

TEACHER GUIDE

11th–12th Grade

Includes Student
Worksheets

Science



Weekly Lesson Schedule



Labs



Supply List



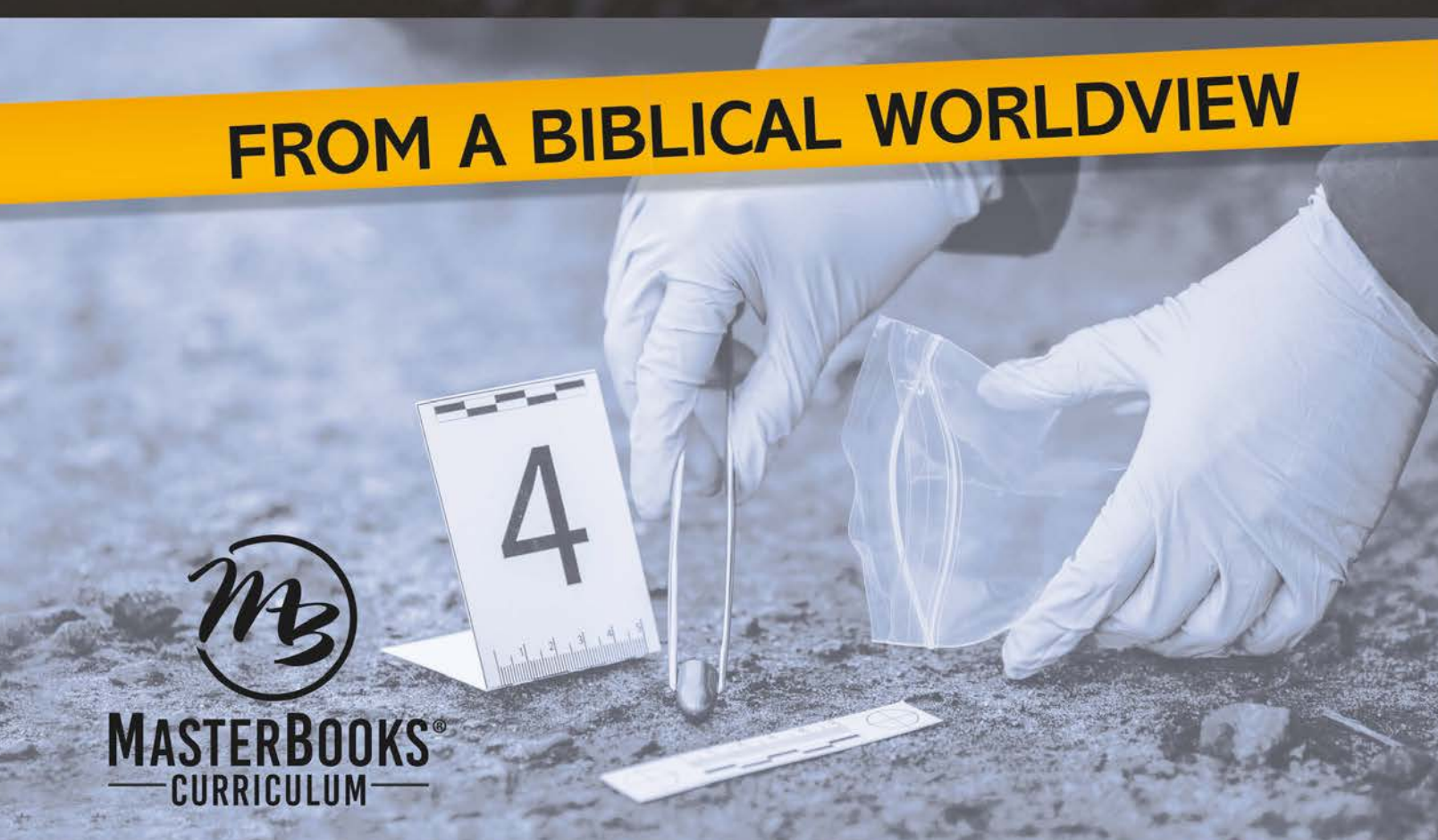
Answer Key

Intro to FORENSIC SCIENCE

FROM A BIBLICAL WORLDVIEW



MASTERBOOKS®
— CURRICULUM —





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All Scriptures marked (KJV) are from the King James Version.

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About the Author



Jennifer Hall Rivera EdD is the Director of Educational Programs for Answers in Genesis at the Creation Museum where she oversees and presents in daily workshops and is involved in educational outreach and the high school lab programs. Her interest in the forensic sciences started at an early age and is credited to the godly instruction of her father, a renowned fingerprint expert. Her experience in the field of forensic science includes employment in a crime scene unit, over a decade of teaching, journal publications, and numerous speaking events.



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Course Description: This forensic science textbook was developed to teach your student how to use keen observational techniques while providing a substantive understanding of the disciplines that make up forensic science. But more importantly, the goal of this textbook is to demonstrate how to study forensic science through the lens of a biblical worldview. In every lesson, your student will be provided applicable Scripture woven throughout the text, practical labs, and review materials to enhance understanding of the content.

As your student studies forensic science this year, they will learn how to distinguish between sensationalized forensic science in fictional crime scene television shows and news reports with that of authentic practice. This would be a great conversation topic for you to have with your student throughout the course. To bridge the understanding between what they watch on TV versus practical application, several case studies are provided for them in the textbook. These case studies are meant to raise their awareness of some of the most famous crimes in history, both solved and unsolved, while examining real investigative practices, time frames, and judicial results.

Features



Target Level

Designed for grades 11–12
1 Credit with Labs



Flexible 180-Day Schedule

Approximately 45 minutes per lesson, five days a week



Open & Go

Daily Schedule, Master Supply List, Answer Keys



Engaging Application

Exercises, Labs, Extension Activities

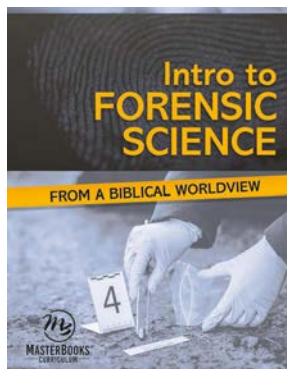


Assessments

Unit Tests, Cumulative Tests

Objectives

- ▶ Study forensic science through a biblical lens and learn how science clearly confirms the Bible.
- ▶ Discover how casts are taken of shoeprints and tire marks and how they are used in investigation.
- ▶ Evaluate fire and blood spatter patterns and how they are used to determine origin and method.
- ▶ Explore several types of microscopes and their purposes in forensic science.
- ▶ Examine the role of alcohol, drugs, tools, insects, and more in crime scene investigation.



Companion Book

Parent Introduction

Welcome to *Forensic Science* for high school students. You've selected one of the most captivating science courses for your student that will pique their interest for the entire year. During this course study, your student will evaluate real case studies, analyze forensic science articles, participate in hands-on labs, and develop an understanding of how to view forensics through the lens of God's Word.

At the heart of forensic science is the search for truth. And though an investigator may grope through the darkness for the truth behind a crime, as Christians, we realize that only in Christ and the Scriptures can we find authentic truth. John 17:17 (KJV) tells us, "Thy word is truth." Nonetheless, crime scene personnel are on the frontlines in pursuit of evidence to bring closure for the victims and punishment for the guilty. Therefore, forensic science is a scientific discipline composed of solid scientific practices, technology, and investigator expertise.

In the search for truth, investigators will have to examine grim circumstances, crime scenes, and criminal activity. Many of these situations are distressing and even disturbing for the investigator. This makes it even more important to study the Bible for understanding and clarity. You as the teacher will play a pivotal role in guiding the student in this study of investigative processes and a biblical worldview when assessing examples of criminal activity and case studies.

A few key concepts for teachers and parents can be found in God's Word. Isaiah 26:3 states, "You keep him in perfect peace whose mind is stayed on you, because he trusts in you." Also, criminal activity is rooted in the sinful nature of man, and understanding the fallen nature of man is important when studying forensic science. In essence, the discipline of forensic science would not need to exist without the fall of man into sin as described in Genesis 3. God's original creation was "very good" at the end of the creation week. This means in God's perfect creation there was no theft, murder, kidnappings, and other forms of criminal activity. But the entrance of sin changed everything. Though studying a sinful, fallen world can sometimes be challenging, through a biblical lens, we can strive to learn the amazing investigative techniques available to investigators through the ingenuity of our Creator God. John 1:3 reminds us of this: "All things were made through him, and without him was not any thing made that was made."

The study of forensic science is a fascinating course for high schoolers. Enjoy learning alongside your student as they study the complexity and design interwoven in forensic techniques established by our all-powerful, all-knowing Creator God.

Intro to Forensic Science follows a cycle of reading, corresponding exercise, application, and lab. Each lesson has 2–4 readings paired with their own one-page exercise. An introduction page is included at the start of the lessons in the teacher guide with helpful vocabulary and brief information about the case study. At the end of each lesson, students will complete an application exercise of the material they learned and then a lab. There are 34 lessons, which are grouped into units. There is a test at the end of each unit, as well as a cumulative test each semester.

Case Studies

Each lesson covers a particular forensic discipline or topic and begins with a case study outlining a true crime or event. These cases often describe hard and disturbing topics involving some of the worst of human sin nature. Some of these cases include the trial of the century of O.J. Simpson, Ted Bundy, the death of Michael Jackson, the Oklahoma City bombing, Andrea Yates, the St. Valentine's Day Massacre, the murder of Marilyn Sheppard, Gary Ridgway (the Green River Killer), John Wayne Gacy (the Killer Clown), Jonestown, and others. With such cases, there is a lot of sensitive information that is examined, mentioned, or implied — including, but not limited to, graphic depictions of bodies, child murder, sexual assault, homosexual relationships, drugs, alcohol, gang violence, coerced suicide, and mass murder.

The teacher should review each case study before the student begins the lesson. The student is also encouraged to take notes on things they want to discuss with the teacher from each case. There is space included on the back of the introduction page of each lesson for case notes. The teacher should then discuss the cases with the student, addressing difficult information and any fears this study may evoke, as well as be prepared to pray with the student.

Bible Component

A Bible verse relating to the lesson precedes each case study. There is also a biblical component within each lesson that further explores the topic in light of the Bible. These provide the student with a helpful and encouraging perspective, turning their focus to God's Word before and after encountering difficult subjects. Throughout the course, students will see why forensic science is a necessary field of study in our broken world and also how a godly individual can bring glory to God through such a career.

Applications & Labs

The applications and labs are opportunities for students to apply the knowledge they've gained from each lesson. The application exercises include labeling, defining, matching, critical thinking, and more. The labs in this course help students connect the forensic techniques they learn about to the real world. Some labs are more hands-on — such as creating and sketching a mini crime scene, processing fingerprints, and taking shoe impressions — while others focus more on critical thinking — such as identifying a criminal based on blood analysis, calculating the trajectory of a bullet, and criminal profiling. Each lab takes 1–2 days to complete.

WARNING: As with any science course that includes experiments, the materials and procedures can be potentially hazardous if not handled properly. Make sure to follow all instructions very carefully:

- ✓ Wear proper safety equipment when needed, including gloves, safety goggles/glasses, and heat protective gear
- ✓ Keep small children away from where the labs are conducted
- ✓ Wash hands, surfaces, and equipment properly after each experiment
- ✓ Make sure clothing and other household surfaces are protected from staining, burns, and other damage.

Students need to receive permission from their teacher before conducting labs with potentially hazardous materials and procedures. These labs are marked with a warning note. However, if the teacher is not comfortable with the student conducting these labs, the teacher can conduct the lab themselves and have the student observe. Lessons 20 and 24 include virtual lab components with videos that can be found on the Supplemental Resources page at masterbooks.com/classroom-aids.

Unit & Cumulative Tests

There are a total of eight units in this course, with one test per unit. Each of the units includes a different number of lessons and will test the student over information covered in the exercises. There are two cumulative tests, one per semester, which cover information from the unit tests.

Grading

It is always the prerogative of an educator to assess student grades however he or she might deem best. The following is only a suggested guideline based on the material presented through this course. To calculate the percentage of the worksheets and tests, the educator may use the following guide. Divide total number of questions correct (example: 43) by the total number of questions possible (example: 46) to calculate the percentage out of 100 possible.

$43/46 = 93$ percent correct.

The suggested grade values are noted as follows:

90 to 100 percent = A

80 to 89 percent = B

70 to 79 percent = C

60 to 69 percent = D

0 to 59 percent = F



A detailed list is in the back of the book.

Kitchen Supplies

- | | |
|---|--|
| <input type="checkbox"/> Baking soda | <input type="checkbox"/> Quarter measuring cup |
| <input type="checkbox"/> Flour | <input type="checkbox"/> Liquid measuring cup (up to 50 mL) |
| <input type="checkbox"/> Salt | <input type="checkbox"/> Toothpicks |
| <input type="checkbox"/> Sugar | <input type="checkbox"/> Clear containers |
| <input type="checkbox"/> Powdered sugar | <input type="checkbox"/> Small pot |
| <input type="checkbox"/> Vinegar | <input type="checkbox"/> Thermometer |
| <input type="checkbox"/> Oven mitts | <input type="checkbox"/> Timer |
| <input type="checkbox"/> Tongs | <input type="checkbox"/> Funnel |
| <input type="checkbox"/> Aluminum foil | <input type="checkbox"/> Screen or sifter |
| <input type="checkbox"/> Aluminum pan | <input type="checkbox"/> Small bowl |
| <input type="checkbox"/> Teaspoon measure | <input type="checkbox"/> Small white plates (if not using microscope slides) |
| <input type="checkbox"/> Tablespoon measure | <input type="checkbox"/> Small clear glasses (50 mL capacity) |

Food Items

- | | |
|---|---|
| <input type="checkbox"/> Colored marshmallows | <input type="checkbox"/> Evaporated milk* |
| <input type="checkbox"/> Licorice ropes | <input type="checkbox"/> Tomato paste* |
| <input type="checkbox"/> Potato | <input type="checkbox"/> Red food coloring* |
| <input type="checkbox"/> Ice | |
| <input type="checkbox"/> Olive oil | |
| <input type="checkbox"/> Circus peanut candy | |

*These items are for making simulated human blood.
An alternative is watered red paint.

Household Supplies

- | | |
|---|--|
| <input type="checkbox"/> Water | <input type="checkbox"/> Clear plastic cups |
| <input type="checkbox"/> Distilled water | <input type="checkbox"/> Spoons |
| <input type="checkbox"/> Soap | <input type="checkbox"/> Paper plate |
| <input type="checkbox"/> Tailor's measuring tape (metric) | <input type="checkbox"/> Heavy paper plate or foam tray |
| <input type="checkbox"/> Metric ruler | <input type="checkbox"/> Stopwatch |
| <input type="checkbox"/> Plastic zip bags (sandwich and gallon size) | <input type="checkbox"/> Wipes/disinfecting wipes |
| <input type="checkbox"/> Marker | <input type="checkbox"/> Various items to fingerprint (e.g., plastic bag, glass jar or container, empty water bottle, empty soda can, business card, etc.) |
| <input type="checkbox"/> Masking tape | <input type="checkbox"/> Disposable plastic container with lid |
| <input type="checkbox"/> Clear packing tape | <input type="checkbox"/> Super glue |
| <input type="checkbox"/> Scissors | <input type="checkbox"/> Baby oil |
| <input type="checkbox"/> Camera or phone camera | <input type="checkbox"/> Plastic or cardboard box |
| <input type="checkbox"/> Scientific calculator | <input type="checkbox"/> Shoe with tread pattern |
| <input type="checkbox"/> Paper towels | <input type="checkbox"/> Aerosol hairspray |
| <input type="checkbox"/> Peer, parent, or sibling | <input type="checkbox"/> Scrub brush, old toothbrush, or sponge |
| <input type="checkbox"/> 4 pieces of evidence that can fit on a table (e.g., cell phone, tablet, computer, pencil, piece of paper, coffee mug, knife, keys, etc.) | <input type="checkbox"/> Drawing compass |
| <input type="checkbox"/> Computer | <input type="checkbox"/> 5" x 7" Styrofoam™ plate |
| <input type="checkbox"/> Lighter | <input type="checkbox"/> Grocery receipt* |

- Sock*
- Written note, card, or journal*
- Metal spoon*

- Hairbrush*
- Optional: clipboard

*Or something comparable to these items.

