Review Lesson 6 and Lesson 6 Quiz			
	Day 48	Review Lesson 7 and Lesson 7 Quiz			
	Day 49	Review Lesson 8 and Lesson 8 Quiz			
	Day 50	Take Exam 2 (Lessons 5–8) Pages 297–298 • (TG)			
Week 2	Day 51	Begin Chapter 9, Cell Division • Read Pages 86–88 to the last full paragraph • (BIO) Complete Lesson 9 Worksheet 1 Page 77 • (TG)			
	Day 52	Finish reading Chapter 9 • Pages 88 from the last paragraph–90 • (BIO) • Complete Lesson 9 Worksheet 2 Page 78 • (TG)			
	Day 53	Read Laboratory 9, Cell Division Pages 92–93 • (BIO) Start Laboratory 9 Pages 79–80 • (TG)			
	Day 54	Conclude Laboratory 9 and Prepare Lesson 9 Lab Report Page 81 • (TG) • Review Chapter 9 for quiz			
	Day 55	Complete Quiz 9 Page 253 • (TG)			
Week 3	Day 56	Begin Chapter 10, Ecosystems • Read Pages 94–97 • (BIO) Complete Lesson 10 Worksheet 1 Page 83 • (TG)			
	Day 57	Finish reading Chapter 10 • Pages 98–101 • (BIO) Complete Lesson 10 Worksheet 2 Page 84 • (TG)			
	Day 58	Read Laboratory 10, Ecosystems Pages 102–103 • (BIO) Start Laboratory 10 Pages 85–86 • (TG)			
	Day 59	Conclude Laboratory 10 and Prepare Lesson 10 Lab Report Pages 87–88 • (TG) • Review Chapter 10 for quiz			
	Day 60	Complete Quiz 10 Page 255 • (TG)			
Week 4	Day 61	Begin Chapter 11, Biomes • Read Pages 104–110 • (BIO) Complete Lesson 11 Worksheet 1 Page 89 • (TG)			
	Day 62	Finish reading Chapter 11 • Pages 111–117 • (BIO) Complete Lesson 11 Worksheet 2 Page 90 • (TG)			
	Day 63	Read Laboratory 11, Biomes Pages 118–119 • (BIO) Start Laboratory 4 Page 91 • (TG)			
	Day 64	Conclude Laboratory 11 and Prepare Lesson 11 Lab Report Page 93 • (TG) • Review Chapter 11 for quiz			
	Day 65	Complete Quiz 11 Page 257 • (TG)			
Week 5	Day 66	Begin Chapter 12, Energy Capture — Photosynthesis • Read Pages 120–125 • (BIO) Complete Lesson 12 Worksheet 1 Page 95 • (TG)			
	Day 67	Finish reading Chapter 12 • Pages 126–127 • (BIO) Complete Lesson 12 Worksheet 2 Page 96 • (TG)			
	Day 68	Read Laboratory 12, Photosynthesis Pages 128–129 • (BIO) Start Laboratory 12 Pages 97–98 • (TG)			
	Day 69	Conclude Laboratory 12 and Prepare Lesson 12 Lab Report Page 99 • (TG) • Review Chapter 12 for quiz			
	Day 70	Complete Quiz 12 Page 259 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Week 6	Day 71	Review Lesson 9 and Lesson 9 Quiz			
	Day 72	Review Lesson 10 and Lesson 10 Quiz			
	Day 73	Review Lesson 11 and Lesson 11 Quiz			
	Day 74	Review Lesson 12 and Lesson 12 Quiz			
	Day 75	Take Exam 3 (Lessons 9–12) Pages 299–300 • (TG)			
Week 7	Day 76	Begin Chapter 13, Energy Release — Respiration • Read Pages 130–134 • (BIO) Complete Lesson 13 Worksheet 1 Pages 101 • (TG)			
	Day 77	Finish reading Chapter 13 • Pages 135–137 • (BIO) Complete Lesson 13 Worksheet 2 Pages 103–104 • (TG)			
	Day 78	Read Laboratory 13, Cellular Respiration Pages 138–139 • (BIO) Start Laboratory 13 Pages 105–106 • (TG)			
	Day 79	Conclude Laboratory 13 and Prepare Lesson 13 Lab Report Page 107 • (TG) • Review Chapter 13 for quiz			
	Day 80	Complete Quiz 13 Page 261 • (TG)			
Week 8	Day 81	Begin Chapter 14, Chromosomes and Genes Read Pages 140–143 • (BIO) Complete Lesson 14 Worksheet 1 Page 109 • (TG)			
	Day 82	Finish reading Chapter 14 • Pages 144–145 • (BIO) • Complete Lesson 14 Worksheet 2 Page 110 • (TG)			
	Day 83	Read Laboratory 14, Chromosomes and Genes Pages 146–149 • (BIO) • Start Laboratory 14 Pages 111–113 • (TG)			
	Day 84	Conclude Laboratory 14 and Prepare Lesson 14 Lab Report Page 115 • (TG) • Review Chapter 14 for quiz			
	Day 85	Complete Quiz 14 Pages 263–264 • (TG)			
Week 9	Day 86	Begin Chapter 15, The Genetic Code • Read Pages 150–152 • (BIO) • Complete Lesson 15 Worksheet 1 Page 117 • (TG)			
	Day 87	Finish reading Chapter 15 • Pages 153–155 • (BIO) Complete Lesson 15 Worksheet 2 Page 118 • (TG)			
	Day 88	Read Laboratory 15, The Genetic Code Pages 156–157 • (BIO) Start Laboratory 15 Pages 119–120 • (TG)			
	Day 89	Conclude Laboratory 15 and Prepare Lesson 15 Lab Report Page 121 • (TG) • Review Chapter 15 for quiz			
	Day 90	Complete Quiz 15 Page 265 • (TG)			
		Mid-Term Grade			

