ELECTROSTATICS PRACTICE TEST (SAMPLE)

STUDY GUIDE

SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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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. State the energy density of an electrostatic field in vacuum.

A. u = ε0 E

B. u = (1/2) ε0 E

C. u = (1/2) E^2

D. u = (1/2) ε0 E^2

2. Which statement correctly describes the electric field due to an infinite plane sheet of charge with surface density σ?

A. The field is parallel to the sheet

B. The field is perpendicular to the sheet with magnitude ε0/σ on each side

C. The field is zero on both sides

D. The field is perpendicular to the sheet with magnitude σ/(2 ε0) on each side

3. There are two types of electric charges. Which are they?

A. Neutral and Charged

B. Positive and Negative

C. Static and Dynamic

D. Conducting and Insulating

4. How does increasing plate area A affect the capacitance of a parallel-plate capacitor at fixed separation and dielectric?

A. C   A^2

B. C   1/A

C. C   A

D. C is independent of A

5. What happens to the capacitance when a dielectric fully fills the space between the plates?

A. C′ = κ C0

B. C′ = C0 / κ

C. C′ = κ^2 C0

D. C′ = C0

6. What is the energy stored in a charged capacitor?

A. U = (1/2) C V^2

B. U = C V^2

C. U = Q V

D. U = Q^2 / (2 C)

7. Electric field E is defined as the force Fe on a test charge q0 divided by q0, and its direction corresponds to the force on a positive test charge.

A. E is a scalar quantity.

B. E has no direction.

C. E equals the potential energy per charge.

D. E is a vector defined as Fe/q0 with direction equal to the force on a positive test charge.

8. The electric field due to a single positive point charge at distance r points in which direction?

A. Toward the charge

B. Tangential to a circle around the charge

C. Perpendicular to the radius toward the charge

D. Away from the charge

9. A test charge q is moved through a potential difference ΔV by an external agent. What is the work done by the external agent?

A. W_ext = q ΔV

B. W_ext = ΔV / q

C. W_ext = q^2 ΔV

D. W_ext = ΔV

10. In a circuit with a voltmeter and an ammeter used to measure current and voltage across a resistor, where should the ammeter and voltmeter be placed?

A. The ammeter should be placed before the resistor and the voltmeter after the resistor in its path.

B. The ammeter should be placed before the resistor and the voltmeter across the resistor

C. The voltmeter should be placed after the resistor and the ammeter in parallel with the resistor

D. Both meters should be placed in parallel with the resistor

Answers

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

Explanations

1. State the energy density of an electrostatic field in vacuum.

A. u = ε0 E

B. u = (1/2) ε0 E

C. u = (1/2) E^2

D. u = (1/2) ε0 E^2

The energy stored per unit volume in an electrostatic field in vacuum scales with the square of the field strength, with a proportionality constant of one-half the vacuum permittivity. This gives u = (1/2) ε0 E^2. The reason is that energy density in fields grows with the field magnitude squared, and ε0 sets the field–energy coupling in vacuum. In vacuum, ε0 is the full permittivity, so it appears in the expression. The other forms either miss the square on the field or omit ε0, which would give incorrect units or the wrong dependence on E.

2. Which statement correctly describes the electric field due to an infinite plane sheet of charge with surface density σ?

A. The field is parallel to the sheet

B. The field is perpendicular to the sheet with magnitude ε0/σ on each side

C. The field is zero on both sides

D. The field is perpendicular to the sheet with magnitude σ/(2 ε0) on each side

An infinite plane of charge creates a uniform electric field that is perpendicular to the plane on both sides, and its strength does not depend on distance from the plane. Using Gauss's law with a pillbox straddling the plane, the enclosed charge is σA and the total outward flux is E A on each side, so 2E A = σA/ε0, giving E = σ/(2ε0). The field points away from the plane for positive σ (toward it for negative σ). So the description that fits is a field perpendicular to the sheet with magnitude σ/(2ε0) on each side. The field is not parallel to the sheet, the magnitude isn't ε0/σ, and the field is not zero.

3. There are two types of electric charges. Which are they?

A. Neutral and Charged

B. Positive and Negative

C. Static and Dynamic

D. Conducting and Insulating

Electric charge comes in two signs: positive and negative. Protons carry positive charge and electrons carry negative charge, so objects are charged when they have an excess or deficit of electrons; when there's no net excess or deficit, the object is neutral. The two signs are fundamental because charges of opposite signs attract and like signs repel, and the magnitude of a charge is a multiple of the elementary charge. The other options describe states or material properties rather than the signs of charge: neutral vs charged is about having zero net charge, static vs dynamic refers to whether the charge is at rest or moving, and conducting vs insulating describes how easily charge flows in a material.

4. How does increasing plate area A affect the capacitance of a parallel-plate capacitor at fixed separation and dielectric?