Craft Supplies

- Pencil
- Red pen and black pen
- Graph paper
- Playdough or fast-drying craft clay
- Pipe cleaners (5 colors)
- Ink pad (or ground pencil)
- Plain index cards (no lines)
- 2 lbs Plaster of Paris
- Small paintbrush
- White poster board
- Watered red paint (if not using simulated human blood)
- Colored pencils (at least 16 colors)
- 4 transparency plates (1 sheet of 8" x 11.5" transparency film cut into four 4" x 6" pieces)
- Black extra-fine point permanent marker

Tools/Outdoor Supplies

- Water hose or bucket
- Sand or soil
- 2 different hammers*
- 2 different screwdrivers*
- 2 different pliers*

*Other tools can be substituted for this lab.

Lab Supplies

- Forceps
- Safety goggles
- Microscope
- Magnifying glass or magnifier app (if microscope isn't available)
- Microscope slides (if using a microscope)
- Iodine
- Fingerprint black powder or magnetic powder (or ground pencil lead or eyeshadow)
- Fingerprint dusting brush or magnetic wand (or makeup or soft artist brush)
- Small water dropper
- Human hair sample
- Three animal fur samples
- Several samples of 3 different natural fibers
- Several samples of 3 different synthetic fibers
- Test tubes
- Test tube rack
- Acetone
- Protective safety gloves (for liquids and glass)
- Glycerin
- Soil samples (4 kinds)
- Small petri dishes (glass or plastic)
- pH strips (available at a pharmacy or supermarket)
- Latex gloves
- Electronic balance

Miscellaneous Items

- Skull anatomy reference material or online source (with teacher's permission)
- Glass drinking containers (5 different types, e.g., drinking glass, borosilicate glass, glass tea bottle, etc.)*
- 5 pieces of cloth (old t-shirts or towels, etc.)*

*You are going to break the glass drinking containers to retrieve shard samples, so make sure to be careful and use materials that you don't mind throwing away.

Intro to Forensic Science Daily Schedule



Calendar		Assignment	Due Date	✓	Grade
► First Semester-First Quarter					
Week 1	Day 1	Intro to Forensic Science Student Book • Lesson 1 • Pages 8–12 • (ITFS) Intro to Forensic Science Teacher Guide • Lesson 1 • Exercise 1 Pages 23–24 • (TG)			
	Day 2	Lesson 1 • Pages 13–15 • (ITFS) Lesson 1 • Exercise 2 • Pages 25–26 • (TG)			
	Day 3	Lesson 1 • Application • Pages 27–28 • (TG)			
	Day 4	Lesson 1 • Lab • Pages 29–30 • (TG)			
	Day 5	Lesson 2 • Pages 16–20 • (ITFS) Lesson 2 • Exercise 1 • Pages 33–34 • (TG)			
Week 2	Day 6	Lesson 2 • Pages 20–24 • (ITFS) Lesson 2 • Exercise 2 • Pages 35–36 • (TG)			
	Day 7	Lesson 2 • Application • Pages 37–38 • (TG)			
	Day 8	Lesson 2 • Lab • Pages 39–40 • (TG)			
	Day 9	Lesson 2 • Lab • Pages 39–40 • (TG)			
	Day 10	Unit 1 Test • Lessons 1–2 • Pages 467–468 • (TG)			
Week 3	Day 11	Lesson 3 • Pages 26–30 • (ITFS) Lesson 3 • Exercise 1 • Pages 43–44 • (TG)			
	Day 12	Lesson 3 • Pages 30–34 • (ITFS) Lesson 3 • Exercise 2 • Pages 45–46 • (TG)			
	Day 13	Lesson 3 • Application • Pages 47–50 • (TG)			
	Day 14	Lesson 3 • Lab • Pages 51–52 • (TG)			
	Day 15	Lesson 4 • Pages 36–40 • (ITFS) Lesson 4 • Exercise 1 • Pages 55–56 • (TG)			
Week 4	Day 16	Lesson 4 • Pages 40–44 • (ITFS) Lesson 4 • Exercise 2 • Pages 57–58 • (TG)			
	Day 17	Lesson 4 • Application • Pages 59–60 • (TG)			
	Day 18	Lesson 4 • Lab • Pages 61–62 • (TG)			
	Day 19	Lesson 4 • Lab • Pages 61–62 • (TG)			
	Day 20	Unit 2 Test • Lessons 3–4 • Pages 469–470 • (TG)			
Week 5	Day 21	Lesson 5 • Pages 46–51 • (ITFS) Lesson 5 • Exercise 1 • Pages 65–66 • (TG)			
	Day 22	Lesson 5 • Pages 51–55 • (ITFS) Lesson 5 • Exercise 2 • Pages 67–68 • (TG)			
	Day 23	Lesson 5 • Pages 55–57 • (ITFS) Lesson 5 • Exercise 3 • Pages 69–70 • (TG)			
	Day 24	Lesson 5 • Pages 58–61 • (ITFS) Lesson 5 • Exercise 4 • Pages 71–72 • (TG)			
	Day 25	Lesson 5 • Application • Page 73 • (TG) Lesson 5 • Lab • Pages 75–78 • (TG)			

Calendar		Assignment	Due Date	✓	Grade
Week 6	Day 26	Lesson 5 • Lab • Pages 75–78 • (TG)			
	Day 27	Lesson 6 • Pages 62–67 • (ITFS) Lesson 6 • Exercise 1 • Pages 81–82 • (TG)			
	Day 28	Lesson 6 • Pages 67–69 • (ITFS) Lesson 6 • Exercise 2 • Pages 83–84 • (TG)			
	Day 29	Lesson 6 • Application • Pages 85–86 • (TG)			
	Day 30	Lesson 6 • Lab • Pages 87–88 • (TG)			
Week 7	Day 31	Lesson 6 • Lab • Pages 87–88 • (TG)			
	Day 32	Lesson 7 • Pages 70–74 • (ITFS) Lesson 7 • Exercise 1 • Pages 91–92 • (TG)			
	Day 33	Lesson 7 • Pages 74–77 • (ITFS) Lesson 7 • Exercise 2 • Pages 93–94 • (TG)			
	Day 34	Lesson 7 • Pages 77–79 • (ITFS) Lesson 7 • Exercise 3 • Pages 95–96 • (TG)			
	Day 35	Lesson 7 • Pages 80–83 • (ITFS) Lesson 7 • Exercise 4 • Pages 97–98 • (TG)			
Week 8	Day 36	Lesson 7 • Application • Pages 99–100 • (TG) Lesson 7 • Lab • Page 101 • (TG)			
	Day 37	Lesson 8 • Pages 84–88 • (ITFS) Lesson 8 • Exercise 1 • Pages 105–106 • (TG)			
	Day 38	Lesson 8 • Pages 89–92 • (ITFS) Lesson 8 • Exercise 2 • Pages 107–108 • (TG)			
	Day 39	Lesson 8 • Pages 93–95 • (ITFS) Lesson 8 • Exercise 3 • Pages 109–110 • (TG)			
	Day 40	Lesson 8 • Application • Pages 111–112 • (TG) Lesson 8 • Lab • Page 113 • (TG)			
Week 9	Day 41	Lesson 9 • Pages 96–100 • (ITFS) Lesson 9 • Exercise 1 • Pages 117–118 • (TG)			
	Day 42	Lesson 9 • Pages 101–103 • (ITFS) Lesson 9 • Exercise 2 • Pages 119–120 • (TG)			
	Day 43	Lesson 9 • Pages 104–106 • (ITFS) Lesson 9 • Exercise 3 • Pages 121–122 • (TG)			
	Day 44	Lesson 9 • Pages 106–110 • (ITFS) Lesson 9 • Exercise 4 • Pages 123–124 • (TG)			
	Day 45	Lesson 9 • Application • Pages 125–126 • (TG)			

Intro to Forensic Science Daily Schedule



Calendar	Assignment	Due Date	✓	Grade
► First Semester-Second Quarter				
Week 1	Day 46	Lesson 9 • Lab • Pages 127–129 • (TG)		
	Day 47	Unit 3 Test • Lessons 5–9 • Pages 471–472 • (TG)		
	Day 48	Lesson 10 • Pages 112–115 • (ITFS) Lesson 10 • Exercise 1 • Pages 133–134 • (TG)		
	Day 49	Lesson 10 • Pages 116–118 • (ITFS) Lesson 10 • Exercise 2 • Pages 135–136 • (TG)		
	Day 50	Lesson 10 • Pages 119–121 • (ITFS) Lesson 10 • Exercise 3 • Pages 137–138 • (TG)		
Week 2	Day 51	Lesson 10 • Pages 122–125 • (ITFS) Lesson 10 • Exercise 4 • Pages 139–140 • (TG)		
	Day 52	Lesson 10 • Application • Page 141 • (TG) Lesson 10 • Lab • Page 143 • (TG)		
	Day 53	Lesson 11 • Pages 126–129 • (ITFS) Lesson 11 • Exercise 1 • Pages 147–148 • (TG)		
	Day 54	Lesson 11 • Pages 130–132 • (ITFS) Lesson 11 • Exercise 2 • Pages 149–150 • (TG)		
	Day 55	Lesson 11 • Pages 133–135 • (ITFS) Lesson 11 • Exercise 3 • Pages 151–152 • (TG)		
Week 3	Day 56	Lesson 11 • Pages 136–139 • (ITFS) Lesson 11 • Exercise 4 • Pages 153–154 • (TG)		
	Day 57	Lesson 11 • Application • Page 155 • (TG) Lesson 11 • Lab • Pages 157–158 • (TG)		
	Day 58	Lesson 12 • Pages 140–143 • (ITFS) Lesson 12 • Exercise 1 • Pages 161–162 • (TG)		
	Day 59	Lesson 12 • Pages 144–146 • (ITFS) Lesson 12 • Exercise 2 • Pages 163–164 • (TG)		
	Day 60	Lesson 12 • Pages 147–149 • (ITFS) Lesson 12 • Exercise 3 • Pages 165–166 • (TG)		
Week 4	Day 61	Lesson 12 • Pages 150–153 • (ITFS) Lesson 12 • Exercise 4 • Pages 167–168 • (TG)		
	Day 62	Lesson 12 • Application • Pages 169–170 • (TG) Lesson 12 • Lab • Pages 171–172 • (TG)		
	Day 63	Lesson 13 • Pages 154–158 • (ITFS) Lesson 13 • Exercise 1 • Pages 175–176 • (TG)		
	Day 64	Lesson 13 • Pages 159–161 • (ITFS) Lesson 13 • Exercise 2 • Pages 177–178 • (TG)		
	Day 65	Lesson 13 • Pages 162–165 • (ITFS) Lesson 13 • Exercise 3 • Pages 179–180 • (TG)		

Calendar		Assignment	Due Date	✓	Grade
Week 5	Day 66	Lesson 13 • Application • Pages 181–182 • (TG) Lesson 13 • Lab • Pages 183–184 • (TG)			
	Day 67	Lesson 14 • Pages 166–170 • (ITFS) Lesson 14 • Exercise 1 • Pages 187–188 • (TG)			
	Day 68	Lesson 14 • Pages 171–175 • (ITFS) Lesson 14 • Exercise 2 • Pages 189–190 • (TG)			
	Day 69	Lesson 14 • Application • Page 191 • (TG) Lesson 14 • Lab • Pages 193–196 • (TG)			
	Day 70	Lesson 14 • Lab • Pages 193–196 • (TG)			
Week 6	Day 71	Lesson 15 • Pages 176–180 • (ITFS) Lesson 15 • Exercise 1 • Pages 199–200 • (TG)			
	Day 72	Lesson 15 • Pages 181–184 • (ITFS) Lesson 15 • Exercise 2 • Pages 201–202 • (TG)			
	Day 73	Lesson 15 • Application • Page 203 • (TG)			
	Day 74	Lesson 15 • Lab • Pages 205–206 • (TG)			
	Day 75	Unit 4 Test • Lessons 10–15 • Pages 473–474 • (TG)			
Week 7	Day 76	Study Day • Cumulative Test 1 • Lessons 1–15			
	Day 77	Cumulative Test 1 • Lessons 1–15 • Pages 475–478 • (TG)			
	Day 78	Lesson 16 • Pages 186–190 • (ITFS) Lesson 16 • Exercise 1 • Pages 209–210 • (TG)			
	Day 79	Lesson 16 • Pages 191–194 • (ITFS) Lesson 16 • Exercise 2 • Pages 211–212 • (TG)			
	Day 80	Lesson 16 • Pages 195–198 • (ITFS) Lesson 16 • Exercise 3 • Pages 213–214 • (TG)			
Week 8	Day 81	Lesson 16 • Pages 199–203 • (ITFS) Lesson 16 • Exercise 4 • Pages 215–216 • (TG)			
	Day 82	Lesson 16 • Application • Page 217 • (TG)			
	Day 83	Lesson 16 • Lab • Pages 219–220 • (TG)			
	Day 84	Lesson 17 • Pages 204–207 • (ITFS) Lesson 17 • Exercise 1 • Pages 223–224 • (TG)			
	Day 85	Lesson 17 • Pages 208–210 • (ITFS) Lesson 17 • Exercise 2 • Pages 225–226 • (TG)			
Week 9	Day 86	Lesson 17 • Pages 211–213 • (ITFS) Lesson 17 • Exercise 3 • Pages 227–228 • (TG)			
	Day 87	Lesson 17 • Application • Page 229 • (TG)			
	Day 88	Lesson 17 • Lab • Pages 231–232 • (TG)			
	Day 89	Lesson 18 • Pages 214–217 • (ITFS) Lesson 18 • Exercise 1 • Pages 235–236 • (TG)			
	Day 90	Lesson 18 • Pages 218–220 • (ITFS) Lesson 18 • Exercise 2 • Pages 237–238 • (TG)			
		Mid-Term Grade			

Intro to Forensic Science Daily Schedule



Calendar		Assignment	Due Date	✓	Grade
▶ Second Semester-Third Quarter					
Week 1	Day 91	Lesson 18 • Pages 221–223 • (ITFS) Lesson 18 • Exercise 3 • Pages 239–240 • (TG)			
	Day 92	Lesson 18 • Pages 224–227 • (ITFS) Lesson 18 • Exercise 4 • Pages 241–242 • (TG)			
	Day 93	Lesson 18 • Application • Pages 243–244 • (TG) Lesson 18 • Lab • Pages 245–246 • (TG)			
	Day 94	Lesson 18 • Lab • Pages 245–246 • (TG)			
	Day 95	Lesson 19 • Pages 228–232 • (ITFS) Lesson 19 • Exercise 1 • Pages 249–250 • (TG)			
Week 2	Day 96	Lesson 19 • Pages 233–235 • (ITFS) Lesson 19 • Exercise 2 • Pages 251–252 • (TG)			
	Day 97	Lesson 19 • Pages 236–239 • (ITFS) Lesson 19 • Exercise 3 • Pages 253–254 • (TG)			
	Day 98	Lesson 19 • Application • Pages 255–256 • (TG) Lesson 19 • Lab • Pages 257–259 • (TG)			
	Day 99	Lesson 19 • Lab • Pages 257–259 • (TG)			
	Day 100	Lesson 20 • Pages 240–244 • (ITFS) Lesson 20 • Exercise 1 • Pages 263–264 • (TG)			
Week 3	Day 101	Lesson 20 • Pages 245–248 • (ITFS) Lesson 20 • Exercise 2 • Pages 265–266 • (TG)			
	Day 102	Lesson 20 • Pages 249–253 • (ITFS) Lesson 20 • Exercise 3 • Pages 267–268 • (TG)			
	Day 103	Lesson 20 • Application • Page 269 • (TG) Lesson 20 • Lab • Pages 271–274 • (TG)			
	Day 104	Lesson 20 • Lab • Pages 271–274 • (TG)			
	Day 105	Lesson 21 • Pages 254–258 • (ITFS) Lesson 21 • Exercise 1 • Pages 277–278 • (TG)			
Week 4	Day 106	Lesson 21 • Pages 259–262 • (ITFS) Lesson 21 • Exercise 2 • Pages 279–280 • (TG)			
	Day 107	Lesson 21 • Pages 263–267 • (ITFS) Lesson 21 • Exercise 3 • Pages 281–282 • (TG)			
	Day 108	Lesson 21 • Application • Pages 283–284 • (TG)			
	Day 109	Lesson 21 • Lab • Pages 285–289 • (TG)			
	Day 110	Lesson 21 • Lab • Pages 285–289 • (TG)			

