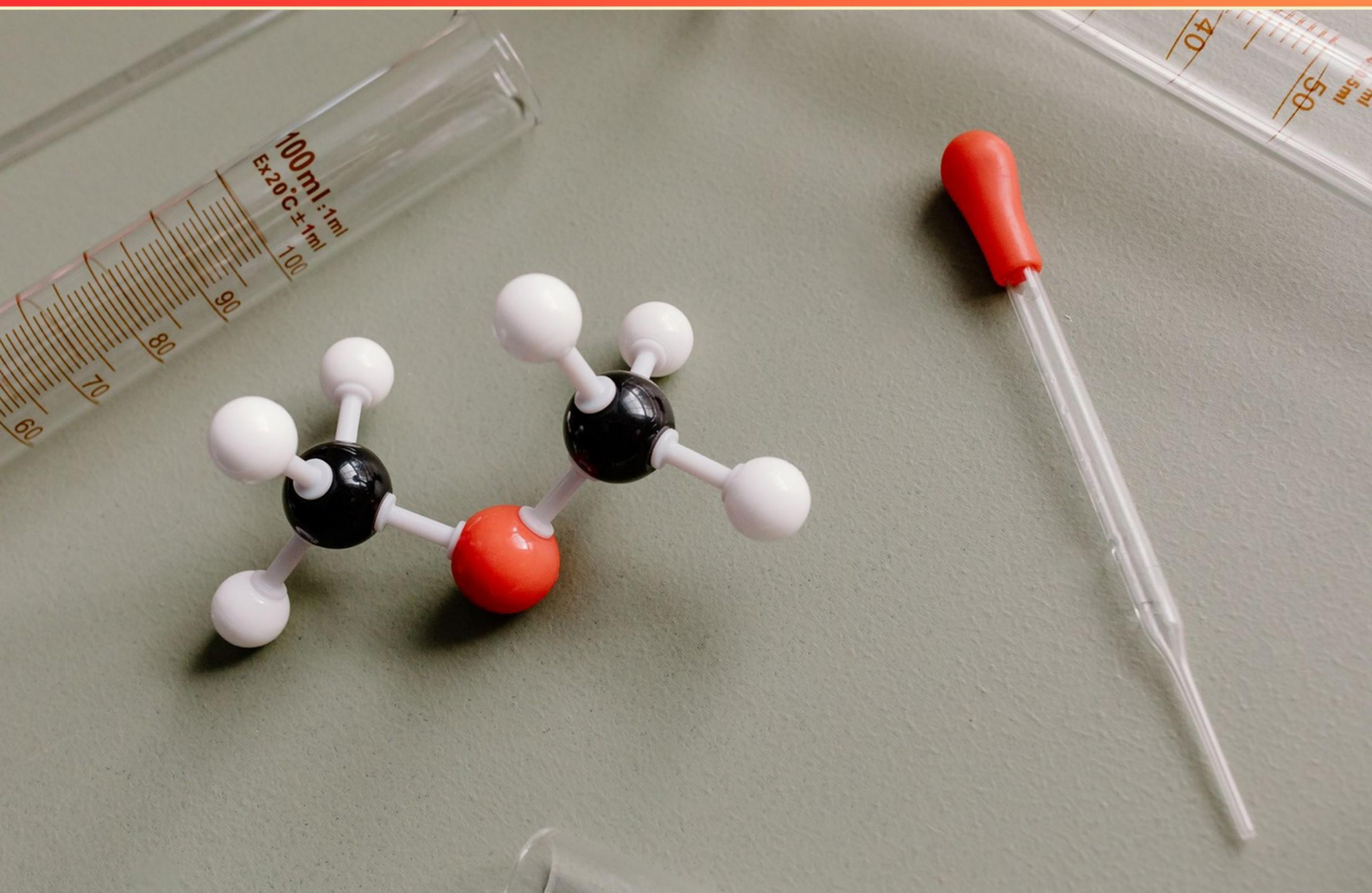


HSC PHYSICS PRACTICE EXAM (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

VISIT US ONLINE FOR
THE FULL VERSION STUDY GUIDE

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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

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- 1. In what setting might eddy currents be particularly useful?**
 - A. Electrical generation
 - B. Electromagnetic braking
 - C. Energy storage
 - D. Thermal regulation

