

# WGU Guide for Secondary Science Praxis and State Content Tests

*Updated by the WGU Secondary Education Science Team*

## Start here…

This guide will help you get started with your Praxis or state content test study with free online learning resources. These resources are aimed at learners planning to teach grades 9-12; some are not recommended for middle grades or elementary science teacher candidates. Another WGU Guide has been prepared for elementary science teacher candidates. Work with a tutor if you can. Rely on your WGU Mentor to help you stay on track with program requirements and deadlines. Passing high-stakes standardized tests is a team effort – you are not alone!

## What are the topics covered in the guide?

Topics covered in this guide are:

- FAQs: What to expect from any science Praxis or State Content Test
- **Discipline specific content**
  - Biology (Life Sciences)
  - Chemistry (Physical Sciences)
  - Physics (Physical Sciences)
  - Earth & Space Sciences
- **Content common to all tests regardless of discipline:**
  - Concepts in Science
  - Science Inquiry & Society (includes engineering & technology)

## FAQs: What to expect from any Science Praxis or State Content Test

**When should I take this test?**

Give yourself at least 4 weeks of serious study before registering for the test. There is a waiting period before you can retake the test. Keep this in mind while planning when to take your test. The waiting period can be as long as 28 days. Please check the ETS website for the current waiting period.

**Where can I take the test?**

You may take Praxis tests either at home with ProctorU or at a testing center; check sites for updated access and cost information. If you go to a testing center, then follow the ETS Testing Center Guidelines. Please **test your system BEFORE exam day** – follow ETS At Home Testing Guidance.

**What COVID (or other disease) protocols should I be aware of?**

Please check with your local testing center before test day. You may need to bring proof of vaccination or your own mask to wear throughout the experience. Follow the ETS testing center guidelines.

- If you are taking the Praxis at home, there may still be specific criteria to follow.

**Are there additional study guides?**

Each Science Praxis or state content test has a study guide or study companion provided by the publisher or state at no cost.

**Can I use any calculator?**

While state content tests may allow you to use an on-screen calculator, **you will not be allowed a calculator for any Secondary Science *Praxis* test**.

**Can I use formula sheets?**
There will be **no physics or chemistry formula sheets** for Praxis tests, but you will be provided a very plain onscreen **periodic table** and a **table of information**. State content tests may provide online formula sheets or tables of information with different formats or topics.

**May I use anything else to help me?**
You may use scratch paper at a testing center or a whiteboard at home. Be prepared to show both sides of the whiteboard to the proctor to show it is clean; if the whiteboard is bolted to the wall, show that it cannot be removed. You may use only those materials provided to you or approved by the proctor, such as pencils or whiteboard pens and erasers. Otherwise, your work area must be completely clean.

**What question formats are on the test? Multiple choice, short answer, essay, etc.?**
Each test is comprised of mostly of multiple choice test items. Most questions will be standard: select one answer from four options. Some test items will have multiple correct answers. You may also encounter at least one "drag & drop" test item where you are asked to move answer options to various parts of the screen.

While Science Praxis tests do not contain short answer or essay items, some state content tests do. For example, California's CSET tests are famous for challenging essay items on a variety of topics in multiple science disciplines.

**Is there partial credit for answers that have multiple correct answers?**
More than 10% of each test may involve multiple choice items where you select more than one answer option; all responses must be correct, or the entire test item will be marked wrong. There is no partial credit.

**Where can I get information about accommodations?**
If you need accommodation for medical or language concerns, please refer to the test site for further guidance. Testing center locations or dates may be limited. See the ETS Disabilities page and the ETS Bulletin Supplement for Test Takers with Disabilities or Health-Related Needs.

If your primary language is not English (PLNE), then go to the **bottom of page 12** of the ETS Praxis Tests Information Bulletin for guidance how to request extended testing time.

Praxis tests require a lot of documentation for an accommodation request. ETS may take weeks to review those documents and not every request for accommodation is granted.

**Is there a waiting period in between attempts?**
There is usually a mandatory waiting period between attempts at the *Praxis* or state content tests; check individual sites for more specific information.

## Discipline Specific Content: *Biology* (Life Sciences)

**Get organized: What do you know and need to know?**
Not every test is available every month so plan ahead to schedule study time as well as register for the test itself.

