This course supports the assessments for Middle School Science: Content Knowledge. Students should take the Middle School Praxis (5440) when possible, but can take the General Science Praxis (5435) if necessary. This course prepares students for both exams. The course covers 2 competencies and represents 1 competency unit. This course may take up to 4 weeks to complete.

Introduction

Overview
This course covers the following topics:

- Scientific methodology, techniques, and history
- Basic principles
- Physical sciences
- Life science
- Earth/space sciences
- Science, technology, and society

Watch the following video for an introduction to this course:

Note: To download this video, right-click the following link and choose "Save as...": download video.

Competencies
This course provides guidance to help you demonstrate the following 2 competencies:

- **Competency 2033.1.1: Synthesis of Middle School Science Concepts and Processes**
  The graduate synthesizes concepts and processes from across middle school science to generate a comprehensive understanding of the subject.

- **Competency 2033.1.2: Verification of Middle School Science Content Knowledge and Skills**
  The graduate verifies that they possess the requisite middle school science knowledge and skills by passing the middle school science content knowledge test required to become a beginning teacher of middle school science.

Teaching Dispositions Statement
Please review the Statement of Teaching Dispositions.

Preparing for Success

The information in this section is provided to detail the resources available for you to use as you complete this course.

Learning Resources
The learning resources listed in this section are required to complete the activities in this course. For many resources, WGU has provided automatic access through the course. However, you may need to manually enroll in or independently acquire other resources. Read the full instructions provided to ensure that you have access to all of your resources in a timely manner.

The course assessment is the Middle School Science (5440) Praxis Subject Assessment or the General Science (5435) Praxis Subject Assessment. These are third-party exams offered by Educational Testing Services (ETS). You will need to identify a testing center and schedule a date to take this exam. Please discuss the information found at the following web page with your program mentor to ensure that you have plenty of time to review all relevant content before taking the exam.

- **Exam Registration**

**Important! Preparing for the Online Exam**

Download the following free study companions from the [ETS website](#):

- Study Companion General Science: Content Knowledge
- Study Companion Middle School Science: Content Knowledge

Within these resources are practice questions for each Praxis Subject Assessment. After working through this course, you will use these practice questions as the pre-assessment for the actual exam.

Register for your preferred Praxis Subject Assessment dates at least 4 weeks in advance of the test on the [Test Centers and Dates](#) web page.

This online exam must be taken at an approved testing center, not from home. It is acceptable to take the Praxis Subject Assessment in a neighboring state. Use the [Test Center Locator](#) to identify the nearest testing center.

For disability accommodations, please see [Accommodations for Test Takers with Disabilities or Health-Related Needs](#). Note that requests for accommodation, as well as registration, must be made in writing through U.S. mail (not online). It may take 6 to 12 weeks for accommodations to be made and your range of available testing dates may be restricted.

If you need additional time because English is not your native language, please see [Test Takers Needing PLNE Accommodations](#).

**Start planning now!**

**Enroll in Learning Resources**

Take a moment to enroll in the learning resources listed in this section. To enroll, navigate to the Learning Resources tab, click the Sections button, and then click the Enroll Now button for each resource. Once your instructor approves your enrollment in the resource, you will receive an email with further access instructions. Contact your instructor if you have questions.
C616 - Middle School Science: Content Knowledge

Course of Study

Chemistry—Section 1 of OWL
This web-based resource provides access to Thinkwell videos, mastery questions, end of chapter (EOC) questions, and the following e-text:


Please follow these registration steps carefully in order to access your resource.

- Go to http://login.cengagebrain.com/course/E-24YE3Q87N3UZ8.
- Under New Students enter your WGU email address using the @my.wgu.edu extension and click Create a New Account.
- Enter the required information to create an account: First Name, Last Name, Password, Security Question and Answer, and check the box to agree to the terms of the site.
- You will be logged in under your new account. Click the Open button next to your Chemistry resource listing.
- Please make note of the log in credentials you created for this site.
- We recommend adding https://login.cengagebrain.com/cb/login.htm to your browser Favorites so you can easily log in to the resource in the future.

After logging in, choose "Assignment List" from the left-hand column. Complete the activities in the "Introduction to OWL" folder to be sure your computer is compatible with this resource. The following 4 and a half minute recording will help you navigate OWL:

- OWL Introduction

For technical support with this resource, you can contact Cengage. For content and resource navigation questions, please contact your course instructor.

Automatically Enrolled Learning Resources

You can access the learning resources listed in this section by clicking on the links provided throughout the course. You may be prompted to log in to the WGU student portal to access the resources.

VitalSource E-Texts
The following textbooks are available to you as an e-text within this course. You will be directly linked to the specific readings required within the activities that follow.


Note: These e-texts are available to you as part of your program tuition and fees, but you may
purchase a hard copy at your own expense through VitalSource or a retailer of your choice. If you choose to do so, please use the ISBN listed to ensure that you receive the correct edition.

The following sites provide instruction on how to create a VitalSource account, use features such as downloading your e-texts for offline use, and to purchase a print-on-demand option, if available.

- VitalSource navigational video
- Print-On-Demand Option

The ETS Practice Exam is a full-length practice test that allows you to work through a set of test questions to simulate what you will experience on the actual day of the PRAXIS exam. After a completed attempt, you can view your score and review explanations for the correct answers. You will have unlimited attempts regardless of any notice to the contrary on the ETS website. This practice test includes one set of test questions. Retaking it will not provide different sets of questions or change the order in which they are delivered. If you have any questions, please contact your course instructor.

**Topics and Pacing**

The pacing guide suggests a weekly structure to pace your completion of learning activities. It is provided as a suggestion and does not represent a mandatory schedule. Follow the pacing guide carefully to complete the course in the suggested time frame.