Second Semester Suggested Daily Schedule

Date	Day	Assignment	Due Date	✓	Grade
Second Semester-Third Quarter					
Week 1	Day 91	Begin Chapter 16, Expression of DNA — Transcription • Read Pages 158-161 to top paragraph • (BIO) Complete Lesson 16 Worksheet 1 Page 123 • (TG)			
	Day 92	Finish reading Chapter 16 • Pages 161 from top paragraph-163 • (BIO) • Complete Lesson 16 Worksheet 2 Page 124 • (TG)			
	Day 93	Read Laboratory 16, Transcription — mRNA Pages 164-167 • (BIO) • Start Laboratory 16 Pages 125-128 • (TG)			
	Day 94	Conclude Laboratory 16 and Prepare Lesson 16 Lab Report Page 129 • (TG) • Review Chapter 16 for quiz			
	Day 95	Complete Quiz 16 Page 267 • (TG)			
Week 2	Day 96	Review Lesson 13 and Lesson 13 Quiz			
	Day 97	Review Lesson 14 and Lesson 14 Quiz			
	Day 98	Review Lesson 15 and Lesson 15 Quiz			
	Day 99	Review Lesson 16 and Lesson 16 Quiz			
	Day 100	Take Exam 4 (Lessons 13–16) Pages 301-302 • (TG)			
Week 3	Day 101	Begin Chapter 17, Expression of DNA — Translation • Read Pages 168-170 • (BIO) Complete Lesson 17 Worksheet 1 Page 131 • (TG)			
	Day 102	Finish reading Chapter 17 • Pages 171-173 • (BIO) Complete Lesson 17 Worksheet 2 Page 132 • (TG)			
	Day 103	Read Laboratory 17, Disruption of DNA Translation and Products of DNA Translation within Bacteria Cells Pages 174- 177 • (BIO) • Start Laboratory 17 Pages 133-136 • (TG)			
	Day 104	Conclude Laboratory 17 and Prepare Lesson 17 Lab Report Page 137 • (TG) • Review Chapter 17 for quiz			
	Day 105	Complete Quiz 17 Page 269 • (TG)			
Week 4	Day 106	Begin Chapter 18, Perpetuation of Life • Read Pages 178-181 • (BIO) • Complete Lesson 18 Worksheet 1 Page 139 • (TG)			
	Day 107	Finish reading Chapter 18 • Pages 182-185 • (BIO) Complete Lesson 18 Worksheet 2 Page 140 • (TG)			
	Day 108	Read Laboratory 18, Diverse Products of Protein Translation at Different Stages of Development Pages 186-189 • (BIO) Start Laboratory 18 Pages 141-143 • (TG)			
	Day 109	Conclude Laboratory 18 and Prepare Lesson 18 Lab Report Page 145 • (TG) • Review Chapter 18 for quiz			
	Day 110	Complete Quiz 18 Page 271 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Week 5	Day 111	Begin Chapter 19, Genetics Patterns I • Read Pages 190-193 • (BIO) • Complete Lesson 19 Worksheet 1 Page 147 • (TG)			
	Day 112	Finish reading Chapter 19 • Pages 194-195 • (BIO) Complete Lesson 19 Worksheet 2 Page 148 • (TG)			
	Day 113	Read Laboratory 19, Human Genetics Pages 196-199 • (BIO) Start Laboratory 19 Pages 149-152 • (TG)			
	Day 114	Conclude Laboratory 19 and Prepare Lesson 19 Lab Report Pages 153-155 • (TG) • Review Chapter 19 for quiz			
	Day 115	Complete Quiz 19 Page 273 • (TG)			
Week 6	Day 116	Review Lesson 17 and Lesson 17 Quiz			
	Day 117	Review Lesson 18 and Lesson 18 Quiz			
	Day 118	Review Lesson 19 and Lesson 19 Quiz			
	Day 119	Review Lessons 17–19			
	Day 120	Take Exam 5 (Lessons 17–19) Pages 303-304 • (TG)			
Week 7	Day 121	Begin Chapter 20, Genetics Patterns 2 • Read Pages 200-202 • (BIO) • Complete Lesson 20 Worksheet 1 Page 157 • (TG)			
	Day 122	Finish reading Chapter 20 • Pages 203-207 • (BIO) Complete Lesson 20 Worksheet 2 Page 158 • (TG)			
	Day 123	Read Laboratory 20, Dihybrid Test Cross with Corn Pages 208-211 • (BIO) • Start Laboratory 20 Pages 159-162 • (TG)			