Calendar		Assignment	Due Date	✓	Grade
Week 5	Day 111	Lesson 22 • Pages 268–272 • (ITFS) Lesson 22 • Exercise 1 • Pages 293–294 • (TG)			
	Day 112	Lesson 22 • Pages 273–276 • (ITFS) Lesson 22 • Exercise 2 • Pages 295–296 • (TG)			
	Day 113	Lesson 22 • Pages 277–281 • (ITFS) Lesson 22 • Exercise 3 • Pages 297–298 • (TG)			
	Day 114	Lesson 22 • Application • Pages 299–300 • (TG) Lesson 22 • Lab • Pages 301–304 • (TG)			
	Day 115	Lesson 22 • Lab • Pages 301–304 • (TG)			
Week 6	Day 116	Lesson 23 • Pages 282–287 • (ITFS) Lesson 23 • Exercise 1 • Pages 307–308 • (TG)			
	Day 117	Lesson 23 • Pages 288–291 • (ITFS) Lesson 23 • Exercise 2 • Pages 309–310 • (TG)			
	Day 118	Lesson 23 • Pages 292–295 • (ITFS) Lesson 23 • Exercise 3 • Pages 311–312 • (TG)			
	Day 119	Lesson 23 • Application • Pages 313–314 • (TG) Lesson 23 • Lab • Pages 315–316 • (TG)			
	Day 120	Lesson 23 • Lab • Pages 315–316 • (TG)			
Week 7	Day 121	Lesson 24 • Pages 296–300 • (ITFS) Lesson 24 • Exercise 1 • Pages 319–320 • (TG)			
	Day 122	Lesson 24 • Pages 301–303 • (ITFS) Lesson 24 • Exercise 2 • Pages 321–322 • (TG)			
	Day 123	Lesson 24 • Pages 304–307 • (ITFS) Lesson 24 • Exercise 3 • Pages 323–324 • (TG)			
	Day 124	Lesson 24 • Application • Pages 325–326 • (TG) Lesson 24 • Observation Lab • Pages 327–328 • (TG)			
	Day 125	Lesson 24 • Observation Lab • Pages 327–328 • (TG)			
Week 8	Day 126	Lesson 25 • Pages 308–312 • (ITFS) Lesson 25 • Exercise 1 • Pages 331–332 • (TG)			
	Day 127	Lesson 25 • Pages 313–315 • (ITFS) Lesson 25 • Exercise 2 • Pages 333–334 • (TG)			
	Day 128	Lesson 25 • Pages 316–318 • (ITFS) Lesson 25 • Exercise 3 • Pages 335–336 • (TG)			
	Day 129	Lesson 25 • Application • Pages 337–338 • (TG)			
	Day 130	Lesson 25 • Lab • Pages 339–341 • (TG)			
Week 9	Day 131	Unit 5 Test • Lessons 16–25 • Pages 479–480 • (TG)			
	Day 132	Lesson 26 • Pages 320–324 • (ITFS) Lesson 26 • Exercise 1 • Pages 345–346 • (TG)			
	Day 133	Lesson 26 • Pages 325–329 • (ITFS) Lesson 26 • Exercise 2 • Pages 347–348 • (TG)			
	Day 134	Lesson 26 • Pages 330–333 • (ITFS) Lesson 26 • Exercise 3 • Pages 349–350 • (TG)			
	Day 135	Lesson 26 • Application • Pages 351–352 • (TG)			

Intro to Forensic Science Daily Schedule

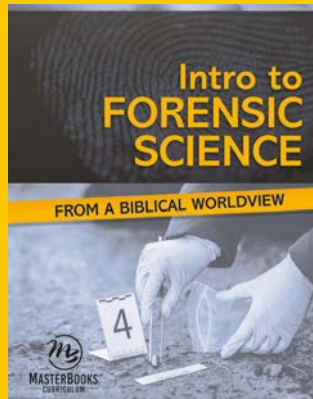


Calendar	Assignment	Due Date	✓	Grade
▶ Second Semester-Fourth Quarter				
Week 1	Day 136	Lesson 26 • Lab • Pages 353–354 • (TG)		
	Day 137	Lesson 27 • Pages 334–338 • (ITFS) Lesson 27 • Exercise 1 • Pages 357–358 • (TG)		
	Day 138	Lesson 27 • Pages 338–341 • (ITFS) Lesson 27 • Exercise 2 • Pages 359–360 • (TG)		
	Day 139	Lesson 27 • Application • Page 361 • (TG)		
	Day 140	Lesson 27 • Lab • Pages 363–364 • (TG)		
Week 2	Day 141	Lesson 28 • Pages 342–345 • (ITFS) Lesson 28 • Exercise 1 • Pages 367–368 • (TG)		
	Day 142	Lesson 28 • Pages 346–348 • (ITFS) Lesson 28 • Exercise 2 • Pages 369–370 • (TG)		
	Day 143	Lesson 28 • Pages 349–351 • (ITFS) Lesson 28 • Exercise 3 • Pages 371–372 • (TG)		
	Day 144	Lesson 28 • Application • Pages 373–374 • (TG)		
	Day 145	Lesson 28 • Lab • Pages 375–377 • (TG)		
Week 3	Day 146	Lesson 29 • Pages 352–356 • (ITFS) Lesson 29 • Exercise 1 • Pages 381–382 • (TG)		
	Day 147	Lesson 29 • Pages 357–359 • (ITFS) Lesson 29 • Exercise 2 • Pages 383–384 • (TG)		
	Day 148	Lesson 29 • Pages 360–362 • (ITFS) Lesson 29 • Exercise 3 • Pages 385–386 • (TG)		
	Day 149	Lesson 29 • Application • Pages 387–388 • (TG)		
	Day 150	Lesson 29 • Lab • Pages 389–390 • (TG)		
Week 4	Day 151	Unit 6 Test • Lessons 26–29 • Pages 481–482 • (TG)		
	Day 152	Lesson 30 • Pages 364–369 • (ITFS) Lesson 30 • Exercise 1 • Pages 393–394 • (TG)		
	Day 153	Lesson 30 • Pages 370–373 • (ITFS) Lesson 30 • Exercise 2 • Pages 395–396 • (TG)		
	Day 154	Lesson 30 • Pages 374–377 • (ITFS) Lesson 30 • Exercise 3 • Pages 397–398 • (TG)		
	Day 155	Lesson 30 • Application • Page 399 • (TG)		
Week 5	Day 156	Lesson 30 • Lab • Pages 401–402 • (TG)		
	Day 157	Lesson 31 • Pages 378–382 • (ITFS) Lesson 31 • Exercise 1 • Pages 405–406 • (TG)		
	Day 158	Lesson 31 • Pages 383–385 • (ITFS) Lesson 31 • Exercise 2 • Pages 407–408 • (TG)		
	Day 159	Lesson 31 • Pages 386–388 • (ITFS) Lesson 31 • Exercise 3 • Pages 409–410 • (TG)		
	Day 160	Lesson 31 • Application • Pages 411–412 • (TG)		

Calendar		Assignment	Due Date	✓	Grade
Week 6	Day 161	Lesson 31 • Lab • Pages 413–416 • (TG)			
	Day 162	Unit 7 Test • Lessons 30–31 • Pages 483–484 • (TG)			
	Day 163	Lesson 32 • Pages 390–395 • (ITFS) Lesson 32 • Exercise 1 • Pages 419–420 • (TG)			
	Day 164	Lesson 32 • Pages 396–399 • (ITFS) Lesson 32 • Exercise 2 • Pages 421–422 • (TG)			
	Day 165	Lesson 32 • Pages 400–403 • (ITFS) Lesson 32 • Exercise 3 • Pages 423–424 • (TG)			
Week 7	Day 166	Lesson 32 • Application • Pages 425–426 • (TG)			
	Day 167	Lesson 32 • Lab • Pages 427–428 • (TG)			
	Day 168	Lesson 33 • Pages 404–407 • (ITFS) Lesson 33 • Exercise 1 • Pages 431–432 • (TG)			
	Day 169	Lesson 33 • Pages 408–411 • (ITFS) Lesson 33 • Exercise 2 • Pages 433–434 • (TG)			
	Day 170	Lesson 33 • Application • Pages 435–436 • (TG)			
Week 8	Day 171	Lesson 33 • Lab • Page 437 • (TG)			
	Day 172	Lesson 34 • Pages 412–417 • (ITFS) Lesson 34 • Exercise 1 • Pages 441–442 • (TG)			
	Day 173	Lesson 34 • Pages 418–421 • (ITFS) Lesson 34 • Exercise 2 • Pages 443–444 • (TG)			
	Day 174	Lesson 34 • Pages 422–425 • (ITFS) Lesson 34 • Exercise 3 • Pages 445–446 • (TG)			
	Day 175	Lesson 34 • Application • Page 447 • (TG)			
Week 9	Day 176	Lesson 34 • Lab • Pages 449–460 • (TG)			
	Day 177	Lesson 34 • Lab • Pages 449–460 • (TG)			
	Day 178	Unit 8 Test • Lessons 32–34 • Pages 485–486 • (TG)			
	Day 179	Study Day • Cumulative Test 2 • Lessons 16–34			
	Day 180	Cumulative Test 2 • Lessons 16–34 • Pages 487–490 • (TG)			
		Final Grade			

FORENSIC EXERCISES

For use with
Forensic Science



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Lesson 1

What is Forensic Science?

Great are the works of the LORD, studied by all who delight in them (Psalm 111:2).

Terms to Know

American Academy of Forensic Sciences (AAFS) – outlines the roles of a forensic scientist as having the ability to distinguish relevant facts from random ones, conduct appropriate testing measures, develop hypotheses, and interpret these results in an attempt to “reach a conclusion or opinion” regarding the evidence’s relationship to the crime.¹

Criminalist – a forensic science expert.

Case Study

Teacher: Review the case study and discuss it with your student. Be sure to address any notes the student took, as well as sensitive or difficult topics you want to talk through with your student. This case should be very familiar! You may want to discuss some of the details surrounding the death and resurrection of Jesus Christ, as well as salvation.

Student: Review the case study. You can use this page to take notes on anything from the case that you have questions or concerns about. Discuss your thoughts with your teacher.

CASE STUDY



Multiple Choice

Circle the best answer from the choices below.

1. Which of the following steps are included in forensic investigation?
 - a. Collection and examination of physical evidence
 - b. Interpretation of data
 - c. Drawing conclusions
 - d. Clear and concise reporting
 - e. Collaboration
 - f. All of the above

2. Which of the following qualifications are required to be a forensic expert? (There is more than one answer.)
 - a. College degree
 - b. Training
 - c. Certification
 - d. Expertise in all disciplines of forensic science
 - e. Professional speaking experience

3. The Latin root for the word science, *scientia*, means:
 - a. Study
 - b. Truth
 - c. Accuracy
 - d. Knowledge
 - e. None of the above

4. The Bible's historical record can be trusted:
 - a. In the New Testament only
 - b. Genesis 12 through the remainder of the Bible
 - c. From the very first verse in Genesis to last verse in Revelation
 - d. The Bible is a story and is therefore unreliable

Short Answer

Respond to the following questions in complete sentences.

1. How does Psalm 111:2 apply to the study of science?

2. What is the definition of forensic science? Include the Latin roots in your definition.

3. How has the definition of science changed over time? Fill in the chart below.

1828	
1913	
2023	



Multiple Choice

Circle the best answer from the choices below.

1. Which of the following are fields of forensics expertise in the FBI? (There is more than one answer.)
 - a. Chemists
 - b. Toxicology
 - c. Fingerprints & Biometric Examiners
 - d. Cryptanalyst Forensic Examiner
 - e. Jurisprudence

2. The earliest beginnings of the techniques we associate with forensic science can be traced to approximately:
 - a. 6,000 years ago
 - b. 300 B.C.
 - c. 1600s
 - d. 1800s
 - e. 1910

Matching

Mark the letter in front of the best answer.

- | | | |
|--------------------|-----------------------|---------------------------|
| a. Sherman Osborne | b. Alphonse Bertillon | c. Edmond Locard |
| d. Alec Jeffreys | e. Sir Edward Henry | f. Sir Arthur Conan Doyle |

1. _____ Nicknamed the “Sherlock Holmes of France”
2. _____ Father of document examination
3. _____ Developed the testing necessary to process an individual’s DNA and create a DNA fingerprint
4. _____ Father of poroscopy
5. _____ Created a fictional character who sparked innovation in the physical world
6. _____ Created a fingerprint classification system

Short Answer

Respond to the following questions in complete sentences.

1. State Locard's Exchange Principle. Why is this principle the basis of forensic science?

a. _____

b. _____

2. What was the most important discovery of the past 100 years for forensic science?

3. How did Alec Jeffreys advance this discovery from question 2?

4. What is the AAFS?



Unit Identification. Using the following terms and descriptions, identify which investigative unit, according to the AAFS, that would analyze the evidence on the next page. (Some have more than one answer.)

Anthropology: the study of human biological and physiological characteristics and their development.

Criminalistics: the forensic analysis of physical evidence from a crime scene.

Digital & Multimedia Sciences: the forensic analysis of digital and multimedia evidence (e.g., network analysis, digitized evidence, analog and/or digital audio and video).

Engineering & Applied Sciences: the forensic analysis in the natural, physical, and forensic sciences (e.g., accident reconstruction, aviation incidences, and building accessibility).

General: the forensic analysis of accounting, art, consulting, pathology, crime scene, firearms, photograph, and veterinary.

Jurisprudence: the lawyers and judges involved in forensic cases.

Forensic Nursing Science: focuses on investigations and patient care.

Odontology: the study of forensic dentistry.

Pathology/Biology: the study of human remains and the life sciences (e.g., entomology, genetics, microbiology, ecology, and botany).

Psychiatry & Behavioral Science: the study of the human mind in relation to mental disorders, behavioral disorders, biological contributors, psychotherapeutic aspects, and social issues.










Questioned Documents: the analysis of handwriting, typewriting, office machine impressions, inks, papers, obliterations, and the recovery of latent print indentations.

Toxicology: the analysis of drugs and toxins postmortem, human performance, and general drug testing.

Anthropology
 Engineering & Applied Sciences
 Forensic Nursing Science
 Psychiatry & Behavioral Science

Criminalistics
 General
 Odontology
 Questioned Documents

Digital & Multimedia Sciences
 Jurisprudence
 Pathology/Biology
 Toxicology

 <p style="text-align: center;">A</p>	 <p style="text-align: center;">B</p>	 <p style="text-align: center;">C</p>
 <p style="text-align: center;">D</p>	 <p style="text-align: center;">E</p>	 <p style="text-align: center;">F</p>
 <p style="text-align: center;">G</p>	 <p style="text-align: center;">H</p>	 <p style="text-align: center;">I</p>

Optional Activity: Teacher's Discretion No Yes Due Date: _____

Research a forensic career of interest. Is it offered in local, state, and/or national agencies? Identify the requirements necessary to apply, the salary range, and experience needed.

3. You will now measure your partner's nine body measurements. Record these measurements below.

1. Height: _____ cm
2. Sitting height: _____ cm
3. Length of outstretched arms from one index fingertip to the other: _____ cm
4. Length of outstretched arm from shoulder to the index fingertip: _____ cm
5. Length of lower arm from elbow to tip of the index finger: _____ cm
6. Length of the right ear: _____ cm
7. Length of head from front to back: _____ cm
8. Circumference of the head: _____ cm
9. Length of the left foot: _____ cm

Analysis Questions

1. Compare and contrast your measurements to those of your partner.

a. What differences can you identify?

b. Do you feel the difference is significant enough to distinguish between the two of you?

2. Look carefully at the measurement recorded in #5. What measurement used in the Book of Genesis in the Bible does this refer to?

