

OSAT Physical Science Practice Test (Sample)

Study Guide



Everything you need from our exam experts!

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 - 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

- 1. What is meant by ionization potential?**
 - A. The energy required to break a chemical bond**
 - B. The energy needed to strip an atom or molecule of an electron**
 - C. The temperature at which atoms become ionized**
 - D. The total charge of an ion**
- 2. What is temperature NOT dependent upon?**
 - A. Types of objects**
 - B. Size of the particles**
 - C. Mass of a substance**
 - D. Heat content**
- 3. Which of the following best describes Newton's First Law of Motion?**
 - A. An object at rest stays at rest**
 - B. An object in motion tends to stay in motion**
 - C. Both A and B**
 - D. An object changes its motion only when acted upon by a force**
- 4. Which experiment led to the understanding of the nuclear model of the atom?**
 - A. Millikan's oil drop experiment**
 - B. Geiger-Marsden experiment**
 - C. Thomson's cathode ray experiment**
 - D. Einstein's photoelectric effect experiment**
- 5. What does the process of photosynthesis primarily utilize from the environment?**
 - A. Minerals**
 - B. Animal respiration**
 - C. Light energy**
 - D. Soil nutrients**

- 6. Which statement defines an isometric thermodynamic process?**
- A. A process with changing temperature**
 - B. A process at constant volume**
 - C. A process at constant pressure**
 - D. A process involving phase transitions**
- 7. What does thermal conductivity in heat transfer refer to?**
- A. The ability of a material to conduct electricity**
 - B. The measure of a material's ability to transfer thermal energy**
 - C. The rate of thermal energy production in a material**
 - D. The resistance of a material to heat flow**
- 8. Why do atoms in solids vibrate?**
- A. Because of low temperature**
 - B. Because they have excess kinetic energy**
 - C. Because all solids contain some thermal energy**
 - D. Because they are in constant motion**
- 9. How does mass change theoretically in relation to speed and relativity?**
- A. Mass decreases as speed increases**
 - B. Mass remains constant throughout all speeds**
 - C. Mass increases as the speed approaches the speed of light**
 - D. Mass is irrelevant to the speed of light**
- 10. Where is the equivalence between laws and symmetries present in Noether's theorem?**
- A. In physical laws based on thermodynamic systems**
 - B. In physical laws based on action defined over symplectic space**
 - C. In geometric interpretations of physics**
 - D. In statistics and probabilities of events**

Answers

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1. B
2. A
3. C
4. B
5. C
6. B
7. B
8. C
9. C
10. B

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Explanations

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1. What is meant by ionization potential?

- A. The energy required to break a chemical bond
- B. The energy needed to strip an atom or molecule of an electron**
- C. The temperature at which atoms become ionized
- D. The total charge of an ion

Ionization potential, also known as ionization energy, refers to the energy required to remove an electron from a neutral atom or molecule, thereby converting it into a positively charged ion. This energy is a fundamental concept in chemistry and physics that helps to understand how atoms interact and form bonds. When enough energy is provided to overcome the attraction between the negatively charged electron and the positively charged nucleus, the electron can be removed. The amount of energy needed varies among different elements and is influenced by factors such as the electron's distance from the nucleus and the overall electron configuration of the atom. Higher ionization potentials typically indicate that it is more difficult to remove an electron, which can be related to the stability of the electronic configuration. For example, noble gases have high ionization potentials because their electron configurations are stable. In summary, the definition of ionization potential aligns with the energy required to strip an atom or molecule of an electron, making this the correct choice.

2. What is temperature NOT dependent upon?

- A. Types of objects**
- B. Size of the particles
- C. Mass of a substance
- D. Heat content

Temperature is a measure of the average kinetic energy of the particles in a substance. It reflects how fast those particles are moving. The properties that contribute to temperature include things like the size of the particles, the mass of the substance, and the heat content, as all of these factors can influence the kinetic energy of the particles. When considering the types of objects, it's important to note that temperature itself does not depend on what the object is made of. For example, ice and steam can both be at 0 degrees Celsius, but one is solid and the other is a gas. Thus, the temperature does not inherently depend on the material type but rather on the motion of the particles constituting that material. Therefore, while temperature is influenced by particle motion and interactions, the type of object plays no direct role in defining its temperature.