We recommend reviewing these topics and identifying areas requiring further study. No calculator is permitted for the Praxis but may be allowed on a state content test. You may have access to an online **periodic table** and **table of information**.

The ETS Study Companion for the Biology (5236) Praxis includes very helpful information about the test and preparation.

- Page 3 describes the overall test, such as number of questions and time allowed.
- Pages 5-17 provide a detailed breakdown of content with each topic, which include:
    - Nature and Impact of Science and Engineering (13%)
    - Cell Biology: Cell Structure and Function (22%)
    - Genetics and Evolution (26%)
    - Diversity of Life and Organismal Biology (20%)
    - Ecology: Organisms and Environments (19%)

The ETS Study Companion for the Biology: Content Knowledge (5235) Praxis includes very helpful information about the test and preparation.

- Page 5 describes the overall test, such as number of questions and time allowed.
- Pages 6-11 provide a detailed breakdown of content with each topic, which include:
    - Nature of Science: Scientific Inquiry, Methodology, Techniques, and History (15%)
    - Molecular and Cellular Biology (20%)
    - Genetics and Evolution (20%)
    - Diversity of Life and Organismal Biology (20%)
    - Ecology: Organisms and Environments (15%)
    - Science, Technology, and Social Perspectives (10%)

**Review major historical figures: Who did what when?**
As you work through these materials, make note of the major historical figures who have contributed to science. There is no set list so limit yourself to the 10 most famous people in your field.

- Make a timeline from 1500-2000 CE. Add scientists to this timeline as you encounter them. Indicate when they worked and what they did. For example: *Marie Curie – early 1900s – researched radioactivity*.
- You may also look at this list of famous biologists.

**Use key resources: How can you fill key knowledge gaps?**
Once you determine concept areas requiring review, here are some recommended resources:

Videos:

- Amoeba Sisters - Biology
    - Ameoba Sisters Handouts
- Bozeman Science - Biology
- Crash Course - Ecology
- Khan Academy - Biology

**Pay attention to other exam content: Have you reviewed the basic principles of science?**

- Concepts in Science
- Science Inquiry & Society (includes engineering & technology)

**Work through practice questions: Did you master the concepts?**
Content knowledge is not enough! You need to practice solving sample test items. Consider your test-taking strategy while you work through sample questions from reliable sources.

- Start with the appropriate ETS Study Companion:
  - Biology (5236): take the sample Praxis test on pages 23-48.
  - Biology: Content Knowledge (5235): take the sample Praxis test on pages 17-27.
- If appropriate, check your state content test site for a free sample test.
- Do not pay for full-length sample tests unless necessary. ETS is currently sending access to a full-length sample test at no additional cost when you register for the Praxis – that practice is subject to change and may end with no notice.
  - If you choose to purchase a full-length sample test for the Biology: Content Knowledge (5235) Praxis, please select Form 2.

For additional study materials from ETS, please see:

- Biology (5236) Praxis page
- Biology: Content Knowledge (5235) Praxis page

## Discipline Specific Content: *Chemistry* (Physical Sciences)

**Get organized: What do you know and need to know?**
Not every test is available every month so plan ahead to schedule study time as well as register for the test itself.

We recommend reviewing these topics and identifying areas requiring further study. No calculator is permitted for the Praxis but may be allowed on a state content test. You may have access to an online **periodic table** and **table of information**.

The ETS Study Companion for the Chemistry (5246) Praxis includes very helpful information about the test and preparation.

- Page 3 describes the overall test, such as number of questions and time allowed.
- Pages 5-14 provide a detailed breakdown of content with each topic, which include:
    - Nature and Impact of Science and Engineering (14%)
    - Principles and Models of Matter and Energy (25%)
    - Chemical Composition, Bonding, and Structure (20%)
    - Chemical Reactions and Periodicity (23%)
    - Solutions and Acid-Base Chemistry (18%)

The ETS Study Companion for the Chemistry: Content Knowledge (5245) Praxis exam includes very helpful information about the test and preparation.