3. What limitations do you see with this system of classification?

Lesson 9

Computer Forensics

All things were made through him, and without him was not any thing made that was made (John 1:3).

Terms to Know

Ad clicking – hackers display advertisements that may entice the user to click on an ad and open malware.

Keylogging – hackers record the user's keystrokes to decipher passwords, etc.

Phishing – an email disguised as professional in which the user is requested to provide passwords, address, telephone number, etc.

Ransomware – hackers access computer files and lock the user out, often demanding ransom to regain access.

Screenshot managing – hackers access the user's screen and take screenshots of passwords, etc.

Webcam managing – hackers hijack the user's webcam in hopes of watching the user's keystrokes for passwords, conversations, and other data.

Application – refers to individual authorization within a single application or service.

Computer network – a group of computers, using similar protocols, that are connected to one another for the purpose of communicating data electronically.

Endpoint – the breaking down of a network into individual systems.

Firewall – prevents unauthorized access to specific devices, such as hardware or software, and protects from people trying to get into the computer system. Based upon a set of security rules, a firewall will either allow traffic to access or block information on a computer or network.

Virtual Private Network (VPN) – a type of network security that, when used to connect to the internet, encrypts your request and masks your location.



Multiple Choice

Circle the best answer from the choices below.

1. What is computer forensics also known as?
 - a. Cybercrime
 - b. Cyber sleuthing
 - c. Internet investigation
 - d. Online crime analysis
 - e. None of the above

2. Just as a computer requires a(n) _____, creation requires a(n) _____.
 - a. Inventor, Designer
 - b. Designer, Author
 - c. Programmer, Creator
 - d. Programmer, Inventor
 - e. Inventor, Creator

3. What two symbols does binary code use?
 - a. *Laghu* and *guru*
 - b. 0's and 1's
 - c. Light and heavy
 - d. + and -
 - e. All of the above
 - f. None of the above

Matching

Mark the letter in front of the best answer.

- a. Charles Babbage b. Ada Lovelace c. Pingala d. Gottfried Leibniz

1. _____ Developed a binary numeral system using light (*laghu*) and heavy (*guru*)
2. _____ Formalized binary logic in the 1700s
3. _____ Considered the father of computers
4. _____ The first computer programmer

Short Answer

Respond to the following questions in complete sentences.

1. Give two examples of technology in the Bible and their scriptural reference.

a. _____

b. _____

2. What are algorithms? What do they serve as?

a. _____

b. _____

3. What two early computing machines did Charles Babbage invent and in what years?

a. _____

b. _____



Multiple Choice

Circle the best answer from the choices below.

1. What are the three main components every computer consists of?
 - a. Control bus, Microsoft Word, and hard drive
 - b. CPU, RAM, and control bus
 - c. Hard drive, RAM, and control bus
 - d. RAM, CPU, and internet browser
 - e. Internet browser, NIC, and CPU
 - f. None of the above

2. What term is associated with erasing data on computer systems? (There is more than one answer.)
 - a. Wiping (deep formatting)
 - b. Smudging
 - c. Dusting
 - d. Erasing
 - e. Shredding
 - f. Reformatting
 - g. Reprogramming

3. Traces of data that remain on a system is called:
 - a. Dark data
 - b. Residual data
 - c. Lost data
 - d. Invisible data
 - e. Chalkboard data

Abbreviations

Write out the full title of each abbreviation below.

1. CPU: _____
2. RAM: _____
3. NIC: _____
4. OS: _____

Short Answer

Respond to the following questions in complete sentences.

1. Define hardware and software and provide two examples of each.

a. _____

b. _____

2. Provide an example of how the operating system allows the application software to talk to the hardware other than the one given in the lesson.

3. What is format?

4. What records data on the hard drive when it is formatted?



Read from page 104 to the heading “Security” on page 106.

Multiple Choice

Circle the best answer from the choices below.

1. In what year did Tim Berners-Lee introduce the world to the internet?
 - a. 1961
 - b. 1970
 - c. 1991
 - d. 1992
 - e. None of the above
2. What is the primary challenge for a computer forensic investigator regarding email correspondence?
 - a. The lack of cache
 - b. The lack of encryption
 - c. The lack of sender/receiver identification
 - d. All of the above
 - e. None of the above
3. Servers are described as virtual filing cabinets. What important functions do servers provide?
 - a. Storage
 - b. Collaboration
 - c. Information delivery
 - d. Electronic surveillance
 - e. All of the above
 - f. None of the above

Fill-in-the-Blank

Fill in the blanks with the correct answer.

1. A(n) _____ address is an address that points to a location on the internet.
2. _____ history is a record of the website addresses that the computer has recently visited and any data associated with the websites.
3. _____ is temporary storage that retains information about browser history, frequently visited sites, and search terms.

Short Answer

Respond to the following questions in complete sentences.

1. What are cookies, as related to the internet? Provide an example.

2. A computer forensic investigator will conduct a thorough examination of all activity on the computer. In what areas will the investigator search?

3. Why is it never wise to insert a USB drive from an unknown source into a personal computer?



Multiple Choice

Circle the best answer from the choices below.

1. What do firewalls do?
 - a. Prevent unauthorized access to specific devices
 - b. Protect from people trying to get into the computer system
 - c. Allow traffic to access or block information on a computer or network
 - d. All of the above
 - e. None of the above

2. For a computer forensic investigator to search for information related to a case on a computer, what steps apply? (There is more than one answer.)
 - a. Obtain a search warrant for the computer
 - b. Obtain a search warrant for the individual files
 - c. Immediately download all files onto the investigator's personal computer for analysis
 - d. No chain of custody is required, the search warrant covers this requirement
 - e. Secure the computer from unauthorized access
 - f. No search warrant is needed

Matching

Mark the letter in front of the best answer.

- | | | |
|---------------|------------------------|--------------------|
| a. Ransomware | b. Screenshot managing | c. Ad clicking |
| d. Keylogging | e. Phishing | f. Webcam managing |

1. _____ Hackers access the user's screen and take screenshots of passwords, etc.
2. _____ Hackers display advertisements that may entice the user to click on an ad and open malware
3. _____ Hackers access computer files and lock the user out, often demanding ransom to regain access
4. _____ An email disguised as professional in which the user is requested to provide passwords, address, telephone number, etc.
5. _____ Hackers hijack the user's webcam in hopes of watching the user's keystrokes for passwords, conversations, and other data
6. _____ Hackers record the user's keystrokes to decipher passwords, etc.

Short Answer

Respond to the following questions in complete sentences.

1. What are the six categories that human cybercrime falls into?

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

2. What are AF tools?

3. What are the four goals of AF tools?

a. _____

b. _____

c. _____

d. _____

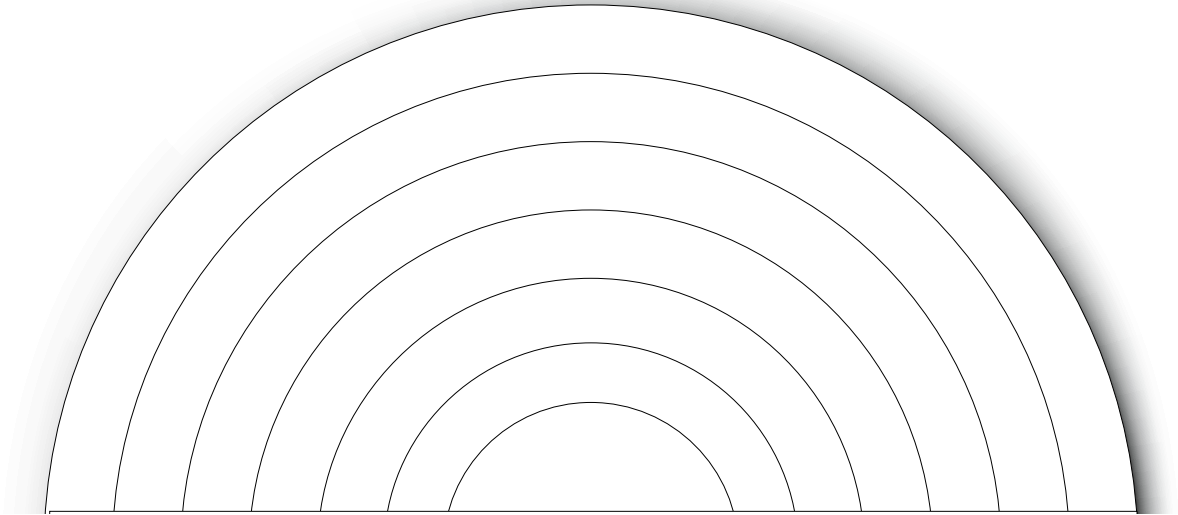
4. What does a conviction in a criminal computer forensic investigation result in? What about in a civil court case?

a. _____

b. _____



1. Label the seven layers of cybersecurity on the diagram below.



2. Explain why humans are identified as the number one key to protection of information.

3. Fill in the chart below of the basic differences between hardware and software.

	Hardware	Software
Types		
Function		
Examples		
Nature		

Take time to study Lessons 5–9 for the Unit 3 Test.



Encoding and Decoding Data

Note: Cyber criminals use many ways to reach your data. They use simple to complex approaches to find and translate that data to something meaningful and potentially use it against you.

Encoding is a process of converting readable text data from one form to another form. Decoding is reverting the form back to its original text data. While encoding and decoding are similar to encryption and decryption, their intent is different. While encryption and decryption are used to obfuscate or hide the data from the user, encoding and decoding are used for data transmissions, compression, and storage, and are easily translatable. For this exercise, the student will decode a series of messages from binary to ASCII (and ultimately to characters). Interpret the results and come to a conclusion. Then the student will create an encoded message.

Note: Never send sensitive data in email, text, and social media. This includes date of birth and social security numbers. While many social media and financial banks claim that they are safe, there is always a flaw in security.

Terminology

The following is a brief terminology list to help you with the exercise:

- ✓ Bit – a 0 or 1 value.
- ✓ Byte – a sequence of zeros or ones with the length of eight bits.
- ✓ Register – the storage width of the byte’s representation. For our examples, we are using 7-byte-width registers with padding to separate the bytes.
- ✓ Padding – used for clarity of byte representation and is not required.

01001101 01101001 01100011 01101000 01100001 01100101 01101100

Exercise – Decoding

Convert the following encoded binary messages to ASCII using the Simple Binary ASCII Table Reference on page 129.

Note: Cyber criminals are able to decipher many messages that they are able to capture. Sometimes they can use that information against you.

1.

01001101 01101001 01100011 01101000 01100001 01100101 01101100 00100000 01010011 01110100
01100101 01110000 01101000 01101001 01101110 01100111 01101000 01101111 01110101 01110011
01100101 00100000 01101100 01101001 01110110 01100101 01110011 00100000 01101001 01101110
00100000 00110010 00110101 00110110 00110010 00100000 01010111 01100101 01110011 01110100
01101001 01101110 01100111 01100110 01101001 01101100 01101100 00100000 01001100 01101110
00101110 00100000 01000011 01100001 01110010 01110100 01100101 01110010 00101100 00100000
01001101 01010011 00100000 00110010 00110011 00110100 00110101 00110110

2.

```
01001101 01101001 01100011 01101000 01100001 01100101 01101100 00100000 01010011 01110100
01100101 01110000 01101000 01101001 01101110 01100111 01101000 01101111 01110101 01110011
01100101 00100000 01101001 01110011 00100000 01101111 01101110 00100000 01110110 01100001
01100011 01100001 01110100 01101001 01101111 01101110
```

3.

```
01001101 01101001 01100011 01101000 01100001 01100101 01101100 00100000 01010011 01110100
01100101 01110000 01101000 01101001 01101110 01100111 01101000 01101111 01110101 01110011
01100101 00100000 01101001 01110011 00100000 01110011 01101001 01101110 01100111 01101100
01100101 00100000 01100001 01101110 01100100 00100000 01101100 01101001 01110110 01100101
01110011 00100000 01100001 01101100 01101111 01101110 01100101
```

4. What would a cyber criminal be able to ascertain if they are able to obtain and decode these messages?

5. Bonus: Encode the words “Don’t be a cyber target” in binary.



Simple Binary ASCII Table Reference

Char	Ascii	Binary	Char	Ascii	Binary	Char	Ascii	Binary
	chr(27)	0100111	F	chr(70)	1000110	c	chr(99)	1100011
*	chr(42)	0101010	G	chr(71)	1000111	d	chr(100)	1100100
+	chr(43)	0101011	H	chr(72)	1001000	e	chr(101)	1100101
,	chr(44)	0101100	I	chr(73)	1001001	f	chr(102)	1100110
-	chr(45)	0101101	J	chr(74)	1001010	g	chr(103)	1100111
.	chr(46)	0101110	K	chr(75)	1001011	h	chr(104)	1101000
/	chr(47)	0101111	L	chr(76)	1001100	i	chr(105)	1101001
0	chr(48)	0110000	M	chr(77)	1001101	j	chr(106)	1101010
1	chr(49)	0110001	N	chr(78)	1001110	k	chr(107)	1101011
2	chr(50)	0110010	O	chr(79)	1001111	l	chr(108)	1101100
3	chr(51)	0110011	P	chr(80)	1010000	m	chr(109)	1101101
4	chr(52)	0110100	Q	chr(81)	1010001	n	chr(110)	1101110
5	chr(53)	0110101	R	chr(82)	1010010	o	chr(111)	1101111
6	chr(54)	0110110	S	chr(83)	1010011	p	chr(112)	1110000
7	chr(55)	0110111	T	chr(84)	1010100	q	chr(113)	1110001
8	chr(56)	0111000	U	chr(85)	1010101	r	chr(114)	1110010
9	chr(57)	0111001	V	chr(86)	1010110	s	chr(115)	1110011
:	chr(58)	0111010	W	chr(87)	1010111	t	chr(116)	1110100
;	chr(59)	0111011	X	chr(88)	1011000	u	chr(117)	1110101
@	chr(64)	1000000	Y	chr(89)	1011001	v	chr(118)	1110110
A	chr(65)	1000001	Z	chr(90)	1011010	w	chr(119)	1110111
B	chr(66)	1000010	`	chr(96)	1100000	x	chr(120)	1111000
C	chr(67)	1000011	a	chr(97)	1100001	y	chr(121)	1111001
D	chr(68)	1000100	b	chr(98)	1100010	z	chr(122)	1111010
E	chr(69)	1000101						

Page intentionally left blank.

Lesson 16

Human Fingerprints

I praise you, for I am fearfully and wonderfully made. Wonderful are your works; my soul knows it very well (Psalm 139:14).

Terms to Know

Bifurcation – a type of minutiae; the location where a single ridge splits into two separate ridges.

Core – the location of the center of the pattern area.

Crossover – a type of minutiae; the location where two ridges cross and form an “X.”

Delta – the location where two ridges diverge and a point of reference or friction skin is visible at the center of the divergence. The term comes from the geographical term for a river delta.

Island – a type of minutiae; the location of a single spot of friction skin.

Ridge ending – a type of minutiae; the location where a ridge abruptly ends and does not continue.

Dermal layer – the connective tissue in skin that nourishes the epidermis. Fingerprint ridges and furrows are anchored deep within the dermal layer.

Epidermis – the thinner, outer layer of skin. This layer serves as a barrier against contagions and contains the sensory receptors.

Final – in the Henry classification system, the ridge count of the pinky finger in the right hand. If there is no loop in the right pinky, the left-hand pinky is used and placed in the denominator. If there is a loop in the right hand, the denominator is left blank. If there is no loop in either pinky finger, there is no final.

Key – in the Henry classification system, the ridge count of the first loop.

Major – in the Henry classification system, the ridge count or whorl tracing of the right thumb (numerator) and of the left thumb (denominator).

Primary – in the Henry classification system, the value of fingers 2, 4, 6, 8, 10 +1 (numerator) and of fingers 1, 3, 5, 7, 9 +1 (denominator). Calculating the primary is the most important step in the classification process.

Secondary – in the Henry classification system, the capital letter representation of the right index print pattern (A, T, U, R, W) (numerator) and of the left index print pattern (denominator).

Sub-secondary – in the Henry classification system, the ridge count codes (I, O) or whorl tracings (I, M, O) in fingers 2–4 of the right hand (numerator) and of the left hand (denominator). If a finger has a print in the small letter group, this will take precedence.

