

pogil answer key membrane structure and function Online PDF

Pogil answer key membrane structure and function is an essential resource for students and educators seeking to understand the intricate details of cell membranes. The cell membrane, also known as the plasma membrane, plays a vital role in maintaining cellular integrity, regulating the movement of substances, and facilitating communication between cells. This article provides a comprehensive overview of membrane structure and function, supported by insights typically found in Pogil activities and their answer keys.

Understanding the Structure of the Cell Membrane

Basic Composition of the Membrane

The cell membrane is primarily composed of a phospholipid bilayer, which forms the fundamental structure of the membrane. This bilayer is embedded with various proteins that serve multiple functions.

- **Phospholipids:** Each phospholipid molecule has a hydrophilic (water-attracting) head and two hydrophobic (water-repelling) tails. These molecules arrange themselves into a bilayer, with heads facing outward towards the aqueous environment and tails facing inward, away from water.
- **Proteins:** Membrane proteins are integral or peripheral and are essential for transport, signaling, and structural support.
- **Cholesterol:** Cholesterol molecules intersperse within the bilayer, maintaining fluidity and stability across temperature variations.
- **Carbohydrates:** Carbohydrate chains attached to proteins (glycoproteins) or lipids (glycolipids) are involved in cell recognition and signaling.

Fluid Mosaic Model

The widely accepted model describing membrane structure is the Fluid Mosaic Model. This model depicts the membrane as a dynamic and flexible structure with a mosaic of various proteins floating in or on the fluid phospholipid bilayer.

- The bilayer's fluidity allows for membrane flexibility, movement, and self-healing.
- Proteins can move laterally within the membrane, facilitating processes like cell signaling and

transport.

- The mosaic nature refers to the diverse array of proteins and carbohydrate molecules embedded within the membrane.

Functions of the Cell Membrane

Protection and Structural Support

The cell membrane provides a protective barrier that shields the internal components of the cell from the external environment. It maintains cell shape and offers structural support through cytoskeletal attachments.

Selective Permeability

One of the most critical functions of the membrane is its selective permeability?allowing certain molecules to pass while blocking others. This control is vital for maintaining homeostasis within the cell.

- **Passive Transport:** Facilitates the movement of substances without energy input, including diffusion, osmosis, and facilitated diffusion.

- **Active Transport:** Requires energy (ATP) to move molecules against their concentration gradient via transport proteins.

Cell Signaling and Communication

Membrane proteins act as receptors for signaling molecules like hormones. When a signaling molecule binds to a receptor, it triggers a cascade of cellular responses.

Transport of Materials

The membrane manages the intake of nutrients and the expulsion of waste products through various mechanisms:

- **Diffusion:** Movement of molecules from high to low concentration.
- **Facilitated Diffusion:** Movement via specific transport proteins.
- **Endocytosis and Exocytosis:** Bulk transport of large molecules or particles.

Membrane Proteins and Their Roles

Types of Membrane Proteins

Membrane proteins are pivotal for the membrane's functionality. They can be classified into:

- **Integral Proteins:** Span the entire membrane and are involved in transport and signaling.
- **Peripheral Proteins:** Attached temporarily to the membrane surface, often involved in support and enzyme activity.

Functions of Membrane Proteins

Membrane proteins serve various essential roles, including:

- Transport of ions and molecules across the membrane.
- Serving as receptors for chemical signals.
- Participating in cell recognition and adhesion.
- Enzymatic activity to catalyze biochemical reactions.

Membrane Dynamics and Adaptations

Fluidity and Temperature Effects

The membrane's fluidity is influenced by temperature and lipid composition. Cholesterol acts as a buffer, preventing the membrane from becoming too fluid or too rigid.

Membrane Flexibility and Repair

The dynamic nature of the membrane allows it to change shape during processes like cell division, endocytosis, and motility. Its flexibility is crucial for cell survival and function.

Relevance of Pogil Activities on Membranes

Pogil activities centered around membrane structure and function typically involve:

- Analyzing diagrams of membrane composition.
- Understanding how proteins and lipids contribute to membrane functions.
- Exploring how membrane permeability varies with different molecules.
- Applying concepts to real-world scenarios such as drug delivery and disease mechanisms.

The answer key for these activities provides detailed explanations, reinforcing concepts such as the importance of membrane fluidity, the role of specific proteins, and the mechanisms of transport.