- 2. What term describes the induced emf that opposes the applied emf in an electric circuit?**
 - A. Back emf
 - B. Forward emf
 - C. Dynamic emf
 - D. Counter emf

- 3. Which theory describes the relationship between space, time, and matter?**
 - A. Quantum mechanics
 - B. Relativity
 - C. Newtonian physics
 - D. Field theory

- 4. Which aspect of relativity states that the laws of physics are the same for all inertial observers?**
 - A. Principle of relativity
 - B. Equivalence principle
 - C. Principle of inertia
 - D. Law of conservation

- 5. What is the primary function of brushes in an electric motor?**
 - A. To cool the motor
 - B. To maintain electrical contact
 - C. To support the rotor
 - D. To increase efficiency

6. Which term best describes forces that are not due to physical interactions but are considered in accelerating frames of reference?
- A. Inertial forces
 - B. Weightless forces
 - C. Fictive forces
 - D. Non-inertial forces
7. What term describes the time it takes for half the given mass of a radioactive element to change into a new element?
- A. Decay rate
 - B. Decay constant
 - C. Half life
 - D. Exponential decay
8. What phenomenon describes the apparent contraction of an object's length in the direction of motion as observed by a stationary observer?
- A. Mass dilation
 - B. Length contraction
 - C. Time dilation
 - D. Relative motion
9. Which imaging technique utilizes short-lived radioisotopes produced in accelerators?
- A. X-ray computed tomography (CT)
 - B. Positron emission tomography (PET)
 - C. Magnetic resonance imaging (MRI)
 - D. Ultrasound
10. What effect does gravity have on the motion of a spacecraft according to the slingshot effect?
- A. Slows it down
 - B. Increases fuel efficiency
 - C. Accelerates it
 - D. Changes its trajectory

Answers

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

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Explanations

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1. In what setting might eddy currents be particularly useful?

- A. Electrical generation
- B. Electromagnetic braking**
- C. Energy storage
- D. Thermal regulation

Eddy currents are loops of electrical current that are induced within conductors by a changing magnetic field due to Faraday's law of electromagnetic induction. In the context of electromagnetic braking, these currents are particularly useful because they generate opposing magnetic fields when a conductor moves through a magnetic field. This opposition creates a force that acts on the conductor, effectively slowing it down. In the case of electromagnetic braking, the induced eddy currents can lead to a rapid dissipation of kinetic energy as heat, which can be advantageous in applications like trains or roller coasters where precise and efficient braking is desired. This method of slowing down provides a smoother operation and can reduce wear on mechanical braking systems, making it an effective alternative to conventional braking methods. The other settings mentioned, while they may involve electromagnetic principles, do not leverage the benefits of eddy currents in the same way as braking systems do. For example, electrical generation typically focuses on harnessing induced currents rather than opposing them, energy storage involves maintaining and managing energy without necessarily relying on the concepts of induced currents, and thermal regulation usually relates to managing temperatures rather than directly converting kinetic energy to thermal energy through induced currents.

2. What term describes the induced emf that opposes the applied emf in an electric circuit?

- A. Back emf**
- B. Forward emf
- C. Dynamic emf
- D. Counter emf

The term that describes the induced emf which opposes the applied emf in an electric circuit is referred to as "back emf." This phenomenon primarily occurs in inductive components like coils and transformers, where a change in current induces an electromotive force that acts in the opposite direction to the current flow. The concept can be understood through Lenz's Law, which states that the direction of induced current (and hence the induced emf) will always oppose the change in magnetic flux that produced it, thereby resisting the applied emf. This property is crucial in the operation of devices such as electric motors, where the back emf is a factor in limiting the current as the motor speeds up. In contrast, forward emf, dynamic emf, and counter emf either do not specifically describe this opposing behavior or apply in different contexts or definitions that are not directly related to the opposing nature described in the question. Thus, back emf is the most appropriate term for this specific interaction in electric circuits.

