

chemistry pogil answer key

chemistry pogil answer key materials are essential resources for educators and students engaging with Process Oriented Guided Inquiry Learning (POGIL) activities in chemistry. These answer keys provide detailed solutions and explanations for POGIL exercises, which are designed to promote active learning and critical thinking in the study of chemistry. Utilizing a chemistry POGIL answer key helps verify student responses, facilitates self-assessment, and supports instructors in delivering effective feedback. This article explores the purpose and advantages of chemistry POGIL answer keys, discusses their role in enhancing learning outcomes, and offers guidance on how to use them efficiently within chemistry curricula. Additionally, it addresses common questions and best practices for integrating these answer keys in both classroom and remote learning environments.

- Understanding Chemistry POGIL and Its Educational Benefits
- The Role of a Chemistry POGIL Answer Key
- How to Use Chemistry POGIL Answer Keys Effectively
- Advantages of Incorporating POGIL Answer Keys in Chemistry Instruction
- Best Practices for Educators Utilizing Chemistry POGIL Answer Keys
- Common Challenges and Solutions When Using POGIL Answer Keys

Understanding Chemistry POGIL and Its Educational Benefits

Process Oriented Guided Inquiry Learning (POGIL) is an instructional approach that emphasizes student-centered learning through structured group activities. In chemistry education, POGIL engages students with carefully designed models and questions that encourage exploration and critical thinking. The method fosters a deeper understanding of chemical concepts by guiding students step-by-step through inquiry-based tasks rather than passive lecture formats. Chemistry POGIL activities typically cover a broad range of topics, from atomic structure and chemical bonding to thermodynamics and reaction kinetics. This approach aligns with active learning principles and has been shown to improve retention and comprehension in chemistry courses.

Key Features of Chemistry POGIL Activities

Each POGIL activity is structured around a model or set of data, followed by guided questions that gradually build understanding. Key features include:

- Collaborative learning in small groups
- Focus on process skills such as data interpretation and reasoning
- Incremental questioning to scaffold complex concepts
- Emphasis on student ownership of learning
- Development of communication and teamwork skills

The Role of a Chemistry POGIL Answer Key

A chemistry POGIL answer key serves as a comprehensive solution guide for the questions and problems presented in POGIL activities. It provides correct answers along with explanations that clarify the reasoning behind each response. This resource is invaluable for instructors, enabling them to verify student work and offer targeted feedback. For students, answer keys are tools for self-evaluation and reinforcement of concepts after completing activities independently or in groups. The answer key also supports consistency in grading and helps maintain the integrity of the learning process.

Components of a Typical Chemistry POGIL Answer Key

Answer keys vary depending on the activity but generally contain the following elements:

- Clear, step-by-step solutions to all guided questions
- Explanations of underlying chemical principles
- Examples illustrating problem-solving strategies
- Clarifications on common misconceptions
- References to relevant textbook sections or supplementary materials

How to Use Chemistry POGIL Answer Keys Effectively

The effective use of a chemistry POGIL answer key enhances the learning process without undermining the inquiry-based nature of the activities. Educators should encourage students to attempt all questions independently or collaboratively before consulting the answer key. Post-activity review sessions guided by the answer key can clarify misunderstandings and deepen comprehension. Additionally, answer keys can be used as a reference during lesson planning to anticipate student difficulties and tailor instruction

accordingly.

Strategies for Integrating Answer Keys into Instruction

Some recommended practices for leveraging chemistry POGIL answer keys include:

1. Distributing answer keys only after students have completed the activity to promote critical thinking.
2. Using answer keys to facilitate group discussions and peer instruction.
3. Providing partial answers or hints instead of full solutions to stimulate problem-solving.
4. Incorporating answer keys into formative assessments to track student progress.
5. Encouraging students to compare their answers with the key to identify errors and misunderstandings.

Advantages of Incorporating POGIL Answer Keys in Chemistry Instruction

Integrating answer keys alongside POGIL activities offers multiple benefits for both students and instructors. For students, answer keys provide immediate feedback and reinforce learning by explaining complex concepts with clarity. This transparency helps build confidence and reduces frustration during challenging topics. For educators, answer keys save preparation time, improve grading accuracy, and promote uniform standards across different classes. Furthermore, answer keys support differentiated instruction by allowing learners to progress at their own pace.