**Week 1:**

- Preparing for Success

**Basic Principles of Science**

- Methodology and Philosophy
- Scientific Tools
- Safety
- Scientific Ideas Changing Over Time

**Chemistry**

- Atomic Models
- Stoichiometry
- Energy
- The Structure of Atoms
- Bonding of Atoms
- Intermolecular Interactions
- Solutions and Solubility
- Acid-Base Chemistry and Equilibrium

**Week 2:**

**Physics**

- Mechanics
- Properties of Matter
- Electromagnetism
- Applications of Light

**Life Sciences**

- Life Sciences

**Earth and Space Science**

- Minerals, Rocks, and Rock Cycle
- Water, Ice, and Wind
- Plate Tectonics
- Earthquakes and Interior Structure
- Volcanoes, Mountains, Folds, Faults, and Maps
- Topographic and Geologic Maps
- History of Life on Earth

**Week 3: Oceans and Atmospheres**

- Ocean Features
- Surface Currents and Thermohaline Circulation
- Atmosphere Composition and Structure
- Clouds, Air Pressure, and Weather
- Weather and Climate

**Week 4: Space Sciences**

- Traditional Astronomy
- Beyond Our Solar System
- Galaxies and the Universe

**Final Steps:**
Exam Requirements

*Note: This pacing guide does not replace the course. Please continue to refer to the course for a comprehensive list of the resources and activities.*

Understanding the Assessment

Understandably, most people are nervous on exam day. To help reduce any anxiety, you should learn more about the exam experience and how to best prepare.

**ETS Middle School Science Praxis Subject Assessment and General Science Praxis Subject Assessment**

Watch the following videos to better understand the assessment. The first is an interactive demonstration of how the exam is administered, the tools available during the exam, and the general format of questions.

- [Computer-Delivered Testing Demonstration (Flash)](#) | [View Transcript](#) (1:31)
- [What to Expect on the Day of Your Computer-Delivered Test (Flash)](#) (7:00)

Watching these videos will help you be prepared for the exam experience, allowing you to demonstrate your Middle School Science or General Science content competency.

**Study Companion**

ETS created a [Middle School Science Study Companion](#) and [General Science Study Companion](#) to help you prepare for this challenging exam.

**Study Plan**

Recommended Activities

Follow the guidance in sections 1 ("Learn About Your Test"), 4 ("Determine Your Strategy for Success"), and 5 ("Develop Your Study Plan") in the [Middle School Science Study Companion](#) or [General Science Study Companion](#). Be *honest* with yourself—identify areas in which you are comfortable (and continue to check your competence in these areas), areas that you understand but need more practice, and areas in which you still need to learn the content. Set aside the time that you need to ensure success on this exam.

Read the following sections of the study companion:
1. Learn About Your Test
2. Familiarize Yourself with Test Questions
3. Practice with Sample Test Questions
4. Determine Your Strategy for Success
5. Develop Your Study Plan
6. Review Smart Tips for Success
7. Understand Your Scores

The ETS Practice Exam is a full-length practice test that allows you to work through a set of test questions to simulate what you will experience on the actual day of the Praxis exam. After a completed attempt, you can view your score and review explanations for the correct answers. You will have unlimited attempts regardless of any notice to the contrary on the ETS website. This practice test includes one set of test questions. Retaking it will not provide different sets of questions or change the order in which they are delivered. If you have any questions, please contact your course instructor.

Outside Vendor Assessment

Complete the General Science: Content Knowledge (5435) Praxis Subject Assessment or the Middle School Science (5440) Praxis Subject Assessment. This is a third-party exam offered through ETS. Many states require individuals to pass this exam as part of the teacher certification process. WGU requires you to pass this exam as a program requirement, regardless of the state in which you hold or are seeking certification.

- WGU will pay for your first two attempts of the Praxis exam. You will be responsible for paying for the third and subsequent attempts, if necessary.
- This exam is computer-delivered. WGU will not pay for extended or emergency registration, so be sure to plan ahead when scheduling the exam.
- Visit Test Centers and Dates to see where and when tests are available in your area.
- You are not allowed a calculator for this exam. You will have access to a periodic table of elements during the exam and you are strongly encouraged to use it.
- In order to receive a pass on your Degree Plan, you must pass the exam based upon the WGU cut score (generally 150 or higher; check with your course instructor). Additionally, if the state in which you seek licensure also requires the Praxis exam, you must pass the exam based on that state's cut score before you will be admitted into demonstration teaching or allowed to graduate. Please note that it is possible to pass the exam based on either the WGU cut score or your state's cut score, and still need to take it again in order to satisfy the other cut score.
- If your state requires you to take a state exam for teacher licensure, you are still required to take the Praxis as a WGU graduation requirement in addition to the state exam you must take for licensure.
- For directions on how to receive access to outside vendor assessments, see "How to Schedule a Praxis Exam."
Basic Principles of Science

This section covers life, earth, and physical sciences.

Methodology and Philosophy
You will explore the processes involved in scientific inquiry, the disciplines within science, and scientific terms.

Problem Solving

To review methods of scientific inquiry and how they are used in basic problem-solving, read through the following flowchart representing the process of scientific inquiry.

- "How Science Works: The Flowchart"

Scientific Tools
In science, data is usually only as good as its measurement tools.

Measurement, Data, and Models

Use the following online library to review processes involved in scientific data collection and manipulation, and how to interpret and draw conclusions from data presented in tables, graphs, and charts:

- Visionlearning Library

Safety
Providing a safe learning environment is essential in the classroom.

Creating a Safe Environment

Use the following web page to review safety in the classroom.