	Day 124	Conclude Laboratory 20 and Prepare Lesson 20 Lab Report Page 163 • (TG) • Review Chapter 20 for quiz			
	Day 125	Complete Quiz 20 Page 275 • (TG)			
Week 8	Day 126	Begin Chapter 21, Genetic Mutations and Variations • Read Pages 212-214 • (BIO) Complete Lesson 21 Worksheet 1 Page 165 • (TG)			
	Day 127	Finish reading Chapter 21 • Pages 214-219 • (BIO) Complete Lesson 21 Worksheet 2 Page 166 • (TG)			
	Day 128	Read Laboratory 21, Genetic Variation Pages 220-223 • (BIO) Start Laboratory 21 Pages 167-169 • (TG)			
	Day 129	Conclude Laboratory 21 and Prepare Lesson 21 Lab Report Page 171 • (TG) • Review Chapter 21 for quiz			
	Day 130	Complete Quiz 21 Page 277 • (TG)			
Week 9	Day 131	Begin Chapter 22, Genomics • Read Pages 224-227 end of top paragraph • (BIO) Complete Lesson 22 Worksheet 1 Page 173 • (TG)			
	Day 132	Finish reading Chapter 22 • Pages 228 from first full paragraph-229 • (BIO) Complete Lesson 22 Worksheet 2 Page 174 • (TG)			
	Day 133	Read Laboratory 22, Plants Pages 230-233 • (BIO) Start Laboratory 22 Pages 175-177 • (TG)			
	Day 134	Conclude Laboratory 22 and Prepare Lesson 22 Lab Report Page 179 • (TG) • Review Chapter 22 for quiz			
	Day 135	Complete Quiz 22 Page 279 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Second Semester-Fourth Quarter					
Week 1	Day 136	Review Lesson 20 and Lesson 20 Quiz			
	Day 137	Review Lesson 21 and Lesson 21 Quiz			
	Day 138	Review Lesson 22 and Lesson 22 Quiz			
	Day 139	Review Lessons 20–22			
	Day 140	Take Exam 6 (Lessons 20–22) Pages 305-306 • (TG)			
Week 2	Day 141	Begin Chapter 23, Plant Taxonomy • Read Pages 234-238 • (BIO) Complete Lesson 23 Worksheet 1 Page 181 • (TG)			
	Day 142	Finish reading Chapter 23 • Pages 239-243 • (BIO) Complete Lesson 23 Worksheet 2 Page 182 • (TG)			
	Day 143	Read Laboratory 23, Protists and Fungi Pages 244-247 • (BIO) Start Laboratory 23 Pages 183-186 • (TG)			
	Day 144	Conclude Laboratory 23 and Prepare Lesson 23 Lab Report Page 187 • (TG) • Review Chapter 23 for quiz			
	Day 145	Complete Quiz 23 Page 281 • (TG)			
Week 3	Day 146	Begin Chapter 24, Animal Taxonomy — Invertebrates • Read Pages 248-252 • (BIO) Complete Lesson 24 Worksheet 1 Pages 189-191 • (TG)			
	Day 147	Finish reading Chapter 24 • Pages 253-257 • (BIO) Complete Lesson 24 Worksheet 2 Pages 191-192 • (TG)			
	Day 148	Read Laboratory 24, Invertebrate Animals Pages 258-263 • (BIO) Start Laboratory 24 Pages 193-198 • (TG)			
	Day 149	Conclude Laboratory 24 and Prepare Lesson 24 Lab Report Page 199 • (TG) • Review Chapter 24 for quiz			
	Day 150	Complete Quiz 24 Page 283 • (TG)			
Week 4	Day 151	Begin Chapter 25 Animal Taxonomy — Vertebrates • Read Pages 264-270 • (BIO) Complete Lesson 25 Worksheet 1 Pages 201-202 • (TG)			
	Day 152	Finish reading Chapter 25 • Pages 271-277 • (BIO) Complete Lesson 25 Worksheet 2 Pages 203-204 • (TG)			
	Day 153	Read Laboratory 25, Vertebrate Animals Pages 278-283 • (BIO) Start Laboratory 25 Pages 205-208 • (TG)			
	Day 154	Conclude Laboratory 25 and Prepare Lesson 25 Lab Report Page 209 • (TG) • Review Chapter 25 for quiz			
	Day 155	Complete Quiz 25 Page 285 • (TG)			
Week 5	Day 156	Review Lesson 23 and Lesson 23 Quiz			
	Day 157	Review Lesson 24 and Lesson 24 Quiz			
	Day 158	Review Lesson 25 and Lesson 25 Quiz			
	Day 159	Review Lessons 23–25			
	Day 160	Take Exam 7 (Lessons 23–25) Pages 307-308 • (TG)			