Conclusion

The membrane structure and function are fundamental to cellular life. Its intricate design, featuring a phospholipid bilayer with embedded proteins and cholesterol, enables it to serve as a selective barrier, facilitate communication, and support cellular processes. Understanding these concepts through tools like Pogil activities and their answer keys enhances comprehension and fosters a deeper appreciation of cell biology. Whether studying for exams or conducting research, a solid grasp of membrane structure and function is indispensable for advancing in biological sciences.

Pogil Answer Key Membrane Structure and Function: An Investigative Review

Understanding the intricacies of cell membrane structure and function is fundamental to grasping the complexities of cellular biology. The Pogil answer key membrane structure and function serves as a critical resource for students and educators aiming to decode the multifaceted roles of biological membranes. This article delves into the detailed architecture of membranes, the mechanisms underpinning their functions, and the educational significance of Pogil activities in fostering comprehension.

Introduction to Cell Membranes

Cell membranes, also known as plasma membranes, are essential barriers that delineate the cell's interior from its external environment. They are dynamic, semi-permeable structures that regulate the ingress and egress of substances, facilitate communication, and contribute to cellular integrity.

The foundational model describing membrane structure is the Fluid Mosaic Model, proposed by Singer and Nicolson in 1972, which portrays the membrane as a phospholipid bilayer embedded with various proteins, creating a fluid yet organized mosaic.

Membrane Structure: Composition and Organization

Phospholipid Bilayer

At the core of membrane architecture lies the phospholipid bilayer, composed of phospholipids with hydrophilic (polar) heads and hydrophobic (nonpolar) tails. This arrangement creates a semi-permeable barrier that permits the diffusion of small, nonpolar molecules while restricting larger or charged entities.

Key features include:

- Hydrophilic heads face aqueous environments inside and outside the cell.
- Hydrophobic tails face each other, forming the interior of the bilayer.
- The bilayer exhibits fluidity, allowing lateral movement of lipids and proteins.

Membrane Proteins

Integral and peripheral proteins perforate or associate with the bilayer, fulfilling roles such as transport, signaling, and structural support. Their distribution and types significantly influence membrane function.

Types include:

- Integral proteins: span the membrane; often function as channels or transporters.
- Peripheral proteins: attached to the membrane surface; involved in signaling or structural activities.

Cholesterol and Other Lipids

Cholesterol molecules are interspersed within the phospholipid bilayer, modulating fluidity and stability. The composition of lipids varies depending on cell type and function.

Glycocalyx

A carbohydrate-rich layer attached to proteins and lipids on the extracellular surface, playing roles in cell recognition and protection.

Mechanisms of Membrane Function

Selective Permeability

The membrane's primary function is to regulate what enters and exits the cell. This selectivity is achieved through:

- Passive transport: diffusion, facilitated diffusion, and osmosis, which do not require energy.
- Active transport: carrier proteins and pumps that use ATP to move substances against their concentration gradient.
- Endocytosis and exocytosis: bulk transport mechanisms for large molecules.

Transport Proteins and Channels

Transport proteins form specific pathways, facilitating the movement of molecules such as ions, glucose, and amino acids.

- Channel proteins: form hydrophilic pores.
- Carrier proteins: undergo conformational changes to shuttle substances.
- Aquaporins: specialized channel proteins for water transport.

Cell Signaling and Communication

Membrane proteins also serve as receptors for signaling molecules (hormones, neurotransmitters), initiating cascades that influence cellular responses.

Cell Recognition and Adhesion

Glycoproteins and glycolipids contribute to cell recognition, crucial in immune response and tissue formation.

Pogil Activities and Answer Keys: A Tool for Deep Understanding

The Process Oriented Guided Inquiry Learning (POGIL) approach emphasizes active student engagement through inquiry-based activities. The Pogil answer key membrane structure and function provides detailed guidance, ensuring learners grasp core concepts through exploration, analysis, and application.

Educational Significance of Pogil Activities

- Encourages critical thinking and problem-solving.
- Reinforces understanding of complex structures and processes.
- Promotes collaboration and discussion among students.
- Facilitates retention through active learning.

Sample POGIL Activity Themes

- Analyzing the fluid mosaic model.
- Investigating membrane permeability to different molecules.
- Exploring the roles of membrane proteins in transport.
- Modeling the mechanisms of active and passive transport.
- Understanding the impact of cholesterol on membrane fluidity.