Case Study

Teacher: Review the case study and discuss it with your student. Be sure to address any notes the student took, as well as sensitive or difficult topics you want to talk through with your student. Topics covered in this case include firearms and murder.

Student: Review the case study. You can use this page to take notes on anything from the case that you have questions or concerns about. Discuss your thoughts with your teacher.

Notes



Multiple Choice

Circle the best answer from the choices below.

- When do fingerprints develop in the mother's womb during fetal development?
 - By 6 weeks
 - Between 10 and 16 weeks
 - Between 16 and 20 weeks
 - Between 20 and 32 weeks
 - By 36 weeks
- God gave humans a special identity through their friction skin patterns in the form of how many unique details?
 - Over 100
 - Over 1,000
 - Over 10,000
 - Over 100,000
 - One million
- In what year did Dr. Johann Mayer publish the first information about the uniqueness of friction ridge skin?
 - 1788
 - The early 1700s
 - 1823
 - 1902
 - None of the above

Fill-in-the-Blank

Fill in the blanks with the correct answer.

- “For you formed my inward parts. . . I am fearfully and wonderfully made”
(_____ 139:13–14).
- The surface of friction skin is extremely _____ and can relay information directly to your brain.

Short Answer

Respond to the following questions in complete sentences.

1. What three qualities does the value in fingerprint identification lie in?

a. _____

b. _____

c. _____

2. What sorts of artifacts can evidence be found that demonstrates early civilizations recognized that fingerprints held value in someone's identity?

3. What was J.E. Purkinje the first person to do?



Multiple Choice

Circle the best answer from the choices below.

1. What types of fingerprint patterns are still used today? (There is more than one answer.)
 - a. Arch
 - b. Loop
 - c. Whorl
 - d. Swirl
 - e. All of the above
2. It is a _____ certainty that no two people will have identical fingerprint patterns.
 - a. 0%
 - b. 25%
 - c. 50%
 - d. 75%
 - e. 100%
3. The order of fingerprint patterns in humans from most common to rarest is:
 - a. Whorls, loops, arches
 - b. Loops, whorls, arches
 - c. Arches, whorls, loops
 - d. Loops, arches, whorls
 - e. None of the above

Matching

Mark the letter in front of the correct person.

- | | | |
|-----------------------|-------------------------|---------------------|
| a. Sir Francis Galton | b. Sir William Herschel | c. Sir Edward Henry |
| d. Dr. Henry Faulds | e. Alphonse Bertillon | |

1. _____ Credited as the first European to implement the methodology of fingerprint identification
2. _____ Considered the father of the eugenics movement
3. _____ Devised the first system of classification based on a series of nine core body measurements
4. _____ Developed a systematic method to classify fingerprints by assigning numerical values to fingers with the presence of the whorl pattern
5. _____ Given credit for first publishing the practice of fingerprint identification

Short Answer

Respond to the following questions in complete sentences.

1. What is eugenics?

2. What did Sir Francis Galton conclude after years of fingerprint research for eugenics?

3. What happened in the West case that forever changed the use of fingerprints?

4. What are the four common examples of fingerprint minutiae given in the lesson, as well as the two common locations in a print?

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____



Multiple Choice

Circle the best answer from the choices below.

1. Arches are characterized by:
 - a. Presence of a delta
 - b. Presence of a core
 - c. Sufficient recurve
 - d. Presence of two deltas
 - e. No delta or core
 - f. Ridge count of at least one

2. What essential point must a loop meet? (There is more than one answer.)
 - a. Presence of a delta
 - b. Presence of a core
 - c. Sufficient recurve
 - d. Presence of two deltas
 - e. No delta or core
 - f. Ridge count of at least one

3. Whorls are characterized by: (There is more than one answer.)
 - a. Presence of a delta
 - b. Presence of a core
 - c. Sufficient recurve
 - d. Presence of two deltas
 - e. No delta or core
 - f. Ridge count of at least one

4. The ridge count is the number of ridges that cross an imaginary straight line from the _____ to the _____ of the fingerprint.
 - a. Core, bifurcation
 - b. Delta, core
 - c. Delta, ridge ending
 - d. Core, ridge ending
 - e. Bifurcation, ridge ending

Short Answer

Respond to the following questions in complete sentences.

1. List the eight subdivisions of arches, loops, and whorls.

a. _____

b. _____

c. _____

d. _____

e. _____

2. Explain the basics of how Sir Edward Henry's fingerprint classification system works.

3. What is the key?

4. Label the whorl tracings below.



a. _____ b. _____ c. _____



Multiple Choice

Circle the best answer from the choices below.

1. The most important step in the classification process is calculating the:
 - a. Key
 - b. Major
 - c. Primary
 - d. Secondary
 - e. Sub-secondary
 - f. Final

2. The secondary is simply the pattern type in the:
 - a. Middle fingers
 - b. Index fingers
 - c. Thumbs
 - d. Pinkies
 - e. All of the above
 - f. None of the above

3. The sub-secondary is the pattern type in the:
 - a. Index fingers
 - b. Middle fingers
 - c. Ring fingers
 - d. All of the above
 - e. None of the above

4. The final is the ridge count of:
 - a. The index finger in the right hand
 - b. The pinky finger in the right hand
 - c. The middle finger in the left hand
 - d. The ring finger in the left hand
 - e. The thumbs on both hands

Short Answer

Respond to the following questions in complete sentences.

1. What is the major?

2. Fill out the missing information in the chart below used to calculate the primary in fingerprint classification.

Finger 1 <hr/> <hr/>	Finger 2 <hr/> 16 points	<hr/> Right middle <hr/>	<hr/> 8 points	Finger 5 Right pinky <hr/>
<hr/> Left thumb <hr/>	<hr/> Left index 2 points	Finger 8 <hr/> 2 points	Finger 9 <hr/> 	Finger 10 <hr/> 1 point

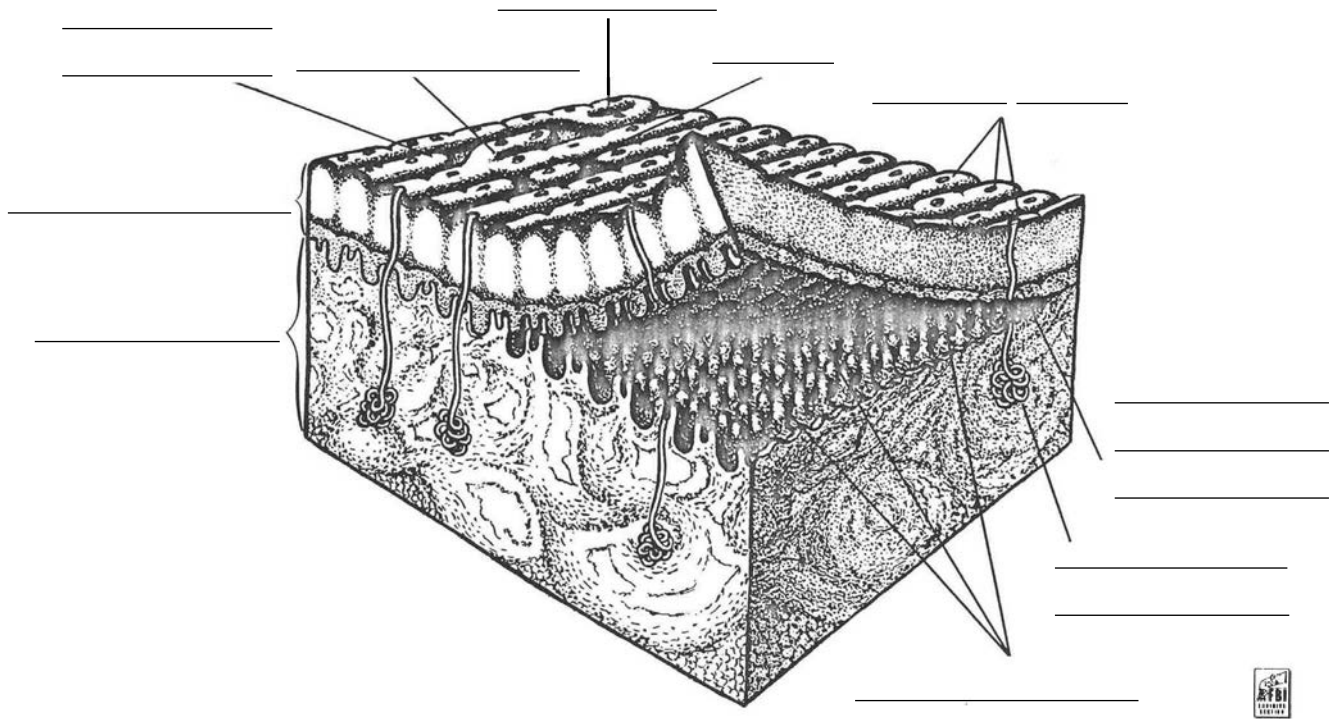
3. In ulnar loops, the number of ridges present from the delta to the core in each index, middle, and ring finger determines the code of I or O. Complete the chart below.

Code	Index	Middle	Ring
I			
O			

4. What do the values of I, M, and O mean in relation to whorls?



1. Label the parts of friction skin in the graphic below.



2. Label the types of minutiae in the graphic below. Also identify the core and delta (remember that these are not technically minutiae but common locations in a print).



Page intentionally left blank.



Recording & Identifying Fingerprints

Fingerprint patterns are the iconic tool used in criminal identification. Fingerprints are left behind by the secretions from sweat pores found on the surface of friction ridge skin. Friction ridge skin covers the surface of the hands and feet. Due to God’s design of friction ridge skin, an uneven surface is created, which aids in a nonslip surface and firmer grip. Fingerprints develop in the mother’s womb between 10 and 16 weeks and remain with an individual until the dermal and epidermal layers of skin fully decompose after death. The value in fingerprint identification lies in three qualities: individuality, identifiable characteristics, and unchanging structure. The beauty, design, and complexity behind the structure of friction ridge skin testifies to a Master Artist and Creator God who loved every single person so much He gave them 20 unique fingerprint patterns (ten on the fingers and ten on the toes) unlike anyone else who will ever live on the face of the earth . . . past, present, or future.

Fingerprints are classified into three broad categories: arch, loop, and whorl.



loops

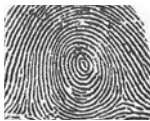


whorls



arches

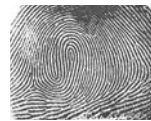
These three pattern types are further divided into eight total patterns.



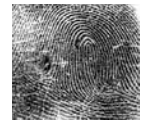
plain whorl



central pocket loop whorl



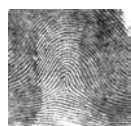
double loop whorl



accidental whorl



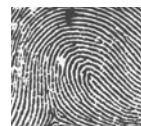
plain arch



tented arch



radial loop (right hand)



ulnar loop (right hand)



radial loop (left hand)



ulnar loop (left hand)

Materials

Pen or pencil

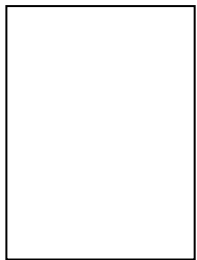
Wipes

Ink pad (or ground pencil)

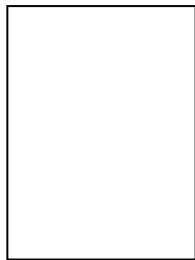
Procedure

Part 1: Printing

1. Ink each of your fingers and print them on the fingerprint card below, one at a time. Use the nail-to-nail roll technique for both inking and printing. This means you start on one side of your finger and roll it across the ink pad (or paper) to the other side. Let the ink dry.
2. On the second blank below each fingerprint, identify the pattern as arch, loop, or whorl.
3. Bonus: On the first blank below each fingerprint, identify each of your fingerprints as one of the eight subtypes of patterns.



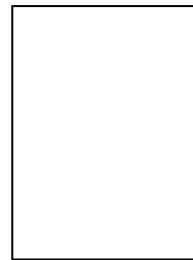
right thumb



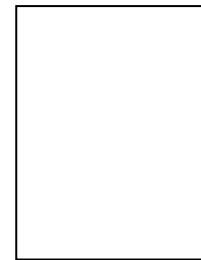
right index



right middle



right ring



right little

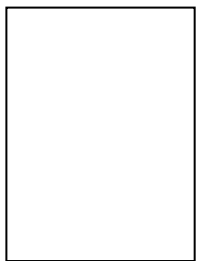
Pattern: _____

Pattern: _____

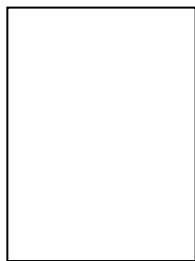
Pattern: _____

Pattern: _____

Pattern: _____



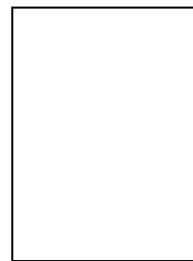
left thumb



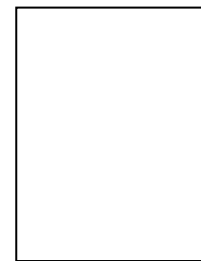
left index



left middle



left ring



left little

Pattern: _____

Pattern: _____

Pattern: _____

Pattern: _____

Pattern: _____

Part 2: Classification

1. The first step in classifying fingerprints is to identify the pattern of each finger with a letter under the finger. Use the information and fingerprint card example on page 197 in the student book to help you with this.
2. You will now classify the primary of your fingerprints. Use the information on page 198 in the student book to help you. _____
3. Now classify the secondary of your fingerprints. Use the information on page 199 in the student book to help you. _____

Lesson 25

Residues and Patterns

This is he who came by water and blood—Jesus Christ; not by the water only but by the water and the blood. And the Spirit is the one who testifies, because the Spirit is the truth (1 John 5:6).

Terms to Know

Back spatter – a type of transfer bloodstain; the result of blood spatter on the perpetrator from the attack on the victim.

Contact bleeding – a type of transfer bloodstain; a simple person-to-person transfer of blood.

Swipe – also called a smear; a type of transfer bloodstain. This is when wet blood is transferred to a surface that did not originally have blood on it.

Wipe – also called a smudge; a type of transfer bloodstain. This occurs when a clean, non-blood-bearing object moves through a wet bloodstain and alters the appearance of the original stain.

Contact and collapse – the first phase of impact a blood drop progresses through; the flattening of the blood droplet upon impact.

Dispersion – the third phase of impact a blood drop progresses through; the separation of spatter or small droplets from the main droplet.

Displacement – the second phase of impact a blood drop progresses through; the spreading out of the blood droplet.

Retraction – the fourth and final phase of impact a blood drop progresses through; the adhesion of blood particles that do not completely separate and are drawn back into the parent droplet.

Arterial spray spatter – a bloodstain pattern that occurs when a main artery or the heart is ruptured.

Cast-off spatter – a bloodstain pattern caused by the blood released from a bloody projectile.

Expired blood – a bloodstain pattern caused by a bleeding mouth or nose from an internal injury.

Flow pattern – a bloodstain pattern that is the result of the flow of blood downward due to the force of gravity. There are two types of flow patterns, active and passive.

Gunshot spatter – a bloodstain pattern; the forward blood spatter emitted from the exit wound and back spatter from the entrance wound of a gunshot.

Impact spatter – a bloodstain pattern; when a blood source is impacted by a blow that causes a random dispersion of smaller drops of blood.

Pool pattern – a bloodstain pattern; the collection of blood in a pool on an undisturbed, nonporous surface.

Splash pattern – a bloodstain pattern that is visible when a pool of blood splashes outward and resembles the shape of an exclamation point.

Trail pattern – a bloodstain pattern caused by a series of drops that form by the dripping of blood from an object, weapon, or injury.

Void pattern – a bloodstain pattern; a space where there is no visible blood spatter.

Active flow – a type of flow pattern; blood emitting from an open wound.

Passive flow – a type of flow pattern; a blood pattern due to arterial spurt.

Drawback effect – when blood spatter sprays into the muzzle of a firing gun.

Case Study

Teacher: Review the case study and discuss it with your student. Be sure to address any notes the student took, as well as sensitive or difficult topics you want to talk through with your student. Topics covered in this case include adultery, murder, alcoholism, drugs, addiction, graphic description of the crime scene and body, and implied violent behavior.