Date	Day	Assignment	Due Date	✓	Grade
Week 6	Day 161	Begin Chapter 26, Views of Biological Origins • Read Pages 284-188 • (BIO) Complete Lesson 26 Worksheet 1 Page 211 • (TG)			
	Day 162	Finish reading Chapter 26 • Pages 289-295 • (BIO) Complete Lesson 26 Worksheet 2 Pages 213-214 • (TG)			
	Day 163	Read Laboratory 26, Decomposition or Fossilization Pages 296-297 • (BIO) • Start Laboratory 26 Pages 215-217 • (TG)			
	Day 164	Conclude Laboratory 26 and Prepare Lesson 26 Lab Report Page 219 • (TG) • Review Chapter 26 for quiz			
	Day 165	Complete Quiz 26 Page 287 • (TG)			
Week 7	Day 166	Begin Chapter 27, Evidences of Biological Origins • Read Pages 298-302 • (BIO) Complete Lesson 27 Worksheet 1 Page 221 • (TG)			
	Day 167	Finish reading Chapter 27 • Pages 303-305 • (BIO) Complete Lesson 27 Worksheet 2 Page 222 • (TG)			
	Day 168	Read Laboratory 27, Diversity Within Kinds of Creation Pages 306-307 • (BIO) • Start Laboratory 27 Pages 223-224 • (TG)			
	Day 169	Conclude Laboratory 27 and Prepare Lesson 27 Lab Report Page 225 • (TG) • Review Chapter 27 for quiz			
	Day 170	Complete Quiz 27 Page 289 • (TG)			
Week 8	Day 171	Begin Chapter 28, Human Origins • Read Pages 308-311 • (BIO) Complete Lesson 28 Worksheet 1 Pages 227-228 • (TG)			
	Day 172	Finish reading Chapter 28 • Pages 312-315 • (BIO) Complete Lesson 28 Worksheet 2 Pages 229-230 • (TG)			
	Day 173	Read Laboratory 28, Human Origins Pages 316-319 • (BIO) Start Laboratory 28 Pages 231-232 • (TG)			
	Day 174	Conclude Laboratory 28 and Prepare Lesson 28 Lab Report Page 233 • (TG) • Review Chapter 28 for quiz			
	Day 175	Complete Quiz 28 Page 291 • (TG)			
Week 9	Day 176	Review Lesson 26 and Lesson 26 Quiz			
	Day 177	Review Lesson 27 and Lesson 27 Quiz			
	Day 178	Review Lesson 28 and Lesson 28 Quiz			
	Day 179	Review Lessons 26–28			
	Day 180	Take Exam 8 (Lessons 26–28) Pages 309-310 • (TG)			
		Final Grade			

**Worksheets
and
Laboratory Reports**



Fill in the Blank

1. All atoms with the same chemical behavior are the same _____.
2. The basic building blocks of atoms are _____, _____, and _____.
3. The atomic number of an atom is its number of _____.
4. Atoms with the same atomic number are the same _____.
5. A combination of two or more atoms is called a _____.
6. _____ molecules of CO_2 are used to make one molecule of glucose.
7. For every molecule of glucose formed in photosynthesis, _____ molecules of O_2 are formed.
8. There are _____ H atoms in one glucose molecule.
9. There are _____ C atoms in one glucose molecule.
10. _____ and _____ are found in the nucleus of an atom.

Short Answer

11. What is a structural formula?
12. Write out the chemical equation for photosynthesis as given in the text.

Matching

- A. Crossed different varieties of peas B. Found that cells only came from other cells
C. Developed a system for classifying plants and animals
13. _____ Rudolf Virchow
 14. _____ Carolus Linnaeus
 15. _____ Gregor Mendel



Fill in the Blank

1. A proton has a charge of _____.
2. A neutron has no charge — it is _____.
3. An electron has a charge of _____.
4. The mass of an atom is determined by its _____ and _____.
5. An atom's atomic mass number is the sum of the number of its _____ and _____.
6. Isotopes are atoms that have the same number of _____ but different numbers of _____.
7. Erwin Schrodinger in 1926 described the electrons of atoms by their energies rather than their physical positions. He referred to these energy levels as _____.
8. According to his model, there could be _____ electrons in the innermost shell's orbital (the lowest energy level).

Short Answer

9. Are $^{14}\text{C}_6$ and $^{12}\text{C}_6$ isotopes of each other? Why?

10. Are $^{14}\text{C}_6$ and $^{14}\text{N}_7$ isotopes of each other? Why?

Matching

A. Lose B. 8 C. Attract D. 4 E. Gain

11. _____ An atom would be more stable if there were a total of this many electrons in the outermost shell.
12. _____ Metal atoms like sodium and calcium tend to do this with electrons to achieve this number.
13. _____ Non-metal atoms like oxygen and chlorine tend to do this with electrons to achieve this number.
14. _____ Opposite charged objects do this to each other.
15. _____ How many chemical bonds are there for each carbon atom in the glucose molecule?