Answer Key Components

An effective Pogil answer key for membrane structure and function would include:

- Clear explanation of phospholipid bilayer arrangement.
- Identification of types and functions of membrane proteins.
- Descriptions of transport mechanisms with diagrams.
- Clarification of the role of cholesterol and other lipids.
- Application questions relating membrane structure to cellular health and disease.

Membrane Dynamics and Function in Health and Disease

Membrane Fluidity and Its Regulation

Membrane fluidity influences protein function, signaling, and membrane trafficking. Factors affecting fluidity include:

- Fatty acid saturation: unsaturated fatty acids increase fluidity.
- Cholesterol content: modulates fluidity depending on temperature.
- Temperature: higher temperatures increase fluidity.

Membrane Dysfunction and Disease

Disruptions in membrane structure or function can lead to various health issues:

- Cystic fibrosis: mutation in the CFTR protein affects chloride transport.
- Neurodegenerative diseases: misfolded membrane proteins impair signaling.
- Cancer: altered membrane composition facilitates metastasis.

Therapeutic Implications

Understanding membrane dynamics informs drug design and delivery strategies, such as liposomes and nanoparticle carriers.

Conclusion

The Pogil answer key membrane structure and function encapsulates core biological principles that are vital for understanding cellular life. A comprehensive grasp of membrane architecture?its

composition, organization, and dynamic processes? enables deeper insights into cell physiology, disease mechanisms, and therapeutic innovations. As educational tools, Pogil activities and their corresponding answer keys serve as invaluable resources in fostering active, inquiry-based learning, thereby shaping the next generation of biologists and healthcare professionals.

In sum, exploring membrane structure and function through structured activities and detailed answer keys enhances conceptual understanding, promotes critical thinking, and underscores the importance of membranes in maintaining cellular homeostasis and overall organismal health.

Question What is the primary function of the membrane structure in cells? The primary function of the cell membrane is to regulate the movement of substances in and out of the cell, providing a protective barrier and facilitating communication and transport between the cell and its environment. How does the fluid mosaic model describe the structure of the cell membrane? The fluid mosaic model describes the cell membrane as a flexible, dynamic structure composed of a phospholipid bilayer with embedded proteins, cholesterol, and other molecules, allowing for fluidity and functionality. What role do membrane proteins play in membrane function? Membrane proteins are involved in various functions including transport of molecules, acting as enzymes, signal transduction, cell recognition, and maintaining the cell's structural integrity. How does membrane fluidity affect its function? Membrane fluidity allows for the proper functioning of membrane proteins, facilitates the movement of lipids and proteins within the membrane, and is crucial for processes like endocytosis, exocytosis, and cell signaling. Why is the phospholipid bilayer considered selective in its permeability? The phospholipid bilayer is selectively permeable because its hydrophobic core allows small, nonpolar molecules to pass through easily while restricting larger or polar molecules, thus controlling the internal environment of the cell.

Related keywords: membrane structure, cell membrane, phospholipid bilayer, membrane proteins, membrane function, POGIL activity, cell biology, biological membranes, membrane transport, membrane organization

Pogil high school biology answer key

Pogil High School Biology Answer Key

Understanding the concepts covered in high school biology can be challenging for many students. To facilitate effective learning and assessment, educators and students often turn to resources such as the Pogil (Process Oriented Guided Inquiry Learning) approach. One vital component of this method is the availability of an accurate and comprehensive Pogil high school biology answer key. This answer key serves as an essential guide, helping students verify their understanding, prepare

for exams, and deepen their grasp of complex biological concepts. In this article, we will explore the importance of the Pogil high school biology answer key, how to utilize it effectively, and key tips for maximizing its benefits.

What Is Pogil in High School Biology?

Understanding the Pogil Approach

Pogil, or Process Oriented Guided Inquiry Learning, is an instructional strategy designed to promote active learning through student-centered inquiry. In high school biology, Pogil activities are structured around guided questions and activities that encourage students to explore biological concepts collaboratively and critically.

Key features of Pogil include:

- Student-centered learning: Students actively engage in problem-solving rather than passively receiving information.
- Structured activities: Carefully designed activities guide students through the scientific process.
- Collaborative work: Students work in groups to foster discussion and deeper understanding.
- Focus on process skills: Emphasizes scientific reasoning, analysis, and application.