A. C   A^2

B. C   1/A

C. C   A

D. C is independent of A

In a parallel-plate capacitor, the ability to store charge per volt scales with the overlapping plate area. With fixed separation d and dielectric ε, the capacitance is C = εε0 A / d. This means doubling the plate area doubles the capacitance, because each unit area behaves like its own tiny capacitor and these add in parallel. So increasing A increases C linearly, and the constant of proportionality εε0/d sets how large C becomes for a given area. The other options would require nonlinear, inverse, or no dependence on area, which contradicts the formula and the parallel arrangement.

5. What happens to the capacitance when a dielectric fully fills the space between the plates?

A. C′ = κ C0

B. C′ = C0 / κ

C. C′ = κ^2 C0

D. C′ = C0

The key idea is that inserting a dielectric between the plates increases the capacitor's ability to store charge for the same voltage by a factor equal to the dielectric constant, κ. For a parallel-plate capacitor with vacuum, the capacitance is C0 = ε0 A / d. When a dielectric with relative permittivity κ fills the space, the permittivity becomes ε = ε0 κ, so the capacitance becomes C = ε A / d = ε0 κ A / d = κ C0. This means the new capacitance is larger by κ, not smaller or the same, and not κ squared. The dielectric reduces the electric field for the same charge, and that reduction directly translates into a larger capacitance by the factor κ.

6. What is the energy stored in a charged capacitor?

A. U = (1/2) C V^2

B. U = C V^2

C. U = Q V

D. U = Q^2 / (2 C)

Energy stored in a capacitor is the work required to assemble the charges against the electric field between the plates. If the capacitor carries charge Q, the voltage is V = Q/C. The small amount of work to add a bit of charge dq is V dq, so the total energy is U = ∫ from 0 to Q of V(q) dq = ∫0^Q (q/C) dq = Q^2/(2C). Substituting Q = CV gives U = (1/2) C V^2. This shows the same energy can be written in multiple equivalent forms, such as (1/2) C V^2, or (1/2) QV, or Q^2/(2C). In the given context, the standard form in terms of C and V is (1/2) C V^2, which is why that option is correct.

7. Electric field E is defined as the force Fe on a test charge q0 divided by q0, and its direction corresponds to the force on a positive test charge.

A. E is a scalar quantity.

B. E has no direction.

C. E equals the potential energy per charge.

D. E is a vector defined as Fe/q0 with direction equal to the force on a positive test charge.

Electric field is a vector field that tells us the force a unit positive test charge would feel at each point in space. It is defined as E = Fe / q0, and its direction is the same as the force on a positive test charge. This means E has both magnitude and direction, so it isn't a scalar and it isn't directionless. It isn't the potential energy per charge—that quantity is electric potential (voltage), not the field. The statement that matches the definition describes E as a vector given by Fe divided by q0, with its direction aligned with the force on a positive test charge.

8. The electric field due to a single positive point charge at distance r points in which direction?

A. Toward the charge

B. Tangential to a circle around the charge

C. Perpendicular to the radius toward the charge

D. Away from the charge

The electric field from a positive point charge radiates outward. At any point a distance r away, the field points along the line from the charge to that point, away from the charge. This follows from E = F/q: a small positive test charge placed in the field would experience a force in the same direction as the field, which for a positive source charge is away from the source. The magnitude is kq/r^2, but the direction remains outward along the radial line. So the field points away from the charge. Choices describing a direction toward the charge, tangential to a circle around the charge, or perpendicular to the radius toward the charge do not match the radial, outward nature of the field for a positive charge.

9. A test charge q is moved through a potential difference ΔV by an external agent. What is the work done by the external agent?

A. W_ext = q ΔV

B. W_ext = ΔV / q

C. W_ext = q^2 ΔV

D. W_ext = ΔV

Moving a charge through a potential difference changes its electric potential energy by ΔU = q ΔV. If you move the charge slowly so its kinetic energy stays the same, the work you do is exactly this change in potential energy, so W_ext = ΔU = q ΔV. The units also line up: volts times coulombs give joules, which are units of energy. The other expressions don't have the right units or physical meaning for work in this context.

10. In a circuit with a voltmeter and an ammeter used to measure current and voltage across a resistor, where should the ammeter and voltmeter be placed?

A. The ammeter should be placed before the resistor and the voltmeter after the resistor in its path.

B. The ammeter should be placed before the resistor and the voltmeter across the resistor

C. The voltmeter should be placed after the resistor and the ammeter in parallel with the resistor

D. Both meters should be placed in parallel with the resistor

Measuring current and voltage correctly requires meters to be placed in the proper places so they don't disturb the circuit. An ammeter must be in series with the component whose current you want to measure, so all the current flowing through the resistor also flows through the ammeter. A voltmeter, on the other hand, must be connected in parallel with the component so it can measure the voltage drop across that component without drawing significant current from the circuit. If you place the voltmeter in series, it would force a high-resistance path and give an incorrect voltage reading; if the ammeter is placed in parallel, it could short out part of the circuit or bypass the resistor, leading to wrong current measurement. So the correct setup is to place the ammeter in series with the resistor and connect the voltmeter across the resistor to read its voltage drop.

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://electrostatics.examzify.com

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