Benefits Summary

- Enhances student understanding through guided feedback
- Supports active learning and inquiry-based pedagogy
- Facilitates efficient and consistent grading for instructors
- Promotes self-directed learning and accountability
- Assists in identifying and addressing common student misconceptions

Best Practices for Educators Utilizing Chemistry POGIL Answer Keys

To maximize the educational value of chemistry POGIL answer keys, instructors should adopt best practices that align with active learning principles. Maintaining the balance between guidance and independent thinking is crucial. Educators are encouraged to use answer keys as teaching aids rather than simple grading tools. Incorporating answer keys into reflective activities and discussions enhances conceptual clarity and critical analysis.

Recommended Educator Approaches

- Use answer keys to design formative quizzes or review sessions
- Encourage students to explain their reasoning before consulting the key
- Integrate answer keys into collaborative peer-review activities
- Adapt answer keys to align with specific course goals and student needs
- Monitor student use of answer keys to prevent overreliance

Common Challenges and Solutions When Using POGIL Answer Keys

Despite their benefits, chemistry POGIL answer keys may present challenges if not managed appropriately. Overdependence on answer keys can diminish student engagement and critical thinking. Some students might use answer keys prematurely, bypassing the inquiry process. Additionally, discrepancies between answer keys and student responses can create confusion if not addressed properly.

Addressing Challenges

Effective strategies to overcome these obstacles include:

- Setting clear guidelines on when and how answer keys should be used
- Encouraging active problem-solving before consulting solutions
- Providing opportunities for students to discuss differing answers and reasoning
- Updating answer keys regularly to reflect curriculum changes and feedback
- Incorporating instructor-led debriefs to clarify complex answers

Frequently Asked Questions

What is a POGIL answer key in chemistry?

A POGIL answer key in chemistry provides the correct answers and explanations for the Process Oriented Guided Inquiry Learning activities used to teach various chemistry concepts.

Where can I find a reliable chemistry POGIL answer key?

Reliable chemistry POGIL answer keys are often available through educational resources provided by instructors, official POGIL websites, or authorized academic platforms.

Are chemistry POGIL answer keys free to access?

Some chemistry POGIL answer keys are freely accessible, but many are restricted to educators or require purchase due to copyright and academic integrity policies.

How can chemistry POGIL answer keys help students?

They help students by providing detailed explanations and correct solutions to guided inquiry questions, enhancing understanding and reinforcing learning.

Can I use chemistry POGIL answer keys for exam preparation?

Yes, using POGIL answer keys can be an effective way to review concepts and practice problem-solving skills in preparation for exams.

Is it ethical to use chemistry POGIL answer keys without permission?

Using answer keys without permission can violate academic integrity policies; it's important to use them as study aids rather than shortcuts and follow your institution's guidelines.

Do chemistry POGIL answer keys cover all topics in the curriculum?

Most POGIL answer keys cover a wide range of topics included in the chemistry curriculum, but availability depends on the specific POGIL activity sets used.

How do instructors typically use chemistry POGIL answer keys?

Instructors use them to facilitate guided inquiry sessions, check student work, and provide accurate feedback during chemistry lessons.

Can chemistry POGIL answer keys be used for group study?

Yes, they are designed to support collaborative learning and can be effectively used during group study sessions to promote discussion and understanding.

What should I do if the chemistry POGIL answer key doesn't match my textbook?

If there's a mismatch, verify the edition and source of both materials, consult your instructor, or refer to official POGIL resources to ensure accuracy.

Additional Resources

1. *Chemistry POGIL Activities for High School*

This book offers a comprehensive collection of Process Oriented Guided Inquiry Learning (POGIL) activities tailored for high school chemistry students. Each activity encourages critical thinking and collaboration, helping students grasp fundamental chemistry concepts through inquiry-based learning. The answer key provides detailed explanations to support teachers in assessing student understanding effectively.

2. *POGIL® Activities for General Chemistry: The Nucleus*

Focused on nuclear chemistry, this resource contains carefully designed POGIL activities that engage students in exploring nuclear reactions, radioactivity, and nuclear stability. The accompanying answer key helps instructors quickly check student responses and clarify complex ideas. It is ideal for supplementing general chemistry courses with interactive learning methods.

3. *Process Oriented Guided Inquiry Learning in Chemistry: A Teacher's Guide*

This guidebook offers educators practical strategies for implementing POGIL in their chemistry classrooms. It includes sample activities, assessment tips, and an answer key to facilitate smooth integration of inquiry-based learning. The book emphasizes student engagement and the development of problem-solving skills.