3. Which of the following best describes Newton's First Law of Motion?

- A. An object at rest stays at rest**
- B. An object in motion tends to stay in motion**
- C. Both A and B**
- D. An object changes its motion only when acted upon by a force**

Newton's First Law of Motion, often referred to as the law of inertia, states that an object will remain at rest or continue in uniform motion in a straight line unless acted upon by a net external force. This law defines the behavior of objects in both states: at rest and in motion. The first part of the law—"an object at rest stays at rest"—indicates that a stationary object will not start moving unless a force causes it to do so. The second part—"an object in motion tends to stay in motion"—means that an object moving at a constant velocity will continue to do so unless a force alters its state of motion. Both aspects highlight the principle of inertia, which is the tendency of objects to resist changes in their state of motion. Therefore, the most comprehensive and accurate description of Newton's First Law of Motion combines both of these principles, leading to the understanding that an object at rest will remain at rest and an object in motion will continue moving in the absence of a net external force. This is why the choice that includes both components, encapsulating the essence of the law, is the best answer.

4. Which experiment led to the understanding of the nuclear model of the atom?

- A. Millikan's oil drop experiment**
- B. Geiger-Marsden experiment**
- C. Thomson's cathode ray experiment**
- D. Einstein's photoelectric effect experiment**

The Geiger-Marsden experiment, also known as the Rutherford gold foil experiment, was pivotal in establishing the nuclear model of the atom. Conducted in 1909 by Hans Geiger and Ernest Marsden under the direction of Ernest Rutherford, the experiment involved firing alpha particles at a thin foil of gold. The observation that some alpha particles were deflected at large angles, and a small fraction even bounced back, was unexpected based on the existing plum pudding model, which suggested that atoms were uniform and diffuse. The significant deflections indicated that a small, dense, positively charged nucleus must be present within the atom, leading to the conclusion that the atom consists of a central nucleus surrounded by electrons in orbit. This fundamentally transformed the understanding of atomic structure, establishing the basis for the nuclear model that describes atoms having a concentrated nucleus. In contrast, the other experiments mentioned focused on different aspects of atomic physics. Millikan's oil drop experiment determined the charge of the electron, Thomson's cathode ray experiment identified the electron and proposed the existence of particles smaller than atoms, while Einstein's work on the photoelectric effect provided support for the quantum theory of light, but none of these directly contributed to the realization of the nuclear structure of the atom.

5. What does the process of photosynthesis primarily utilize from the environment?

- A. Minerals**
- B. Animal respiration**
- C. Light energy**
- D. Soil nutrients**

Photosynthesis primarily utilizes light energy from the environment to convert carbon dioxide and water into glucose and oxygen. During this process, plants, algae, and some bacteria capture light energy, mainly from the sun, through a pigment called chlorophyll located in their chloroplasts. This energy drives the chemical reactions that transform carbon dioxide and water into organic compounds, which serve as food for the plant and, ultimately, for other organisms in the ecosystem. While some of the other options may contribute to a plant's overall health or growth, they do not play a direct role in the photosynthetic process itself. Minerals and soil nutrients are essential for various physiological functions and development, but they are not the primary energy source for photosynthesis. Similarly, animal respiration, which involves the consumption of oxygen and the release of carbon dioxide, is not part of the photosynthetic process; rather, it serves as part of the larger carbon cycle involving both plants and animals.

6. Which statement defines an isometric thermodynamic process?

- A. A process with changing temperature**
- B. A process at constant volume**
- C. A process at constant pressure**
- D. A process involving phase transitions**

An isometric thermodynamic process is defined as a process that occurs at constant volume. This means that throughout the process, the volume of the system does not change, even if pressure and temperature may vary. In such a process, the work done by or on the system is zero because work is defined as a function of volume change ($\text{work} = \text{pressure} \times \text{change in volume}$). Therefore, since the volume remains constant, there can be no work associated with this process, highlighting the unique nature of isometric conditions. Understanding this definition is crucial for analyzing different thermodynamic processes, particularly in contexts such as ideal gas behavior and internal energy changes, where volume plays a significant role in the calculations and outcomes of those processes. The other choices refer to different thermodynamic conditions (changing temperature, constant pressure, and phase transitions) that do not characterize an isometric process.

