Description
This course of study outlines the learning activities that will help you demonstrate competence in the subject area of natural sciences. Your competence will be assessed through a proctored objective assessment and performance tasks that apply scientific inquiry and create diagrams of scientific concepts. Depending on your educational background and work experience, this course of study can take up to twelve weeks to complete. Following this document sequentially is an important part of your assessment preparation. This course of study is also designed to help you become an independent learner by providing multiple learning methods. These steps may be completed more quickly than shown below as determined in consultation with your mentor.

Introduction
Welcome to the Natural Sciences Course of Study! This course of study will help you develop competency in the areas of scientific concepts, life science, physical science, earth, and space science. Each of the activities located in the course of study is designed to help you learn key concepts to meet the competencies for this domain of study. There are three course mentors who are excited to help you with your studies. They all have many years of teaching experience and enjoy working with students of all ages and abilities. If you require any additional assistance or have any questions please feel free to contact the course mentors for this area—Jill Nugent, Shauna Horne, or Dr. Murphy Nmezi.

Course Mentor Shauna Horne
Email shorne@wgu.edu
Telephone 1-866-895-9660, x1817
Office Hours Monday, 7:00am–1:00pm, 8:00pm–10:00pm, Mountain Time
Tuesday, 7:00am–3:00pm, Mountain Time
Wednesday, 7:00am–3:00pm, Mountain Time
Thursday, 6:30am–9:00am, 11:30am–3:00pm, 6:00pm–8:00 pm, Mountain Time
Friday, 6:30am – 2:30pm, Mountain Time

Course Mentor Jill Nugent
Email jnugent@wgu.edu
Telephone 1-866-895-9660, x5518
Office Hours Monday, 7:00am–4:00pm, Central Time
Wednesday, 7:00am–4:00pm, Central Time
Thursday, 7:00am–4:00pm, 5:00pm–7:00pm, Central Time
Friday, 8:00am–11:00am, Central Time
Sunday, 8:00pm–10:00pm, Central Time

Course Mentor Dr. Murphy Nmezi
Email mnmezi@wgu.edu
Telephone 1-866-895-9660, x5434
Office Hours Monday - Friday, 10:00am–7:00pm, Mountain Time

Have you ever wondered what causes earthquakes and changes in the season? Or what your genes have to do with your past and your future? You will discover the answers to these and many more questions as you engage in the study of the natural sciences! Through the lens of scientific thought and inquiry, you will uncover historical and emerging findings in the physical, life, earth, and space sciences.
In addition you will recognize applications and make connections to your own life, as well as the world around you. You will begin to discern the intricate connectivity of all systems on Earth. We invite you to learn more about the natural world and awaken the curious scientist inside you!

Understanding science can help us better understand things around us, such as technology, medicine, and the environment. Throughout this course of study, you will be completing activities designed to help you work through topics such as scientific concepts and methodologies as well as key concepts from life, earth, space, and physical science. The topics are chunked into manageable sets of weekly activities to complete. Be sure to confirm your understanding each week. This practice will help you build on your knowledge. Becoming competent in natural science will help you understand how scientists view the world and how scientific inquiry is fundamental in investigating the structure and processes found in the natural world.

This course of study covers the following competencies:

**Competency 102.5.1: Scientific Concepts**
The graduate states and understands the fundamental, unifying concepts, theories, tools, processes, methods, and systems in the various sciences.

**Competency 102.5.2: Scientific Inquiry**
The graduate plans, conducts, and reports a scientific investigation to test a hypothesis.

**Competency 102.5.3: Life Science Knowledge**
The graduate knows, understands, and uses the fundamental concepts of life science.

**Competency 102.5.4: Earth and Space Science Knowledge**
The graduate knows, understands, and uses the fundamental concepts of earth and space science.

**Competency 102.5.5: Physical Science Knowledge**
The graduate knows, understands, and uses the fundamental concepts of physical science.

**Required Learning Resources:**
- Conceptual Integrated Science—an interactive online learning resource that contains the required e-texts:
- Thinkwell’s Science—a web-based resource that includes multimedia video lectures, review notes, interactive animations, and sample exercises.

This course of study is designed to prepare you for the ISC4/ISC5 assessment, a proctored objective assessment, and ISA4, a performance assessment consisting of seven performance tasks.

**Natural Science Part II (ISC4 or ISC5)**
The Natural Science Part II assessment is a scheduled, proctored objective assessment at a secure testing center. There are multiple forms of the Natural Science Part II assessment. Each form contains a total of 43 items. The IBT Prometric server "counts" each matching item separately. The IBT item counts range from 99 to 106 depending on the form of the assessment you receive.

The assessment consists of multiple choice, multiple selection, and matching questions on science concepts, science inquiry, life, earth, space, and physical science. You will have two hours to complete the assessment. When you go to the proctored site, do not bring any texts or study materials with you.
Make sure you bring personal identification. Be sure you are rested and wear comfortable clothes. You will take the assessment online. Read each question carefully to make sure you understand what you are being asked to do. Reread the question if needed. The passing score on the entire test is 54% or better.

**Natural Science Part I (ISA4)**
The Natural Science Part I assessment (ISA4) consists of seven performance tasks that are completed using TaskStream. The tasks are designed to demonstrate your competency based on application of concepts. The instructions for each task can be accessed through TaskStream. Read through the directions and the grading rubric before beginning each task. The tasks can be completed in any order. Once each task is completed, submit it to be evaluated.

*Note: Business, IT, and ISC5 students do not complete the ISA4 and do not complete the performance tasks listed in the modules. Business and IT students are responsible to know the information assessed in the performance tasks for the Natural Science objective assessment (ISC4/ISC5).*

**Week 1
Preparing for Success**
To successfully complete ISC and ISA, you need the appropriate resources to help with your learning. You should also prepare a calendar to schedule times devoted to your studies.

**Acquire Learning Resources**
Arrange to obtain the learning resources listed below so there will be no delays in your studies. These items are essential as this document guides you weekly in their use. Some of these items must be shipped to you, so be sure that your mailing address information is current. If you click your name on your AAP, you can check your contact information.

- **Enroll in Conceptual Integrated Science**
  Conceptual Integrated Science provides access to additional learning resources including an e-text. You will enroll in this resource through your AAP. Once you have enrolled, you will receive an e-mail from with specific instructions on how to access it. The textbook included is listed below.

**Textbooks:** An electronic version of the primary text aligned to this course of study is included in the Conceptual Integrated Science resource you will enroll in through your AAP. If you would like a hard copy of the text, you are encouraged to purchase it at your convenience.
  - Additional chapters from a secondary text are also included in the Conceptual Integrated Science resource.

*Note: The WGU bookstore has these books available for immediate purchase and delivery. You may shop at other online bookstores, but be sure to order early and use the correct ISBN to get the correct edition.*

*Note: Please retain all e-mails and materials you receive regarding your learning resources. The information contained in these materials is very helpful.*
Enroll in Thinkwell Science Online

URL:
Thinkwell
http://www.thinkwell.com

Thinkwell Science with George Wolfe, Dean Harman, Gordon Yee, and Steve Pollock is the first next-generation science text for online learners. It communicates the fundamentals of science to students using engaging, interactive media. You will enroll in this resource through your AAP. Once you have enrolled, you will receive an e-mail confirmation from Thinkwell with your username and password (usually within 24 hours). You can access the material by going to the above link and entering your log-in information. If you have dial-up Internet access, you can order the Thinkwell CDs for a nominal cost.