4. *POGIL Activities for Organic Chemistry: Functional Groups and Reactions*

Designed for organic chemistry students, this collection of POGIL activities focuses on understanding functional groups and reaction mechanisms through collaborative inquiry. The answer key provides step-by-step solutions, making it easier for instructors to guide students through challenging material. It promotes active learning and deeper comprehension of organic chemistry principles.

5. *Active Learning in Chemistry: POGIL Strategies and Answer Key*

This book presents a variety of POGIL strategies aimed at fostering active learning in chemistry courses at all levels. It includes detailed answer keys that help teachers evaluate student work efficiently and provide targeted feedback. The resource supports the development of critical thinking and teamwork in the chemistry classroom.

6. POGIL for Chemistry: Molecular Structure and Bonding

Focusing on molecular structure and chemical bonding, this book contains POGIL activities that guide students through inquiry-based exploration of atomic orbitals, bonding theories, and molecular geometry. The answer key aids instructors in verifying student understanding and addressing misconceptions. It is a valuable tool for making abstract concepts accessible.

7. Guided Inquiry and POGIL in Chemistry Education

This text explores the theoretical foundations and practical applications of guided inquiry and POGIL methods in chemistry teaching. It offers a range of activities along with comprehensive answer keys to support educators in delivering effective, student-centered lessons. The book emphasizes the importance of inquiry in developing scientific reasoning skills.

8. POGIL Activities for Analytical Chemistry

Targeting analytical chemistry topics, this resource includes inquiry-based activities that cover instrumentation, quantitative analysis, and data interpretation. The detailed answer key assists instructors in managing classroom discussions and assessing student progress. It encourages the application of analytical techniques through collaborative learning.

9. Enhancing Chemistry Learning Through POGIL: Instructor's Answer Key Companion

This companion book provides answer keys and explanatory notes for a wide range of POGIL activities used in chemistry courses. It serves as an essential resource for instructors seeking to implement POGIL effectively and ensure accurate assessment. The detailed solutions help clarify student misconceptions and promote deeper understanding of chemical concepts.

[Chemistry Pogil Answer Key](#)

Chemistry POGIL Answer Key: Unlock Your Chemistry Potential

Are you struggling to grasp the complex concepts of chemistry? Do endless hours of studying leave you feeling frustrated and overwhelmed? Is your POGIL (Process Oriented Guided Inquiry Learning) workbook a source of anxiety rather than understanding? You're not alone! Many students find POGIL activities challenging, leading to confusion and lower grades. The lack of readily available, accurate answers can exacerbate this frustration, leaving you feeling lost and unsure of your progress.

This ebook, "Mastering Chemistry with POGIL: A Comprehensive Guide and Answer Key," provides the support you need to conquer your chemistry challenges. It's designed to help you understand the underlying principles, not just memorize answers.

What's Inside:

Introduction: Understanding POGIL and its benefits, effective study strategies.

Chapter 1: Fundamentals of Matter and Measurement: Detailed solutions and explanations for all POGIL activities related to the fundamentals of matter, including significant figures, unit conversions, and dimensional analysis.

Chapter 2: Atomic Structure and Periodicity: Comprehensive answers and insightful explanations for POGIL activities focusing on atomic structure, electron configurations, and periodic trends.

Chapter 3: Chemical Bonding and Molecular Geometry: Step-by-step solutions and visual aids for POGIL activities covering chemical bonding theories (Lewis structures, VSEPR theory), molecular geometry, and polarity.

Chapter 4: Chemical Reactions and Stoichiometry: Clear explanations and detailed solutions to all POGIL activities on balancing chemical equations, stoichiometric calculations, limiting reactants, and percent yield.

Chapter 5: Solutions and Aqueous Reactions: Comprehensive coverage of POGIL activities related to solution concentration, solubility, precipitation reactions, and acid-base chemistry.

Chapter 6: Thermodynamics and Equilibrium: In-depth explanations and solutions for POGIL activities on enthalpy, entropy, Gibbs free energy, equilibrium constants, and Le Chatelier's principle.

Chapter 7: Kinetics and Rate Laws: Detailed solutions and explanations for POGIL activities focused on reaction rates, rate laws, activation energy, and reaction mechanisms.

Conclusion: Review of key concepts, tips for exam preparation, and resources for further learning.