3. Which theory describes the relationship between space, time, and matter?

- A. Quantum mechanics
- B. Relativity**
- C. Newtonian physics
- D. Field theory

The theory that describes the relationship between space, time, and matter is relativity. This theory, developed by Albert Einstein, fundamentally changed our understanding of physics by introducing the concept that space and time are intertwined in a four-dimensional continuum known as spacetime. In relativity, the effects of gravity are explained as the curvature of spacetime caused by the presence of mass. For example, massive objects like planets and stars create a warping effect in spacetime, which influences the motion of other objects nearby. This contrasts with previous notions such as Newtonian physics, which treated space and time as separate and absolute entities, lacking the flexibility that relativity incorporates. Moreover, relativity, particularly in its special form, also revolutionized our understanding of simultaneity and the speed of light as a constant for all observers, regardless of their relative motion. This intricately ties in the concepts of matter through its relationships with energy, as expressed in the famous equation $E=mc^2$, which relates energy (E) to mass (m) and the speed of light (c). While quantum mechanics deals with the behavior of particles at subatomic scales and field theory describes how forces are transmitted through fields, it is relativity that uniquely addresses the larger-scale interplay.

4. Which aspect of relativity states that the laws of physics are the same for all inertial observers?

- A. Principle of relativity**
- B. Equivalence principle
- C. Principle of inertia
- D. Law of conservation

The principle of relativity states that the laws of physics are invariant and apply equally to all inertial observers, meaning that no matter the velocity at which an observer is moving, the fundamental principles governing physical phenomena remain unchanged. This principle was notably established by Galileo and further expanded by Einstein in his theory of special relativity. Understanding this principle is crucial, as it leads to various implications, such as the requirement that the speed of light is constant for all observers, regardless of their relative motion. It ensures that all inertial frames of reference can be regarded as equivalent for the formulation of physical laws, which is a cornerstone of modern physics. Other choices relate to different concepts within physics. For example, the equivalence principle pertains to the relationship between gravitational and inertial mass, mainly in the context of general relativity. The principle of inertia refers to the tendency of an object to remain at rest or in uniform motion unless acted upon by a force, which is a foundational idea in classical mechanics. Meanwhile, the law of conservation involves principles like conservation of energy or momentum, which are distinct from the foundational principle that defines the behavior of physical laws across different reference frames.

5. What is the primary function of brushes in an electric motor?

- A. To cool the motor
- B. To maintain electrical contact**
- C. To support the rotor
- D. To increase efficiency

The primary function of brushes in an electric motor is to maintain electrical contact. Brushes are typically made of conductive materials such as carbon and are designed to press against the commutator in a DC motor or against the rotor in an AC motor. This contact allows electrical current to flow into the rotating part of the motor, enabling it to generate the magnetic field required for rotation. In a typical scenario, as the motor spins, the brushes ensure that there is a continuous electrical connection, allowing the motor to operate smoothly and efficiently. Without the brushes, the electrical connection would be intermittent or non-existent, leading to the motor not functioning properly. While cooling the motor is important for overall performance, the brushes primarily facilitate the essential electrical connection that makes motor operation possible. Supporting the rotor and increasing efficiency may be secondary benefits in some designs, but the fundamental role of brushes is indeed to maintain that vital electrical contact between stationary and rotating parts.

6. Which term best describes forces that are not due to physical interactions but are considered in accelerating frames of reference?

- A. Inertial forces
- B. Weightless forces
- C. Fictive forces**
- D. Non-inertial forces

The term that best describes forces that arise in accelerating frames of reference, but are not due to physical interactions, is "fictive forces." These forces are not the result of a direct physical influence but are perceived due to the motion of the observer's frame of reference. For example, when you are in a car that accelerates, you feel as if you are being pushed back against the seat; this sensation arises from the car's acceleration rather than a traditional force acting on you. In accelerating frames, fictive forces help to account for the motion in a way that aligns with the principles of classical mechanics. They allow observers in non-inertial frames to apply Newton's laws as if they were in inertial frames by introducing these additional forces for convenience. Common examples include the centrifugal force you feel when making a sharp turn or the Coriolis effect experienced in rotating systems. The other terms do not adequately describe the concept of forces that arise from the frame of reference. Inertial forces refer to the actual forces experienced by objects in an inertial frame, while non-inertial forces typically relate to the forces experienced in such frames, but this term does not specifically connote the absence of physical interaction like fictive forces do. Weightless