Note: Please retain all emails and materials you receive regarding your learning resources. The information contained in these materials is very helpful.

This web-based resource includes multimedia video lectures, review notes, interactive animations, and sample exercises. You enroll through the “Learning Resources” tab for ISC/ISA within your AAP. You will receive an e-mail with directions on accessing this resource. Your mentor will need to approve this learning resource.

Access WGU Library E-Reserves
Additional chapters are available through the WGU library e-reserves. These chapters provide additional information on physical science topics. To access the e-reserve chapters:
1. Go to the “Resources” tab in the student portal.
2. Click on the “Library” tab and write down the e-reserve password.
3. Enter WGU library, then e-reserves.
4. Select “Course of Study.”
5. Scroll down to “Liberal Arts” and click “Search.”
6. Click on “LibArt_NaturalSciences” and enter the password.
7. Click on “View” and then you will be able to click on the chapters listed in the course of study.

Natural Sciences Self-Assessment
Take the natural sciences student self-assessment form, which is available to measure your level of competency in the natural sciences before you start your work. This will help you determine areas to concentrate on as you work through the learning resources. You will find the natural sciences student self-assessment form on your AAP under the ISC4/ISC5 and ISA4 “Learning Resources” tab.

After you complete the activities in the course of study, you will take a preassessment prior to taking the ISC4/ISC5 objective assessment. The preassessment will be explained in more detail during Week 9.

Depending on how you scored on the self-assessment, you may be able to take the preassessment sooner. This should only be done in consultation with your mentor.

Study Notebook
Create an area or document (electronic or manual) where you can take notes on the readings, vocabulary, guiding questions, and activities throughout this course of study. For
ideas on how to divide this notebook into sections, see the learning community or contact your mentor or a course mentor for this area. Before taking the preassessment and assessment, review your notes.

☐ The Learning Community
If you need further assistance, please feel free to post a question in the learning community or contact a course mentor.

Scientific Concepts and Inquiry
The activities for this subject will introduce you to the overarching concepts associated with the natural sciences.

Background Information
You will begin your journey to prepare for the natural science assessments by focusing on scientific concepts and scientific inquiry. The purpose of these activities is to understand the scientific method, identify overarching concepts and themes, and recognize the impact of key historical developments in various science disciplines. Activities will also address scientific inquiry, emphasizing the identification of variables and the use of experimentation in testing scientific hypotheses.

Competency 102.5.1: Scientific Concepts
The graduate states and understands the fundamental, unifying concepts, theories, tools, processes, methods, and systems in the various sciences.

Competency 102.5.2: Scientific Inquiry
The graduate plans, conducts, and reports a scientific investigation to test a hypothesis.

Scientific Concepts
Does science change over time? Is it merely a collection of facts that must be memorized, or is it a process? What is the role of experimentation in scientific studies? As you complete the activities for this topic, you will examine scientific methodologies and investigate the contributions of different scientists to our understanding of the natural world. An understanding of how science examines the world will help you evaluate scientific articles and information presented from various sources. Your study of scientific concepts includes resources from the Thinkwell chapter, “Biology: Exploring Life” (WGU library e-reserves), and other Internet resources. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.

☐ Scientific Concepts
Read Thinkwell, chapter 1.1. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on the concepts and ideas as you think about the answers:

• How is the scientific method used to solve problems?
• What are quantitative observation and deductive reasoning?
• How are systems and subsystems used in scientific studies?
• How do models aid in understanding scientific concepts?
• Why is it important to incorporate quantifiable measurements in experiments?
• What are some examples of systems that are evolving or achieving equilibrium?
• How are relational diagrams used to identify system patterns: time, space, energy, and matter?
• How did Charles Darwin apply the scientific method?
• How have scientific views changed over time?
• Make a list of important scientific discoveries.

☐ Thinkwell Exercises
Answer the questions for each of the chapter 1.1 subchapters. Check your answers and review concepts as needed. Discuss any questions you may have with a course mentor or in the learning community.

☐ Biology, Chapter 1 - Exploring Life
Read chapter 1 - Exploring Life in Biology. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community, if needed. Pay close attention to the following, and take notes as you read the chapter:
• What are the properties of life?
• What are the levels of biological organization?
• What is systems biology?
• Describe positive and negative feedback in biological systems.
• What is the role of hypotheses in scientific inquiry?
• How do you design a controlled experiment?
• What are the themes that unify biology?

☐ Unifying Concepts and Processes
URL:
Unifying Concepts and Processes
http://agpa.uakron.edu/k12/national_standards/unifying_concepts_and_processes.html

Visit the “Unifying Concepts and Processes” web link above and take notes on the following questions:
• How are systems used to study science?
• What is evidence?
• How do scientists use models?

☐ Scientific Discoveries
Go to the Natural Science Learning Community and click on the discussion thread “Scientific Discoveries.” Post a message about a theme or discovery in science that you find interesting.

Read through the messages in the “Scientific Discoveries” discussion thread and respond to one message.

Scientific Inquiry
Have you ever performed an experiment? How does an experiment differ from a demonstration? As you complete the activities in this topic, you will learn about the scientific method and the role of scientific inquiry in acquiring knowledge. In ISA4 you will design and perform an experiment of your choosing. The information in this topic will help prepare you for this task. Your study of scientific inquiry includes lessons from Thinkwell. Be sure to utilize each of these lessons, as they provide information on the topics you will need to master to achieve competency in this topic.
Conceptual Integrated Science, Chapter 1
Read chapter 1 in Conceptual Integrated Science. To locate chapter 1 in the PDF version of the e-text, go to p. 27. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
- How is the scientific method used to solve problems?
- How would you explain how observation, question, hypothesis, prediction, and conclusion work?
- What is the principle of falsifiability?
- How would you define the terms fact, theory, law, evidence, and experiment. Can you give examples of each?

Applying the Scientific Method
Read chapter 2.1 in Thinkwell. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
- What are the steps included in the scientific method?
- What role does scientific inquiry have in acquiring knowledge?
- How would you define scientific inquiry, theory, hypothesis, independent variable, and dependent variable?
- What are the criteria for a valid hypothesis?
- How would you describe the threats to internal and external validity?
- What factors should be considered when designing an experiment?
- What are some different ways to report data?
- What is the purpose of a literature review in a scientific experiment?
- How would you explain causal link?

Thinkwell Exercises
Answer the questions for each of the chapter 2.1 subchapters except 2.1.5. Check your answers and review concepts as needed. Discuss any questions you may have with a course mentor or in the learning community.

Analyzing an Experiment
Read chapter 2.2 from Thinkwell. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read these selections:
- What are characteristics of well-formed questions?
- What is the purpose of graphical representations?
- What are some common pitfalls in science experiments?

Scientific Concepts Quiz
Go to Week 1 of the Conceptual Integrated Science course. Click on “Scientific Concepts Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in
your notes? Discuss any questions you may have with a course mentor or in the learning community.