**Fill in the Blank**

1. A water molecule has a partial _____ charge on the oxygen side and a partial _____ charge on the side of the hydrogen atoms.
2. This causes the slightly positive end (the hydrogen side) of one molecule to be _____ to the slightly negative end (the oxygen side) of another water molecule.
3. This weak attraction is called a _____ bond.
4. Water molecules are polar, and oil is _____.
5. The word for water loving is _____ and the word for water fearing is _____.

Short Answer

6. A calorie is:

Matching

A. Less

B. Oxygen

C. Heat

D. Hydrogen

7. _____ Water has a high heat capacity, meaning that it takes considerable heat to turn water to steam?
8. _____ Ice is _____ dense than liquid water which is why ice floats in liquid water.
9. _____ If it were not for the these bonds between water molecules, water would boil at less than -200°F .
10. _____ What is light enough to be a gas at room temperature, so water should be even more so?

**Fill in the Blank**

1. About 1 out of every _____ water molecules comes apart as _____ and _____.
2. _____ is an acid.
3. _____ is a base.
4. pH = 7 is _____.
5. pH = 9 has _____ x more OH^- (or base) than pH = 7.
6. pH = 6 has _____ x more H^+ (or acid) than pH = 7.

Matching

A. Acidic

B. Neutral

C. pH 7.8

D. Basic

7. _____ More base than acid
8. _____ More acid than base
9. _____ Acid equals base
10. _____ Healthy body fluids

PROCEDURE

Answer the questions in this lab in your lab report with complete sentences.

The pH of a solution is measured by the reaction of H^+ ions and OH^- ions with indicator compounds in pH paper.

1. Add 50 ml (milliliters measured with a 50 ml graduated cylinder) of distilled water to a 100 ml beaker. Dip a piece of pH indicator paper in the water. Match the color of the wet pH paper to the color chart on the pH paper container to determine the pH of distilled water. Write down all of your results. You may use the lab notes section on the right.
2. Use the eyedropper to add 5 drops of vinegar to the distilled water and determine its pH.
3. Add another 5 drops of vinegar to the water and determine its pH.
4. Do this one more time and determine its pH.
5. Describe the trend in the pH values as more vinegar (acetic acid) is added. If you added more OH^- ions to water, the pH would increase.
6. Add about $\frac{1}{2}$ teaspoon of sodium bicarbonate (baking soda, $NaHCO_3$) to the water vinegar mixture. Describe what happens. Check the pH after the $NaHCO_3$ is added. What did the $NaHCO_3$ do to the pH?

Some plants (especially grasses) grow best when the soil is slightly acidic and dark green leafy plants and legumes (beans) favor slightly basic soil.

Digestive enzymes in your stomach function best in a strong acidic solution and the enzymes in the small intestine function best in a slightly basic fluid.

The following procedure demonstrates the hydrogen bonds between water molecules.

1. Fill a drinking glass with a smooth rim with water. Use an eyedropper to add water until the water forms a slight elevated dome over the middle of the water surface. This dome shape of the water surface is called a meniscus.
2. Take a sewing needle and with a pair of tweezers gently lay the needle on the top of the meniscus so that it floats. This is possible because of the hydrogen bonds between the water molecules. It is as if the water molecules are holding hands underneath the needle holding it so that it floats.
3. With the eyedropper, add a drop of liquid soap to the water. What happens to the needle and the meniscus? The soap disrupts the hydrogen bonds between the water molecules.



Laboratory Report (20 points possible)

The pH of a solution

Hydrogen bonding between water molecules



Fill in the Blank

1. Smaller units of larger molecules are called _____.
2. The larger molecules that are composed of many of the smaller units are called _____.
3. A 6-carbon sugar molecule is called a _____.
4. Two 6-carbon sugar molecules combined together are called a _____.
5. Many 6-carbon sugar molecules bonded together are called _____.
6. Fructose is found in _____.
7. Fructose is an _____ of glucose, meaning that it has the same number of each _____ as in glucose but they are in a different _____.
8. Sucrose (table sugar) is formed by bonding together a _____ molecule and a _____ molecule.
9. Glucose is a _____ sugar molecule, also called a _____.
10. Sucrose is a _____ sugar molecule, also called a _____.
11. Maltose is formed by bonding a _____ molecule to a _____ molecule.
12. Lactose is formed by bonding a _____ molecule to a _____ molecule.
13. Lactose is found in _____.
14. Two common starch molecules found in plants are _____ and _____.

Matching

A. Energy B. Microorganisms C. Glycogen D. Glucose

15. _____ What starch in animal tissues is called.
16. _____ Starches (like amylose and amylopectin) are these kind of storage molecules.
17. _____ Cellulose is a polymer (and also a polysaccharide) formed by bonding with what in such a way that grazers and humans cannot digest it?
18. _____ In grazers and termites, cellulose is digested by this.

Short Answer

19. Write the molecular formula for glucose.



Fill in the Blank

- _____ is a polysaccharide found in the shells of insects and crustaceans.
- Lipids include _____ and _____ molecules.
- They are _____ (attracts oil and repels water).
- In contrast to water, they are _____ solvents such as oils.
- Animal fats are called _____.
- The main backbone structure of animal fats is a _____ molecule.
- Three _____ are attached to this backbone.