Student: Review the case study. You can use this page to take notes on anything from the case that you have questions or concerns about. Discuss your thoughts with your teacher.

Notes



Multiple Choice

Circle the best answer from the choices below.

1. How much blood volume would a human have to lose to produce death?
 - a. 20%
 - b. 40%
 - c. 60%
 - d. 80%
 - e. None of the above

2. Blood spatter analysis requires an understanding of: (There is more than one answer.)
 - a. Geometry
 - b. Statistics
 - c. Physics
 - d. Calculus
 - e. Probability

Fill-in-the-Blank

Fill in the blanks with the correct answer.

1. As the Bible says in Leviticus 17:11, life is in the _____.

2. A cut vein or artery will result in a loss of half a _____ of blood per _____.

3. Dr. Dana Sneed said that math is predictable because God is _____.

Short Answer

Respond to the following questions in complete sentences.

1. What is blood spatter analysis?

2. What is the goal of blood spatter analysis?

3. What must happen to leave a blood spatter pattern?

4. What characteristics of blood contribute to the unique shape of the patterns left behind?



Multiple Choice

Circle the best answer from the choices below.

1. Whose research laid the groundwork for future pioneers in the study of blood spatter analysis?
 - a. Dr. Victor Balthazard
 - b. Dr. Paul Kirk
 - c. Dr. Eduard Piotrowski
 - d. Sam Sheppard
 - e. None of the above

2. If the parent drop falls at an angle less than 90 degrees, it will have a:
 - a. Spine
 - b. Satellite spatter
 - c. Arm
 - d. Tail
 - e. None of the above

Matching

Mark the letter in front of the best answer.

- | | | | |
|-------------------|---------------------|--------------|-------------|
| a. Swipe or smear | b. Back spatter | c. Passive | d. Transfer |
| e. Wipe or smudge | f. Contact bleeding | g. Projected | |

1. _____ The result of blood spatter on the perpetrator from the attack on the victim
2. _____ The result of a bloody surface coming into contact with a clean surface, thereby leaving bloody residue
3. _____ Drops of blood pulled down by gravity alone
4. _____ When wet blood is transferred to a surface that did not originally have blood on it
5. _____ A simple person-to-person transfer of blood
6. _____ The result of a force or action that causes exposed blood to be expelled
7. _____ Occurs when a clean, non-blood-bearing object moves through a wet bloodstain and alters the appearance of the original stain

Short Answer

Respond to the following questions in complete sentences.

1. Describe the three characteristics of a single drop of blood.

a. _____

b. _____

c. _____

2. The elongated shape of blood droplets can be measured to determine what eight characteristics?

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

3. Briefly define each of the following types of blood spatter:

a. Impact spatter: _____

b. Gunshot spatter: _____

c. Cast-off spatter: _____

d. Arterial spray spatter: _____

e. Expirated blood: _____



Multiple Choice

Circle the best answer from the choices below.

1. The pointed end of a bloodstain always points toward the:
 - a. Victim
 - b. Attacker
 - c. Direction of travel
 - d. Origin
 - e. None of the above

2. The angle of impact is defined as a(n) _____ angle formed between the blood drip and the surface.
 - a. Acute
 - b. Obtuse
 - c. Right
 - d. None of the above

3. Which search pattern is the best search methodology to locate and identify all blood spatter evidence?
 - a. Spiral inward
 - b. Spiral outward
 - c. Parallel
 - d. Zone
 - e. Grid

Fill-in-the-Blank

Fill in the blanks with the correct answer.

1. The area of convergence is the point at which the drops of blood in an impact pattern _____.

2. The area of convergence in a three-dimensional space is the area in which the _____ or _____ was present when the blood spatter stain was produced.

Short Answer

Respond to the following questions in complete sentences.

1. Briefly define each of the following types of blood spatter:

a. Void pattern: _____

b. Flow patterns: _____

c. Pool patterns: _____

d. Splash patterns: _____

e. Skeletonization of blood patterns: _____

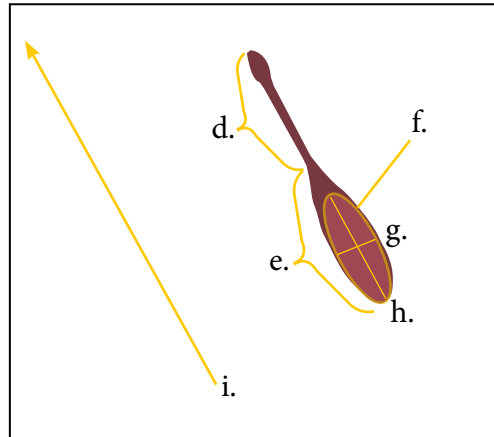
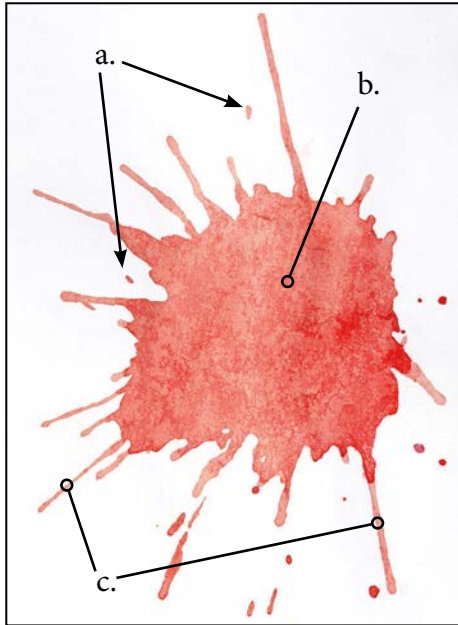
f. Trail patterns: _____

2. What does analyzing blood spatter require?

3. What is the formula to measure the impact angle?

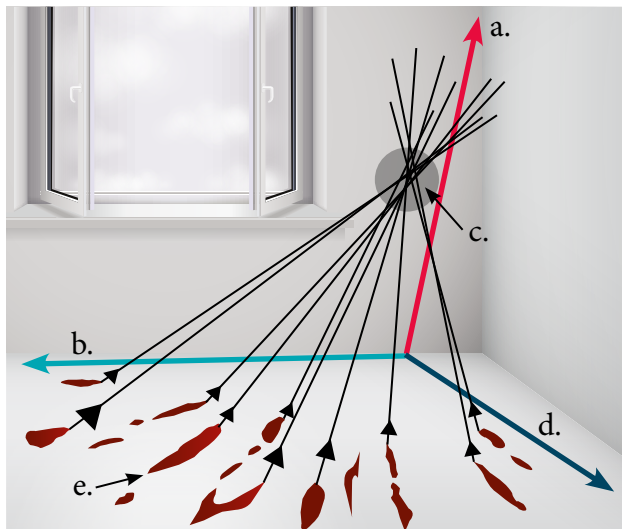


1. Label the images below of blood spatter and a blood drop.



- a.
- b.
- c.
- d.
- e.
- f.
- g.
- h.
- i.

2. Label the image below of area of origin in a three-dimensional space.



- a.
- b.
- c.
- d.
- e.

Word Bank

Use the blood spatter patterns from the word bank to label each image below.

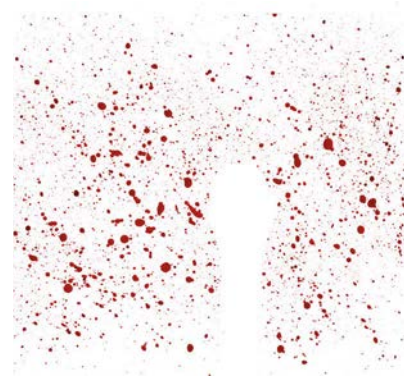
gunshot spatter cast-off spatter arterial spray spatter expired spatter void pattern
pool skeletonization of blood trail pattern



a. _____



b. _____



c. _____



d. _____



e. _____



f. _____



g. _____



h. _____

Take time to study Lessons 16–25 for the Unit 5 Test.



Blood Spatter

Blood spatter analysis examines the physical properties of blood, in addition to the shapes, locations, and distribution patterns of bloodstains. If the parent drop falls at an angle less than 90 degrees, it will have a tail. The tail always points toward the direction of travel. The elongated shape of these droplets can be measured to determine the following characteristics:

- ✓ The direction from which the blood originated
- ✓ Angle from which the blood originated
- ✓ Location and position of the victim
- ✓ Movement of the bleeding suspect or victim
- ✓ Number of blows to the victim
- ✓ The type of injuries
- ✓ The location of the attacker

To determine the direction and angle of impact, only the circular portion of the stain is measured for the length and width. If the length and width are the same, the blood droplet fell perpendicular to the surface and is a 90-degree stain. As the angle decreases, the more elongated the stain. The angle of impact is defined as an acute angle formed between the blood drip and the surface. Using trigonometry, the impact angle can be calculated. The formula to measure the impact angle is:

$$\sin (A) = \frac{\text{width of bloodstain}}{\text{length of bloodstain}}$$

NOTE: You need your teacher’s permission and supervision to conduct this lab.

Materials

- White poster board
- Watered red paint or *simulated human blood
- Latex glove
- Scientific calculator

*Recipe for simulated blood: Combine 4 oz evaporated milk, 2–3 Tbsp tomato paste, and red food coloring. Add water as needed for consistency.

Calculating impact angle:

1. Divide the width of the bloodstain by the length of the bloodstain. This number should be a decimal.
2. Input the decimal into a scientific calculator and hit “2nd” and “sin.” This is the angle of impact.

Example: A bloodstain measures 0.6 mm wide and 15 mm long.

$$\frac{0.6 \text{ mm}}{15 \text{ mm}} = 0.4$$

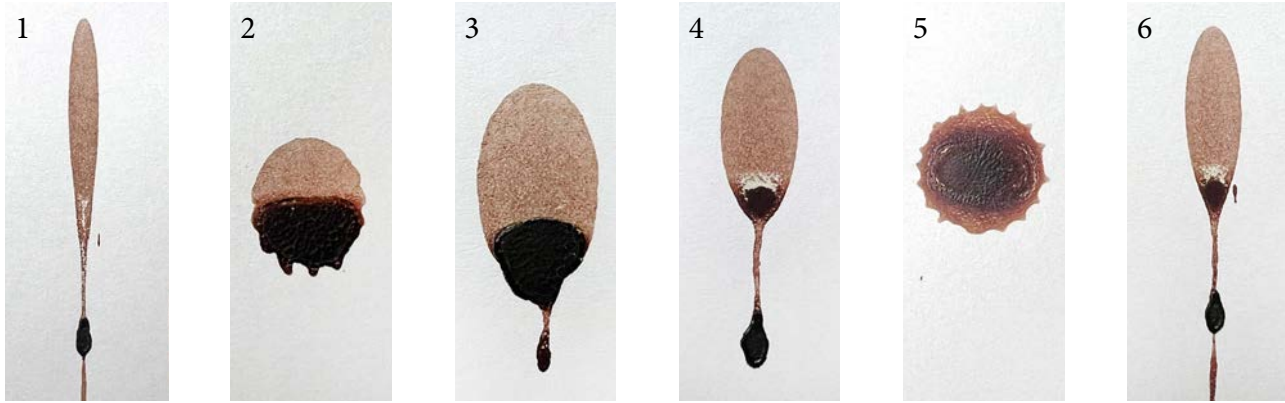
$$\sin \text{ of } 0.4 = 24^\circ \text{ angle of impact}$$

Note: There is a 5-degree error factor when using this formula; therefore, the calculation is valid to plus or minus 5 degrees of the actual angle of impact.

Procedure

Part 1

1. Measure the length and width (in mm) of the six bloodstain patterns provided below. Record this information in Data Table 1.
2. Using the formula explained above, calculate the estimated impact angle of each bloodstain and record your answers in the data table.



Data Table 1

Blood Stain	Width (mm)	Length (mm)	Estimated Impact Angle
1			
2			
3			
4			
5			
6			

Part 2

1. Prop a piece of white poster board on the ground against a wall or tree. Be sure you do this in an area where cast-off spray is permissible.
2. Put on a glove and dip your fingers in the simulated blood.
3. Project the simulated blood onto the poster board from various directions, moving the hand in an upward, downward, and side-to-side direction. This will provide various cast-off patterns for analysis.
4. Allow the simulated blood spatter to dry completely.
5. Measure the width and length in millimeters of four bloodstains on the poster board. Log the information on Data Table 2.
6. Calculate the estimated impact angle and record your answers on the data table.



Data Table 2

Stain Number	Width (mm)	Length (mm)	Estimated Impact Angle
1			
2			
3			
4			

Analysis

1. Does the calculated impact angle of each bloodstain coincide with the tails determining direction of travel?

2. What factors could distort the conclusions and overall analysis of impact angle?

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DETAILED SUPPLY LIST



Detailed Supply List

General Supplies

- Pencil
- Red pen and black pen
- Tailor's measuring tape (metric)
- Metric ruler
- Microscope, magnifying glass, or magnifier app
- Plastic zip bags
- Marker
- Masking tape
- Scientific calculator
- Scissors
- Forceps
- Camera or phone camera
- Paper towels
- Water

Lab 1

- A peer, parent, or sibling

Lab 3

- 4 pieces of evidence that can easily fit on a table (e.g., cell phone, tablet, computer, pencil, piece of paper, coffee mug, knife, keys, etc.)
- Graph paper
- Optional: clipboard

Lab 4

- Household items listed in chart on page 61, or comparable items

Lab 5

- $\frac{1}{4}$ cup baking soda
- $\frac{1}{4}$ cup flour
- $\frac{1}{4}$ cup salt
- $\frac{1}{4}$ cup sugar
- $\frac{1}{4}$ cup powdered sugar
- 1 Tbsp of one of the above powders selected by friend or family member
- Vinegar
- Lighter
- Safety goggles
- Oven mitts
- Aluminum foil
- Tongs

- 6 microscope slides (if using a microscope)
- Iodine
- 12 clear plastic cups
- Aluminum pan
- Teaspoon measure
- 20 mL liquid measure
- 6 spoons

Lab 6

- 2 different hammers*
- 2 different screwdrivers*
- 2 different pliers*
- 1 can of playdough or fast-drying craft clay
- Paper plate
- Heavy paper plate or foam tray

*Other tools can be substituted for this lab.

Lab 10

- 4 colors of marshmallows, 10 of each
- 2 licorice ropes
- 12 toothpicks

Lab 14

For teacher:

- Pipe cleaners in 5 colors (blue, white, yellow, pink, and brown)

For student:

- Simulated entomology evidence for Cases 1 & 2 (created by teacher)

Lab 15

For teacher:

- Raw potato
- Small pot
- Thermometer
- Timer

For student:

- Boiled potato
- Ice cubes
- Thermometer
- Oven mitt
- Stopwatch
- Tongs or spoon



Lab 16

- Ink pad (or ground pencil)
- Wipes

Lab 18

- Various items to fingerprint and process (e.g., plastic bag, glass jar or container, empty water bottle, empty soda can, business card, etc.)
- Disposable plastic container with lid
- Aluminum foil
- Fingerprint black powder or magnetic powder (or ground pencil lead or eyeshadow)
- Fingerprint dusting brush or magnetic wand (or makeup or soft artist brush)
- 20 plain index cards (no lines)
- Clear packing tape
- Ink pad
- Computer
- Super glue

Lab 19

- Microscope slides and cover slips (if using a microscope)
- Small water dropper
- Human hair sample
- Three animal fur samples

Lab 20

- Microscope slides and cover slips (if using a microscope)
- Small water dropper
- Several samples of 3 different natural fibers
- Several samples of 3 different synthetic fibers
- Samples of one of the fibers used in the lab, selected by teacher
- Safety goggles
- Test tubes (1 per synthetic fiber)
- Test tube rack
- Funnel
- Acetone
- Safety gloves (for liquids)

Lab 21

- 5 different types of glass drinking containers (drinking glass, borosilicate glass, glass tea bottle, etc.)*
- Samples of one of the glass drinking containers, selected by teacher*
- 5 pieces of cloth (old t-shirts or towels, etc.)*
- Hammer
- Protective safety gloves (for broken glass)
- 5 plastic containers
- Distilled water
- Olive oil
- Baby oil
- Glycerin
- 4 test tubes or clear glass containers
- 50 mL liquid measure
- Electronic balance

*You are going to break the glass drinking containers to retrieve shard samples, so make sure to be careful and use materials that you don't mind throwing away.