7. What term describes the time it takes for half the given mass of a radioactive element to change into a new element?

- A. Decay rate
- B. Decay constant
- C. Half life**
- D. Exponential decay

The correct term for the time it takes for half of a given mass of a radioactive element to decay into a different element is known as half-life. This concept is fundamental in the study of radioactivity and nuclear physics, as it quantifies the rate at which a radioactive substance transforms. Half-life provides a clear measure of the stability of a radioactive isotope, with shorter half-lives indicating that the material decays more quickly. Understanding half-life is crucial because it allows scientists to predict how long it will take for a sample to reduce to a certain amount or to understand the behavior of radioactive materials in various contexts, such as in dating archaeological finds or managing radioactive waste. The other terms mentioned do not accurately describe this specific time frame. The decay rate refers to how frequently decay events occur over time, while the decay constant is a proportionality factor that defines the rate of decay for a particular substance, but does not directly convey the time-related aspect of half-life. Exponential decay describes the process by which the quantity of a radioactive substance decreases over time, but again, it does not specifically measure the time it takes to reach half of the original quantity. Thus, half-life is the most accurate and relevant term for this concept.

8. What phenomenon describes the apparent contraction of an object's length in the direction of motion as observed by a stationary observer?

- A. Mass dilation
- B. Length contraction**
- C. Time dilation
- D. Relative motion

The phenomenon that describes the apparent contraction of an object's length in the direction of motion, as perceived by a stationary observer, is indeed length contraction. This effect is a fundamental aspect of Einstein's theory of special relativity. According to this theory, as an object moves closer to the speed of light, it appears to shorten in length along the direction of its motion from the perspective of an observer who is not moving with the object. Length contraction occurs because the laws of physics are the same for all observers regardless of their relative speeds. When an object approaches relativistic speeds (close to the speed of light), time appears to pass slower for that object from the perspective of the stationary observer, which factors into how distance is perceived. This results in a measurable contraction of length along the direction of motion. The other concepts, such as mass dilation and time dilation, relate to different effects observed in relativistic physics, but do not describe the contraction of length. Mass dilation refers to how an object's mass appears to increase with speed, while time dilation involves the differing passage of time as observed from different reference frames. Relative motion is a broader term that encompasses the movement of objects concerning one another, rather than a specific effect like length contraction.

9. Which imaging technique utilizes short-lived radioisotopes produced in accelerators?

- A. X-ray computed tomography (CT)
- B. Positron emission tomography (PET)**
- C. Magnetic resonance imaging (MRI)
- D. Ultrasound

Positron emission tomography (PET) is a medical imaging technique that indeed utilizes short-lived radioisotopes produced in particle accelerators or nuclear reactors. In PET scans, these radioisotopes are typically isotopes such as carbon-11 or fluorine-18, which are incorporated into forms of glucose or other biologically relevant molecules. When these compounds are injected into the body, they emit positrons as they decay. When a positron encounters an electron, they annihilate each other, resulting in the emission of gamma rays. PET scanners detect these gamma rays, allowing for the visualization of metabolic processes in the body, providing critical information regarding diseases such as cancer. In contrast, techniques like X-ray computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound do not use radioisotopes for imaging. CT scans primarily rely on X-rays, MRI utilizes strong magnetic fields and radio waves, and ultrasound employs high-frequency sound waves to create images of the body's internal structures. Thus, PET is the only technique listed that matches the criteria for using short-lived radioisotopes produced in accelerators.

10. What effect does gravity have on the motion of a spacecraft according to the slingshot effect?

- A. Slows it down
- B. Increases fuel efficiency
- C. Accelerates it**
- D. Changes its trajectory

The slingshot effect, also known as gravity assist, utilizes the gravitational field of a celestial body to alter the speed and direction of a spacecraft. When a spacecraft approaches a planet, it falls towards the planet due to gravity, gaining speed as it does so. As the spacecraft swings around the planet, it can also gain additional speed by using the planet's orbital motion, effectively transferring some of the planet's momentum to the spacecraft. The acceleration of the spacecraft occurs because it is drawn into the gravitational well of the planet, allowing it to move faster as it exits the gravitational influence. This technique is beneficial for missions requiring high speeds to reach distant destinations without expending additional fuel. By maximizing the gravitational pull of the planet, the spacecraft can achieve increased velocity, making it a crucial tool in space travel strategies. In contrast, options related to slowing down or changing the trajectory without an increase in speed do not accurately capture the primary purpose and function of the slingshot effect regarding an increase in speed and efficiency of the spacecraft's journey.

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://hscphysics.examzify.com>

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

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