Matching

A. Unsaturated fatty acids

C. Polyunsaturated fatty acids

B. Liquids

D. Saturated fatty acids

- _____ Fatty acids with no double bonds between their carbon atoms are classified as what?
- _____ Fatty acids with one double bond between their carbon atoms are called what?
- _____ Fatty acids with several double bonds between their carbon atoms are called what?
- _____ Fats with a high content of polyunsaturated fatty acids are what at room temperature?

Short Answer

- Fats with a large proportion of saturated fatty acids have what?
- When the energy intake from food exceeds the energy used by the body, what happens?



Laboratory Report (20 points possible)

1. Results from test tube 1
2. Results from test tube 2
3. Results from test tube 3
4. Results from test tube 4
5. The effect of amylase on starch
6. The effect of amylase on sucrose

Starch content of potato

Lab result

Conclusion and explanation

Starch content of apple

Lab result

Conclusion and explanation

Starch content of banana

Lab result

Conclusion and explanation

Starch content of corn

Lab result

Conclusion and explanation

Quizzes

Match the Correct Answers

- | | |
|----------------------------|---|
| _____ 1. Electron | A. determined by its protons and neutrons |
| _____ 2. Mass of an atom | B. has 8 neutrons |
| _____ 3. Atomic number | C. have the same number of protons but not neutrons |
| _____ 4. Isotopes | D. has a negative charge |
| _____ 5. $^{14}\text{C}_6$ | E. the number of an atom's protons |

Circle the Correct Answers

6. A glucose molecule has _____ carbon atoms.
- A. 2
 - B. 4
 - C. 6
 - D. 12
7. Metals tend to _____ electrons.
- A. gain
 - B. lose
 - C. annihilate
8. A proton has a charge of _____.
- A. +1
 - B. -1
 - C. 0
9. Metals and non-metals form _____ bonds.
- A. metallic
 - B. covalent
 - C. ionic
 - D. hydrogen
10. Non-metals and non-metals form _____ bonds.
- A. metallic
 - B. covalent
 - C. ionic
 - D. hydrogen

11. _____ is formed in photosynthesis.
- A. CO_2
 - B. O_2
 - C. H_2O_2
 - D. $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
12. _____ is **not** an ion.
- A. O_2
 - B. Cl^-
 - C. Na^+
 - D. H^+
13. Elements are identified by their number of _____.
- A. protons
 - B. neutrons
 - C. electrons
 - D. glyptons
14. Schrodinger called the energy levels of electrons _____.
- A. layers
 - B. orbits
 - C. orbitals
 - D. calories
15. It was determined that atoms were more stable if they had _____ electrons in their outer shell.
- A. 2
 - B. 4
 - C. 6
 - D. 8

**Circle the Correct Answers**

- Water has a partial _____ charge on the oxygen side and a partial _____ charge on the hydrogen side.
 - +, +
 - , -
 - +, -
 - , +
- Water dissolves polar compounds because of its _____ bonds.
 - ionic
 - hydrogen
 - covalent
 - metallic
- Water has a _____ heat capacity.
 - low
 - high
 - average
 - zero
- One out of every _____ water molecules comes apart.
 - 3
 - 10
 - 1,000
 - 10,000,000
- _____ is an acid.
 - OH^-
 - H_2O
 - H^+
 - O^-
- _____ is a base.
 - OH^-
 - H_2O
 - H^+
 - O^-

7. A solution of pH 9 has _____ times more base than a solution of pH 7.
- A. 2
 - B. 10
 - C. 100
 - D. 1,000
8. _____ keeps water from boiling at -200°F .
- A. Air pressure
 - B. Hydrogen bonds
 - C. Salt
 - D. Ice
9. Water is _____ and oil is _____.
- A. polar, polar
 - B. non-polar, non-polar
 - C. non-polar, polar
 - D. polar, non-polar
10. _____ means water loving.
- A. Hydrophilic
 - B. Hydrophobic
 - C. Hydroplaning
 - D. Hydroprolific

Match the Correct Answers

- | | |
|-------------------|--------------------------|
| _____ 11. Calorie | A. pH 7 |
| _____ 12. Acidic | B. heat energy |
| _____ 13. Basic | C. pH 3 |
| _____ 14. Neutral | D. pH 12 |
| _____ 15. Ice | E. less dense than water |



Match the Correct Answers

- | | |
|------------------------|---|
| _____ 1. Sucrose | A. found in milk |
| _____ 2. Lactose | B. glycogen |
| _____ 3. Lipid | C. triglycerides |
| _____ 4. Animal fat | D. is hydrophobic |
| _____ 5. Animal starch | E. glucose and fructose bonded together |