- Laboratory Safety

Scientific Ideas Changing Over Time
This section covers some of the scientific contributions made by major historical figures.

Keeping Track of the Major Players

As you work through this course, make note of the major historical figures who have contributed to science.

Use the following web pages to become familiar with historical developments of science and the contributions of major historical figures.

- Famous Astronomers
- Famous Biologists
- Famous Chemists
- Famous Physicists
Chemistry

It is essential to have a solid understanding of atomic structure to understand the more complicated content within chemistry. The properties of an atom determine how it reacts with other atoms.

This section reviews basic chemistry concepts.

Please note that for this “Chemistry” section you will need to access eight different chapters from the *Chemistry: Content Knowledge* e-textbook. To access this e-textbook you will need to go to Preparing for Success then Learning Resources and follow the instructions.

**Atomic Models**

You will review the connection between atoms and molecules. Once different atoms bond to form compounds, universal names are used for convenience of communication. You need to become familiar with all of the common nomenclature in order to progress in chemistry. This is similar to memorizing the alphabet before you try to read.

**Atoms, Molecules, and Ions**

Take the Chapter 2 end of chapter (EOC) exam in the *Chemistry* text within the OWL resource to check your understanding of the following concepts:

- Basic atom structure
- Elements, atoms, compounds, molecules, and mixtures
- Occurrence and abundance of the elements and their isotopes

If your score is less than 75%, review the following chapter:

- Chapter 2: "Atoms, Molecules, and Ions"

**Stoichiometry**

You will review the mole concept, as well as how it applies to chemical composition. You will review how to convert between moles, molecules, grams, and elements.

**Chemical Equations**

Take the Chapter 3 end of chapter (EOC) exam in the *Chemistry* text within the OWL resource to check your understanding of the following concept:

- How to balance and use simple chemical equations

If your score is less than 75%, review the following chapter:

- Chapter 3: "Stoichiometry"

**Energy**

The food people eat provides them with energy. The fuel in a car provides the energy for it to
move. The sun provides energy for a plant during photosynthesis. Chemical reactions must account for the energy within the reaction.

You will review various forms of energy in this section.

**Forms of Energy**

Take the Chapter 6 end of chapter (EOC) exam in the *Chemistry* text within the OWL resource to check your understanding of the following concepts:

- Basic relationships between energy and matter
- Pros and cons of power generation based on various sources

If your score is less than 75%, review the following chapter:

- Chapter 6 "Thermochemistry"

**The Structure of Atoms**

The periodic table may be the greatest tool ever used by chemists. It was originally used to describe patterns observed in properties of elements before it eventually became apparent that it could also be used to predict patterns in elements.

This section covers atomic structure and periodic trends.

**Periodic Trends**

Take the Chapter 7 end of chapter (EOC) exam in the *Chemistry* text within the OWL resource to check your understanding of the following concept:

- How to use the periodic table to predict the physical and chemical properties of elements

If your score is less than 75%, review the following chapter:

- Chapter 7: "Atomic Structure and Periodicity"

**Bonding of Atoms**

You will review general bonding concepts. A chemical bond is the energy that holds atoms together. The three types of bonding are ionic bonding, covalent bonding, and polar covalent bonding.

**Bonding and Structure**

Take the chapter 8 end of Chapter (EOC) exam in the *Chemistry* text within the OWL resource to check your understanding of the following concept:

- Types of chemical bonding and the composition of simple chemical compounds

If your score is less than 75%, review the following chapter:
- Chapter 8: "Bonding: General Concepts"

**Intermolecular Interactions**

You will study both intramolecular bonding and intermolecular forces. As the names imply, intramolecular bonding is the chemical bonding that takes place within a molecule to hold the atoms together, and intermolecular bonding takes place between molecules to hold them together into liquids and solids.

**Liquids and Solids**

Take the Chapter 10 end of chapter (EOC) exam in the Chemistry text within the OWL resource to check your understanding of the following concepts:

- States of matter and phase changes between them
- Solids, liquids, gases, and plasmas

If your score is less than 75%, review the following chapter:

- Chapter 10: "Liquids and Solids"

**Solutions and Solubility**

You will review the properties of solutions. To give the proper definition of a solution, a number of other terms need to be defined first. It is easiest to start at the beginning. An element is a substance that contains only one type of atom, such as hydrogen (H). A compound is a substance that contains more than one type of element, such as water (H2O). A mixture is a substance that contains two or more substances, such as sugar dissolved in water, which contains both water molecules and sucrose.

**Properties of Solutions**

Take the Chapter 11 end of chapter (EOC) exam in the Chemistry text within the OWL resource to check your understanding of the following concept:

- Solutions and solubility

If your score is less than 75%, review the following chapter:

- Chapter 11: "Properties of Solutions"

**Acid-Base Chemistry and Equilibrium**

You will review the properties of acids and bases. Acid-base reactions are important in organic chemistry. Many of the reactions that take place in organisms involve acid-base reactions. The rate at which you breathe is influenced by the acidity of your blood. Carbonic anhydrase, an organic enzyme, regulates the acidity of your blood. Acid-base reactions also allow you to discuss the importance of solutions and molecular structure in chemical reactions.

**Acids and Bases**

Take the Chapter 14 end of chapter (EOC) exam in the Chemistry text within the OWL resource to check your understanding of the following concept:
Basic concepts in acid-base chemistry

If your score is less than 75%, review the following chapter:

- Chapter 14: "Acids and Bases"

**Physics**

You will learn about the laws that govern linear and rotational motion, forces, momentum, energy, and gravity.

**Mechanics**

You will study the meaning of force, different ways to categorize force, and Newton's laws of motion. You will learn to conceptualize how each law defines motion.