Common Pogil Activities in High School Biology

Some typical activities include:

- Investigating cell structure and function
- Exploring genetics and heredity
- Analyzing ecological relationships
- Studying photosynthesis and cellular respiration
- Understanding biological evolution

The Significance of a Pogil High School Biology Answer Key

Why Is the Answer Key Important?

An accurate Pogil high school biology answer key is an invaluable resource for both students and teachers. Its significance can be summarized as follows:

- Self-Assessment Tool: Students can use the answer key to check their responses, identify misconceptions, and reinforce learning.
- Teacher Resource: Educators can quickly verify student work, provide targeted feedback, and ensure consistency in grading.
- Study Aid: Acts as a guide for understanding correct reasoning and biological principles.
- Preparation for Exams: Helps students familiarize themselves with typical questions and expected answers.

Benefits of Using the Answer Key Effectively

- Promotes independent learning and confidence.
- Encourages critical thinking by comparing students' reasoning with model answers.
- Facilitates timely feedback and remediation.
- Enhances comprehension of complex biological concepts.

How to Find and Access Pogil High School Biology Answer Keys

Sources for Answer Keys

Students and teachers can access Pogil answer keys through various channels:

- Official Pogil Resources: The Pogil Project's website offers a range of activities and answer keys, often available for free or through membership.
- School or District Resources: Many schools subscribe to Pogil curriculum packages that include answer keys.
- Educational Publishers: Some publishers provide accompanying answer keys for Pogil activity books.
- Online Educational Platforms: Websites like Teachers Pay Teachers or educational forums sometimes share curated answer keys.

Tips for Accessing Reliable Answer Keys

- Always verify the source to ensure accuracy.
- Use the most recent versions aligned with current curriculum standards.
- Cross-reference with teacher guidance or textbooks when possible.

How to Use the Pogil High School Biology Answer Key Effectively

Strategies for Students

To maximize learning, students should:

- **Attempt the Activity First:** Complete the Pogil activity without looking at the answer key to develop problem-solving skills.
- **Use the Answer Key for Reflection:** After completing the activity, compare responses to understand mistakes.
- **Analyze Reasoning:** Don't just match answers; review explanations to grasp underlying concepts.
- **Ask Questions:** If discrepancies arise, seek clarification from teachers or peers.

Strategies for Teachers

Educators can:

- **Integrate the Answer Key into Assessments:** Use it to develop quizzes and tests.
- **Facilitate Discussions:** Use answers to guide classroom discussions and address misconceptions.
- **Provide Feedback:** Use the answer key to give detailed feedback to students.
- **Encourage Peer Review:** Promote collaborative correction sessions using the answer key.

Common Challenges and Ethical Considerations

Potential Challenges in Using Answer Keys

While answer keys are valuable, some challenges include:

- **Over-reliance:** Students might depend solely on answer keys, hindering independent thinking.
- **Misinterpretation:** Incorrect or outdated answer keys can mislead learners.
- **Limited Critical Thinking:** Focusing only on answers rather than understanding.

Ethical Use of Answer Keys

- Use answer keys as a learning aid, not as a shortcut to grades.
- Avoid copying answers verbatim; strive to understand the reasoning.
- Respect intellectual property rights by using authorized resources.

Enhancing Biology Learning with the Pogil Answer Key

Tips for Effective Study

- Integrate with Class Activities: Use answer keys alongside classroom lessons.
- Create Study Groups: Discuss answers and reasoning with peers.
- Supplement with Other Resources: Combine with textbooks, videos, and lab activities.
- Practice Regularly: Consistent practice solidifies understanding.

Additional Resources for High School Biology Students

- Pogil Teacher Guides: For in-depth facilitation
- Biology Textbooks: For foundational knowledge
- Online Educational Platforms: For tutorials and quizzes
- Laboratory Experiments: To reinforce theoretical concepts

Conclusion

A comprehensive Pogil high school biology answer key is an essential resource that supports effective learning, accurate assessment, and deeper understanding of biological concepts. When used ethically and strategically, it empowers students to become independent learners and critical thinkers. Whether accessed through official Pogil resources or educational platforms, the answer key should serve as a guide to foster curiosity, comprehension, and scientific reasoning. By integrating these resources into study routines and classroom activities, students and teachers alike can enhance their biology education and achieve academic success.