Week 2
Physical Science Part I
The activities for this subject focus on the structure of matter and the physical and chemical properties of matter.

Background Information
These activities will help you recognize the structure and organization of matter and understand how elements and compounds are rearranged in chemical reactions.

Competency 102.5.5: Physical Science Knowledge
The graduate knows, understands, and uses the fundamental concepts of physical science.

Chemical Interactions
Firework displays, chemical weathering of rocks, and digestion of food are all examples of chemical reactions. What are some other examples that come to mind? As you study chemical interactions, you will focus on the structure of the atom, how atoms combine to form molecules and compounds, and how molecules and compounds react and form new substances during chemical reaction. Your study includes resources from Conceptual Integrated Science and chapters from the Biology textbook located in the WGU library e-reserves. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.

☐ Conceptual Integrated Science, Chapter 9
Read chapter 9 in Conceptual Integrated Science. To locate chapter 9 in the PDF version of the e-text, go to p. 193. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following concepts and ideas, and take notes as needed:
- Describe the structure of the atom.
- Draw and label the subatomic particles that make up a carbon (C-12) atom and the particles that make up a C-14 isotope of carbon.
- Define the following terms: atomic number, atomic mass, atomic symbol, atomic mass unit (Dalton).
- Explain the shell model of the atom and why it is used when discussing chemical reactions.

☐ Atom Quiz
Go to Week 2 of the Conceptual Integrated Science course. Click on “Chapter 9 Atom Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.
Conceptual Integrated Science, Chapter 11
Read chapter 11 in Conceptual Integrated Science. To locate chapter 11 in the PDF version of the e-text, go to p. 243. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
- How would you contrast the states of matter (solids, liquids, gases) by examining atomic structure, atomic movement, pressure, and volume?
- What information about an element can be determined using the periodic table?
- How is the periodic table organized?

Investigating Matter Quiz
Go to Week 2 of the Conceptual Integrated Science course. Click on “Chapter 11 Investigating Matter Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

Biology, Chapter 2 - Chemical Context of Life
Read chapter 2 - Chemical Context of Life in Biology. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
- How are molecules different than atoms?
- How would you describe the atoms and chemical bonds that are part of the water molecule?
- Why are valence electrons important in the formation of ionic and covalent bonds?
- Why does carbon tend to form covalent bonds?
- Why are some molecules polar and others nonpolar?
- How would you explain hydrogen bonds and Van der Waals interactions?

Conceptual Integrated Science, Chapter 12
Read chapter 12 in Conceptual Integrated Science. To locate chapter 12 in the PDF version of the e-text, go to p. 267. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
- What is a chemical reaction?
- Why is the law of mass conservation important in chemical reactions?
- How would you describe acid-base reactions?
- How would you explain oxidation-reduction reactions?
- How can you tell if a reaction classifies as an oxidation-reduction reaction?
- Why is oxygen a common oxidizing agent?
- How do catalysts affect chemical reactions?
☐ **Nature of Chemical Bonds Quiz**
   Go to Week 2 of the Conceptual Integrated Science course. Click on “Chapter 12 Nature of Chemical Bonds Quiz,” answer the quiz questions, submit for grading, and then check your answers.

   The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

☐ **Biology, Section 9.1**
   Read section 9.1 in chapter 9 - Cellular Respiration in Biology. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Take notes on the following concepts:
   - Define oxidizing agent, reducing agent, oxidation, and reduction.
   - Explain how glucose is oxidized during respiration.

☐ **Chemical Reactions Quiz**
   Go to Week 2 of the Conceptual Integrated Science course. Click on “Chapter 13 Chemical Reactions Quiz,” answer the quiz questions, submit for grading, and then check your answers.

   The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

---

**Week 3**

**Physical Science Part II**

The activities associated with this subject focus on understanding the various forms of energy.

**Background Information**

These activities will help you be able to describe the different forms of energy, recognize how energy is transferred, and understand the role of energy on Earth and in the universe.

**Competency 102.5.5: Physical Science Knowledge**

The graduate knows, understands, and uses the fundamental concepts of physical science.

**Energy**

What is energy? There are many different types of energy and many that we use on a daily basis. We have to pay money for certain kinds of energy in our homes and vehicles. As a society we are currently experiencing an energy crisis and are seeking for more cost-efficient and cleaner sources of energy. During your study of energy, you will learn about heat energy, light energy,
and nuclear energy. You will examine the benefits and consequences of using nuclear reactions to produce electricity. Your study of energy includes resources from Conceptual Integrated Science. Be sure to read each of these chapters, as they provide information on the topics you will need to master to achieve competency in this topic.

☐ Conceptual Integrated Science, Chapter 4
Read chapter 4 in Conceptual Integrated Science. To locate chapter 4 in the PDF version of the e-text, go to p. 83. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
• How would you explain how the amount of kinetic and potential energy changes as a pendulum swings from side to side?
• What is the conservation of energy?
• What is the scientific definition of work?
• What is the advantage of using a machine?
• How does kinetic energy relate to heat, sound, and light?

☐ Momentum and Energy Quiz
Go to Week 3 of the Conceptual Integrated Science course. Click on “Chapter 4 Momentum and Energy Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

☐ Conceptual Integrated Science, Chapter 6
Read chapter 6 in Conceptual Integrated Science. To locate chapter 6 in the PDF version of the e-text, go to p. 124. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to following questions, and take notes on the concepts and ideas as you read:
• How is heat transfer different than thermal energy?
• How does a thermometer measure temperature?
• How would you describe the laws of thermodynamics?
• How would you contrast the three types of heat transfer: conduction, convection, and radiation?

☐ Heat Quiz
Go to Week 3 of the Conceptual Integrated Science course. Click on “Chapter 6 Heat Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in
your notes? Discuss any questions you may have with a course mentor or in the learning community.

- **Conceptual Integrated Science, Chapter 8**
  Read chapter 8 in *Conceptual Integrated Science*. To locate chapter 8 in the PDF version of the e-text, go to p. 168. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
  - How would you contrast the types of electromagnetic waves found in the electromagnetic spectrum?
  - Why do submerged objects appear to be nearer the surface than they actually are?
  - How would you define *reflection*, *refraction*, and *diffraction of sound and light*?
  - How does light act as both a wave and a particle?

- **Sound and Light Quiz**
  Go to Week 3 of the Conceptual Integrated Science course. Click on “Chapter 8 Sound and Light Quiz,” answer the quiz questions, submit for grading, and then check your answers.

  The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

- **Conceptual Integrated Science, Chapter 10**
  Read chapter 10 in *Conceptual Integrated Science*. To locate chapter 10 in the PDF version of the e-text, go to p. 216. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
  - How do the strong force and the repulsive electrical force affect the nucleus of an atom?
  - How would you compare and contrast fission and fusion?
  - What is the mass-energy relationship, and how does it relate to fission reactions?

- **Energy Discussion**
  Go to the Natural Science Learning Community and click on the discussion thread “Energy.” Post a message describing something you learned about energy that you thought was interesting or shares your thoughts about our energy consumption and our dependence on oil.