Mastering Chemistry with POGIL: A Comprehensive Guide and Answer Key

Introduction: Understanding POGIL and Effective Study Strategies

Keywords: POGIL, Process Oriented Guided Inquiry Learning, chemistry, study strategies, active learning, problem-solving, critical thinking, collaborative learning

POGIL (Process Oriented Guided Inquiry Learning) is a pedagogical approach that emphasizes active learning and collaborative problem-solving. Unlike traditional lectures, POGIL activities encourage students to actively construct their understanding of chemical concepts through guided inquiry. This approach, while beneficial for deep learning, can also present challenges for some students. The open-ended nature of POGIL activities may lead to frustration if students lack a clear understanding of the underlying principles or if they get stuck on a particular problem.

This introductory chapter aims to bridge that gap. We will explore the philosophy behind POGIL,

highlighting its strengths and addressing potential difficulties. We will also provide practical study strategies specifically tailored to succeed in a POGIL-based chemistry course.

Effective POGIL Study Strategies:

Read the introductory material thoroughly: Before attempting any POGIL activity, carefully read the introductory text and any relevant sections in your textbook. Gain a foundational understanding of the concepts before diving into the problems.

Form a study group: Collaborating with peers is crucial for POGIL. Different perspectives and problem-solving approaches can help you overcome challenges and deepen your understanding. Discuss your ideas openly, and don't be afraid to ask questions.

Break down complex problems: Divide complex POGIL activities into smaller, manageable steps.

Focus on understanding each step before moving on to the next.

Seek clarification when needed: Don't hesitate to ask your instructor or teaching assistant for help if you are stuck. They can provide guidance and clarification on any confusing concepts or problems.

Review your work regularly: Regularly review your POGIL activities and solutions to reinforce your understanding and identify areas where you need further clarification.

Use additional resources: Supplement your learning with additional resources such as online tutorials, videos, and practice problems.

Chapter 1: Fundamentals of Matter and Measurement: Detailed Solutions and Explanations

(This section would contain detailed explanations and solutions for POGIL activities related to significant figures, unit conversions, dimensional analysis, scientific notation, and density. Each problem would be broken down step-by-step with clear explanations of the underlying principles.)

This chapter will cover topics like significant figures, using the correct number of significant figures in calculations, converting between units (e.g., metric to imperial), performing dimensional analysis to solve complex problems, working with scientific notation, and calculating density and its applications. Examples will include worked-out problems and explanations illustrating the reasoning behind each step.

Chapter 2: Atomic Structure and Periodicity: Comprehensive Answers and Insightful Explanations

(This section would provide comprehensive answers and insightful explanations for POGIL activities related to atomic structure, including subatomic particles, isotopes, electron configurations, and periodic trends. Visual aids and diagrams will be used to enhance understanding.) This chapter would delve into the structure of the atom, explaining protons, neutrons, and electrons. It would cover isotopes and their properties, and systematically explain electron configurations and how to derive them using the Aufbau principle, Hund's rule, and the Pauli exclusion principle. The periodic table's structure and the trends in atomic radius, ionization energy, and electronegativity will be

explained in detail with examples from the POGIL exercises.

Chapter 3: Chemical Bonding and Molecular Geometry: Step-by-Step Solutions and Visual Aids

(This section will cover covalent, ionic, and metallic bonding. It will provide step-by-step solutions and visual aids (e.g., Lewis structures, VSEPR theory diagrams) for POGIL activities focusing on predicting molecular shapes and polarities.) This chapter will focus on different types of chemical bonds: ionic, covalent, and metallic. It will explain how to draw Lewis structures, predict molecular shapes using VSEPR theory, determine molecular polarity, and understand the relationship between molecular structure and properties. Detailed explanations and visual aids (3D representations where possible) will be included for each POGIL activity.

Chapter 4: Chemical Reactions and Stoichiometry: Clear Explanations and Detailed Solutions

(This section provides clear explanations and detailed solutions to all POGIL activities on balancing chemical equations, stoichiometric calculations, limiting reactants, and percent yield.) Balancing chemical equations will be covered using different methods, followed by a comprehensive explanation of stoichiometric calculations, including mole-to-mole, mole-to-gram, and gram-to-gram conversions. The concept of limiting reactants and percent yield will be explained in detail, with numerous examples from the POGIL activities. Students will learn how to identify the limiting reactant and calculate the theoretical and actual yield of a reaction.

Chapter 5: Solutions and Aqueous Reactions: Comprehensive Coverage of POGIL Activities

(This section provides comprehensive coverage of POGIL activities related to solution concentration (molarity, molality, etc.), solubility, precipitation reactions, and acid-base chemistry.) This chapter covers various aspects of solutions, including molarity, molality, and other concentration units. It will delve into solubility rules, predicting precipitation reactions, and performing stoichiometric calculations related to solution chemistry. Acid-base chemistry will be covered, including strong and weak acids and bases, pH, and neutralization reactions. POGIL activities related to these topics will be thoroughly explained.