Remember: The goal of using the Pogil answer key is not just to find the right answers but to understand the scientific principles behind them. This approach promotes meaningful learning and prepares students for future scientific challenges.

Pogil High School Biology Answer Key: A Comprehensive Review

When it comes to mastering high school biology, students often seek reliable resources to guide their learning and preparation. One such resource that has gained popularity among educators and students alike is the Pogil High School Biology Answer Key. This answer key is an integral component of the Process Oriented Guided Inquiry Learning (POGIL) methodology, designed to foster deep understanding, critical thinking, and active engagement with biological concepts. In this review, we will explore the features, benefits, limitations, and overall effectiveness of the Pogil High School Biology Answer Key to help educators and students determine its value in their academic

journey.

Understanding Pogil and Its Role in Biology Education

What Is Pogil?

Pogil, or Process Oriented Guided Inquiry Learning, is an instructional approach that emphasizes student-centered learning through guided inquiry activities. Instead of traditional lecture-based lessons, Pogil activities involve students working collaboratively to explore biological concepts, analyze data, and develop understanding through carefully crafted questions and prompts.

Key features of Pogil include:

- Emphasis on inquiry and exploration
- Collaborative group work
- Use of visual representations and models
- Focus on developing critical thinking skills

This methodology aims to shift the role of the teacher from a lecturer to a facilitator, encouraging students to discover concepts actively rather than passively receiving information.

The Importance of the Answer Key in Pogil

The Pogil High School Biology Answer Key serves as a crucial resource for both teachers and students. It provides the correct responses to the activities, questions, and problems included in Pogil exercises. Its primary functions include:

- Guiding teachers in assessment and feedback
- Assisting students in self-checking their understanding
- Ensuring consistency and accuracy in grading
- Serving as a reference to clarify complex concepts

Because Pogil activities are inquiry-based, the answer key often contains more than just straightforward answers; it offers explanations and reasoning processes that help deepen understanding.

Features and Content of the Pogil High School Biology Answer Key

Scope of Content Covered

The answer key typically corresponds to a comprehensive high school biology curriculum, covering topics such as:

- Cell structure and function
- Photosynthesis and respiration
- Genetics and heredity
- Evolution and natural selection
- Ecology and ecosystems
- Molecular biology

Each section aligns with specific activities designed to promote exploration and understanding of these concepts.

Format and Accessibility

Most Pogil answer keys are provided in digital formats such as PDFs, making them easily accessible for educators and students. They often include:

- Correct answers to activity questions
- Explanations of reasoning
- Diagrams and visual aids
- Notes on common misconceptions

Some versions are integrated into online platforms, allowing for interactive engagement and immediate feedback.

Level of Detail and Explanations

While the primary purpose of the answer key is to provide correct responses, many include detailed explanations to help students understand the reasoning behind each answer. This feature enhances self-directed learning and helps clarify complex concepts that may be confusing when only provided with the correct option.

Pros and Cons of the Pogil High School Biology Answer Key

Pros

- Supports Inquiry-Based Learning: Complements the Pogil approach by providing clear guidance

on activity answers, fostering autonomous learning.

- Enhances Understanding: Detailed explanations help students grasp the underlying principles, not just memorize facts.
- Assists Teachers: Serves as a reliable resource for grading, planning, and providing feedback.
- Encourages Critical Thinking: Promotes reasoning and analytical skills through guided explanations.
- Flexible Use: Can be adapted for various instructional settings, including classroom, homework, or exam review.
- Resource for Self-Study: Enables students to assess their understanding independently, encouraging self-correction.

Cons

- Potential for Over-Reliance: Students might depend heavily on answer keys, reducing independent critical thinking.
- Limited Engagement if Used Passively: Without active engagement with the activities, merely looking at answers diminishes learning.
- Variability in Quality: Not all answer keys are created equal; some may lack thorough explanations or contain errors.
- Accessibility Issues: Some resources might only be available through paid platforms or require specific subscriptions.
- Does Not Replace Active Learning: The answer key is a tool, but effective learning depends on the activities and student effort.