Circle the Correct Answers

6. Fructose is a(n) _____ of glucose.
- A. isotope
 - B. replica
 - C. manufactured copy
 - D. isomer
7. Sucrose is a _____.
- A. monosaccharide
 - B. disaccharide
 - C. polysaccharide
8. Cellulose is a _____.
- A. monosaccharide
 - B. disaccharide
 - C. polysaccharide
9. Lipids include _____ and _____.
- A. fats, water
 - B. sucrose, glucose
 - C. fats, oil
 - D. amylose, oil
10. Excess energy is stored as _____ around the body.
- A. fat
 - B. starch
 - C. water
 - D. adipose tissue

Match the Correct Answers

- _____ 11. Starch A. fatty acids with no double bonds
_____ 12. Glucose B. an energy storage molecule
_____ 13. Glycerol C. backbone of animal fat
_____ 14. Polyunsaturated fatty acid D. monosaccharide
_____ 15. Saturated fatty acid E. fatty acids with many double bonds

Exams

Match the Correct Answers

- | | |
|--------------------------------|---|
| _____ 1. Glucose | A. metal and non-metal |
| _____ 2. Metal | B. 6 carbon atoms |
| _____ 3. Non-metal | C. gains electrons |
| _____ 4. Covalent bond | D. loses electrons |
| _____ 5. Ionic bond | E. non-metal and non-metal |
| _____ 6. Isotopes | A. have 8 electrons in outer shell |
| _____ 7. Atomic number | B. has + and – ends |
| _____ 8. More stable atoms | C. same number of protons, different number of neutrons |
| _____ 9. Water | D. allow water to dissolve polar compounds |
| _____ 10. Hydrogen bonds | E. the number of an atom's protons |
| _____ 11. pH 3 | A. base |
| _____ 12. pH 9 | B. less dense than water |
| _____ 13. -OH | C. what Schrodinger called the energy levels of electrons |
| _____ 14. Ice | D. more base than acid |
| _____ 15. Orbitals | E. more acid than base |
| _____ 16. Sucrose | A. animal starch |
| _____ 17. Glycogen | B. no double bonds |
| _____ 18. Triglycerides | C. polysaccharide |
| _____ 19. Cellulose | D. glucose and fructose bonded together |
| _____ 20. Saturated fatty acid | E. animal fat |
| _____ 21. Starch | A. an energy storage molecule |
| _____ 22. Adipose tissue | B. an acid and the carboxylic end of an amino acid |
| _____ 23. Protein | C. in RNA but not in DNA |
| _____ 24. -COOH | D. excess energy stored around the body |
| _____ 25. Uracil | E. chain of amino acids |

- | | |
|-----------------------------------|---------------------------------|
| _____ 26. Ribonucleic acid | A. backbone of nucleic acid |
| _____ 27. Thymine | B. primary structure of protein |
| _____ 28. Sugar and phosphate | C. RNA |
| _____ 29. ATP | D. stores energy in cells |
| _____ 30. Sequence of amino acids | E. in DNA but not in RNA |

**Answers to Worksheets,
Laboratory Reports,
Quizzes
and
Exams**

Biology Worksheet and Lab Report Answer Keys

Lesson 1

Worksheet 1

1. Element
2. Protons, neutrons, electrons (in any order)
3. Protons
4. Element
5. Molecule
6. 6
7. 6
8. 12
9. 6
10. Protons, neutrons (in any order)
11. A two-dimensional picture of the arrangement of the atoms in a molecule.
12. $12 \text{ H}_2\text{O} + 6 \text{ CO}_2 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{ O}_2 + 6 \text{ H}_2\text{O}$
13. B
14. C
15. A

Lesson 1

Worksheet 2

1. +1
2. Neutral
3. -1
4. Protons, neutrons (any order)
5. Protons, neutrons (any order)
6. Protons, neutrons (in this order)
7. Shells
8. 2
9. Yes. They both have 6 protons and they have different numbers of neutrons.
10. No. They have different numbers of protons.
11. B
12. A
13. E
14. C
15. D

Lesson 1

Lab Report

The student is to go to a place outdoors and describe the observed life forms. The report is to consist of complete sentences and clear descriptions. Award a possible 20 points for the overall descriptions:

- 8 points for identifying and describing a keystone species (one that if removed would have a large impact on the others)
- 6 points for identifying and describing consumers (feeders)
- 6 points for identifying and describing decomposers. The impacts of bacterial decomposition will be seen rather than the bacteria themselves. Mold also counts as a decomposer.

Lesson 2

Worksheet 1

1. Negative, positive (in this order)
2. Attracted
3. Hydrogen
4. Non-polar
5. Hydrophilic, hydrophobic
6. the amount of heat energy necessary to raise 1 gram of water one degree Celsius
7. C
8. A
9. D
10. B

Lesson 2

Worksheet 2

1. 10 million, H^+ and $-\text{OH}$
2. H^+
3. $-\text{OH}$
4. Neutral
5. 100
6. 10
7. D
8. A

9. B
10. C

Lesson 2

Lab Report

When grading the lab report, award

- 10 possible points for following directions
- 10 points for answering the questions for the pH procedures and hydrogen bonding procedures

The answers are the student's observations. 20 points possible overall.