  Read through the messages under the “Energy” discussion thread and respond to one message.
Week 4
Physical Science Part III
The activities associated with this subject cover the concepts of electricity, magnetism, motion, and work.

Background Information
These activities summarize Newton’s laws of motion, define terms related to motion, and explain the advantage of simple machines.

Competency 102.5.5: Physical Science Knowledge
The graduate knows, understands, and uses the fundamental concepts of physical science.

Electricity and Magnetism
Why is the earth magnetic? What is the relationship between electricity and magnetism, and how is this relationship applied? As you proceed through these activities, you will explain the difference between electricity and magnetism and understand how the two forces can work together in applications like electromagnets. Your study of electricity and magnetism includes resources from Conceptual Integrated Science and other online resources. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.

- Conceptual Integrated Science, Chapter 7
  Read chapter 7 in Conceptual Integrated Science. To locate chapter 7 in the PDF version of the e-text, go to p. 145. Take notes on the following questions as you read the chapter:
  - What is the source of a gravitational field, an electric field, and a magnetic field?
  - How do conductors and insulators affect electrical current?
  - How does static electricity compare to electric current?
  - What is the advantage of using a parallel circuit over a series circuit?
  - How do electromagnets, electric meters, and electric motors work?

- Electricity and Magnetism Quiz
  Go to Week 3 of the Conceptual Integrated Science course. Click on “Chapter 7 Electricity and Magnetism Quiz,” answer the quiz questions, submit for grading, and then check your answers.

  The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

- Electricity
  URLs:
  Electrical Circuits
  http://www.allaboutcircuits.com/vol_1/chpt_5/1.html

  The Structure of Matter
  http://www.physicsclassroom.com/Class/estatics/
  Visit the “Electrical Circuits” and “The Structure of Matter” web links above and take notes on the following concepts.
Electrical Circuits
• Draw and label the different types of electrical circuits: parallel, series, and series-parallel.

The Structure of Matter
• Explain the structure of the atom and how the location of electrons affects electrical charge.
• What is static cling?

Motion and Work
Do all things move? What about nonliving matter? Is there any motion associated with atoms? During your study of motion and work, you will define motion and cite examples of Newton’s three laws of motion. You will also investigate work and explain how simple machines are used to decrease the force involved in the work we do on a daily basis. Your study of motion and work includes resources from Conceptual Integrated Science and Internet resources. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.

☐ Conceptual Integrated Science, Chapter 2
Read chapter 2 in Conceptual Integrated Science. To locate chapter 2 in the PDF version of the e-text, go to p. 43. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following question:
• How do acceleration, speed, and velocity describe the motion of an object?

☐ Describing Motion Quiz
Go to Week 4 of the Conceptual Integrated Science course. Click on “Chapter 2 Describing Motion Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

☐ Conceptual Integrated Science, Chapter 3
Read chapter 3 in Conceptual Integrated Science. To locate chapter 3 in the PDF version of the e-text, go to p. 62. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
• Why is Newton’s first law of motion a restatement of Galileo’s concept of inertia?
• How would you explain Newton’s three laws of motion? Give examples.
• For which phenomenon are Newton’s laws inaccurate?
Newton’s Laws of Motion Quiz
Go to Week 4 of the Conceptual Integrated Science course. Click on “Chapter 3 Newton’s Laws of Motion Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

Website Visit
URL:
Simple Machines

Distance and Displacement
http://www.physicsclassroom.com/Class/1DKin/U1L1c.cfm

Speed and Velocity
http://www.physicsclassroom.com/Class/1DKin/U1L1d.cfm

Visit the “Simple Machines,” “Distance and Displacement,” and “Speed and Velocity” web links above and take notes on the following concepts.

Simple Machines
• Describe the six types of simple machines.
• Explain how each type of simple machine makes work easier.

Distance and Displacement
• Define distance and displacement.

Speed and Velocity
• Define speed and velocity

Week 5
Life Science Part I
The activities associated with this subject examine various life processes associated with organisms.

Background Information
The purpose of these activities is to explain various fundamental processes associated with organisms, including the transference of genetic information from parents to offspring. The life processes emphasized in the activities include the cellular processes of photosynthesis and respiration, as well as organ system processes including the digestive system, the reproductive system, and the immune response.

Competency 102.5.3: Life Science Knowledge
The graduate knows, understands, and uses the fundamental concepts of life science.
**Life Processes**

Congratulations! You have now completed your study of the main concepts of physical science. You will now begin your study of the life sciences. How do we define life? What is it that differentiates living things from nonliving matter? As you complete the activities in this topic, you will investigate the characteristics of living things as well as look at the differences of living things at the cellular level. You will also explain some of the processes associated with living things such as homeostasis, photosynthesis, reproduction, digestion, and immunity. Your study of life processes includes resources from Conceptual Integrated Science and Internet resources. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.

**Conceptual Integrated Science, Chapter 15**

Read chapter 15 in *Conceptual Integrated Science*. To locate chapter 15 in the PDF version of the e-text, go to p. 345. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:

- What are the characteristics of living things?
- How would you compare eukaryotic cells and prokaryotic cells?
- How would you explain the process of cell division?
- How would you explain the light dependent and light independent reactions associated with photosynthesis?

**Basic Unit of Life Quiz**

Go to Week 5 of the Conceptual Integrated Science course. Click on “Chapter 15 Basic Unit of Life Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

**Conceptual Integrated Science, Chapter 19**

Read chapter 19 in *Conceptual Integrated Science*. To locate chapter 19 in the PDF version of the e-text, go to p. 455. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:

- How is the human body organized?
- What are some examples of homeostasis?
- How would you explain the role of specific hormones in controlling growth, development, and reproduction?
- How would you outline the human reproduction process?

**Biology, Chapter 46 – Animal Reproduction**

Read chapter 46 – Animal Reproduction in *Biology*. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your
study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
- How do hormones regulate the female reproductive cycle?
- How do hormones regulate the male reproductive cycle?
- Explain the function of hormones in conception, embryonic development, and birth.

Control and Development Quiz
Go to Week 5 of the Conceptual Integrated Science course. Click on “Chapter 19 Control and Development Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

Conceptual Integrated Science, Chapter 20
Read chapter 20 in Conceptual Integrated Science. To locate chapter 20 in the PDF version of the e-text, go to p. 479. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following, and take notes on concepts and ideas as you read:
- How do the digestive system organs function?
- What are the differences between innate and acquired immunity?
- Explain the functions of immune system organs and structures.
- How does the human body fight against pathogens?

Care and Maintenance Quiz
Go to Week 5 of the Conceptual Integrated Science course. Click on “Chapter 20 Care and Maintenance Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

Website Visit
URL:
Living Things: Daily Living
http://www.fi.edu/tfi/units/life/living/living.html

Visit the “Living Things” web link above and take notes on the following concept:
- What resources do living things need to survive and grow?
Genetics
What types of traits did you inherit from your parents? What about your grandparents? Are all traits inherited? During your study of genetics, you will define genetics and heredity, investigate the process of meiosis, and explain how Mendel’s experiments aided in our understanding of the passing of traits from parents to offspring. Your study of genetics includes resources from Conceptual Integrated Science and Internet resources. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.