Chapter 6: Thermodynamics and Equilibrium: In-Depth Explanations and Solutions

(This section offers in-depth explanations and solutions for POGIL activities on enthalpy, entropy, Gibbs free energy, equilibrium constants, and Le Chatelier's principle.) This chapter will introduce the concepts of enthalpy, entropy, and Gibbs free energy. It will explain how these thermodynamic quantities determine the spontaneity of a reaction. Equilibrium constants will be discussed, and the impact of changes in conditions (temperature, pressure, concentration) on equilibrium will be explained using Le Chatelier's principle. POGIL activities related to these topics will be meticulously solved.

Chapter 7: Kinetics and Rate Laws: Detailed Solutions and Explanations

(This section will present detailed solutions and explanations for POGIL activities focused on reaction rates, rate laws, activation energy, and reaction mechanisms.) This chapter will explain the factors that influence the rate of a reaction, including concentration, temperature, and catalysts. It will cover rate laws, including determining the order of a reaction and calculating the rate constant. Activation energy and reaction mechanisms will be discussed, with detailed explanations of how they affect reaction rates. POGIL activities will be used to illustrate these concepts.

Conclusion: Review of Key Concepts, Tips for Exam Preparation, and Resources for Further Learning

This concluding chapter will provide a concise summary of the key concepts covered in the book. It will offer valuable tips for exam preparation, such as effective study techniques and strategies for tackling challenging problems. Additionally, it will point to helpful resources for further learning, including websites, textbooks, and online tutorials. The goal is to empower students to confidently approach future chemistry challenges.

FAQs

1. What if my POGIL workbook is different from the one used in this book? The principles and

concepts are universal, so the explanations can still be helpful even if the specific problems differ slightly.

2. Can I use this book for other chemistry courses besides the one my POGIL is from? The core chemistry principles are broadly applicable, but the relevance of specific chapters might vary.
3. Is this book suitable for all levels of chemistry students? While foundational concepts are covered, the depth of explanation is designed for high school or introductory college-level chemistry.
4. How can I best utilize this answer key effectively without just copying answers? Use the explanations to understand why an answer is correct, not just that it's correct. Try the problems independently first.
5. Are diagrams included to help visualize complex concepts? Yes, wherever visually depicting concepts aids understanding, diagrams are included.
6. Does this book cover all possible POGIL activities? No, this is a guide, not an exhaustive solution manual. It's designed to aid understanding of fundamental concepts.
7. What if I still struggle after using this book? Consider seeking further help from your teacher, tutor, or study group.
8. Is this book suitable for self-study? Absolutely! It's designed to guide independent learning.
9. Are there any practice problems included beyond the POGIL answers? While the focus is on explaining the POGIL activities, the explanations provide a wealth of additional examples that act as practice problems.

Related Articles:

1. Understanding Molarity and Molality in Chemistry: Explains the difference and how to calculate these essential solution concentration units.
2. Mastering Chemical Equilibrium: A Step-by-Step Guide: Provides a detailed explanation of equilibrium concepts and calculations.
3. The Importance of Dimensional Analysis in Chemistry: A detailed explanation of dimensional analysis and its applications in problem solving.
4. Balancing Chemical Equations: A Comprehensive Tutorial: Step-by-step methods for balancing various types of chemical equations.
5. A Visual Guide to VSEPR Theory and Molecular Geometry: Uses diagrams and examples to explain molecular shapes and polarities.
6. Understanding Reaction Kinetics and Rate Laws: Explores the factors that affect reaction rates and how to calculate rate constants.
7. Thermodynamics in Chemistry: A Simple Explanation of Enthalpy, Entropy, and Gibbs Free Energy: Explains the concepts in an accessible way.
8. Acid-Base Chemistry: A Beginner's Guide: Covers the basics of acids, bases, and pH calculations.
9. How to Effectively Study Chemistry Using Active Learning Techniques: Strategies for active and effective learning.

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Garoutte, 2014-02-24 Classroom activities to support a General, Organic and Biological Chemistry text Students can follow a guided inquiry approach as they learn chemistry in the classroom. General, Organic, and Biological Chemistry: A Guided Inquiry serves as an accompaniment to a GOB Chemistry text. It can suit the one- or two-semester course. This supplemental text supports Process Oriented Guided Inquiry Learning (POGIL), which is a student-focused, group-learning philosophy of instruction. The materials offer ways to promote a student-centered science classroom with activities. The goal is for students to gain a greater understanding of chemistry through exploration.