**Newton's First Law of Motion**

Take the [Chapter 2 quiz](#) within the Conceptual Physics resource to check your understanding of the following concept:

- Newton's first law: inertia

If your score is less than 75%, review the following chapter:

- [Chapter 2: "Newton's First Law of Motion: Inertia"](#)

**Linear Motion**

Take the [Chapter 3 quiz](#) within the Conceptual Physics resource to check your understanding of the following concept:

- Describing linear motion in one and two dimensions

If your score is less than 75%, review the following chapter:

- [Chapter 3: "Linear Motion"](#)

**Newton's Second Law of Motion**

Take the [Chapter 4 quiz](#) within the Conceptual Physics resource to check your understanding of the following concepts:

- Newton's second law: $f = ma$
- Friction

If your score is less than 75%, review the following chapter:

- [Chapter 4: "Newton's Second Law of Motion"](#)
Take the **Chapter 5 quiz** within the Conceptual Physics resource to check your understanding of the following concept:

- Newton's third law: action-reaction forces

If your score is less than 75%, review the following chapter:

- **Chapter 5: "Newton's Third Law of Motion"**

**Momentum**

Take the **Chapter 6 quiz** within the Conceptual Physics resource to check your understanding of the following concepts:

- Conservation of energy and conservation of momentum
- Collisions

If your score is less than 75%, review the following chapter:

- **Chapter 6: "Momentum"**

**Energy**

Take the **Chapter 7 quiz** within the Conceptual Physics resource to check your understanding of the following concepts:

- Work, energy, and power
- Simple machines and mechanical advantage

If your score is less than 75%, review the following chapter:

- **Chapter 7: "Energy"**

**Rotational Motion**

Take the **Chapter 8 quiz** within the Conceptual Physics resource to check your understanding of the following concept:

- Circular motion in one and two dimensions

If your score is less than 75%, review the following chapter:

- **Chapter 8: "Rotational Motion"**

**Gravity**

Take the **Chapter 9 exam** within the Conceptual Physics resource to check your understanding of the following concept:

- Mass, weight, and gravity
If your score is less than 75%, review the following chapter:

- **Chapter 9: "Gravity"

**Projectiles**

Take the **Chapter 10 quiz** within the Conceptual Physics resource to check your understanding of the following concepts:

- Projectile motion
- Planetary orbits

If your score is less than 75%, review the following chapter:

- **Chapter 10: "Projectile and Satellite Motion"

**Properties of Matter**

This section covers the properties of fluids.

**Fluids**

Take the **Chapter 13 quiz** within the Conceptual Physics resource to check your understanding of the following concept:

- Physical properties of fluids

If your score is less than 75%, review the following chapter:

- **Chapter 13: "Liquids"

**Waves**

You will learn about the basic properties of waves and how they apply to sound and the Doppler effect.

**Vibrations and Waves**

Take the **Chapter 19 quiz** within the Conceptual Physics resource to check your understanding of the following concepts:

- Basic characteristics of waves
- Doppler effect

If your score is less than 75%, review the following chapter:

- **Chapter 19: "Vibrations and Waves"

**Sound**

Take the **Chapter 20 quiz** within the Conceptual Physics resource to check your understanding of the following concept:
Basic characteristics and phenomena of sound

If your score is less than 75%, review the following chapter:

- Chapter 20: "Sound"

**Electromagnetism**

You will learn about the laws, principles, and concepts that describe electrostatics, electric current, and magnetism. You will learn how these concepts are similar and related.

**Electricity and Magnetism**

Take the Chapter 22 quiz within the Conceptual Physics resource to check your understanding of the following concept:

- Electrical nature of materials

If your score is less than 75%, review the following chapter:

- Chapter 22: "Electrostatic"

**Electric Current**

Take the Chapter 23 quiz within the Conceptual Physics resource to check your understanding of the following concept:

- Analyzing basic series and parallel electrical circuits

If your score is less than 75%, review the following chapter:

- Chapter 23: "Electric Current"

**Magnetism**

Take the Chapter 24 quiz within the Conceptual Physics resource to check your understanding of the following concept:

- Magnetic fields and forces

If your score is less than 75%, review the following chapter:

- Chapter 24: "Magnetism"

**Applications of Light**

This section covers the application of light. You will learn how to analyze situations that include the reflection, refraction, diffraction, and/or scattering of light.

**Light**

Take the Chapters 25 and Chapter 26 quizzes within the Conceptual Physics resource to check your understanding of the following concepts:
- Characteristics of light and the electromagnetic spectrum
- Absorption and transmission

If your score is less than 75%, review the following chapters:

- Chapter 25: "Electromagnetic Induction"
- Chapter 26: "Properties of Light"

**Basic Optics**

Take the Chapter 28 quiz within the Conceptual Physics resource to check your understanding of the following concepts:

- Basic optics
- Reflection, refraction, dispersion

If your score is less than 75%, review the following chapters:

- Chapter 28: "Reflection and Refraction"

**Light Waves**

Take the Chapter 29 quiz within the Conceptual Physics resource to check your understanding of the following concepts:

- Interference, scattering, and polarization
- Diffraction

If your score is less than 75%, review the following chapters:

- Chapter 29: "Light Waves"

**Life Sciences**

This section covers the life science content using the MindTap Cengage learning resource.

**Life Sciences**

You will use the MindTap Cengage learning resource to review the life science content. This same resource is referenced within the Principles of Biology course in your program.

**Life Sciences**

Read the following chapters from the Biology e-book within the MindTap Cengage learning resource. Access the e-book using the blue book icon on the right-hand side. After reading a chapter, complete the Self Quiz at the end of the chapter. If you want to discuss any content, contact the Biology course instructors at this address: biology@wgu.edu.