Lesson 3

Worksheet 1

1. Monomers
2. Polymers
3. Monosaccharide
4. Disaccharide
5. Polysaccharides
6. Fruit
7. Isomer, atom, arrangement
8. Glucose, fructose (either order)
9. 6-carbon, monosaccharide
10. 12-carbon, disaccharide
11. Glucose, glucose
12. Glucose, galactose (either order)
13. Milk
14. Amylose, amylopectin (either order)
15. C
16. A
17. D
18. B
19. $C_6H_{12}O_6$

Lesson 3

Worksheet 2

1. Chitin
2. Fat, oil (either order)
3. Hydrophobic
4. Non-polar

5. Triglycerides
6. Glycerol
7. Fatty acids
8. D
9. A
10. C
11. B
12. Higher melting point and are solid at room temperatures
13. The excess is stored first in the form of glycogen in the liver and then in adipose tissue around the body

Lesson 3

Lab Report

The report for steps 1–8 describes the results for test tubes 1–4. The answers to the questions are the student's observations. Award

- 15 possible points for steps 1–8
 - 5 possible points for the answers (student observations) for step 9. Iodine turns food dark blue or black when starch is present
- 20 points possible overall.

Lesson 4

Worksheet 1

1. Muscle tissue, cell membranes, and enzymes (any order)
2. Amino acids
3. Amino, carboxyl (in this order)
4. 20
5. Atoms
6. Glycine, H (hydrogen)
7. B
8. A
9. C
10. Long chain of amino acids
11. Coiling of a polypeptide chain into a spiral helix
12. The coiling of a polypeptide chain into a spiral helix
13. When polypeptide chains lie side by side forming a sheet-like structure

Biology Quiz Answer Keys

Quiz #1

Chemical Principles in Biology

1. D
2. A
3. E
4. C
5. B
6. C
7. B
8. A
9. C
10. B
11. B
12. A
13. A
14. C
15. D

Quiz #2

Water

1. D
2. B
3. B
4. D
5. C
6. A
7. C
8. B
9. D
10. A
11. B
12. C
13. D
14. A
15. E

Quiz #3

Carbohydrates and Lipids

1. E
2. A
3. D
4. C
5. B
6. D
7. B
8. C
9. C
10. D
11. B
12. D
13. C
14. E
15. A

Quiz #4

Proteins and Nucleic Acids

1. A
2. D
3. B
4. E
5. C
6. A
7. A
8. C
9. B
10. D
11. E
12. A
13. C
14. D
15. B

Biology Exam Answer Keys

Examination #1 (Lessons 1–4)

1. B
2. D
3. C
4. E
5. A
6. C
7. E
8. A
9. B
10. D
11. E
12. D
13. A
14. B
15. C
16. D
17. A
18. E
19. C
20. B
21. A
22. D
23. E
24. B
25. C
26. C
27. E
28. A
29. D
30. B

Examination #2 (Lessons 5–8)

1. E
2. C
3. A
4. D
5. B
6. D
7. C
8. E
9. B
10. A
11. B
12. A
13. D
14. E
15. C
16. C
17. D
18. A
19. B
20. E
21. C
22. B
23. E
24. D
25. A
26. A
27. D
28. B
29. E
30. C

Biology Slide Cross-Reference

This reference provides page numbers in the *Master's Class Biology* curriculum and optional *Biology through a Microscope* book for the corresponding lab exercise slides. Additional information about the content in *Biology through a Microscope* is noted on the right.

Lab 5

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
Thread	54-55	6	Darkfield microscopy contrast
Marker	Physical practice only, not imaged		

Lab 6

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
Cheek Cells	63	13	Comparison of stains, not cheek cells
<i>Spirogyra</i>	64	53	
<i>Paramecium</i>	64-65	84-85	
Bacteria	65	80-81	Scanning electron microscope images

Lab 8

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
<i>Paramecium</i>	81, 83	84-85	
<i>Amoeba</i>	84	78-79	
Human Blood	85		
Frog Blood	85	19	Darkfield microscopy contrast

Labs 9, 14

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
Onion Root Tip Mitosis	89, 91		
<i>Ascaris</i> (Mitosis)	93	28-29	Large cross sections of whole organism

Lab 17

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
Muscle Types	175-176	10	Various magnifications
Motor Neurons	176	10	

Lab 18

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
Fern Life Cycle	188	60-61	
Moss Life Cycle	188-189	70-71	

Lab 22

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
<i>Ranunculus</i> root (c.s.)	231	56-57	
<i>Ranunculus</i> stem (c.s.)	232	57	
<i>Ficus</i> leaf (c.s.)	233	Cover	

Lab 23

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
<i>Amoeba</i>	546	78-79	
Diatoms	245-246	6, 53	
<i>Euglena</i>	245, 247	82-83	Highlights pellicle
<i>Volvox</i>	245-247	53	
Yeast		62	
Mold		62-63	

Lab 24

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
<i>Planaria</i>	260	16-17	
Earthworm (c.s.)	260		

Lab 25

Slide	Biology Student Book Pages	Biology through a Microscope Pages	Biology through a Microscope Notes
Frog ovary	279		
Frog sperm	280		
Human skin	280	11	