- Page 5 describes the overall test, such as number of questions and time allowed.
- Pages 6-10 provide a detailed breakdown of content with each topic, which include:
    - Basic Principles of Matter and Energy; Thermodynamics (15%)
    - Atomic and Nuclear Structure (10%)
    - Nomenclature; Chemical Composition; Bonding and Structure (15%)
    - Chemical Reactions; Periodicity (20%)
    - Solutions and Solubility; Acid-Base Chemistry (15%)
    - Scientific Inquiry and Social Perspectives of Science (13%)
    - Scientific Procedures and Techniques (12%)

**Review major historical figures: Who did what when?**
As you work through these materials, make note of the major historical figures who have contributed to science. There is no set list so limit yourself to the 10 most famous people in your field.

- Make a timeline from 1500-2000 CE. Add scientists to this timeline as you encounter them. Indicate when they worked and what they did. For example: *Marie Curie – early 1900s – researched radioactivity*.
- You may also look at this list of famous chemists.

**Use key resources: How can you fill key knowledge gaps?**
Once you determine concept areas requiring review, here are some recommended resources:

**Videos**:

- Penguin Prof - Start with *Chemistry Basics Part I + Chemistry Basics Part II*
- Tyler DeWitt Chemistry YouTube Channel
- Melissa Maribel Chemistry YouTube Channel
- Bozeman Science – Chemistry
- Khan Academy - Chemistry

**Textbook**:

- OpenStax Chemistry - Use 'view online' mode for best results.

**Periodic Tables:**

- Interactive online
    - Electron configurations
- Plain
    - Other styles

**Pay attention to other exam content: Have you reviewed the basic principles of science?**

- Concepts in Science
- Science Inquiry & Society (includes engineering & technology)

**Work through practice questions: Did you master the concepts?**

Content knowledge is not enough! You need to practice solving sample test items. Consider your test-taking strategy while you work through sample questions from reliable sources.

- Start with the appropriate ETS Study Companion:
    - Chemistry (5246): take the sample Praxis test on pages 21-36.
    - Chemistry: Content Knowledge (5245): take the sample Praxis test on pages 17-27.
- If appropriate, check your state content test site for a free sample test.
- Do not pay for full-length sample tests unless necessary. ETS is currently sending access to a full-length sample test at no additional cost when you register for the Praxis – that practice is subject to change and may end with no notice.

For additional study materials from ETS, please see:

- Chemistry (5246) Praxis page
- Chemistry: Content Knowledge (5245) Praxis page

## Discipline Specific Content: *Physics* (Physical Sciences)

**Get organized: What do you know and need to know?**
Not every test is available every month so plan ahead to schedule study time as well as register for the test itself.

We recommend reviewing these topics and identifying areas requiring further study. No calculator is permitted for the Praxis but may be allowed on a state content test. You may have access to an online **periodic table** and **table of information**.

Physics Praxis and state content exams are not calculus-based! **Be prepared to do some algebra by hand** or to set up a strategy using specific formulae. You will not be expected to fully solve complex math problems without a calculator.

The ETS Study Companion for the Physics (5266) Praxis includes very helpful information about the test and preparation.

- Page 3 describes the overall test, such as number of questions and time allowed.
- Pages 5-13 provide a detailed breakdown of content with each topic, which include:
  - Nature and Impact of Science and Engineering (12%)
  - Principles and Models of Matter and Energy (15%)
  - Mechanics (35%)
  - Electricity and Magnetism (21%)
  - Waves (17%)

The ETS Study Companion for the Physics: Content Knowledge (5265) Praxis exam includes very helpful information about the exam and preparation.

- Page 5 describes the overall test, such as number of questions and time allowed.
- Pages 6-10 provide a detailed breakdown of content with each topic, which include:
  - Mechanics (30%)
  - Electricity and Magnetism (20%)
  - Optics and Waves (13%)
  - Heat, Energy, and Thermodynamics (12%)
  - Modern Physics, and Atomic and Nuclear Structure (13%)
  - Scientific Inquiry, Processes, and Social Perspectives (12%)

**Review major historical figures: Who did what when?**
As you work through these materials, make note of the major historical figures who have contributed to science. There is no set list so limit yourself to the 10 most famous people in your field.

- Make a timeline from 1500-2000 CE. Add scientists to this timeline as you encounter them. Indicate when they worked and what they did. For example: *Marie Curie – early 1900s – researched radioactivity*.
- You may also look at this list of famous physicists.