- Chapter 1: "Invitation to Biology"
- Chapter 3: "Molecules of Life"
- Chapter 4: "Cell Structure"
Earth and Space Sciences

Earth and space sciences involve the study of geology, oceanography, meteorology, and astronomy.

Minerals, Rocks, and Rock Cycle
You will review how to identify and classify minerals. You will also review various types of rocks and the rock cycle, as well as the environmental impact of resource extraction and weather, soil, and mass wasting.

Minerals

Read the following in Earth Science:

- p. 33-42 in Chapter 2: "Matter and Minerals"

Complete the following interactive tutorial:

- Minerals

Definition of a Mineral

Complete the following interactive tutorial:

- Most Rocks Are Aggregates of Minerals

Properties of Minerals

Review the following section in Earth Science:


Review the following presentation:
• **Hardness Scales**
  - Figure 2.24 "Common Silicate Minerals"
  - Table 2.1 "Non-Silicate Minerals Groups"

View the following videos:

• **Atoms Make Minerals (18:29)**
• **Mineral Groups (7:08)**

Read the following web page:

• **Using Characteristics of Minerals to Identify Them**

**Minerals Quiz**

Complete the following quiz:

• **Geology Matter and Minerals Quiz**

**Igneous Rocks**

Read the following section in Earth Science:

• pp. 62-71 ("Igneous Rocks: 'Formed by Fire'") in *Chapter 3: "Rocks: Materials of the Solid Earth"*

Complete the following interactive tutorials:

• **Igneous Rocks**
• **Classification of Igneous Rocks, Based on Their Mineral Composition and Texture**
• Identify at least six common igneous rocks as found in Figure 3.7 "Classification of Igneous Rocks, Based on their Mineral Composition and Texture"

View the following videos:

• **Igneous Rock Textures (6:05)**
• **Bowen's Reaction Series (14:08)**

**Sedimentary Rocks**

Read the following section in Earth Science:

• pp. 71-77 ("Sedimentary Rocks: Compacted and Cemented") in *Chapter 3: "Rocks: Materials of the Solid Earth"*

Complete the following interactive tutorial:

• **Sedimentary Rocks**
View the following video:

- **Sedimentary Environments (8:37)**

**Metamorphic Rocks**

Read the following section in Earth Science:

- pp. 78-82 ("Metamorphic Rocks: New Rock from Old") in Chapter 3: "Rocks: Materials of the Solid Earth"

Complete the following interactive tutorial:

- "Metamorphic Rocks"

You should be able to identify five common metamorphic rocks as shown in the following figure of Earth Science:

- Figure 3.29 Classification of Common Metamorphic Rock

Review the following interactive tutorial to familiarize yourself with the sequence of foliation for metamorphic rocks:

- **Foliation Processes**

View the following video:

- **Metamorphic Rocks (25:25)**

**Rock Cycle**

Read the following in Earth Science:

- Chapter 3: "Rocks: Materials of the Solid Earth"

Complete the following interactive tutorial:

- **Rock Cycle**

View the following video:

- **Rock Cycle (5:44)**

**Environmental Impact of Resource Extraction**

Read the following section in Earth Science:

- pp. 87-89 ("Energy Resources: Fossil Fuels") in Chapter 3: "Rocks: Materials of the Solid Earth"
View the following video:

- **Fossil Fuels (10:12)**

Read the following article:

- **Overview of Mining and its Impacts**

**Rock Cycle and Rocks Quiz**

Complete the following quiz:

- **Geology Rocks Materials of the Solid Earth Quiz**

**Weathering, Soil, and Mass Wasting**

Complete the following interactive tutorials:

- **Weathering Rates**
- **Weather and Soil**

Review the following video:

- **Weathering (10:35)**

Read the following in Earth Science and explain what happens with acid precipitation.

- Figure 4.0 "Acid Rain Accelerate the Chemical Weathering of Stone Monuments and Structures" in Chapter 4: "Weathering, Soil, and Mass Wasting"

**Weathering, Soil, and Mass Wasting Quiz**

Complete the following quiz:

- **Geology Weathering Soil and Mass Wasting Quiz**

**Water, Ice, and Wind**

You will review the water cycle, surface water and groundwater, ice and glaciers, and wind and deserts.

**The Water Cycle**

Read the following chapter in *Earth Science*:

- Chapter 5: "Running Water and Groundwater"

Complete the following interactive tutorial:

- "The Hydrologic Cycle"

**Surface Water: Meandering and Braided Streams**
Read the following in *Earth Science*:

- pp. 141-143 ("5.5: Stream Channels") in *Chapter 5: "Running Water and Groundwater"

Complete the following interactive tutorials:

- [Running Water](#)
- [Sediment Transport by Streams](#)
- [Meandering](#)

**Groundwater: Aquifers and Artesian Wells**

Complete the following interactive tutorials:

- [Groundwater](#)
- [Water Table Formation](#)
- [Artesian Systems](#)

**Geology Running Water and Ground Water Quiz**

Complete the following quiz:

- [Geology Running Water and Ground Water Quiz](#)

**Ice and Glaciers**

Read the following section in *Earth Science*:

- pp. 171-192 in *Chapter 6: "Glaciers, Deserts, and Wind"

Complete the following interactive tutorials:

- [Glaciers and Glaciation](#)
- [Glacial Processes](#)

**Wind and Deserts**

Read the following in *chapter 6 ("Glaciers, Deserts, and Wind") of Earth Science*:

Complete the following interactive tutorials:

- [Deserts and Wind](#)
- [Sediment Transport by Wind](#)
- [Cross-Bedding](#)

View the following video:

- [Cross-bedding](#)

**Glaciers, Deserts, and Wind Quiz**
Complete the following quiz:

- *Geology Glaciers Deserts and Wind Quiz*

**Plate Tectonics**
You will review plate tectonics, plate boundaries, geologic hot spots, and paleomagnetics.

**Plate Tectonics**

Read the following chapter in *Earth Science*:

- *Chapter 7 “Plate Tectonics: A Scientific Revolution Unfolds”*

Complete the following interactive tutorials:

- *Plate Tectonics*
- *Crust vs. Lithosphere*
- *Divergent Boundaries*

**Plate Boundaries**

Read about the types of plate boundaries (i.e., divergent, convergent, and transform) in the following chapter of *Earth Science*:

- *Chapter 7 “Plate Tectonics: A Scientific Revolution Unfolds”*

Complete the following interactive tutorials:

- *Divergent Boundary Formation*
- *Sea Floor Spreading and Plate Boundaries*
- *Three Types of Convergent Boundaries*
- *Transform Plate Boundaries*
- *Plate Boundary Features*
- *Motion at Plate Boundaries*

**Geologic Hot Spots**

Read about geologic hot spots (sometimes called mantle plumes or intraplate volcanism) in the following chapter of *Earth Science*:

- *Chapter 7 “Plate Tectonics: A Scientific Revolution Unfolds”*

Complete the following interactive tutorials:

- *Convection and Tectonics*
- *Hot spot Volcano Tracks*

**Magnetic Stripes on the Ocean Floor**

Read the following in *Earth Science*
Complete the following interactive tutorials:

- Paleomagnetics – Magnetic Polarity and Polarity Timescales
- Time Scale of Magnetic Reversals

**Plate Tectonics Quiz**

Complete the Geology Plate Tectonics Scientific Revolution quiz:

- [Geology Plate Tectonics Scientific Revolution Quiz](#)

**Earthquakes & Interior Structure**

You will review earthquakes, seismology, and earth's interior.

**Earthquakes**

Read the following of *Earth Science*:

- [Chapter 8 “Earthquakes and Earth's Interior”](#)

Complete the following interactive tutorials:

- [Earthquakes](#)
- [Tsunami](#)

**Seismology**

Complete the following interactive tutorials:

- [Body Waves (P and S waves) versus Surface Waves](#)
- [Seismic Wave Motion](#)
- [Seismographs](#)

**Earth's Interior**

Complete the following interactive tutorial:

- [Earth's Interior](#)

**Earthquakes & Earth's Interior Quiz**

Complete the following quiz:

- [Geology Earthquakes and Earth's Interior quiz](#)

**Volcanoes, Mountains, Folds, Faults, and Maps**

You will review volcanoes, mountains, folds, faults, accreted terranes, and isostasy.

**Volcanoes**

Read the following in *Earth Science*: 
Complete the following interactive tutorials:

- Volcanoes and Other Igneous Activity
- Igneous Features and Landforms
- Anatomy of a Volcano
- Volcano Types
- Tectonic Settings and Volcanic Activity

**Volcanoes Quiz**

Complete the following quiz:

- Geology Volcanoes and Other Igneous Activity Quiz

**Mountains, Folds, & Faults**

Read the following in *Earth Science*:

- Chapter 10 "Crustal Deformation and Mountain Building"

Complete the following interactive tutorials:

- Mountain Building
- Common Types of Folds
- Faults

**Accreted Terranes**

Read the following in *Earth Science*:

- Chapter 10 "Mountain Building"

Complete the following interactive tutorials:

- Terrane Formation
- Collision and Accretion of small Crustal Fragments to a Continental Margin

**Isostasy**

Read the following chapter in *Earth Science*:

- Chapter 10 "Mountain Building"

Complete the following interactive tutorial:

- Isostasy

**Mountains Quiz**
Complete the following quiz:

- Geology Crustal Deformation Mountain Build Quiz

**Topographic and Geologic Maps**
You will review topographic and geologic maps.

**Topographic Maps**

Watch the following video:

- Topographic Maps

Visit the following web page:

- How to Read a Topographic Map

**Geologic Maps**

Watch the following video:

- Geologic Maps (5:56)

Explore the following web page:

- "USGS Geologic Maps"

**History of Life on Earth**

Complete the following:

**Fossils**

Read the following in *Earth Science*:

- Chapter 11 "Geologic Time"

Complete the following interactive tutorial:

- Fossil Assemblage

**Relative Age-Dating**

Read the section in *Earth Science*:


Complete the following interactive tutorials:

- Relative Dating – Key Principles
- Relative Geologic Dating
Angular Unformities, Noncomformities, and Disconformities
Applying Principles

Radiometric (Isotopic) Age-Dating

Read the following section in Earth Science:

- pp. 360-363 ("11.5: Dating with Radioactivity") in Chapter 11: "Geologic Time"

Complete the following interactive tutorials:

- Dating with Radioactivity
- Radioactive Decay
- Radioactive Decay Curve

Geologic Time Scale

Read the following in Earth Science:

- Chapter 12 "Earth's Evolution through Geologic Time"

Complete the following interactive tutorial:

- Geologic Time Scale

Watch the following presentations:

- Precambrian (6:02)
- Paleozoic (8:24)
- Mesozoic (4:25)
- Cenozoic (4:00)

Geologic Time & History of Life Quizzes

Complete the following quizzes:

- Geology Geologic Time Quiz
- Geology Earth's Evolution Geologic Time Quiz

Oceans & Atmospheres

Outgassing of gases and fluids through volcanic vents provided the raw materials to form Earth's hydrosphere and atmosphere. Geologic and biologic processes, including human activities, continue to modify the planet's water and air.