- **Conceptual Integrated Science, Chapter 16**
  Read chapter 16 in *Conceptual Integrated Science*. To locate chapter 16 in the PDF version of the e-text, go to p. 374. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to and take notes on the following questions, concepts, and ideas as you read these selections:
  - How would you define genes, chromosomes, inheritance, heredity, genotype, and phenotype?
  - What is meiosis, and how does it produce genetic diversity?
  - What are Mendel’s experiments and dominant and recessive traits?
  - What are Mendel’s laws of inheritance?
  - What impact do mutations have on protein synthesis?

- **Website Visit**
  **URLs:**
  - Bacterial Genetics – Mutagenesis
    [http://www.mun.ca/biochem/courses/4103/topics/mutagenesis.html](http://www.mun.ca/biochem/courses/4103/topics/mutagenesis.html)
  - Variation
  Visit the “Bacterial Genetics – Mutagenesis” and “Variation” web links above and take notes on the following concepts.

  - **Bacterial Genetics – Mutagenesis**
    - Define mutagenesis
  - **Variation**
    - Cite examples of inherited and environmental sources of variation

- **Genetics Quiz**
  Go to Week 5 of the Conceptual Integrated Science course. Click on “Chapter 16 Genetics Quiz,” answer the quiz questions, submit for grading, and then check your answers.

  The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.
Week 6
Life Science Part II
This subject examines the diversity of organisms and the theory of evolution.

Background Information
The focus of these activities is to understand interactions between organisms, explain the differences between organisms, identify Linnaean classification, and explain the theory of evolution.

Competency 102.5.3: Life Science Knowledge
The graduate knows, understands, and uses the fundamental concepts of life science.

Diversity of Life
Scientists believe that there are between 10 and 100 million different species of living things. Through natural selection and speciation, organisms become adapted for the environment in which they live. How would you expect an animal living in the desert to differ from one who lives in a tropical rainforest? During your study of this topic, you will investigate the differences between organisms and how they are classified. You will also learn about the process of natural selection and evidence that supports the theory of evolution. Your study of the diversity of life includes resources from Conceptual Integrated Science, Thinkwell, and other online resources. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.

☐ Conceptual Integrated Science, Chapter 18
Read chapter 18 in Conceptual Integrated Science. To locate chapter 18 in the PDF version of the e-text, go to p. 427. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:
  • How does Linnaean classification differ from cladistic classification?
  • What are the characteristics of each of the three domains of life?
  • What is the full scientific name for a dog, starting with domain and ending with species?
  • Why are viruses not included in one of the domains of classification?

☐ Bacteria and Viruses
Read chapter 3.6 in Thinkwell. Take notes on the following as you read the lesson:
  • How do viruses differ from bacteria?

☐ Website Visit
URL: Viruses
Visit the “Viruses” web link above. Compare the structure of viruses and bacteria.

☐ Biological Diversity Quiz
Go to Week 6 of the Conceptual Integrated Science course. Click on “Chapter 18 Biological Diversity Quiz,” answer the quiz questions, submit for grading, and then check your answers.
The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

☐ **Conceptual Integrated Science, Chapter 21**

Read chapter 21 in *Conceptual Integrated Science*. To locate chapter 21 in the PDF version of the e-text, go to p. 501. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to and take notes on the following questions, concepts, and ideas as you read:

- What are some examples of each of the levels of biological organization?
- How would you describe how ecology can be studied at the individual, population, community, and ecosystem biological levels?
- Why is a food web a more accurate representation of the ecological relationships in a community than a food chain?
- The energy cycle is when energy flows through living organisms and escapes as heat. How would you trace the flow of energy from the sun through living organisms?
- How do elements like nitrogen and carbon cycle through the environment?
- Think of abiotic items that play a significant role in ecosystems. What would be the impact if one or all of these factors are removed?

☐ **Conceptual Integrated Science, Chapter 17**

Read chapter 17 in *Conceptual Integrated Science*. To locate chapter 17 in the PDF version of the e-text, go to p. 398. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read these selections:

- How did Lamarck’s theory of evolution differ from Darwin’s theory of evolution?
- How did the work of Charles Lyell and Thomas Malthus influence Charles Darwin?
- Why is natural selection the driving force of evolution?
- What lines of evidence support evolution?

☐ **Ecosystems Quiz**

Go to Week 6 of the Conceptual Integrated Science course. Click on “Chapter 21 Ecosystems Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.
Week 7

Earth and Space Science Part I

This subject covers geologic processes such as the rock cycle, weathering, erosion, and plate tectonics.

Background Information

The focus of these activities is to identify, describe, and analyze various geologic processes and to describe the dynamic nature of the earth.

Competency 102.5.4: Earth and Space Science Knowledge

The graduate knows, understands, and uses the fundamental concepts of earth and space science.

Geologic Processes

Congratulations! You have now successfully completed your study of the life sciences. You will now focus your attention on earth and space science. You have looked at how organisms change over time due to natural selection, but what processes cause the earth to change over time?

During your study of this topic, you will identify the structure of the earth and how movement in the different layers can change the earth over time. Your study of geologic processes includes resources from Conceptual Integrated Science, Thinkwell, and other online resources. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.

Conceptual Integrated Science, Chapter 22

Read chapter 22 in Conceptual Integrated Science. To locate chapter 22 in the PDF version of the e-text, go to p. 531. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following concepts and ideas, and take notes as you read:

- Draw and label the structure of the Earth.
- List and describe the evidence for continental drift, and explain why this theory was not accepted by geologists.
- Explain the composition of tectonic plates.
- Explain the forces that drive the plates.
- Define plate tectonics.
- Why are earthquakes and volcanoes commonly found at plate boundaries?

Plate Tectonics Quiz

Go to Week 7 of the Conceptual Integrated Science course. Click on “Chapter 22 Plate Tectonics Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

Conceptual Integrated Science, Chapter 23

Read chapter 23 in Conceptual Integrated Science. To locate chapter 23 in the PDF version of the e-text, go to p. 557. Be sure to define any vocabulary, clarify any confusing
topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to and take notes on the following questions, concepts, and ideas as you read these selections.

- How is a rock different than a mineral?
- How are igneous, sedimentary, and metamorphic rocks formed?
- What are the characteristics of igneous, metamorphic, and sedimentary rocks? Give examples.
- What are the processes of weathering, erosion, deposition, and sedimentation?
- What are the processes that act on a rock as it passes through the rock cycle?

**Rocks and Minerals Quiz**

Go to Week 7 of the Conceptual Integrated Science course. Click on “Chapter 23 Rocks and Minerals Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

**Conceptual Integrated Science, Chapter 24**

Read chapter 24 in Conceptual Integrated Science. To locate chapter 24 in the PDF version of the e-text, go to p. 582. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following, and take notes on as you read:

- Explain the processes involved in the hydrologic cycle.
- How does the action of water, gravity, wind, and glaciers change the surface of the land?

**Website Visit**

**URL:**

*Weathering*

http://uregina.ca/~sauchyn/geog221/wthrng.html

Visit the “Weathering” web link above and take notes on the following question:

- How do you define physical weathering and frost shattering?