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that exam!

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Hiram F. Gilbert, 2000 Basic Concepts in Biochemistry has just one goal: to review the toughest concepts in biochemistry in an accessible format so your understanding is thorough and complete.--BOOK JACKET.

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chemistry pogil answer key: **POGIL** Shawn R. Simonson, 2023-07-03 Process Oriented Guided Inquiry Learning (POGIL) is a pedagogy that is based on research on how people learn and has been shown to lead to better student outcomes in many contexts and in a variety of academic disciplines. Beyond facilitating students' mastery of a discipline, it promotes vital educational outcomes such as communication skills and critical thinking. Its active international community of practitioners provides accessible educational development and support for anyone developing related courses. Having started as a process developed by a group of chemistry professors focused on helping their students better grasp the concepts of general chemistry, The POGIL Project has grown into a dynamic organization of committed instructors who help each other transform classrooms and improve student success, develop curricular materials to assist this process, conduct research expanding what is known about learning and teaching, and provide professional development and collegiality from elementary teachers to college professors. As a pedagogy it has been shown to be effective in a variety of content areas and at different educational levels. This is an introduction to the process and the community. Every POGIL classroom is different and is a reflection of the uniqueness of the particular context – the institution, department, physical space, student body, and instructor – but follows a common structure in which students work cooperatively in self-managed small groups of three or four. The group work is focused on activities that are carefully designed and scaffolded to enable students to develop important concepts or to deepen and refine their understanding of those ideas or concepts for themselves, based entirely on data provided in class, not on prior reading of the textbook or other introduction to the topic. The learning environment is structured to support the development of process skills -- such as teamwork, effective communication, information processing, problem solving, and critical thinking. The instructor's role is to facilitate the development of student concepts and process skills, not to simply deliver content to the students. The first part of this book introduces the theoretical and philosophical foundations of POGIL pedagogy and summarizes the literature demonstrating its efficacy. The second part of the book focusses on implementing POGIL, covering the formation and effective management of student teams, offering guidance on the selection and writing of POGIL activities, as well as on facilitation, teaching large classes, and assessment. The book concludes with examples of implementation in STEM and non-STEM disciplines as well as guidance on how to get started. Appendices provide additional resources and information about The POGIL Project.

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chemistry pogil answer key: Barriers and Opportunities for 2-Year and 4-Year STEM Degrees National Academies of Sciences, Engineering, and Medicine, National Academy of Engineering, Policy and Global Affairs, Board on Higher Education and Workforce, Division of Behavioral and Social Sciences and Education, Board on Science Education, Committee on Barriers and Opportunities in Completing 2-Year and 4-Year STEM Degrees, 2016-05-18 Nearly 40 percent of the students entering 2- and 4-year postsecondary institutions indicated their intention to major in science, technology, engineering, and mathematics (STEM) in 2012. But the barriers to students realizing their ambitions are reflected in the fact that about half of those with the intention to earn a STEM bachelor's degree and more than two-thirds intending to earn a STEM associate's degree fail to earn these degrees 4 to 6 years after their initial enrollment. Many of those who do obtain a degree take longer than the advertised length of the programs, thus raising the cost of their education. Are the STEM educational pathways any less efficient than for other fields of study? How might the losses be stemmed and greater efficiencies realized? These questions and others are at the heart of this study. Barriers and Opportunities for 2-Year and 4-Year STEM Degrees reviews research on the roles that people, processes, and institutions play in 2-and 4-year STEM degree production. This study pays special attention to the factors that influence students' decisions to enter, stay in, or leave STEM majors—quality of instruction, grading policies, course sequences, undergraduate learning environments, student supports, co-curricular activities, students' general academic preparedness and competence in science, family background, and governmental and institutional policies that affect STEM educational pathways. Because many students do not take the traditional 4-year path to a STEM undergraduate degree, Barriers and Opportunities describes several other common pathways and also reviews what happens to those who do not complete the journey to a degree. This book describes the major changes in student demographics; how students view, value, and utilize programs of higher education; and how institutions can adapt to support successful student outcomes. In doing so, Barriers and Opportunities questions whether definitions and characteristics of what constitutes success in STEM should change. As this book explores these issues, it identifies where further research is needed to build a system that works for all students who aspire to STEM degrees. The conclusions of this report lay out the steps that faculty, STEM departments, colleges and universities, professional societies, and others can take to improve STEM education for all students interested in a STEM degree.

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