7. What does thermal conductivity in heat transfer refer to?

- A. The ability of a material to conduct electricity
- B. The measure of a material's ability to transfer thermal energy**
- C. The rate of thermal energy production in a material
- D. The resistance of a material to heat flow

Thermal conductivity specifically refers to the measure of a material's ability to transfer thermal energy. This property indicates how well heat can move through a substance when there is a temperature difference. Materials with high thermal conductivity, such as metals, allow heat to flow through them easily, while materials with low thermal conductivity, like wood or insulating foams, impede heat flow. When considering thermal conductivity, it is important to distinguish it from electrical conductivity, which relates to how well a material can conduct electricity. The rate of thermal energy production refers to the amount of heat generated, but does not address the transfer of heat itself. Lastly, while the resistance to heat flow describes a related concept, thermal conductivity specifically focuses on how efficiently materials can conduct heat rather than the opposition they provide against heat flow.

8. Why do atoms in solids vibrate?

- A. Because of low temperature
- B. Because they have excess kinetic energy
- C. Because all solids contain some thermal energy**
- D. Because they are in constant motion

Atoms in solids vibrate because all solids contain some thermal energy. This thermal energy comes from the kinetic energy associated with the random motion of the atoms and molecules within the solid. Even at temperatures above absolute zero, atoms possess a certain amount of vibrational energy, which causes them to oscillate around their fixed positions in the crystal lattice structure of the solid. The level of this vibration depends on the temperature: as the temperature increases, thermal energy increases, leading to greater vibration of the atoms. The vibrations do not mean that the atoms are moving freely; instead, they are constrained to oscillate about a mean position within the solid. Thus, the presence of thermal energy is fundamental to the vibrational motion of atoms in solids, regardless of the specific temperature.

9. How does mass change theoretically in relation to speed and relativity?

- A. Mass decreases as speed increases**
- B. Mass remains constant throughout all speeds**
- C. Mass increases as the speed approaches the speed of light**
- D. Mass is irrelevant to the speed of light**

The concept of mass in relation to speed, particularly in the framework of relativity, is rooted in the principles established by Albert Einstein. As an object moves faster and approaches the speed of light, its relativistic mass increases. This increase in mass is not due to the addition of physical matter but rather a consequence of the object's energy increasing with velocity. According to the theory of relativity, as an object's speed approaches the speed of light, the energy required to continue accelerating it increases significantly, making it more "massive" in terms of relativistic mass. At lower speeds, where common physics operates, mass can be treated as constant; however, as velocities get closer to the speed of light, the implications of relativistic physics must be considered, leading to the conclusion that mass effectively increases. This understanding is fundamental in explaining many phenomena in particle physics and cosmic dynamics, where the velocity of particles often approaches relativistic speeds. In summary, the correct response reflects the relationship between mass and speed in a relativistic context, indicating that mass increases as one approaches the speed of light.

10. Where is the equivalence between laws and symmetries present in Noether's theorem?

- A. In physical laws based on thermodynamic systems**
- B. In physical laws based on action defined over symplectic space**
- C. In geometric interpretations of physics**
- D. In statistics and probabilities of events**

Noether's theorem is a fundamental principle in theoretical physics that links symmetries associated with physical systems to conservation laws. According to the theorem, for every continuous symmetry of the action of a physical system, there is a corresponding conservation law. The essence of Noether's theorem lies in the action, which is a functional that summarizes the dynamics of the system. The action is defined over a mathematical structure known as symplectic space, which deals with the phase space of dynamical systems. When a physical system exhibits a symmetry in its action—such as translational symmetry (invariance under shift in position) or rotational symmetry (invariance under changes in orientation)—there are corresponding conserved quantities, like momentum and angular momentum. This deep connection is crucial because it establishes a framework for understanding why certain quantities remain constant over time despite the evolution of the system. So, when focusing on the equivalence between physical laws and symmetries represented in Noether's theorem, the critical aspect is the formulation of the laws via the action principle, particularly in the space defined by the system's phase space, which is inherently linked to symplectic geometry. Therefore, the option mentioning physical laws based on action defined over symplectic space accurately captures the essence

Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

<https://osatphysicalscience.examzify.com>

We wish you the very best on your exam journey. You've got this!