**Use key resources: How can you fill key knowledge gaps?**
Once you determine concept areas requiring review, here are some recommended resources:

Tutorials:

- Physics Classroom: Tutorials for learning, interactives for simulations, video tutorials, and practice questions.
- Hyper Physics Concepts page- great for quick review of concepts, definitions, and equations.
- Sparks Notes Physics review: Reference information for most topics on the exam

Videos:

- Khan Academy - Physics
- Bozeman Science – Physics
- PBS Crash Course in Physics

- Includes content on quantum mechanics that may be on some state content exams but are not on the *Praxis* exam or fully covered in WGU courses.

**Pay attention to other exam content: Have you reviewed the basic principles of science?**

- Concepts in Science
- Science Inquiry & Society (common to all exams regardless of discipline; includes engineering & technology)

**Work through practice questions: Did you master the concepts?**

Content knowledge is not enough! You need to practice solving sample test items. Consider your test-taking strategy while you work through sample questions from reliable sources.

- Start with the appropriate ETS Study Companion:
  - Physics (5266): take the sample Praxis test on pages 19-34.
  - Physics: Content Knowledge (5265): take the sample Praxis test on pages 16-21.
- If appropriate, check your state content test site for a free sample test.
- Do not pay for full-length sample tests unless necessary. ETS is currently sending access to a full-length sample test at no additional cost when you register for the Praxis – that practice is subject to change and may end with no notice.

For additional study materials from ETS, please see:

- Physics (5266) Praxis page
- Physics: Content Knowledge (5265) Praxis page

Students find overlap in preparation for the *Praxis* exam with the *AP Physics* exam. Here are links to the study guides for the *AP Physics I* and *AP Physics II* test prep. Each course includes relevant review materials, practice questions, and equation sheets.

- A Plus AP Physics Practice
- Giancoli AP Physics Practice
- College Board - AP Physics I
- College Board – AP Physics I - Booklet
  - Review materials begin on page 33. Sample test questions on page 208, answer key found on page 221. Equation sheet found on page 244; these will NOT be provided on the *Praxis.*
- College Board – AP Physics II
  - Review materials begin on page 36. Sample test questions on page 225, answer key found on page 233. Equation sheet found on page 244-245; these will NOT be provided on the *Praxis*.

## Discipline Specific Content: *Earth and Space Sciences*

**Get organized: What do you know and need to know?**
Not every test is available every month so plan ahead to schedule study time as well as register for the test itself.

We recommend reviewing these topics and identifying areas requiring further study. No calculator is permitted for the Praxis but may be allowed on a state content test. You may have access to an online **periodic table** and **table of information**.

The ETS Study Companion for the Earth and Space Sciences (5572) Praxis includes very helpful information about the test and preparation.

- Page 3 describes the overall test, such as number of questions and time allowed.
- Pages 5-17 provide a detailed breakdown of content with each topic, which include:
    - Nature and Impact of Science and Engineering (15%)
    - Earth's Processes and Materials (45%)
    - Earth's Hydrosphere and Atmosphere (22%)
    - Astronomy (18%)

The ETS Study Companion for the Earth and Space Sciences: Content Knowledge (5571) Praxis exam includes very helpful information about the exam and preparation.

- Page 5 describes the overall test, such as number of questions and time allowed.
- Pages 6-10 provide a detailed breakdown of content with each topic, which include:
    - Basic Principles and Processes (10%)
    - Tectonics and Internal Earth Processes (15%)
    - Earth Materials and Surface Processes (25%)
    - History of Earth and its Life-forms (15%)
    - Earth's Atmosphere and Hydrosphere (20%)
    - Astronomy (15%)

**Review major historical figures: Who did what when?**
As you work through these materials, make note of the major historical figures who have contributed to science.

- Make a timeline from 1500-2000 CE. Add scientists to this timeline as you encounter them. Indicate when they worked and what they did. For example: *Marie Curie – early 1900s – researched radioactivity*.
    - Famous Earth scientists are Nicholas Steno, James Hutton, Charles Lyell, Charles Darwin, Alfred Wegener, Harry Hess, and Inge Lehman.
- You may also look at this list of famous astronomers for: Nicolas Copernicus, Tycho Brahe, Johannes Kepler, Galileo Galilei, Isaac Newton, Albert Einstein, and Stephen Hawking.