Ocean Features
You will review the features of the ocean floor and properties of ocean water and ocean life.

The Ocean Floor

Read the following in Earth Science:
• **Chapter 13 "The Ocean Floor"**

Read the following web pages:

• **Ocean Floor Features**
• **The Floor of the Ocean Comes into Better Focus**

Read the following in *Earth Science*:

• **Chapter 14 "Ocean Water and Ocean Life"**

Review the following interactive tutorials:

• "Variations in Surface Temperature and Salinity with Latitude"
• "Benthos"

**Surface Currents and Thermohaline Circulation**

You will review surface currents as well as coastal processes and tides.

**Surface Currents**

Complete the following interactive tutorials:

• "Ocean Circulation Patterns"
• "Connection between Ocean Circulation and Climate of Antarctica"
• "Coastal Upwelling"

**Coastal Processes and Tides**

Read the following in *Earth Science*:

• **Chapter 15 "The Dynamic Ocean"**

Review the following web page:

• "Coastal Geological Processes"

Complete the following interactive tutorials:

• "Passage of a Wave"
• "Beach Drift and Longshore Current"
• "Tidal Patterns"

**Atmosphere Composition and Structure**

You will review the composition, structure, and temperature of the atmosphere.

**Introduction to the Atmosphere**

Read the following in *Earth Science*:
Chapter 16 “The Atmosphere: Composition, Structure, and Temperature”

Complete the following interactive tutorials:

- Introduction to the Atmosphere
- Heating Earth’s Surface and Atmosphere
- The Three Mechanisms of Heat Transfer
- Paths Taken by Solar Radiation
- Temperature Data and the Controls of Temperature

Read the following web page:

- Layers of the Atmosphere

Atmosphere Quiz

Complete the following quiz:

- Geology Atmosphere Comp Structure Temp Quiz

Clouds, Air Pressure, and Weather

You will review clouds, air pressure, the Coriolis effect, and local winds.

Clouds

Read the following chapter of Earth Science:

- Chapter 17 “Moisture, Clouds, and Precipitation”

Complete the following interactive tutorials:

- Changes of State Involve an Exchange of Heat
- Moisture and Cloud Formation
- Atmospheric Conditions that Result in Absolute Stability
- Classification of Clouds, Based on Height and Form

View the following video: How to read Tables for Relative Humidity and Dew Point (6:15)

Clouds Quiz

Complete the following quiz:

- Geology Moisture Clouds Precipitation Quiz

Air Pressure and Coriolis Effect

Read the following in Earth Science:

- Chapter 18 "Air Pressure and Wind"
Complete the following interactive tutorials:

- Air Pressure and Wind
- Isobars on a Weather Map

**Coriolis Effect**

Complete the following interactive tutorial:

- Idealized Global Circulation Proposed for the Three-Cell Circulation Model of a Rotating Earth

Review the following web page:

- What is a Rossby wave?

**Local Winds**

Read the following in Earth Science:

- Chapter 18 "Air Pressure and Wind"

Complete the following interactive tutorial:

- "Sea and Land Breezes"

Watch the following videos:

- Coriolis Effect (5:31)
- Atmospheric Circulation (5:32)
- Storms & Vortices (10:14)

Read and explore the following web pages:

- Local and Regional Wind Systems
- NOAA "El Nino Portal & La Nina (El nino - Southern Oscillation)"

**Weather and Climate**

You will review weather patterns, severe storms, and anthropogenic climate change.

**Weather and Climate**

Read the following in Earth Science:

- Chapter 19 "Weather Patterns and Severe Storms"

Complete the following interactive tutorials:

- Basic Weather Patterns
• Idealized Structure of a Large, Mature Midlatitude Cyclone
• National Weather Service Online School

Read and explore the following web page:

• "JetStream - An Online School for Weather"

Practice reading the weather maps in your local area with the following interactive from The Weather Channel:

• Today's Weather

Anthropogenic Climate Change

Read the following section in *Earth Science*:

• pp. 623-628 ("Human Impact on Global Climate Change") in *Chapter 20 "World Climates and Global Climate Change"

Read and explore the following web pages:

• World Climates
• Climate Feedbacks

Air Pressure and Weather Quiz

Complete the following quiz:

• Geology Air Pressure and Wind Quiz

Space Sciences

Space Sciences involve the study of traditional astronomy, our solar system, galaxies, and the universe.

Traditional Astronomy

You will review the origins of modern astronomy, planetary motion, Earth's tilt axis, Earth Moon Sun relationships, the distance of planets from the Sun, the evolution of the Earth and Moon, and the orbital motion of Earth and the other planets.

Astronomy

Read the following chapter in *Earth Science*:

• Chapter 21 "Origin of Modern Astronomy"

Planetary Motion

Complete the following interactive tutorial:

• Ptolemy's Explanation of Retrograde Motion
Read the following web page:

- **Tycho Brahe**

Using a Telescope, Galileo Discovered That Versus Has Phases Like Earth’s Moon

Complete the following interactive tutorial:

- **Using a Telescope, Galileo Discovered That Versus Has Phases Like Earth’s Moon**

To review this shape, refer to the following figure in Earth Science, which depicts two different ellipses:

- Figure 21.10 Drawing Ellipses with Various Eccentricities in Chapter 21: Origins of Modern Astronomy

The eccentricity of an ellipse is dependent on the distance between the foci. If the distance between the foci were zero, what shape would the ellipse have?

Earth’s path around the sun is almost a circle, but not quite. Asteroids and comets have more eccentric paths around the sun than the earth does.