**Earth’s Surface Quiz**

Go to Week 7 of the Conceptual Integrated Science course. Click on “Chapter 24 Earth’s Surface Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.
☐ **Erosion and Landforms**  
Read sections 4.3 and 4.5 in Thinkwell. Take notes on the following questions as you read:  
- What causes the formation of landforms?  
- What are the characteristics of mountains, rivers, glaciers, deltas, alluvial plains, deserts, and volcanoes?

☐ **Website Visit**  
**URL:**  
Landforms  
http://www.enchantedlearning.com/geography/landforms/glossary.shtml  
Visit the “Landforms” web link above and take notes on the various types of landforms. Make flashcards to help you remember them.

☐ **Thinkwell Exercises**  
Complete the exercises for chapters 4.3 and 4.5. Check your answers and review concepts as needed. Discuss any questions you may have with a course mentor or in the learning community.

☐ **Geology Discussion**  
Go to the Natural Science Learning Community and click on the “Geology” discussion thread. Post a message describing something new you learned about geologic processes.  
Read through the messages under the “Geology” discussion thread and respond to one message.

---

**Week 8**  
**Earth and Space Science Part II**  
The activities associated with this subject will compare the objects in the solar system and investigate gravitational force.

**Background Information**  
The focus of these activities is to compare and contrast the world’s oceans, to differentiate between weather and climate, to describe the cyclical nature of water as it moves between the atmosphere and the earth’s surface, and to explain the structure and organization of the objects found in the solar system.

**Competency 102.5.4: Earth and Space Science Knowledge**  
The graduate knows, understands, and uses the fundamental concepts of earth and space science.

**Oceans and Atmosphere**  
During your study of geologic processes, you learned about convection currents in the earth’s mantle. There are also convection currents in the atmosphere that result in the circulation of air. As you complete the activities in this topic, you will examine the differences between weather and climate. Your study of oceans and atmosphere includes resources from Conceptual Integrated Science and Thinkwell. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.
Weather and Climate
Read section 4.7 in Thinkwell. Take notes on the concepts of defining weather and climate as you read.

Thinkwell Exercises
Complete the exercises for section 4.7. Check your answers and review concepts as needed. Discuss any questions you may have with a course mentor or in the learning community.

Currents and Tidal Forces
Read section 4.10 in Thinkwell. Take notes on the following questions as you read:
• Why does the moon have a greater impact on tides than the sun?
• How does the interplay of the sun’s and moon’s gravity influence the tides?
• Why are surface currents important in the ocean’s circulation?

Thinkwell Exercises
Complete the exercises for section 4.10. Check your answers and review concepts as needed. Discuss any questions you may have with a course mentor or in the learning community.

Conceptual Integrated Science, Section 25.1
Read section 25.1 in Conceptual Integrated Science. To locate section 25.1 in the PDF version of the e-text, go to p. 605. Take notes on the following questions as you read:
• What are the six weather elements?
• How is climate different from weather?

Weather Quiz
Go to Week 8 of the Conceptual Integrated Science course. Click on “Chapter 25 Weather Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

Solar System
What role does gravity have in the solar system? How does it affect the formation of galaxies, solar systems, and planets? As you complete the activities associated with this topic, you will identify the unique characteristics of the planets in the solar system and identify other objects contained therein. You will also learn about the universal law of gravitation. Your study of the solar system includes resources from Conceptual Integrated Science and other online resources. Be sure to utilize each of these resources, as they provide a broad range of viewpoints on the topics you will need to master to achieve competency in this topic.

Conceptual Integrated Science, Chapter 5
Read chapter 5 in Conceptual Integrated Science. To locate chapter 5 in the PDF version of the e-text, go to p. 104. Be sure to define any vocabulary, clarify any confusing topics,
and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to the following questions, and take notes on concepts and ideas as you read:

- What is the law of gravitation?
- How does a change in mass or a change in distance affect gravitational pull?
- What is a satellite?

**Gravity Quiz**

Go to Week 8 of the Conceptual Integrated Science course. Click on “Chapter 5 Gravity Quiz,” answer the quiz questions, submit for grading, and then check your answers.

The quizzes found in the provided learning resources can be very helpful in progressing through this area. They are designed to help you identify areas where you may be struggling. It is important to take these quizzes to assess your own progress. Once you have completed the quiz and received your results, compare your lower scoring areas with your study journal. Does your journal address these questions, or are there holes in your notes? Discuss any questions you may have with a course mentor or in the learning community.

**Conceptual Integrated Science, Chapter 27**

Read chapter 27 in *Conceptual Integrated Science*. To locate chapter 27 in the PDF version of the e-text, go to p. 653. Be sure to define any vocabulary, clarify any confusing topics, and answer all of the listed questions (if applicable) in your study notebook. Seek assistance in the learning community as needed. Pay close attention to and take notes on the following questions, concepts, and ideas as you read these selections:

- How does the universal law of gravitation apply to objects in the solar system?
- What are the characteristics of the inner and outer planets?
- What is the size of the moon, and what are its surface features?
- What are the differences among meteors, asteroids, and comets?

**Website Visit**

**URLs:**

**Moon**

http://www.nasa.gov/worldbook/moon_worldbook.html

**Gravity**

http://science.howstuffworks.com/question232.htm

Visit the websites above and take notes on the following concepts.

**Moon**

- Describe the rotation, orbit, and surface features of the moon.

**Gravity**

- What is the gravitational force?
- Explain Einstein’s general theory of relativity.

**Solar System Quiz**

Go to Week 8 of the Conceptual Integrated Science course. Click on “Solar System Quiz,” answer the quiz questions, submit for grading, and then check your answers.
**Week 9**

**Demonstrating Competency Part I**

You have successfully completed the content for ISC4/ISC5. This subject will prepare you for taking the ISC4/ISC5 assessment.

**Preassessment and Assessment**

The activities associated with this topic will prepare you for taking the ISC4/ISC5 assessment.

- **Preparing to Take the Preassessment**
  
  Now that you have done the reading and worked through the Conceptual Integrated Science quizzes, you are ready to take the preassessment (PAIC) for the ISC4/ISC5 objective assessment.

- **Take the PAIC**
  
  You can request this through your AAP. To request the PAIC:
  - Find the PAIC on your AAP.
  - Click the “Yes” link under the “Preassessment Available” section.
  - Click the link to request to take this preassessment.
  - Wait for your mentor to approve this request.

  This preassessment can be taken on your computer at home or any other convenient location. Do not use your notes or texts when taking the preassessment. This will better indicate areas you will need to review before taking the ISC4/ISC5 assessment. The preassessment takes approximately two hours to complete and covers 43 items. A passing score on the PAIC is 54% or better.

- **Additional Review**
  
  Based on your PAIC scores, additional review may be needed.
  - Review the coaching report on your AAP.
  - Find the topics where you scored low and review the corresponding sections in the course of study.
  - Contact a course mentor and your mentor for additional information.

- **Referring for the ISC4/ISC5**
  
  Once you have obtained a satisfactory score on the preassessment, you are ready to demonstrate your competency in the natural sciences domain by taking the ISC4/ISC5 objective assessment. During a call with your mentor, you will refer for and schedule your ISC4/ISC5 assessment.
  - Look at your AAP.
  - Find ISC4/ISC5. Click the “Assessment Referral” tab.
  - Click the “Request Assessment” tab.
  - Find your proctored site.
  - Enter the dates when you prefer to take the assessment.
  - Wait for your mentor to approve this request.