How to Effectively Use the Pogil High School Biology Answer Key

For Students

- Use as a Self-Check Tool: After completing activities, compare your answers with the key to identify areas needing improvement.
- Understand the Explanations: Don't just look at the answer; read the reasoning to deepen your understanding.
- Avoid Rote Memorization: Use answers to guide discussions and further research rather than solely memorizing responses.
- Seek Clarification: If explanations are unclear, consult teachers or additional resources to clarify concepts.

For Educators

- Guide Student Inquiry: Use the answer key to prepare accurate feedback and facilitate discussions.
- Design Complementary Activities: Pair answer keys with extension questions or hands-on experiments.
- Assess Comprehension: Use answers to develop quizzes or formative assessments.
- Promote Critical Thinking: Encourage students to justify their answers and understand the reasoning process.

Limitations and Challenges

While the Pogil High School Biology Answer Key is undoubtedly a valuable resource, it's essential to acknowledge its limitations:

- Risk of Reduced Creativity: Over-reliance might hinder students' ability to think independently.
- Potential for Misuse: Instructors might use it as a shortcut rather than a teaching aid, diminishing its educational value.
- Need for Supplementation: The answer key should be part of a broader instructional strategy that includes hands-on activities, discussions, and multimedia resources.
- Quality Control: Variability in the quality of answer keys across different publishers or sources can impact their usefulness.

Conclusion: Is the Pogil High School Biology Answer Key Worth It?

The Pogil High School Biology Answer Key is a robust resource that enhances the inquiry-based learning process promoted by Pogil activities. Its strengths lie in guiding both students and teachers through complex biological concepts, providing clarity, and supporting critical thinking. When used appropriately as a supplement to active learning strategies, it can significantly improve comprehension, retention, and engagement.

However, it is crucial to approach this resource with an understanding of its limitations. Educators should ensure that it complements, rather than replaces, interactive teaching methods, and students should use it as a tool for understanding rather than simply obtaining answers. Ultimately, the answer key is most effective when integrated into a well-rounded biology curriculum that emphasizes exploration, discussion, and application.

For students aiming to excel in high school biology, leveraging the Pogil answer key alongside active participation in activities can foster a deeper appreciation of biological sciences and prepare them for future scientific endeavors. Educators, on the other hand, will find it invaluable for assessment, feedback, and guiding inquiry, making it a worthwhile investment in the pursuit of science education excellence.

QuestionAnswer What is the purpose of the Pogil High School Biology Answer Key? The Pogil High School Biology Answer Key provides students and teachers with correct answers to Pogil activities, facilitating self-assessment and supporting effective learning. Where can I find the official Pogil High School Biology Answer Key? The official Pogil Biology Answer Keys are typically available through authorized educational websites, teachers, or the Pogil Project's official resources with proper access. Are Pogil Biology Answer Keys suitable for all grade levels? Pogil Biology Answer Keys are primarily designed for high school students, but their complexity can vary; teachers should review them to ensure they are appropriate for their students' levels. How can I use the Pogil Biology Answer Key effectively in my study routine? Use the answer key to check your understanding after completing activities, identify areas needing improvement, and reinforce key concepts in biology. Is the Pogil High School Biology Answer Key available for free? Access to Pogil Answer Keys may vary; some resources are free, while others require purchase or membership through educational institutions or Pogil's official platform. Can teachers customize or create their own Pogil answer keys? Yes, teachers often create or modify Pogil answer keys to better suit their curriculum, and some resources provide customizable answer guides. What topics are covered in the Pogil High School Biology Answer Key? The answer key covers a wide range of biology topics including cell structure, genetics, ecology, evolution, and human body systems, aligned with high school curricula. How reliable are the Pogil Biology Answer Keys for exam preparation? They are generally reliable for understanding core concepts and practicing questions, but students should also review textbooks and class notes for comprehensive exam prep. Are there digital tools or apps that include Pogil Biology Answer Keys? Some educational platforms and apps incorporate Pogil activities and answer keys, but access varies; always ensure the source is authorized and accurate. What should I do if I find discrepancies between my answers and the Pogil Answer Key? Review your work, consult your teacher for clarification, and consider re-examining the concepts to understand the correct responses better.

Related keywords: Pogil biology answers, high school biology solutions, Pogil activity key, biology worksheet answers, Pogil chemistry answer key, biology problem set solutions, high school science answer key, Pogil module answers, biology practice questions, Pogil student guide answers

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