Lab 22

- 4 different soil samples
- 4 containers
- 4 small petri (glass/plastic) dishes
- Screen or sifter
- Small bowl
- 4 microscope slides or small white plates
- 4 mL liquid measure
- 4 50-mL liquid measures
- Distilled water
- 4 stirring rods or spoons
- 4 plastic cups
- 1 tsp measure
- pH strips (available at a pharmacy or supermarket)
- Stopwatch

Lab 23

- 2 lbs Plaster of Paris
- Gallon sealable plastic bag
- Plastic or cardboard box
- Shoe with tread pattern
- Sand or soil
- Aerosol hairspray
- Small paintbrush
- Water hose or bucket of water
- Scrub brush, old toothbrush, or sponge

Lab 25

- White poster board
- Watered red paint or simulated human blood*
- Latex glove

*Recipe for simulated blood: Combine 4 oz evaporated milk, 2–3 Tbsp tomato paste, and red food coloring. Add water as needed for consistency.

Lab 28

- Drawing compass

Lab 29

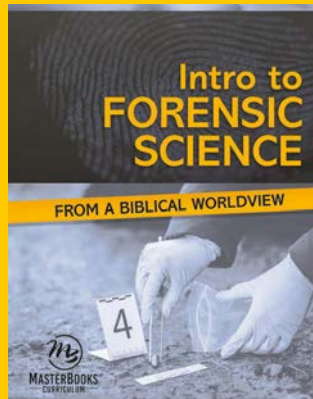
- Colored pencils (at least 16 colors; see color keys in lab)
- Skull anatomy reference material or online source (with teacher's permission)

Lab 30

- 5" x 7" Styrofoam™ plate
- 4 transparency plates (1 sheet of 8" x 11.5" transparency film cut into four 4" x 6" pieces)
- Circus peanut candy
- Black extra-fine point permanent marker
- Disinfecting wipes or soap and water

FORENSIC TESTS

For use with
Forensic Science



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Multiple Choice

Circle the best answer from the choices below.

1. Which of the following steps are included in forensic investigation?
 - a. Collection and examination of physical evidence
 - b. Interpretation of data
 - c. Drawing conclusions
 - d. Clear and concise reporting
 - e. Collaboration
 - f. All of the above

2. The primary difference between historical and observation science is the ability of the scientist to have:
 - a. Keen insight
 - b. A deep understanding of the topic
 - c. Knowledgeable research
 - d. Direct observation
 - e. All of the above

3. What do evolutionists assume is the key to the past?
 - a. Uniformitarianism
 - b. Past
 - c. Present
 - d. Future

Fill-in-the-Blank

Fill in the blanks with the correct answer.

1. The Latin root for the word science, *scientia*, means _____.

2. _____ science relies on observable, experimental, repeatable measure.

3. _____ science is unobservable in its original form.

Short Answer

Respond to the following questions in complete sentences.

1. How does Psalm 111:2 apply to the study of science?

2. How has the definition of science changed over time? Fill in the chart below.

1828	
1913	
2020	

3. State Locard's Exchange Principle. Why is this principle the basis of forensic science?

4. Why is forensic science inherently a historical science? Provide a minimum of three supporting points to justify your answer.

5. Briefly describe the ways a forensic scientist can participate in investigation with a biblical worldview.

FORENSIC ANSWERS

Grading

It is always the prerogative of an educator to assess student grades however he or she might deem best. The following is only a suggested guideline based on the material presented through this course. To calculate the percentage of the worksheets and tests, the educator may use the following guide. Divide total number of questions correct (example: 43) by the total number of questions possible (example: 46) to calculate the percentage out of 100 possible.

$$43/46 = 93 \text{ percent correct.}$$

The suggested grade values are noted as follows:

90 to 100 percent = A

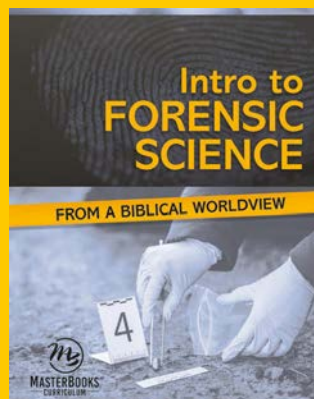
80 to 89 percent = B

70 to 79 percent = C

60 to 69 percent = D

0 to 59 percent = F

For use with
Forensic Science



Exercise Answers

Lesson 1, Exercise 1

Multiple Choice

1. f
2. a, b, and c
3. d
4. c

Short Answer

1. Science means knowledge, and God is knowledge. The God of knowledge is also the Creator and Designer of all creation. Therefore, a scientist in any discipline (geology, astronomy, botany, biology, etc.) is capable of studying science through the lens of God's Word, delighting in that study, and giving the honor and glory of their discoveries to the Lord.
2. Merriam-Webster defines forensic science as "the application of scientific principles and techniques to matters of criminal justice especially as relating to the collection, examination, and analysis of physical evidence."¹⁸ The Latin root for forensic is *forensis*, which means "of or before the forum," and the root of the word science means knowledge. Therefore, the term "forensic science" refers to the acquisition of knowledge gained from the evidence, analysis, and investigator interpretations, with the goal of presenting this knowledge before individuals in the judicial system (the forum).
3. 1828 – Science: "knowledge; the comprehension or understanding of truth or facts by the mind. The science of God must be perfect."¹⁹
1913 – Science: "knowledge as it relates to the physical world, the nature, constitution, and forces of matter, called also natural science."²⁰
2020 – Science: "knowledge or system of knowledge covering general truths, or the operation of general laws obtained and tested through the scientific method."²¹

Lesson 1, Exercise 2

Multiple Choice

1. a, c, and d
2. b

Matching

1. c
2. a
3. d
4. b
5. f
6. e

Short Answer

1. a. When two items come into contact with one another, there is an exchange of material between them.
b. This principle is the basis of forensic science because it is impossible for two things (whether two non-living objects, a living being + living being, or a living being + non-living object) to come into contact without transferring information. This can be in the form of fibers, hairs, animal fur, paint, bodily fluids, fingerprints, etc.
2. The most important discovery of the past 100 years for forensic science was the DNA double helix.
3. Alec Jeffreys developed the testing necessary to process an individual's DNA and create a DNA fingerprint.
4. The AAFS is the American Academy of Forensic Scientists. It is the largest governing body in the field of forensic science and is composed of over 7,000 scientists.

Lesson 1, Application

- A. Fingerprints: Criminalistics
- B. Fiber evidence: Criminalistics
- C. Human hair: Criminalistics/Biology
- D. Drugs: Toxicology
- E. Bullets: Criminalistics/General
- F. Ransom note: Questioned Documents
- G. Revolver: Criminalistics/General
- H. Shoe impression: Criminalistics/General
- I. Skull: Physical Anthropology



Optional Activity: Answers may vary, but students should research a forensic career of their choosing and provide the following information: Is it offered in local, state, and/or national agencies? Identify the requirements necessary to apply, the salary range, and experience needed.

Lesson 1, Lab

1. a. Measurements will vary.
b. Yes, the difference should be significant enough that two different people could be distinguished based on body measurements. The only exception to this is identical twins (discussed in Lesson 16).
2. The cubit (Genesis 6:15).
3. Some people are similar in size, especially identical twins. The system is not specific enough to guarantee unique identity.

Lesson 2, Exercise 1

Multiple Choice

1. d
2. c
3. a and b

Matching

1. a
2. b
3. a

Short Answer

1. 1) The past is not observable: “cannot be seen, smelled, heard, tasted, or sensed in any way.” 2) The past is not predictable and is therefore retrodiction (or stating inferences about the past). 3) It is impossible to recreate the past in the present: “one cannot design an experiment that will replicate the complex variety of conditions that existed in the past—conditions that are often not known in full detail.” 4) Forensic science incorporates the use of existing theories but does not form new theories.²²
2. The term *interpret* is used primarily because the scientist was not privy to a firsthand, observable account of the event being investigated.

3. Answers may vary, but students should provide an example of a crime scene investigation for each of Young’s four reasons why forensic science is a historical science (see the four points from question 1 above).

Lesson 2, Exercise 2

Multiple Choice

1. b, c, and d
2. f

Fill-in-the-Blank

1. Assumptions, bias
2. present
3. hypothesis
4. results

Short Answer

1. The equivalency of historical science to operational science is foundational to evolutionary ideas, considering there is no evidence for molecules-to-man evolution, though this is often conflated with natural selection and change in general, for which there is evidence. For example, evolutionary scientists have never observed a species changing from one taxonomic kind (or family) to another (i.e., a dog to a cat) or identified a species gaining new genetic information of the type needed for molecules-to-man evolution. Evolutionists apply the current nature of scientific processes to unobservable events in the past. They assume the present is the key to the past, a method that primarily relies on uniformitarianism.
2. In the world of forensic science, investigators operating from a biblical worldview must recognize that they are not “good” people sending “bad” people to prison. In the Bible, Romans 3:10 is clear that no one is good: “None is righteous, no, not one.” This goes back to the original sin described in the book of Genesis. At the end of creation week in Genesis chapter one, God tells us it was “very good” (1:31). The earth — including the land,

to be damaged, and it is also used to detect counterfeit money.

4. Graphology is the study of human personality through an individual's writing.
5. Graphologists hypothesize a person's personality, mental health, intellect, and a variety of other factors.

Lesson 8, Application

1. Class characteristics: determine the make and model of the typewriter and examine the typeface, ink, and ribbon. Individual characteristics: examine spacing, misaligned letters, variation in pressure of typeface, spurs or marks unique to the machine, and the ribbon.
2. First begin with nondestructive tests. These may include ultraviolet and infrared technology, microscopy, and a basic visual examination. Other tests include thin layer chromatography. A microsample of the ink is removed from the document for chemical analysis. Since each brand of ink pen will be composed of several organic dyes, separating out those dyes results in a distinct pattern. The pattern will be different for inks with different dye compositions. Chromatography is the best method to compare the composition of ink samples.

Optional Activity

1. Answers will vary, but students should include a piece of document evidence of the Scriptures that surprised them.

Lesson 8, Lab

Answers will vary.

Lesson 9, Exercise 1

Multiple Choice

1. a
2. c
3. b

Matching

1. c
2. d

3. a
4. b

Short Answer

1. Answers will vary, but the lesson provides the following examples: Cain built a city (Genesis 4:17), Tubal-cain was a user of bronze and iron (Genesis 4:22), Noah built an Ark (Genesis 6), mankind built the Tower of Babel (Genesis 11), Nehemiah rebuilt the great wall in Jerusalem (Nehemiah), and Jesus Himself was a carpenter (the Gospels).
2. Algorithms are the step-by-step instructions that define a set of procedures that must be carried out in specific order to obtain a desired result. Algorithms serve as the underpinnings that operate computer programs and are organized by a data structure.
3. Charles Babbage invented the Difference Engine in 1823. He outlined plans for the Analytical Engine in the 1830s and worked on it for the rest of his life, but he never completed it.

Lesson 9, Exercise 2

Multiple Choice

1. b
2. a, d, e, and f
3. b

Abbreviations

1. Central Processing Unit
2. Random Access Memory
3. Network Interface Card
4. Operating system

Short Answer

1. Hardware is defined as a device that is physically connected to a computer. Examples include (student should list two): hard drives, monitors, printers, CD ROM, and video cards. Software is the computer programs that perform tasks on the operating system. Examples include (student should list two): Microsoft® Word, Keynote®, QuickBooks®, Adobe®, internet browser.



- Answers will vary, but students should provide an example of how the operating system allows the application software to talk to the hardware.
- Format is the instructions for an operation system to read and write to a drive (physical device you put data on).
- Binary code, in the form of 0's and 1's, records the data on the hard drive.

Lesson 9, Exercise 3

Multiple Choice

- c
- b
- e

Fill-in-the-Blank

- IP
- Browser
- Cache

Short Answer

- Cookies are a piece of data inside the browser that gives feedback about the user to the server. Cookies mark and track information and are software that lives in the browser. For example, a user will search a certain product or be talking about specific merchandise on or near their computer, only to discover later that afternoon that the exact product is now offered to them in the computer ads popping up on their screen.
- The investigator will search browser history, bookmarks, IP addresses, cache, and cookies.
- It is never wise to insert a USB drive from an unknown source into a personal computer because compromised USB drives contain malware that can infect a computer system.

Lesson 9, Exercise 4

Multiple Choice

- d

- a, b, and e

Matching

- b
- c
- a
- e
- f
- d

Short Answer

- Human cybercrime falls into the six categories of phishing, ransomware, webcam managing, screenshot managing, keylogging, and ad clicking.
- AF tools are Anti-Forensic tools.
- The four goals of AF tools are to 1) avoid detection, 2) disrupt the collection of data, 3) increase the period of time allotted for investigation, and 4) cast doubt on forensic testimony.
- A conviction in a criminal computer forensic investigation will result in incarceration, parole, community service, criminal record, or other form of criminal punishment. The resolution of a civil court case results in some form of monetary payments, a service, or property.

Lesson 9, Application

-



- Human error and failure to follow security protocols are the primary reason for computer crimes.

3.

	Hardware	Software
Types	Input Storage Processing Control Output	System software Programming software Application software
Function	Delivery system Infrequently changed Dependent on software	Perform tasks Easily changed, updated, modified Dependent on hardware
Examples	Hard drives, monitors, printers, CD ROM, video cards	Microsoft® Word, Keynote®, QuickBooks®, Adobe®, internet browser
Nature	Physical	Logical

Lesson 9, Lab

1. Michael Stephinghouse lives in 2562 Westingfill Ln. Carter, MS 23456
2. Michael Stephinghouse is on vacation
3. Michael Stephinghouse is single and lives alone
4. No one will be at Michael Stephinghouse's home and is a potential victim for a crime such as home robbery.
5. 01000100 01101111 01101110 00100111
01110100 00100000 01100010 01100101
00100000 01100001 00100000 01000011
01111001 01100010 01100101 01110010
00100000 01010100 01100001 01110010
01100111 01100101 01110100

Lesson 10, Exercise 1

Multiple Choice

1. b
2. c
3. c

Fill-in-the-Blank

1. every
2. human genome

Short Answer

1. Genotype is genetic and hereditary information, and phenotype is physical characteristic information.
2. The Bible clearly states in Genesis 1:27 that God created humans in His image. All humans are descendants of Adam and Eve and are of one humankind. After a decade of DNA research, the Human Genome Project began to publish their results, which said "there is only one race – the human race." Christians already recognize this fact because the Bible says in Acts 17:26a, "And he made from one man every nation of mankind to live on all the face of the earth." This was the same case for plants and animals (Genesis 1).

Lesson 10, Exercise 2

Multiple Choice

1. d
2. c

Matching

1. Oswald Avery
2. Gregor Mendel
3. Antonie van Leeuwenhoek
4. Robert Hooke
5. Sir Alec Jeffreys
6. Rosalind Franklin

Short Answer

1. Robert Hooke's research of cells is important to the history of DNA because it was in cells that scientists discovered DNA 200 years later.
2. These "invisible" traits are genes.
3. Chargaff's Rules are: 1) In double-stranded DNA, the number of guanine units equals the number of cytosine units (G = C), and the number of adenine units equals the number of thymine units (A = T), and 2) DNA composition varies between species.
4. James Watson and Francis Crick are credited as the first scientists to solve the mystery surrounding the structure of DNA.



Lesson 15, Exercise 2

Multiple Choice

1. c
2. b, c, e, and g
3. a

Matching

1. Homicide
2. Undetermined
3. Accidental
4. Suicide
5. Natural

Short Answer

1. *Pallor mortis* begins between 15–20 minutes of death and results in an extremely pale color in the skin, *rigor mortis* is the stiffening of the joints and muscles due to a loss of adenosine triphosphate, *livor mortis* (or lividity) is the pooling of blood from gravity to the lowest point as the heart stops the circulation of blood through the body, and *algor mortis* is the gradual cooling of the body after death until it reaches the ambient temperature.
2. The primary mechanisms that will influence the rate of decomposition are temperature and humidity, accessibility, cause of death, percent of body fat, and drugs.
3. The six stages of an autopsy are y-incision, removal of organs, stomach contents, sample collection, head and brain, and conclusion.