  The assessment takes approximately two hours to complete. Each form contains a total of 43 items. The IBT Prometric server "counts" each matching item as a separate item. The IBT item “counts” range from 99 to 106 depending on the form of the assessment you receive. A passing score on the ISC4/ISC5 is 54% or better. You will be setting the date for the completion of this exam as your drop date. This is the date that this exam must be completed by or you will receive a “Not Passed” on your first attempts. “Not Passed” does
appear on your transcript if it is not removed during the current term. It is very important for you to continually move forward with your degree.

**Week 10**

**Natural Sciences Application Part I**

The activities associated with this subject will assist you in choosing a science project and completing a scientific report.

**Background Information**

Congratulations on successfully completing ISC4/ISC5! Now that you have successfully demonstrated competency on the ISC4/ISC5 objective assessment, you are ready to begin your ISA4 assessment in TaskStream. **Note: Business, IT, and ISC5 students do not complete ISA4.**

Your first task is to select and perform a science project. Choose a topic that investigates the relationship between two variables and has a measurable outcome.

**Competency 102.2.5: Scientific Inquiry**

The graduate plans, conducts, and reports a scientific investigation to test a hypothesis.

**Science Project**

Use the following resources to design and conduct a scientific inquiry project. Write a report that includes an experimental design plan, a summary of data collected, and a conclusion that supports or rejects the hypothesis.

- **Review Thinkwell’s Scientific Inquiry**
  Review your notes from Week 1 or return to Week 1 and review the activities for scientific inquiry.

- **Website Visit**
  **URLs:**
  - Science Project Ideas
  - Writing Hypotheses
  - Variables

Visit the “Science Project Ideas,” “Hypothesis,” and “Variables” web links above and take notes on the following concepts.

**Science Project Ideas**
- Read through the science project ideas and write down topics you find interesting.

**Writing Hypotheses**
- What is a hypothesis?

**Variables**
- Define the independent, dependent, and controlled variables.
Choosing a Science Project
After researching possible science project ideas, choose a topic that interests you. Answer the following questions to determine if your topic is a good experimental question.

- Does your topic investigate the relationship between two variables?
- Can you put your question into this format: “How does __________ affect ______________?”
- Are your results quantifiable?
- Will you use a measurement tool and measurement unit to collect your data?

Science Project Discussion
Post your topic idea in the “Science Project” discussion thread. Share your idea and how you are planning on measuring the results. Please indicate if you would like feedback on your project topic. Read through the other posts and offer suggestions or encouragement to your peers.

Write Part A of the Report
URL:
ISA4 Task #1 Sample Report

Follow the instructions in TaskStream and write Part A of the report. Part A describes how you are planning on performing the experiment and collecting the data. Include a blank data table showing how you will collect and organize the data. Conduct an Internet search and find two to three experiments that relate to your topic, summarize them, and keep a record of your references. Use the sample report above to help you organize your report.

Perform the Experiment and Finish Writing the Report
Conduct your experiment following your design plan from Part A. Follow the TaskStream instructions for Part B.

Compare Your Task to the Task Checklist
Compare your report to the task checklists for Part A and Part B before submitting in TaskStream for evaluation.

TASK CHECKLIST – Part A
Project Design – Completed Before Performing the Experiment

- Include a clear description of your project (refer to Thinkwell 102.5.2 section 2.2.1 “Determining the Question”).
- Summarize two similar experiments that other people have completed (articles, websites, etc.).
- Cite the references for the similar experiments using in-text citations (refer to the sample report for examples and Thinkwell 102.5.2 section 2.1.7 "Designing a Scientific Inquiry").
- Explain the sequence of events for the experiment (i.e., how will the problem statement be tested?).
- Identify the independent and dependent variables.
- Identify the controlled variables—all the factors that are held constant in each trial.
- Explain how the design plan controls factors other than the independent variable (refer to Thinkwell 102.5.2 section “Experimental Design”).
- Identify the sequence of events that will be used to collect experimental data.
• Explain the tools that will be used to collect the data (ruler, watch, etc.).
• Identify the measurement units that will be used to collect the data.
• Include a blank template that shows how you are going to record your data (refer to the sample report for examples).

**TASK CHECKLIST – Part B**

**Scientific Report – Completed After Performing the Experiment**

• Include a clear problem statement that explains the relationship between two variables (e.g., How does the type of fertilizer affect bean plant growth?).
• State the hypothesis so it shows the proposed relationship between the variables (refer to Thinkwell section “Reviewing the Scientific Method → Hypotheses”).
• Describe the actual data collection process and equipment (tools) used.
• Explain how you ensured the quality of your data using a clear sequence of events.
• Explain the measurement units you used to ensure the quality of your data.
• Summarize your data, and explain what happened to your variables during the experiment.
• Include two graphics/diagrams—data table, bar graph, line graph, pie chart, etc. (refer to the sample report for examples and Thinkwell 102.5.2 section “Data Collecting and Reporting”).
• Include a conclusion that explains why the results of the experiment are valid (Thinkwell 102.5.2 section 2.2.3 “Identifying Common Pitfalls”).
• Explain how the data collected supports or rejects the hypothesis.
• Explain how someone else could replicate your experiment (Thinkwell 102.5.2 section 2.3.3 “Conveying Conclusions”).

**Week 11**

**Natural Sciences Application Part II**

The activities associated with this subject will assist you in completing the life science tasks.

**Background Information**

Scientists use models and diagrams to aid in understanding the form and function of organisms. The following activities will help you label a diagram of the human digestive system and create diagrams of a cell and the life cycle of a frog.

**Competency 102.5.3: Life Science**

The graduate knows, understands, and uses the fundamental concepts of life science.

**Digestive System Task**

Use the following resources to label a diagram of the digestive system. Include a summary of the functions of the digestive system structures.

- **Review Conceptual Integrated Science, Chapter 20**
  Review chapter 20 in *Conceptual Integrated Science*. To locate chapter 20 in the PDF version of the e-text, go to p. 479. Take notes on the following concepts as you read the chapter:
  • Identify the locations of the organs that are part of the digestive system.
  • What are the functions of the human digestive organs?
Labeling the Digestive System Diagram
Go to TaskStream and read the instructions and rubric for the digestive system task.
- Open the PDF or word-processing version of the digestive system diagram.
  - If you use the PDF version, copy the diagram using the camera (snapshot tool), and drag the marquee around the diagram. Open Paint, Microsoft Word, or another application and paste the diagram, and then save it to your computer.
  - If you use the word-processing version, open the diagram and save it to your computer.
- Once you have a saved version of the digestive system diagram, label the structures using textboxes (make sure the diagram itself is not selected).
- Write a paragraph describing the purpose of each major structure.

Check Your Work Using the Task Checklist
Check your work against the following checklist before submitting in TaskStream for evaluation:
- Label four digestive system structures directly on the diagram provided.
- Include a paragraph that explains the function of the four structures identified.