Look at the following figure in Earth Science to review Kepler’s law of equal areas:

- Figure 21.11 Kepler’s Law of Equal Areas in Chapter 21: Origins of Modern Astronomy

A comet far from the sun at aphelion moves slowly. Conversely, when the comet is close to the sun at perihelion, it moves quickly and also has a tail as the sun burns off some of the comet’s ice.

View the following presentation on “Orbital Motion of Earth and Other Planets:”

- Orbital Motion of Earth and Other Planets

**Earth’s Tilt Axis**

Earth is tilted with respect to the Sun. Two main results of that tilt angle are seasons and precession.

Complete the following interactive tutorials:

- Characteristics of the Solstices and Equinoxes
- The Changing Sun Angle
- Precession of Earth’s Axis
- Orbital Variations

**Earth-Moon-Sun Relationships**

As the Moon orbits the Earth and the Earth orbits the Sun, the lineup of these three bodies
cause phases of the moon as well as eclipses.

Complete the following interactive tutorial:

- **Phases of the Moon**

Read and explore the following web pages:

- **Top 4 Keys to Mastering Moon Phases**
- **What is a Total Solar Eclipse?**
- **What is a Total Lunar Eclipse**

Complete the following interactive tutorial:

- **Lunar Eclipse**

**Solar System**

Review the following table in *Earth Science* to see the distance of the planets from the sun:

- Table 21.1 "Period of Revolution and Solar Distances of Planets" in *Chapter 21: "Origins of Modern Astronomy"

**Evolution of Earth and Moon**

Read the following in *Earth Science*:

- pp. 12-14 ("Early Evolution of the Earth") in *Chapter 1: "Introduction to Earth Science"

Complete the following interactive tutorials:

- **The Planets: An Overview**
- **Earth’s Moon**
- **Formation and Filling of Large Impact Basins**

**New Solar System Tour**

Read the following in *Earth Science*:

- **Chapter 22 "Touring Our Solar System"**

Complete the following interactive tutorials:

- **A Brief Tour of the Planets**
- **Orbital Motion of Earth and Other Planets**

**Solar System Tour Quiz**

Complete the following quiz:
• Geology Touring Solar System Quiz

Beyond Our Solar System
You will review spectroscopy, stars, and stellar evolution.

Spectroscopy

Read the following in *Earth Science*:

- Chapter 23 "Light, Astronomical Observations, and the Sun"

Complete the following interactive tutorials:

- Formation of the Three Types of Spectra
- The Doppler Effect

Stars and Stellar Evolution

Complete the following interactive tutorials:

- Diagram of the Sun’s Structure
- Hertzsprung-Russell Diagram
- Evolutionary Stages of Stars Having Various Masses

Read the following in *Earth Science*:

- Chapter 24 “Beyond Our Solar System”

Spectroscopy and Stars Quiz

Complete the following quiz:

- Geology Light Astronomical Observation Sun Quiz

Galaxies and the Universe
You will review spiral galaxies, cosmic microwave background, big bang cosmology, and the expanding universe theory.

Galaxies and The Universe

Reading the following chapter in *Earth Science*:

- Chapter 24 “Beyond Our Solar System”

Read and explore the following web page:

- Cosmic Microwave Background

Watch the following video:
Big Bang Cosmology

Complete the following interactive tutorial:

- Spiral Galaxies
- Raisin Bread Analogy for an Expanding Universe

Galaxies and Universe Quiz

Complete the following quiz:

- Geology Beyond Our Solar System Quiz

Final Steps

Congratulations on completing the activities in this course! This course has prepared you to complete the assessments associated with this course. If you have not already been directed to complete the assessments, schedule and complete your assessments now.

Exam Requirements

In order to receive a "Pass" on your degree plan, you must pass General Science: Content Knowledge (5435) Praxis **Subject Assessment or the Middle School Science (5440) Praxis Subject Assessment** based upon the WGU cut score. Additionally, if the state in which you seek licensure also requires the Praxis exam, you must pass the exam based on that state’s cut score before you will be admitted into Demonstration Teaching or allowed to graduate.

*Note: It is possible to pass the exam based on either the WGU cut score or your state’s cut score and still need to take it again in order to satisfy both cut scores.*

Please review the following article in the WGU Student Handbook:

- Article 2834 WGU Cut Scores for Assessments That Require Praxis Examinations

Payment

WGU will pay for your first two attempts at the General Science: Content Knowledge (5435) Praxis **Subject Assessment or the Middle School Science (5440) Praxis Subject Assessment**. You will be responsible for paying third and subsequent attempts. WGU will not pay for extended or emergency registration, so be sure to plan ahead when scheduling the exam. Please see the following web page for detailed information on test and service fees:

- Test and Service Fees

Scheduling

The General Science: Content Knowledge (5435) Praxis **Subject Assessment or the Middle School Science (5440) Praxis Subject Assessment** is only offered as a computer–delivered
test. Please visit the following web page for a list of available sites and testing windows.

- **Praxis Test Centers and Dates**

These tests are offered only during certain time frames and not all test centers are open on all test dates, so plan accordingly. Once you have selected a testing center and date, use the following directions to schedule your exam:

- **How to Schedule a Praxis Exam**

*Note: You must schedule your Praxis exam through WGU in order to have WGU pay for the exam.*

Follow the ETS guidelines on what to bring on exam day by accessing the following web page:

- **What to Bring**

**Submit Your Score**

You will need to submit your scores to WGU after completing this exam. Once you have submitted your passing score, you will receive a "Pass" on your Degree Plan for the assessment.

After completing an outside vendor assessment, follow the directions for submitting a score report here:

- **Following Outside Vendor Assessments**