**Use key resources: How can you fill key knowledge gaps?**
Once you determine concept areas requiring review, here are some recommended resources:
Textbooks:

- Physical Geology
- Physical Geography
- Geology.com
- Earth & Space Science

Videos – Earth Sciences:

- Khan Academy – Earth Sciences
- Bozeman Science – Earth Sciences
- Vision Learning – Earth Sciences

Videos – Specific subjects:

- Mike Sammartano – Geology
- PBS – Surface Processes
- NWS - Meteorology
- Crash Course - Ecology

Videos – Astronomy:

- Crash Course - Astronomy
- Khan Academy - Astronomy

**Pay attention to other exam content: Have you reviewed the basic principles of science?**

- Concepts in Science
- Science Inquiry & Society (includes engineering & technology)

**Work through practice questions: Did you master the concepts?**

Content knowledge is not enough! You need to practice solving sample test items. Consider your test-taking strategy while you work through sample questions from reliable sources.

- Start with the appropriate ETS Study Companion:
  - Earth and Space Sciences (5572): take the sample Praxis test on pages 23-44.
  - Earth and Space Sciences: Content Knowledge (5571): take the sample Praxis test on pages 16-23.
- If appropriate, check your state content test site for a free sample test.
- Do not pay for full-length sample tests unless necessary. ETS is currently sending access to a full-length sample test at no additional cost when you register for the Praxis – that practice is subject to change and may end with no notice.

For additional study materials from ETS, please see:

- Earth and Space Sciences (5572) Praxis page
- Earth and Space Sciences: Content Knowledge (5571) Praxis page



## Content Common to All Exams: *Concepts in Science*

**What do you need to know about Concepts in Science content common to all tests?**
Sometimes *Praxis* or state content test study guides provided by the test publisher calls this section something else. It's important to understand, though, that the content is all the same.

Here are some descriptions of the same domain:

- Basic Principles and Processes
- Scientific Procedures and Techniques
- Nature of Science: Scientific Inquiry, Methodology, Techniques, and History

This material is very straightforward and can be mastered quickly because you probably learned this content earlier in your academic career.

**Use key resources: How can you fill key knowledge gaps?**
Once you determine concept areas requiring review, here are some recommended resources:

Textbooks:

- OpenStax Chemistry - Use 'view online' mode for best results.

Videos – Math Basics:

- Metric System - Vision Learning
- Metric System - Math Antics
- Units of Distance – Math Antics
- Scientific Notation – Tyler DeWitt
- Significant Figures – Tyler DeWitt

Videos – Math in Science:

- Math in Science – Vision Learning
- Data Analysis & Interpretation – Vision Learning
- Graphs & Visual Data – Vision Learning
- Statistics & Graphing — Bozeman Science

Videos - Accuracy and Precision

- Accuracy & Precision – TED Ed
- Accuracy & Precision – Tyler DeWitt
- Sources of Error – James Budarz
- Uncertainty, Error, Confidence – Vision Learning



## Content Common to All Exams: Science Inquiry & Society

**What do you need to know about Science Inquiry & Society content common to all tests?**
Sometimes *Praxis* or state content test study guides provided by the test publisher calls this section something else. It's important to understand, though, that the content is all the same.

Here are some descriptions of the same domain:

- Science, Technology, and Social Perspectives
- Scientific Inquiry and Social Perspectives of Science
- Scientific Inquiry, Processes, and Social Perspectives

This materials is very straightforward and can be mastered quickly because you probably learned this content earlier in your academic career.

**Use key resources: How can you fill key knowledge gaps?**
There is no one way to approach scientific inquiry; what you may have learned as "scientific method" is general guidance rather than a one-size-fits-all rule regardless of discipline.

Tutorials

- HHMI BioInteractive – How Science Works
- Vision Learning – Scientific Method
- Vision Learning – Process of Science
- Teach Engineering - Engineering Design Process

Educational Standards:

- Since 2012, most states revised their science education standards to align with "A Framework for K-12 Science Education".
- Be prepared to answer questions about the following:
    - Nature of science
    - Crosscutting relationships among disciplines
    - Science and engineering practices in the classroom
    - The role of science, engineering, or technology in society.