Submit in TaskStream
Submit this task in TaskStream for evaluation.

Cell Diagram Task
Use the following resources to create and label a diagram of a cell. Include a description of the functions of the cell organelles.

Review Conceptual Integrated Science, Chapter 15
Review chapter 15 of Conceptual Integrated Science. To locate chapter 15 in the PDF version of the e-text, go to p. 345. Take notes on the following concepts as you read the chapter:
- Identify the structures found in eukaryotic cells.
- Explain the functions of various cell organelles.

Creating a Cell Diagram
Go to TaskStream and read the instructions and rubric for the cell task.

Using a computer graphics program (Paint, PowerPoint, etc.), create and label a graphic representation of an animal cell. Save the graphic in a JPEG or GIF file format. Submit the graphic as an attachment or insert it into the TaskStream DRF as an image.

Check Your Work Using the Task Checklist
Use a computer graphics program to draw the cell diagram (no clipart or other copied images). Check your work against the following checklist:
- Save the diagram in JPEG or GIF file format.
- Include nine recognizable cell structures.
- Label the nine cell structures.
- Describe the nine labeled cell structures.

Submit in TaskStream
Submit this task in TaskStream for evaluation.
Life Cycle of the Frog Diagram
Use the following resources to create and label a diagram of a frog’s life cycle.

☐ The Frog Cycle
URL: Something Froggy

Visit the “Something Froggy” web link above and identify the stages in the life cycle of a frog.

☐ Create a Diagram of the Frog’s Life Cycle
Go to TaskStream and read the instructions and rubric for this task.

Using a computer graphics program (e.g., Paint, PowerPoint, etc.), create and label a small poster of the life cycle of a frog. Save the graphic in a JPEG or GIF file format. Submit the graphic as an attachment, or insert it into the TaskStream DRF as an image. This task can also be drawn by hand and scanned.

☐ Check Your Work Using the Task Checklist
Check your work using the following checklist:
• Include five components of the frog’s life cycle.
• Illustrate and label each component (no clipart or copied images).

☐ Submit in TaskStream
Submit this task in TaskStream for evaluation.

Week 12
Natural Sciences Application Part III
The activities associated with this subject will assist you in completing the physical science and earth and space science tasks.

Background Information
Scientists use models and diagrams to aid in understanding concepts. The following activities will help you create a diagram of geologic time, the water cycle, a hydrogen atom, and a water molecule.

Competency 102.5.4: Earth and Space Science
The graduate knows, understands, and uses the fundamental concepts of earth and space science.

Competency 102.5.5: Physical Science
The graduate knows, understands, and uses the fundamental concepts of physical science.

Geologic Time Task
Use the following resources to create and label a diagram of the geologic time scale.

☐ Geologic Time Scale
URL:
Geologic Time Scale
http://www.enchantedlearning.com/subjects/dinosaurs/glossary/TimeScaleShort.html

Visit the above website to identify eons, eras, and periods associated with geologic time.

☐ Create a Diagram of Geologic Time
Go to TaskStream and read the instructions and rubric for this task. Construct and label the geologic time scale using a graphic program (e.g., Microsoft Excel, Microsoft Word).

☐ Check Your Work Using the Task Checklist
Check your work with the following checklist:
• Include a graph saved in JPEG, GIF, or RTF file format.
• Identify 12 periods of geologic time in the correct order.
• Include the relative timeframe of each period.
• Identify three eras of geologic time in the correct order.
• Include the relative timeframe of each era.
• Identify two eons of geologic time in the correct order.
• Include the relative timeframe of each eon.

☐ Submit in TaskStream
Submit this task in TaskStream for evaluation.

Water Cycle Task
Use the following resources to create and label a diagram of the water (hydrologic) cycle.

☐ Water Cycle
URL:
Water Cycle
http://eo.ucar.edu/basics/images/usgs_water_cycle.jpg

Visit the “Water Cycle” web link above, and identify the processes involved in the water cycle.

☐ Create a Diagram of the Water Cycle
Go to TaskStream and read the instructions and rubric for this task.
• Create and label a diagram of the hydrologic (water) cycle using a graphics program (e.g., Microsoft Paint, PowerPoint, etc.).
• Include arrows to show the direction of movement in the hydrologic cycle.

☐ Check Your Work Using the Task Checklist
Check your work with the following checklist:
• Use a computer graphics program to create the diagram (no clipart, drawings, or other images) and save it in JPEG or GIF file format.
• Include arrows to show directional flow of water.
• Illustrate four elements of the water cycle.
• Label four elements of the water cycle.

☐ Submit in TaskStream
Submit this task in TaskStream for evaluation.
Hydrogen Atom/Water Molecule Task
Use the following resources to create and label a diagram of a hydrogen atom and a diagram of a water molecule.

☐ Review Biology, Chapter 2 - Chemical Context of Life
Review chapter 2 - Chemical Context of Life in Biology. Take notes on the following concepts as you review the chapter:
• Describe the structure of a water molecule.
• List the subatomic particles that comprise an atom.
• Where are protons, neutrons, and electrons located in an atom?

☐ Website Visit
URL:
Water Molecule
http://academic.brooklyn.cuny.edu/biology/bio4fv/page/polar_c.htm

Hydrogen Atom
http://physics.gmu.edu/~rms/astro113/images/L3/l03X44.GIF

Visit the “Water Molecule” and “Hydrogen Atom” web links above.
• Identify the atoms and chemical bonds associated with the water molecule.
• Identify the number of protons and electrons in a hydrogen atom.

☐ Create Hydrogen Atom and Water Molecule Diagrams
Go to TaskStream and read the instructions and rubric for this task.
• Using a graphics program (e.g., Paint, PowerPoint) create and label a model of a hydrogen atom and a water molecule.

☐ Check Your Work Using the Task Checklist
Check your work using the following checklist:
• Create two diagrams using a computer graphics program and save them in JPEG or GIF file format.
• Identify three components of the hydrogen atom. What are specific components of a hydrogen atom? What are specific regions of all atoms?).
• Illustrate and label a diagram showing three components of the hydrogen atom.
• Illustrate and label four components of the water molecule. What are the parts of this molecule and what holds the molecule together?).
• Use a computer graphics program to create the diagram (no clipart, drawings, or other images), and save it in JPEG or GIF file format.

☐ Submit in TaskStream
Submit this task in TaskStream for evaluation.

Conclusion
Congratulations on completing the natural science domain at Western Governors University! You now have an understanding of the scientific concepts, methodologies, and fundamentals of the natural sciences. You can recognize and explain key concepts and processes related to life, earth, space, and physical science. You understand the tools and processes scientists use to study science and have honed scientific skills by utilizing scientific inquiry to solve a problem. As you proceed with your education...
and your career, you will be able to explain scientific concepts and solve additional problems using an organized scientific approach. You are also now acquainted with a scientific view of the world and the importance of evidence in proving hypotheses and developing theories. You will be able to use this knowledge when forming opinions and evaluating science articles. You can stay informed of current events in science by reading science journals (Nature, Scitable, Scientific American, etc) online or in print form.

Feedback
If you wish to provide feedback on this course of study, please contact Bryan Benson at bbenson@wgu.edu.