Lesson 15, Application

Answers will vary but should use a minimum of three sentences for each of the four stages of decomposition to reflect the following:

1. a. Autolysis begins immediately after death and is a form of cellular self-digestion. When the circulation of oxygen stops, excess carbon dioxide causes cell membranes to rupture. Enzymes that are released from the membranes begin to eat the cells from the inside out. During this stage, *pallor mortis* is the first indicator of decomposition. The other stages of autolysis are *rigor mortis*, *livor mortis*, and *algor mortis*.

- b. Bloating is the result of the cellular digestion occurring during autolysis. The gases created from autolysis cause the body to double in size. During this stage, the body will also begin to emit putrid odors called putrefaction. Bloating begins 4–10 days after death. Insect activity is often prevalent in the orifices of the body.
- c. During active decay, all the fluids in the body seep into the surrounding ground surface where the body is lying. The odor is very strong, and insects continue to break down the body tissues and begin to pupate in the surrounding soil. Skin beetles may become active on the decomposing body. This process, also called butyric fermentation, occurs 10–25 days after death.
- d. Skeletonization begins 25–50 days after death and can last for years. Since the process is influenced by several environmental factors, there is no exact time frame for skeletonization. After several weeks, the nails will become dislodged from the body. When the process is complete, only dry skin, hair, and bones will remain. Common insects to the scene are beetles, mites, and the clothes moth. Additionally, plants and fungi begin to inhabit the body.

Lesson 15, Lab

1. Answers will vary based on equipment and experimental error, but the line should be curved, dropping sharply at first and then leveling off.
2. A linear plot would mean that the rate at which the temperature drops is constant. The closer the potato gets to the environmental temperature, however, the less quickly it drops.
3. Environmental temperature does not always stay the same. If the body is outside, weather is a factor.

Lesson 16, Exercise 1

Multiple Choice

1. b
2. c
3. a

Fill-in-the-Blank

1. Psalm
2. sensory

Short Answer

1. The value of fingerprint identification lies in three qualities: individuality, identifiable characteristics, and unchanging structure.
2. There is evidence on early stone artifacts, clay seals, pottery, and documents that demonstrates early civilizations recognized that fingerprints held value in someone's identity.
3. J.E. Purkinje was the first person to organize the patterns of fingerprints into a form of classification system.

Lesson 16, Exercise 2

Multiple Choice

1. a, b, and c
2. e
3. b

Matching

1. Sir William Herschel
2. Sir Francis Galton
3. Alphonse Bertillon
4. Sir Edward Henry
5. Dr. Henry Faulds

Short Answer

1. Eugenics is defined as the study of how to force reproduction within a human population to increase the occurrence of heritable characteristics regarded as desirable.
2. Sir Francis Galton concluded that "there is no peculiar pattern which characterizes persons of any of the above races (English, Welsh, Hebrew, Black)."²⁶
3. In 1903, a man named Will West was arrested and taken to prison. When searching his anthropometry measurements, they found they were very close to another prisoner's — William West — measurements. Upon closer examination, they discovered these two men were identical twins who were unaware they

had a twin brother. This case brought to light a discrepancy in the method of anthropometry. When the fingerprints of Will and William West were analyzed, the technicians discovered they were uniquely different.

4. The four common examples of fingerprint minutiae are ridge ending, bifurcation, island, and crossover. The two common locations in a print are the delta and core.

Lesson 16, Exercise 3

Multiple Choice

1. e
2. a, c, and f
3. b and d
4. b

Short Answer

1. The eight subdivisions of arches, loops, and whorls are the plain arch, tented arch, ulnar loop, radial loop, plain whorl, central pocket loop whorl, double loop whorl, and accidental whorl.
2. The Henry system is based on the presence of whorls in fingers or thumbs. A point value is only given if a whorl is present. If no whorl is present, no value is given for that finger or thumb. The fingerprint classification is written in fraction form. To avoid a value of "0" when no whorls are present, an arbitrary "1" is always added to both the numerator and denominator. Therefore, an individual who has no whorls present on any of their fingers or thumbs has a primary classification of $\frac{1}{1}$. Someone who has whorls on all ten of their fingers will have a classification of $\frac{32}{32}$. Therefore, all fingerprint classifications fall within the range of $\frac{1}{1}$ to $\frac{32}{32}$.
3. The key is the ridge count of the first finger with a loop pattern.
4. a. Inner tracing (I)
b. Meet (M)
c. Outer (O)

Lesson 16, Exercise 4

Multiple Choice

1. c
2. b
3. d
4. b

Short Answer

1. The major is either the whorl tracings or ridge count code in the thumbs.

2.

Finger 1 Right thumb 16 points	Finger 2 Right index 16 points	Finger 3 Right middle 8 points	Finger 4 Right ring 8 points	Finger 5 Right pinky 4 points
Finger 6 Left thumb 4 points	Finger 7 Left index 2 points	Finger 8 Left middle 2 points	Finger 9 Left ring 1 point	Finger 10 Left pinky 1 point

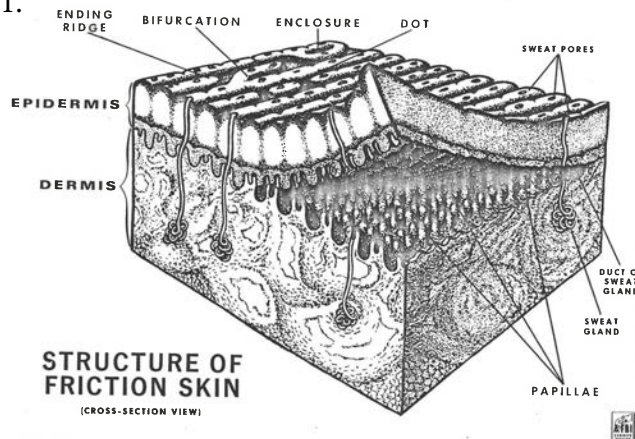
3.

Code	Index	Middle	Ring
I	9 or less ridges	10 or less ridges	13 or less ridges
O	10 or more ridges	11 or more ridges	14 or more ridges

4. Trace from the center of the left delta of a whorl to the center of the right delta. Assign a value of I (inner) for a tracing that flows inside the right delta, M (meet) for a tracing that aligns with the core of the right delta, or an O (outer) for a tracing that flows outside the right delta.

Lesson 16, Application

1.



2.



Lesson 16, Lab

Results will vary.

Lesson 17, Exercise 1

Multiple Choice

1. e
2. a, c, and d
3. c and d

Fill-in-the-Blank

1. perceived, excuse
2. palmar

Short Answer

1. Human fingerprint patterns are a viable form of identification for three distinct reasons: they provide unique identity, they are distinguished by minutiae characteristics, and they do not change during a person's lifetime.
2. Answers will vary, but students should understand that God placed design, beauty, complexity, pattern, and organized information all throughout living things. His fingerprint is His handiwork that we see all around us in creation.
3. The sections of the palm in both humans and primates are the interdigital, hypothenar, and thenar areas.

Lesson 17, Exercise 2

Multiple Choice

1. c
2. b

- Notes at the scene of an arson will document victim(s), witness(es), vehicles, flame, smoke, surroundings, and alarms and sprinklers.
- ACDs (Accelerant Detection Canines) are trained canines that are often used to search for the point of origin.

c. radiation

Matching

- e
- c
- b
- a
- f
- d

Lesson 24, Exercise 3

Multiple Choice

- b
- d
- a, d, and e

Fill-in-the-Blank

- propellant
- amateurs
- nitroglycerin

Short Answer

- The primary difference between arson and explosions is the rapid rate of reaction observable in explosive materials.
- The five categories of explosives outlined in the lesson are low explosives, high explosives, homemade explosives, liquid explosives, and military-grade explosives.
- The goal of explosive evidence examination is to determine the type of explosion, the explosive materials used, and the origin of the materials constructing the device.
- Ninety percent of arsonists go unpunished due to insufficient evidence. Many of these are committed by juveniles experimenting with fire.

Lesson 24, Application

- Fuel:** a solid, liquid, or gas combustible material

Heat: energy required to increase the temperature of the fuel to the flash point

Oxygen: minimum 16%

- a. convection
b. conduction

Lesson 24, Lab

Results of alcohol burn: The alcohol vapors will catch fire quickly and heat up the gases inside the bottle. You will hear a sound from the rapidly expanding gases in addition to the flame. This is a fairly safe lab, as the flame is contained inside the bottle and isopropyl alcohol has a low flashpoint of 55° in a closed container. There should be no residue other than a bit of water or water vapor. (This is called a clean burn and is a result of the high ratio of oxygen to fuel.) The byproducts are water vapor and carbon dioxide.

Results of wood burn: The match should be completely extinguished. The wood chars and forms charcoal and ash residue, as well as smoke. It may continue to glow after the flame has gone out. The flame grows larger as it hits each match head.

Results of petroleum/vegetable oil burn: Vegetable oil burns produce smoke. A black resin will be present in the glass dish. The cotton fibers are also a hydrocarbon, so they will burn if the oil is all consumed.

Lesson 25, Exercise 1

Multiple Choice

- b
- a and c

Fill-in-the-Blank

- blood
- liter, minute
- consistent



Short Answer

1. Blood spatter analysis is the field of forensic examination that deals with the physical properties of blood and the shapes, locations, and distribution patterns of bloodstains.
 2. The goal of blood spatter analysis is to provide a knowledgeable, expert interpretation of the physical events that produced the blood evidence.
 3. When a living person is struck with an object, the initial injury does not cause the blood spatter. There must be an open, bleeding wound that is then struck a second, third, or more times to leave a blood spatter pattern.
 4. The surface tension and viscous nature of blood contribute to the unique shape of the patterns left behind.
3. a. Impact spatter is when a blood source is impacted by a blow that causes a random dispersion of smaller drops of blood.
 - b. Gunshot spatter is the forward blood spatter emitted from the exit wound and back spatter from the entrance wound.
 - c. Cast-off spatter is caused by the blood released from a bloody projectile.
 - d. Arterial spray spatter occurs when a main artery or the heart is ruptured.
 - e. Expired blood patterns are caused by a bleeding mouth or nose from an internal injury.

Lesson 25, Exercise 2

Multiple Choice

1. c
2. d

Matching

1. Back spatter
2. Transfer
3. Passive
4. Swipe or smear
5. Contact bleeding
6. Projected
7. Wipe or smudge

Short Answer

1. The parent drop is the drop of blood from which the satellite spatter originates. The spines are pointed edges on the parent drop that radiate out like a sun. Spines help pinpoint direction. The satellites are small drops of blood that broke free from the parent drop when the blood hit the surface.
2. The elongated shape of blood droplets can be measured to determine the following characteristics: the direction from which the blood originated, angle from which the blood originated, the time of the attack, location and

position of the victim, number of blows to the victim, the type of injuries, and the location of the attacker.

3. a. Impact spatter is when a blood source is impacted by a blow that causes a random dispersion of smaller drops of blood.
- b. Gunshot spatter is the forward blood spatter emitted from the exit wound and back spatter from the entrance wound.
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Lesson 25, Exercise 3

Multiple Choice

1. c
2. a
3. e

Fill-in-the-Blank

1. originated
2. victim, suspect

Short Answer

1. a. Void patterns are a space where there is no visible blood spatter.
- b. Flow patterns are the result of the flow of blood downward due to the force of gravity.
- c. Pool patterns are the collection of blood in a pool on an undisturbed, nonporous surface.
- d. Splash patterns are visible when a pool of blood splashes outward and resemble the shape of an exclamation point.
- e. Skeletonization of blood patterns occur when the edges of a bloodstain begin to dry.
- f. Trail patterns are caused by a series of drops that form by the dripping of blood from an object, weapon, or injury.

2. Analyzing blood spatter requires measurements, accuracy, and calculations.
3. $\sin A = \frac{\text{width of bloodstain}}{\text{length of bloodstain}}$

Lesson 25, Application

1.
 - a. satellite spatters
 - b. parent drop
 - c. spines
 - d. tail or spine
 - e. parent drop
 - f. “fitting” of an ellipse in blood drop
 - g. width
 - h. length
 - i. direction of travel
2.
 - a. Z axis
 - b. Y axis
 - c. area of convergence
 - d. X axis
 - e. blood spatter

Word Bank

- a. cast-off spatter
- b. gunshot spatter
- c. void pattern
- d. arterial spray spatter
- e. expired spatter
- f. pool pattern
- g. trail pattern
- h. skeletonization of blood

Lesson 25, Lab

Part 1

Blood Stain	Width (mm)	Length (mm)	Estimated Impact Angle
1	4	25	9
2	14	16	62

3	15.5	26	37
4	10	22	27
5	16	16	90
6	7	13	33

Part 2

Answers will vary based on the variety of blood spatter evidence generated in the activity.

Lesson 26, Exercise 1

Multiple Choice

1. a and d
2. b
3. a

Fill-in-the-Blank

1. research
2. compound light

Short Answer

1. It is important to recognize that many of the pioneer scientists in history believed in the biblical God, and their scientific study was for the sole purpose of understanding the mysteries in creation.
2. For all practical purposes, a light microscope cannot magnify an object more than about 1,000 times its original size (and in typical use no more than 500 times).
3. The two main limitations to the compound microscope are the object of study must be small enough or thin enough to allow light to be transmitted through it, and it provides only a two-dimensional image.

Lesson 26, Exercise 2

Multiple Choice

1. b
2. b
3. d



Unit 1 Test

Multiple Choice

1. f
2. d
3. c

Fill-in-the-Blank

1. knowledge
2. Operational (or observational)
3. Historical (or origins)

Short Answer

1. Science means knowledge, and God is knowledge. The God of knowledge is also the Creator and Designer of all creation. Therefore, a scientist in any discipline (geology, astronomy, botany, biology, etc.) is capable of studying science through the lens of God's Word, delighting in that study, and giving the honor and glory of their discoveries to the Lord.
2. 1828 – Science: “knowledge; the comprehension or understanding of truth or facts by the mind. The science of God must be perfect.”³²
1913 – Science: “knowledge as it relates to the physical world, the nature, constitution, and forces of matter, called also natural science.”³³
2020 – Science: “knowledge or system of knowledge covering general truths, or the operation of general laws obtained and tested through the scientific method.”³⁴
3. When two items come into contact with one another, there is an exchange of material between them. This principle is the basis of forensic science because it is impossible for two things (whether two non-living objects, a living being + living being, or a living being + non-living object) to come into contact without transferring information. This can be in the form of fibers, hairs, animal fur, paint, bodily fluids, fingerprints, etc.
4. 1) The past is not observable: it “cannot be seen, smelled, heard, tasted, or sensed in any way.” 2) The past is not predictable and is therefore retrodiction (or stating inferences about the past). 3) It is impossible to recreate the past in the present: “one cannot design

an experiment that will replicate the complex variety of conditions that existed in the past—conditions that are often not known in full detail.” 4) Forensic science incorporates the use of existing theories but does not form new theories.³⁵

5. Answers will vary but could include some of the following: The role of a forensic scientist operating through a biblical lens should reflect certain traits and a work ethic that distinguish them from other investigators, including honesty, integrity, servanthood, following policies and procedures, maintaining high levels of excellence, and providing a model of godly leadership. Ultimately, the work of a forensic scientist should glorify the God they serve in every decision, action, and reaction that occurs in the field of investigation.

Unit 2 Test

Multiple Choice

1. b and d
2. d
3. a

Word Bank

1. Parallel
2. Grid, Parallel
3. Spiral inward, Spiral outward, Zone
4. Zone

Short Answer

1. When you hear the words “crime scene,” you might imagine a mysterious, glamorous world where forensic scientists save the day with their brilliant investigative work in just 45 minutes. The reality of crime scene investigation is that it requires the art of observation, along with preservation, methodical procedures, and thorough documentation.
2. A rough sketch should include the following information: directional orientation (compass); case information; location of evidence; location of windows, doorways, and furniture; and triangulation of key evidence.